SEMESTER 3rd		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-301	Strength of Materials	3	1	0	40	60	100	4
BCIE1-302	Fluid Mechanics	3	1	0	40	60	100	4
BCIE1-303	Irrigation Engineering-I	3	1	0	40	60	100	4
BCIE1-304	Building Materials	3	1	0	40	60	100	4
BCIE1-305	Rock Mechanics & Engineering Geology	2	0	0	40	60	100	2
BHUM0-F91	Soft Skills-I	0	0	2	60	40	100	1
BCIE1-306	Fluid Mechanics Lab.	0	0	2	60	40	100	1
BCIE1-307	Strength of Materials Lab.	0	0	2	60	40	100	1
BCIE1-308	Training-I#	-	-	-	60	40	100	2
Total		**14**	**4**	**6**	**440**	**460**	**900**	**23**

 # 4-Week Training during summer vacations after 2nd semester

SEMESTER 4th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-409	Design of Concrete Structures-I	3	1	0	40	60	100	4
BCIE1-410	Structural Analysis-I	3	1	0	40	60	100	4
BCIE1-411	Surveying	3	1	0	40	60	100	4
BCIE1-412	Environmental Engineering-I	3	1	0	40	60	100	4
BCIE1-413	Construction Project Management	3	0	0	40	60	100	3
BHUM0-F92	Soft Skills-II	0	0	2	60	40	100	1
BCIE1-414	Structural Analysis Lab.	0	0	2	60	40	100	1
BCIE1-415	Surveying Lab.	0	0	2	60	40	100	1
BCIE1-416	Concrete Technology Lab.	0	0	2	60	40	100	1
Total		**15**	**4**	**8**	**440**	**460**	**900**	**23**

SEMESTER 5th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-517	Design of Steel Structures-I	3	1	0	40	60	100	4
BCIE1-518	Transportation Engineering-I	3	1	0	40	60	100	4
BCIE1-519	Environmental Engineering-II	3	1	0	40	60	100	4
BCIE1-520	Geomatics Engineering	3	1	0	40	60	100	4
BCIE1-521	Disaster Management	2	0	0	40	60	100	2
BHUM0-F93	Soft Skills-III	0	0	2	60	40	100	1
BCIE1-522	Environmental Engineering Lab.	0	0	2	60	40	100	1
BCIE1-523	Transportation Engineering Lab.	0	0	2	60	40	100	1
BCIE1-524	Training-II (Survey Camp)#	0	0	4	60	40	100	2
Total		**14**	**4**	**10**	**440**	**460**	**900**	**23**

 # 6-Week Training during summer vacations after 4th semester

SEMESTER 6th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-625	Design of Concrete Structures-II	3	1	0	40	60	100	4
BCIE1-626	Geotechnical Engineering	3	1	0	40	60	100	4
BCIE1-627	Numerical Methods in Civil Engineering	3	1	0	40	60	100	4
BCIE1-628	Structural Analysis-II	3	1	0	40	60	100	4
BCIE1-629	Estimating and Costing	3	0	0	40	60	100	3
BHUM0-F94	Soft Skills-IV	0	0	2	60	40	100	1
BCIE1-630	Geotechnical Engineering Lab.	0	0	2	60	40	100	1
BCIE1-631	Concrete Structures Drawing	0	0	2	60	40	100	1
Total		**15**	**4**	**6**	**380**	**420**	**800**	**22**

SEMESTER 7th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-732	Design of Steel Structures-II	3	1	0	40	60	100	4
BCIE1-733	Foundation Engineering	3	1	0	40	60	100	4
BCIE1-734	Irrigation Engineering-II	3	1	0	40	60	100	4
Departmental Elective-I (select any one)		3	1	0	40	60	100	4
BCIE1-756	Pre-Stressed Concrete							
BCIE1-757	Bridge Engineering							
BCIE1-758	Solid Waste Management							
BCIE1-759	Ground Improvement Techniques							
BCIE1-735	Steel Structures Drawing	0	0	2	60	40	100	1
BCIE1-736	Hydraulic Structures Drawing	0	0	2	60	40	100	1
BCIE1-737	Training-III#	0	0	4	60	40	100	2
Total		**12**	**4**	**8**	**340**	**360**	**700**	**20**

 # 8-Week In-House / Industrial Training during summer vacations after 6th semester

SEMESTER 8th		Contact Hrs			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BCIE1-838	Transportation Engineering-II	3	1	0	40	60	100	4
BCIE1-839	Earthquake Resistant Design of Structures	3	1	0	40	60	100	4
Departmental Elective-II (select any one)		3	1	0	40	60	100	4
BCIE1-860	Hydrology & Dams							
BCIE1-861	Pavement Engineering							
BCIE1-862	Advanced Structural Analysis							
BCIE1-863	Advanced Reinforcing Techniques in Soils							
Open Elective-I (select any one)		3	0	0	40	60	100	3
BCIE1-840	Software Lab.	0	0	2	60	40	100	1
BCIE1-841	Advanced Testing Lab.	0	0	2	60	40	100	1
BCIE1-842	Major Project	0	0	6	60	40	100	2
Total		**12**	**3**	**10**	**340**	**360**	**700**	**19**

STRENGTH OF MATERIALS

Subject Code: BCIE1-301 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Unit-I

1. Simple Stresses and Strains: Introduction, stress-strain curves for elastic materials, different types of stresses and strains, elastic limit, Hookes' Law, Young's modulus of elasticity, Bulk modulus, modulus of rigidity, Lateral strain, Elongation due to self-weight bars of tapering sections, bars of varying sections, equivalent area of composite sections, temperature stresses, relation between elastic constants. Volumetric strain.

2. Complex Stress: Introduction, rectangular block subjected to normal stresses along and across two planes, combination of normal and tangential stresses, pure shear, principal stresses and Principal planes, Mohrs Circle, Principal strains, Computation of Principal stresses from Principal strains.

Unit-II

3. Bending moment & shear force diagrams: Introduction, Types of beams, supports and loading, sign conventions for bending moments and shear forces, Shear force and Bending moment diagrams for simply supported, cantilever and overhanging beams for different types of loading. Relationship between Bending moment, Shear Force and loading Graphical method of plotting Bending Moment & Shear Force Diagrams.

4. Bending and Shear Stresses: Introduction, Assumption made in theory of simple bending, derivation of basic equation, determination of stresses in simple sections, built up sections and composite sections. (flitched Beams), Introduction to theory of unsymmetrical bending beams of uniform strength, variation of shear stress across depth of various beam sections.

Unit-III

5. Torsion: Introduction, torsion of shafts and springs, derivation of basic torsion equation, Power transmitted, sections subjected to combined bending and torsion, Principal stresses, equivalent Bending Moment & Torque, Helical spring, analysis of closed Coil helical spring.

6. Strain Energy: Introduction, Strain Energy due to axial Loads, Bending shear and Torsional stress, Impact load, strain energy due to Principal stress & strains, theories of failure.

Unit-IV

7. Deflection of Beams: Derivation of basic equation of elastic curve, deflection in beams with different end conditions and different loadings by double integration method, Macaulay's method.

8. Columns and Struts: Introduction, Euler's buckling loads for columns with different end conditions, limitations of Euler's formula, column carrying eccentric loads, laterally loaded columns, empirical formula.

Recommended Books:

1. Ferdinand P. Beer, E. Russell Johnston Jr., John T. Dewolf and David F. Mazurek, 'Mechanics of Materials (In SI Units)'.
2. D.K. Singh, 'Mechanics of Solids', Pearson Education, **2002**.
3. Stephen H. Crandall, Norman C. Dahl and Thomas J. Lardner, 'An Introduction to the Mechanics of Solids', McGraw-Hill International Editions.
4. Egor P. Popov, 'Engineering Mechanics of Solids', Prentice-Hall of India.

FLUID MECHANICS

Subject Code: BCIE1-302 **L T P C** **Contact Hrs.: 45**
3 1 0 4

UNIT-I

1. **Fluid and their Properties:** Ideal and real fluids, Continuum concept of fluid: density, specific weight and relative density, viscosity and its dependence on temperature, surface tension and capillarity, vapour pressure and cavitation, compressibility band bulk modulus, Newtonian and non-Newtonian fluids.
2. **Fluid Statics:** Concept of pressure, Pascal's law, Action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and centre of pressure, force on a curved surface due to hydrostatic pressure, Buoyancy and flotation, stability of floating and submerged bodies, Meta centric height and its determination.

UNIT-II

3. **Fluid Kinematics:** Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, path line and streak line, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates, stream & velocity potential functions.
4. **Fluid Dynamics:** Euler's equation, Bernoulli's equation and steady flow energy equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions.

UNIT-III

5. **Dimensional Analysis and Similitude:** Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh's and Buckingham's Pi method for dimensional analysis, dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies, Flow Measurement in Manometers, Pitot tubes, Venturimeter and orifice meters, orifices, mouthpieces, notches **(Rectangular and V-notches)** and weirs **(Sharp crested Weirs)**.
6. **Laminar& Turbulent Flow:** Flow through circular section pipe, flow between parallel plates, stokes law, Transition from laminar to turbulent, Critical velocity and critical Reynolds Number Turbulent flows and flow losses in pipes, Darcy equation minor head losses in pipe fittings, hydraulic and energy gradient lines, Effects of turbulent flow in pipes.

UNIT-IV

7. **Uniform flow in open Channels:** Flow classifications, basic resistance equation for open channel flow, Chezy, Manning, Bazin and Kutter formulae, Variation of roughness coefficient, conveyance and normal depth, Velocity Distribution, Most efficient flow sections, rectangular, trapezoidal and circular.
8. **Energy principles and critical flow:** Energy and specific energy in an open channel, critical depth for rectangular and trapezoidal channels, Alternate depths, applications of specific energy to transitions and Broads crested weirs, Momentum and specific force in open channel flow, sequent depths.

Recommended Books:

1. P.N. Modi and S.M. Seth, 'Hydraulics & Fluid Mechanics', Standard Publication.
2. S. Subraminayam, 'Flow in Open Channels', Tata McGraw Hill.

3. Robert N. Fox & Alan T. Macnold, 'Introduction to Fluid Mechanics'.
4. R.K. Bansal, 'Fluid Mechanics', Laxmi Publications.
5. Jagdish Lal, 'Fluid Mechanics', Metropolitan Book Co. (P) Ltd.

IRRIGATION ENGINEERING –I

Subject Code: BCIE1-303 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Unit-I

INTRODUCTION: Importance of Irrigation Engineering, purposes of Irrigation, objectives of Irrigation, Benefits of Irrigation, Advantages of various techniques of irrigation- - Furrow Irrigation, Boarder strip Irrigation, Basin Irrigation, Sprinkler Irrigation, Drip Irrigation.

METHODS OF IRRIGATION: Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta, Duty of water, Base Period, relation between delta, duty and base period, Soil crop relation-ship and soil fertility.

Unit-II

CANAL IRRIGATION: Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt Theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories.

LINED CANALS: Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining

Unit-III

LOSSES IN CANALS, WATER LOGGING AND DRAINAGE: Losses in canals Evaporation and seepage, water logging, causes and ill effects of water logging anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

INVESTIGATION AND PREPARATION OF IRRIGATION PROJECTS: Classification of project, Project preparation-investigations, Design of works and drawings, concept of multi - purpose projects, Major, Medium and minor projects, planning of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

Unit-IV

TUBE - WELL IRRIGATION: Types of tube wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, Assumptions, Theim's & Dupuit's formulae, Limitations of Theim's and Dupuit's formulae. Interference of tube wells with canal or adjoining tube-wells, causes of failure of tubewells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tube well.

RIVER TRAINING WORKS: Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Natural cut-offs and Artificial cut-offs and design Considerations.

Recommended Books:

1. S.K. Sharma, 'Principles & Practice of Irrigation Engg.', S. Chand, Ltd.
2. B.C. Punmia, Pande B.B. Lal, 'Irrigation & Water Power Engg.', Laxmi Publications (P) Ltd.
3. Bharat Singh, 'Fundamentals of Irrigation Engg.', Nem Chand & Bros.
4. S.R. Sahasrabudhe, 'Irrigation Engg. & Hydraulic Structure', S.K. Kataria & Sons.
5. Varshney, Gupta & Gupta, 'Irrigation Engg. & Hydraulic Structure', Nem Chand and Brothers.
6. Santosh Kumar Garg, 'Irrigation Engg. & Hydraulic Structure', Khanna Publishers.

BUILDING MATERIALS

Subject Code: BCIE1-304 **L T P C** **Contact Hrs.: 45**
3 1 0 4

Unit - I

Building Stones: General, Uses of stones, natural bed of stones, qualities of a good building stone, deterioration of stones, preservation of stones, artificial stones, common building stones of India and their uses.

Bricks: General, Composition of good brick earth, Harmful ingredients in brick earth, qualities of good bricks, tests for bricks, classification of bricks.

Timber: Definition, classification of trees, structure of a tree, felling of trees, seasoning of timber, storage of timber, market forms of timber.

Unit - II

Lime: General, some definitions calcination, Hydraulicity, setting, slacking, sources of lime, classification of limes, uses of lime, tests for lime stones.

Cement: Constituents of Cement, Manufacture of Portland cement

Concrete: Introduction, Constituents of concrete, batching of materials, Manufacturing process of cement concrete, workability and factors affecting it, Methods to determine workability, segregation and bleeding of concrete, Strength of concrete and factors affecting it.

Miscellaneous Materials: Paints, Distempering, Glass, Plastics.

Unit - III

Foundation and Walls: Definition, types of foundations, Types of walls and thickness considerations.

Brick and Stone Masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlars joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage.

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Unit - IV

Roofs: Terms used, Classification of roofs and roof trusses, Different roof covering materials.

Plastering and Pointing: Objects, Methods of plastering, Materials and types, Defects in plastering, special material for plastered surface, distempering white washing and colour washing.

Floors: General, Types of floors used in building & and their suitability, factors for selecting suitable floor for building.

Recommended Books:

1. Rangwala, 'Building Materials'.
2. S.P. Bindra, K.R. Arora, 'Building Construction'.
3. M.S. Shetty, 'Concrete Technology'.
4. B.C. Punmia, 'Building construction'.
5. Parbin Singh, 'Building Materials'.
6. Sushil Kumar, 'Building Construction'.

ROCK MECHANICS & ENGINEERING GEOLOGY

Subject Code: BCIE1-305 **L T P C** **Contact Hrs.: 26**
2 0 0 2

UNIT-I

1. **General Geology:** Importance of Engg. Geology applied to Civil Engg. Practices, Weathering, Definition- types and effect, Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.
2. **Rocks & Minerals:** Minerals, their identification, igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes, Rock quality designation (RQD).

UNIT-II

3. **Structural Geology:** Brief idea about stratification, apparent dip, true dip, strike and in Conformities, Folds, faults & joints: definition, classification relation to engineering operations.
4. **Engineering Geology:** Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, reservoirs. Earthquake: Definition, terminology, earthquake waves, intensity, recording of earthquake.

UNIT-III

5. **Engineering properties of rocks and laboratory measurement:** Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature.
6. **In-situ determination of Engineering Properties of Rock masses:** Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test, Simple methods of determining in situ stresses, bore hole test.

UNIT-IV

7. **Improvement in Properties of Rock Masses**: Pressure grouting for dams and tunnels, Rock reinforcement, rock bolting.

Recommended Books:

1. Richard E. Goodman, 'Introduction to Rock Mechanics'.
2. I.W. Farmar, 'Engineering Behaviour of Rocks'.
3. C. Jaager, 'Rock Mechanics and Engineering'.
4. Jaager and Cook, 'Fundamentals of Rock Mechanics'.
5. D.S. Arora, 'Engineering Geology'.
6. Parbin Singh, 'Engineering Geology'.
7. B.P. Verma, 'Rock Mechanics for Engineering'.

SOFT SKILLS-I

Subject Code: **BHUM0-F91** **L T P C**
0 0 2 1

Course Objectives
The course aims to cause a basic awareness about the significance of soft skills in professional and interpersonal communications and facilitate an all-round development of personality.

Course Outcomes
At the end of the course, the student will be able to develop his/her personal traits and expose their personality effectively.

UNIT-1

SOFT SKILLS- Introduction to Soft Skills, Aspects of Soft Skills, Identifying your Soft Skills, Negotiation skills, Importance of Soft Skills, Concept of effective communication.
SELF-DISCOVERY- Self-Assessment, Process, Identifying strengths and limitations, SWOT Analysis Grid.

UNIT-2

FORMING VALUES- Values and Attitudes, Importance of Values, Self-Discipline, Personal Values - Cultural Values-Social Values-some examples, Recognition of one's own limits and deficiencies.

UNIT-3

ART OF LISTENING- Proxemics, Haptics: The Language of Touch, Meta Communication, Listening Skills, Types of Listening, Listening tips.

UNIT-4

ETIQUETTE AND MANNERS- ETIQUETTE- Introduction, Modern Etiquette, Benefits of Etiquette, Taboo topics, Do's and Don'ts for Men and Women. MANNERS- Introduction, Importance of manners at various occasions, Professional manners, Mobile manners. CORPORATE GROOMING TIPS- Dressing for Office: Do's and Don'ts for Men and Women, Annoying Office Habits.

RECOMMENDED BOOKS

1. K. Alex, S. Chand Publishers.
2. Butterfield, Jeff, 'Soft Skills for Everyone', Cengage Learning, New Delhi, **2010**.
3. G.S. Chauhan and Sangeeta Sharma, 'Soft Skills', Wiley, New Delhi, **2016**.
4. Klaus, Peggy, Jane Rohman & Molly Hamaker, 'The Hard Truth About Soft Skills', Harper Collins E-books, London, **2007**.
5. S.J. Petes, Francis, 'Soft Skills and Professional Communication', Tata McGraw Hill Education, New Delhi, **2011**.

FLUID MECHANICS LAB.

Subject Code: BCIEI-306 **L T P C**
0 0 2 1

1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.
2. To study the flow through a variable area duct and verify Bernoulii's energy equation.

3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter/orifice meter)
4. To determine the discharge coefficient for a Vee notch or rectangular notch.
5. To determine the coefficient of discharge for Broad crested weir.
6. To determine the hydraulic coefficients for flow through an orifice.
7. To determine the friction coefficient for pipes of different diameter.
8. To determine the head loss in a pipe line due to sudden expansion/sudden contraction/ bend.
9. To determine the velocity distribution for pipe line flow with a pitot static probe.

Recommended Books

1. John J. Bloomer, 'Practical Fluid Mechanics for Engineering Applications (Mechanical Engineering), Marcel Dekker.
2. S. Sarabjit Singh, 'Fluid Mechanics Practical Manual'.
3. Baljit Kapoor, 'Fluid Mechanics Manual'.

STRENGTH OF MATERIAL LAB.

Subject Code: BCIE1-307 **L T P C**
0 0 2 1

Experiments on **Material Behaviour:** Tests for Impact, Hardness, Torsion, Stiffness, Tensile Strength, Bending and Compression tests, Columns & Struts.

1. To determine Tensile Strength of Mild Steel.
2. To determine Torsional Strength of Mild Steel and Cast Iron.
3. To determine Impact Strength of Mild Steel – Izod's and Charpy tests.
4. To determine Brinell and Vicker's Hardness numbers of Mild Steel.
5. To determine the Rockwell Hardness number of metals.
6. To determine the Fatigue Strength of Mild Steel.
7. To determine experimentally the value of modulus of elasticity of the beam material using deflections formula for simply supported and cantilever beams.
8. To study the behavior of the given material on UTM.
9. Study of behavior of columns and struts with different end conditions.

Recommended Books

1. Timoshenko and D.H. Young, 'Elements of Strength of Materials', Van Nostrand Reinhold Company, New York.
2. Seely and Sindh, 'Advanced Mechanics of Materials'.
3. S. Ramamarutham, 'Strength of Materials', Dhanpat Rai and Sons.
4. IS: 1608-1972-Method for Testing of Steel Products.
5. IS: 1521-1972-Method for Tensile Testing of Steel Wire.
6. IS: 1717-1971-Method for Simple Torsion Testing of Steel Wire.
7. IS: 524-1969-Method of Test for determining Shear Strength of Mild Steel.
8. IS: 1598-1960-Izod Impact Test for Steel.
9. IS: 1499-1959-Method for Charpy Impact Test (U-Notch) for Steel.
10. IS; 1500-1668-Method for Brinell Hardness Test for Steel.
11. IS: 1586-1968-Method for Rockwell Hardness Test for Steel.

12. IS: 1599-1960-Method for Bend Test for Steel Products other than Sheet, Strip, Wire and Tube.
13. IS: 5619-1970-Indian Standard Recommendations for Fatigue Testing of Metals.
14. Manual on Fatigue Testing, A.S.T.M. Special Technical Publication No. 91.
15. IS: 5069-1969- Indian Standard on Glossary of terms relating to methods of mechanical testing of metals.

DESIGN OF CONCRETE STRUCTURE-I

Subject Code: BCIE1-409 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: 1. IS 456, Indian Standard. Plain and Reinforced Concrete -Code of practice is permitted in examination.
2. Examiner requested to provide requisite data for Mix Design Problems; if any.

Unit-I

CONCRETE MIX DESIGN: Introduction, Selection of mix proportions, Durability of concrete, Quality Control of concrete, Introduction of various mix proportion methods, Proportioning of concrete mixes by BIS method of mix design.

Unit-II

RCC Design Philosophies: Introduction, Objectives & methods of analysis & Design, Properties of Concrete and Steel. Philosophies of Working Stress Methods (WSM) & Limit State Method (LSM) in RCC design.
Shear, Torsion & Bond (Only Theory/Concept): Types of shear & torsion, importance in RCC Design Structures, IS Provisions for Shear & Torsion, Bond-types of bonds, Anchorage Bond, Development length & its determination.

Unit-III

RCC Beams: Types of beams, Behaviour in Flexure-Singly reinforced beam, Doubly reinforced beam, Flanged beam, Cantilever beam, Neutral Axis, Neutral Axis Depth, Moment of Resistance, Design of beams- Singly reinforced beam, Doubly reinforced beam, Flanged beam, Cantilever beam.
RCC Slabs: Types of slab systems, Guidelines for Design, Design of One Way and Two Way Slab.

Unit-IV

COLUMNS: Classifications (According to Shape, Length and Loading Conditions), Assumptions, Behaviour and Design of Axially Loaded Columns.

Recommended Books

1. M.S. Shetty, ‘Concrete Technology’, S. Chand & Co.
2. A.M. Neville, ‘Properties of Concrete’, Prentice Hall.
3. M.L. Gambhir, ’Concrete Technology’, Tata McGraw Hill Publishers, New Delhi.
4. Pillai & Menon, ‘Reinforced Concrete Design’, Tata McGraw Hill Education.
5. N. Krishna Raju, ‘Advanced Design of Structures’.

STRUCTURAL ANALYSIS-I

Subject Code: BCIE1-410 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit-I

Deflection of Beams: Review of Double Integration Method and Macaulay's Method, Moment Area Method, Conjugate Beam Method, Unit Load Method, Energy Methods, Maxwell's reciprocal theorem.

Thin Cylinders and Spheres: Introduction, stresses and strains in thin cylinders and spherical shell, volumetric change, wire wound thin cylinders, thin vessels subjected to internal pressure.

Unit-II

Analysis of Determinate Trusses: Introduction, determination of forces in member of trusses by method of joints, method of sections, Tension Coefficient Method, Deflection of Joints of plane frames by Castiglioni's first theorem and unit load method, Effect of Lack of Fit & Temperature Change.

Analysis of Dams, Chimneys and Retaining Walls: Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule, wind pressure on chimneys.

Unit-III

Simple Cable & Arch Structures: Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, Analysis of Cables, Analysis of three hinged (Parabolic and Circular) Arches for Horizontal Thrust, Bending Moment, Normal Thrust, and Radial Shear.

Suspension Bridges: Introduction, Analysis of suspension bridges with two hinged and three hinged stiffening girders, Temperature Stresses in Three Hinged and Two Hinged Stiffening Girders.

Unit-IV

Rolling Loads: Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc.

Influence Lines: Construction of Influence lines for reaction, shear forces and bending moment for beams, influence lines for girders with floor beams, Influence lines for forces in members of frames. Influence lines for Three Hinged Arches & Stiffening Girders.

Book Recommended

1. C.S. Reddy, 'Basic Structural Analysis'.
2. Vazirani & Ratwani, 'Analysis of Structures', Vol- I, -II.
3. C.K. Wang, 'Intermediate Structural Analysis'.

SURVEYING

Subject Code: BCIE1-411 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit - I

Definition, principles of surveying, different types of surveys, topographical map, scale of map. Measurement of distances with chain and tape, direct & indirect ranging, offsets.

Instruments used in traversing, bearings, meridians, declination, dip of magnetic needle, bearing of lines from included angles, local attraction, closing error and its removal.

Unit-II

Principle of plane table survey, setting up the plane table and methods of plane tabling.
Setting up a dumpy level, booking and reducing the levels by rise & fall method and height of instrument method, correction due to curvature and refraction, characteristics of contours, methods of contouring, uses of contour maps.

Unit–III

Temporary and permanent adjustments of theodolite, measurement of horizontal and vertical angles, closed & open traverse, consecutive and independent co-ordinates, advantages and disadvantages of traversing, Latitudes and Departures, closing error, Bowditch & Transit Rules, Gales traverse table, Different cases of omitted measurements.
Determination of tachometer constants, Measurement of horizontal & vertical distances with tachometer.

Unit–IV

Selection of stations and base line for geodetic survey, corrections for base line, satellite station and reduction to centre. Elements of curves, different methods of setting out of curves, transition curve.

Recommended Books

1. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, 'Surveying', Vol. I, II, Laxmi Publications, **2005**.
2. R. Agor, 'Surveying', Khanna Publishers, **1982**.
3. S.S. Bhavikatti, 'Surveying & Levelling', Vol. I, II, **2009**.
4. Narinder Singh, 'Surveying', Tata McGraw Hill.
5. N.N. Basak, 'Surveying and Leveling', Tata McGraw Hill, New Delhi, **2000**.

ENVIRONMENTAL ENGINEERING-I

Subject Code: BCIE1-412 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit - I

Introduction: Beneficial uses of water, water demand, per capita demand, variations in demand, water demand for firefighting, population forecasting and water demand estimation.
Water Sources and Development: Surface and ground water sources; Selection and development of sources; Assessment of potential; Flow measurement in closed pipes, intakes and transmission systems.

Unit - II

Pumps and Pumping Stations: Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations.
Quality and Examination of Water: Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.

Unit - III

Water Treatment: Water treatment schemes; Basic principles of water treatment; Design of

Plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and deflouridation, and water desalination and demineralization, taste and odour removal.

Unit - IV

Water Supply Systems: Pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems.

Rural Water Supply: Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques.

Recommended Books

1. B.C. Punmia, Ashok Jain, Arun Jain, 'Water Supply Engineering- Environmental Engg.', Vol.–I, Laxmi Publications, New Delhi.
2. Arcadio P. Sincero and Gregoria P. Sincero, 'Environmental Engg.- A Design Approach', Prentice Hall of India, New Delhi.
3. Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, 'Environmental Engg.' International Edition, McGraw Hill.
4. S.K. Garg, 'Water Supply Engineering- Environmental Engg.', Vol.–I, Khanna Publishers, Delhi.
5. E.W. Steel, McGhee, J. Terence, 'Water Supply and Sewerage', McGraw Hill.

CONSTRUCTION PROJECT MANAGEMENT

Subject Code: BCIE1-413 **L T P C** **Contact Hrs. 36**
3 0 0 3

UNIT-I

INTRODUCTION: Need for project planning & management, time, activity & event, bar chart, Milestone chart, uses & draw backs.

PERT TECHNOLOGY: Construction of PERT network, time estimates, network analysis, forward pass & backward pass, slack, critical path, data reduction, suitability of PERT for research project.

UNIT-II

CPM TECHNOLOGY: Definitions, network construction, critical path, fundamental rules, determination of project schedule, activity time estimates, float types, their significance in project control.

UNIT-III

CONSTRUCTION EQUIPMENT AND MACHINERY: Tractors, bull dozers, rippers, scrappers, power shovels, dragline, hoes. Line diagram of each, sizes, output, uses, factors affecting selection of each equipment, economic life of equipment, maintenance and repair cost. Hoisting & Transporting Equipment: Hosts, Winches, Cranes, Belt conveyors, Ropeways, trucks & Wagons, Introduction to modern constructional equipment.

UNIT-IV

COST ANALYSIS AND CONTRACT: Type of costs, cost time relationships, cost slopes, conducting a crash programme, determining the minimum total cost of project, numerical

problems. updating a project, when to update, time grid diagram, resource scheduling. planning of different components of civil engineering projects such as a house, workshop, dam, tunnel.

Books Recommended

1. R.L. Peurifoy, 'Construction Planning and Equipment', Tata McGraw Hill, New Delhi.
2. L.S. Srinath, 'PERT and CPM'.
3. Wiest & Levy, 'East West Press Management Guide to PERT & CPM', Prentice Hall.
4. Mahesh Verma, 'Construction Equipment & Planning and Application', Artec Publication.
5. U.K. Shrivastava, 'Construction Planning and Management', Galgotia Publications Pvt. Ltd.
6. U.K. Shrivastava, 'Construction Planning and Management', Galgotia Publications.

SOFT SKILLS-II

Subject Code: BHUM0-F92 **L T P C** **Contact Hrs. 25**

0 0 2 1

UNIT-1

DEVELOPING POSITIVE ATTITUDE- Introduction. Formation of attitude. Attitude in workplace. Power of positive attitude. Examples of positive attitudes. Negative attitudes. Examples of negative attitude. overcoming negative attitude and its consequences. **IMPROVING PERCEPTION-** Introduction. Understanding perception. perception and its application in organizations

UNIT-2

CAREER PLANNING-Introduction. Tips for successful career planning. Goal setting-immediate, short term and long term. Strategies to achieve goals. Myths about choosing career.

UNIT-3

ART OF READING-Introduction. Benefits of reading. Tips for effective reading. the SQ3R technique. Different stages of reading. determining reading rate of students. Activities to increase the reading rate. Problems faced. Becoming an effective reader.

UNIT-4

STRESS MANAGEMENT - Introduction. meaning. positive and negative stress. Sources of stress. Case studies. signs of stress. Stress management tips. Teenage stress.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Rizvi, M. Ashraf, 'Effective Technical Communication', McGraw Hill.
3. Mohan Krishna & Meera Banerji, 'Developing Communication Skills', Macmillan.
4. Kamin, Maxine, 'Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams & Leaders', Pfeiffer & Amp; Company, Washington, DC, **2013**.

STRUCTURAL ANALYSIS LAB.

Subject Code: BCIE1-414 **L T P C** **Contact Hrs. 24**

0 0 2 1

EXPERIMENTS

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem.
2. To determine the Flexural Rigidity of a given beam.

3. To verify the Moment- area theorem for slope and deflection of a given beam.
4. To determine the Carry Over Factor of a prismatic beam with far end fixed.
5. Experiment on three-hinged arch.
6. Experiment on two-hinged arch.
7. Deflection of a statically determinate pin jointed truss.
8. Forces in members of a redundant frame.
9. Experiment on curved beams.
10. Unsymmetrical bending of a cantilever beam.

SURVEYING LAB.

Subject Code: BCIE1-415 **L T P C** **Contact Hrs. 24**
0 0 2 1

1. Measurement of distance, ranging a line.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical
3. method.
4. Different methods of leveling, height of instrument, rise & fall methods.
5. Measurement of horizontal and vertical angle by theodolite.
6. Determination of tachometric constants and determination of reduced levels by tachometric observations.
7. Plane table survey, different methods of plotting, two point & three point problem.
8. Determination of height of an inaccessible object.
9. Setting out a transition curve. Setting out of circular curves in the field using different methods.
10. Introduction of Total Station.

CONCRETE TECHNOLOGY LAB.

Subject Code: BCIE1-416 **L T P C** **Contact Hrs. 24**
0 0 2 1

EXPERIMENTS

1. To Determine the Specific Gravity and Soundness of cement.
2. To Determine the Standard Consistency, Setting Time (Initial and Final Setting Time) of Cement.
3. To Determine the Compressive Strength of Cement.
4. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Fine and Coarse Aggregates.
5. To Determine the workability of Concrete using:
6. (i) Slump Cone Method, (ii) Compaction Factor and (iii) Vee-Bee Time of Concrete.
7. Mix Design of Concrete by IS methods.
8. To Determine the Compressive Strength of Concrete by Cube and Cylinder.
9. To carry out the Split Tensile strength of Concrete.
10. To carry out the Flexural strength of Concrete.
11. To Determine the Compressive strength of Bricks and Tiles as IS standard.

Recommended Books/Manuals

1. M.L. Gambhir, 'Concrete Manual', Dhanpat Rai & Sons Delhi.
2. 'Concrete Lab. Manual', TTTI Chandigarh.
3. M.S. Shetty, 'Concrete Technology, Theory and Practice', S. Chand & Company.

DESIGN OF STEEL STRUCTURES – I

Subject Code: BCIE1-517 **L T P C** **Contact Hrs. 45**
3 1 0 4

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Note: IS 800:2007, General construction in Steel-Code of practice is permitted in examination.

Unit - I

Introduction: Properties of structural steel, I.S. rolled sections, I.S. specifications. **Connections**: Riveted, bolted and welded connections for axial and eccentric loads.

Unit - II

Tension Members: Design of members subjected to axial tension using bolts and welds

Compression Members: Design of axially loaded members, built-up columns, laced and battened columns including the design of lacing and battens using bolts and welds.

Unit - III

Flexural Members: Design of laterally restrained and un-restrained rolled and built-up sections, encased beams using bolts and welds.

Foundation: Design of slab base, gusseted base and grillage foundation using bolts and welds.

Unit - IV

Roof Truss: Design of roof truss using bolts and welds.

Books & Codes Recommended

1. S.K. Duggal, 'Limit State Design of Steel Structures', McGraw Hill.
2. N. Subramanian, 'Design of Steel Structures', Oxford Higher Education.
3. 'Design of Steel Structures', Vol. -1, Ram Chandra Standard Book House – Rajsons.
4. S S Bhavikatti, 'Design of Steel Structures' (by limit state method as per IS: 800-2007)', I.K. International Publishing House.
5. 'IS 800: 2007 (General construction in Steel-Code of practice)'.

TRANSPORTATION ENGINEERING–I

Subject Code: BCIE1-518 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit I

Introduction: Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

Highway Development & Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys.

Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

Unit II

Highway Geometric Design: Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.

Highway Materials: Properties of Sub-grade and Pavement Component Materials, Tests on Sub-Grade Soil, Aggregates and Bituminous Materials.

Highway Construction: Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.

Unit III

Introduction to Pavements Design: Types and Introduction of pavements design.

Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.

Highway Economics & Financing: Total Transportation Cost, Economic Analysis, Sources of Highway Financing.

Unit IV

Traffic Characteristics: Road User Characteristics, Driver Characteristics, Vehicular Characteristics.

Traffic Studies: Volume Studies, Speed Studies, O-D Survey, Parking Study.

Traffic Safety and Control Measures: Traffic Signs, Markings, Islands, Signals, Cause and Type of Accidents, Use of Intelligent Transport System.

Traffic Environment Interaction: Noise Pollution, Vehicular Emission, Pollution Mitigation Measures.

Recommended Books

1. S.K. Khanna and C.E.G. Justo, 'Highway Engineering', Nem Chand and Brothers, Roorkee.
2. L.R. Kadiyali, 'Principles and Practice of Highway Engineering', Khanna Publishers, New Delhi.
3. S.K. Sharma, 'Principles, Practice & Design of Highway Engineering', S. Chand & Company Ltd., New Delhi.

Reference Books

1. C.A.O. Flaherty, 'Highway Engineering', Vol. 2, Edward Arnold, London.
2. Mannering, 'Principles of Highway Engineering & Traffic Analysis', Wiley Publishers, New Delhi.

ENVIRONMENTAL ENGINEERING–II

Subject Code: BCIE1-519 **L T P C** **3 1 0 4** **Contact Hrs. 45**

UNIT -I

Introduction: Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions.

Sewerage Systems: Generation and estimation of community Sewage, flow variations, storm water flow, types of sewers. Design of sewers and storm water sewers, construction & maintenance of sewers, sewer appurtenances, sewage pumping and pumping stations.

UNIT -II

House Drainage: Principles of house drainage, traps, sanitary fittings, systems of plumbing, drainage lay out for residences.

Characteristics of Sewage: Composition of domestic and industrial sewage, sampling, physical, chemical and microbiological analysis of sewage, biological decomposition of sewage, BOD and BOD kinetics, effluent disposal limits.

UNIT -III

Treatment of Sewage: Introduction to unit operations and processes - Primary treatment; screening (theory), grit chamber (theory and design), floatation units, sedimentation tanks(theory and design), Secondary treatment units; ASP (theory and design), Sequencing batch reactors (theory and design), Trickling filters (theory and design) Anaerobic systems; Anaerobic filters (theory), UASB (theory), Anaerobic lagoons, Sludge Handling and disposal; thickening, stabilization, dewatering, drying and disposal.

UNIT -IV

Introduction to Solid Waste Management Systems: Objective, Types and sources, Functional elements, Methods of solid waste management with their limitations.

Low Cost Sanitation Systems: Imhoff tanks (theory and design), septic tank (theory and design), soakage pit/soil absorption systems; stabilization ponds (theory and design); macrophyte ponds; oxidation ponds (theory and design); and constructed wetland systems.

Wastewater Treatment Plants and Advanced Wastewater Treatment: Treatment Plants; site selection, plant design, Hydraulic Profiles, operation and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection and polishing.

Recommended Books

1. B.C. Punmia, Ashok Jain, 'Waste Water Engg. (Environmental Engg.-II)', Laxmi Publications, New Delhi.
2. Arcadio P. Sincero and Gregoria P. Sincero, 'Environmental Engg. - A Design Approach', Prentice Hall of India, New Delhi.
3. Metcalf & Eddy, 'Waste Water Engineering - Treatment and Reuse', TMH, New Delhi.
4. Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, 'Environmental Engg.', International Edition, McGraw Hill.
5. S.K. Garg, 'Environmental Engineering (Vol. II)', Khanna Publishers, Delhi.

GEOMATICS ENGINEERING

Subject Code: BCIE1-520 **L T P C** **Contact Hrs. 45**

3 1 0 4

Unit-I

Photogrammetry: Introduction, Basic Principles, Photo-Theodolite, Elevation of a Point by Photographic Measurement, Aerial Camera, Vertical Photograph, Tilted Photograph, Scale, Crab and Drift, Flight Planning for Aerial Photography, Ground Control for Photogrammetry, Photomaps and Mosaics, Stereoscopic Vision, Stereoscopic parallax, Stereoscopic Plotting Instruments, Applications.

Unit-II

Remote Sensing: Introduction, Basic Principles, Electromagnetic (EM) Energy Spectrum, EM Radiations and the Atmosphere, Interaction of EM radiations with Earth's Surface, Types of remote sensing systems, Remote Sensing Observation Platforms, Satellites and their characteristics – Geostationary and sun-synchronous, Earth Resources Satellites, Meteorological satellites, Sensors, Types and their characteristics, Across track and Along track scanning, Applications of Remote Sensing.

Unit-III

Geographical Information System (GIS): Definition, GIS Objectives, Hardware and software requirements for GIS, Components of GIS, Coordinate System and Projections in GIS, Data structure and formats, Spatial data models – Raster and Vector, Data inputting in GIS, Data base design - editing and topology creation in GIS, Linkage between spatial and non-spatial data, Spatial data analysis – significance and type, Attribute Query, Spatial Query, Vector based spatial data analysis, Raster based spatial data analysis, Errors in GIS, Integration of RS and GIS data, GIS Applications, Introduction to GIS Software Packages.

Unit-IV

Global Positioning System (GPS): Introduction, Fundamental concepts, GPS system elements and signals, GPS measurements and accuracy of GPS, Satellite Movement, GPS Satellites, Co-ordinate systems - Geoids, Ellipsoid and Datum, Spheroid, Customized Local Reference Ellipsoids, National Reference Systems, Worldwide Reference Ellipsoid, WGS 84, Differential-GPS, Classification of GPS receivers, GPS Applications.

Recommended Books

1. K.R. Arora, 'Surveying', Vol-III, Standard Book House, **2007**.
2. J.B. Campbell, 'Introduction to Remote Sensing', Taylor Publications, **2002.**
3. T.K. Chang, 'Geographic Information Systems', Tata McGraw Hill, **2002.**
4. Joseph George, 'Fundamentals of Remote Sensing', Universities Press, **2003**.
5. B.C. Punmia, A.K. Jain, 'Higher Surveying', Luxmi Publications, **2005**.
6. S.K. Duggal, 'Higher Surveying', Vol-III, Tata McGraw Hill.

Reference Books

1. I. Heywood, S. Cornelius, Steve Crver, 'An Introduction to Geographical Information Systems', Pearson Education, **2003**.
2. F.F. Sabbins, 'Remote Sensing Principles and Interpretation', W.H. Freeman and Company, **1985**.
3. E.D. Kaplan, 'Understanding GPS: Principles and Applications', Artec House.

DISASTER MANAGEMENT

Subject Code: BCIE1-521 **L T P C** **Contact Hrs. 25**

2 0 0 2

UNIT-I

Introduction to Disaster Management: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle.

Disaster Mitigation and Preparedness: *Natural Hazards*: causes, distribution pattern,

consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. *Man-madehazards*: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.

UNIT-II

Hazard and Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems.

Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation.

UNIT-III

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.

UNIT-IV

Application of Geoinformatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, early warning systems.

Case Studies: Lessons and experiences from various important disasters with specific reference to Civil Engineering.

Recommended/References Books

1. Iyengar, C.B.R.I., 'Natural Hazards in the Urban Habitat', Tata McGraw Hill Publications.
2. Jon Ingleton (Ed), 'Natural Disaster Management', Tudor Rose, Leicester.
3. R.B. Singh (Ed), 'Disaster Management', Rawat Publications.
4. ESCAP: 'Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction'.

SOFT SKILLS-III

Subject Code: BHUM0-F93 **L T P C** **Contact Hrs. 25**

0 0 2 1

UNIT-1

ART OF WRITING - Introduction, Importance of Writing Creative Writing, Writing tips, Drawback of written communication.

ART OF BUSINESS WRITING - Introduction, Business Writing, Business Letter, Format and Styles, Types of business letters, Art of writing correct and precise mails, Understand netiquette.

UNIT-2

BODY LANGUAGE - Introduction- Body Talk, Forms of body language, uses of body language, Body language in understanding Intra and Inter-Personal Relations, Types of body language, Gender differences, Gaining confidence with knowledge of Kinesics.

UNIT-3

TEAM BUILDING AND TEAM WORK - Introduction, Meaning, Characteristics of an effective team, Role of a Team Leader, Role of Team Members, inter group Collaboration Advantages, Difficulties faced, Group Exercises-Team Tasks and Role-Play, Importance of Group Dynamics.

UNIT-4

TIME MANAGEMENT - Introduction, the 80-20 Rule, three secrets of Time Management, Time Management Matrix, Effective Scheduling, Time Wasters, Time Savers, Time Circle Planner, Difficulties in Time Management, Overcoming Procrastination.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. R.C. Sharma and Krishna Mohan, 'Business Correspondence and Report Writing', TMH, New Delhi, **2016**.
3. N. Krishnaswami and T. Sriraman, 'Creative English for Communication', Macmillan.
4. Penrose, M. John, et al., 'Business Communication for Managers', Thomson South Western, New Delhi, **2007**.
5. Holtz, Shel, 'Corporate Conversations', PHI, New Delhi, **2007.**

ENVIRONMENTAL ENGINEERING LAB.

Subject Code: BCIE1-522 **L T P C** **Contact Hrs. 24**

0 0 2 1

EXPERIMENTS

1. To measure the pH value of a water and waste water samples.
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water and water samples.
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample.
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To determine the concentration of sulphates in water and waste water samples.
10. To find chlorides in given samples of water and waste water.
11. To find acidity and alkalinity of water samples.
12. To determine the COD of a waste water sample.

Recommended Books

1. Sawyer & McCarty, 'Chemistry for Environmental Engg. and Science', TMH, New Delhi.

TRANSPORTATION ENGINEERING LAB.

Subject Code: BCIE1-523 **L T P C** **Contact Hrs. 25**

0 0 2 1

Unit-I

Tests on Sub-Grade Soil

1. Proctor's Compaction Test
2. California Bearing Ratio Test

Unit-II

Tests on Road Aggregates

1. Crushing Value Test

2. Los Angles Abrasion Value Test
3. Impact Value Test
4. Shape Test (Flakiness and Elongation Index)

Unit-III

Tests on Bituminous Materials

1. Penetration Test
2. Ductility Test
3. Softening Point Test
4. Flash & Fire Point Test

Lab. Manuals

1. S.K. Khanna and C.E.G. Justo, 'Highway Material & Pavement Testing', Nem Chand and Brothers, Roorkee.

SURVEY CAMP

Subject Code: BCIE1-524 **L T P C**
0 0 4 2

Survey Camp up to 4 weeks' duration will be held immediately after IVth semester at a Hilly Terrain. The students are required to prepare the Topographical Map of the area by traditional method. Students should also be exposed to modern Survey Equipment and practices, like Total Station, Automatic Level, GPS etc.

DESIGN OF CONCRETE STRUCTURES-II

Subject Code: BCIE1-625 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: Indian Standards-IS 456, IS 3370 and Design Aid SP-16 are permitted in examination.

UNIT-I

1. Design of Foundations – Concept, Application, Types, Components of Footing, Design of Isolated Footing (Square, Rectangular), Combined Footing (Rectangular, Trapezoidal & Strap footing) and Raft Foundation.

2. Design of Stairs: Introduction, Elements of Stairs-Tread, Rise, Flight, Landing, Types of Stairs, Design and Reinforcement detail of Stairs.

UNIT-II

3. Design of Compression Members: Classifications (According to Shape, Length and loading conditions), Assumptions, Guidelines as per Indian Standards, Behavior of Compression Members, Short Compression Members under Axial Load with Uni-axial and Bi-axial Bending, Design of Slender (Long) Columns.

UNIT-III

4. Design of Beams (Continuous and Curved): Definition, Behavior, Design of Continuous beams and Curved beams, Reinforcement detailing.

5. Design of Retaining Walls: Classification, Elements-Stem, Base, Heel, Toe, Behavior and design of Cantilever and Counterfort type retaining wall.

UNIT-IV

6. Design of Domes: Types, Components, Design of Spherical and Conical Dome.

7. Water Tanks: Introduction, Types & uses of Underground water tanks, ground water tanks, Design of Circular and Rectangular water tanks resting on ground, Design of OHSR.

Recommended Books

1. N. Subramanian, 'Design of Reinforced Concrete Structures', Oxford University Press.
2. Pillai & Menon, 'Reinforced Concrete Design', Tata McGraw Hill Education.
3. P.C. Varghese, 'Limit State Design of Reinforced Concrete', Prentice Hall of India Pvt. Ltd.
4. Raju N. Krishna, 'Reinforced Concrete Elements'.
5. Mallick and Rangasamy, 'Reinforced Concrete', Oxford-IBH.

GEOTECHNICAL ENGINEERING

Subject Code: BCIE1-626 **L T P C** **Contact Hrs. 45**

3 1 0 4

Unit-I

Basic Concepts: Definition of soil, Soil mechanics and its application in Civil Engineering, Major soil deposits in India, Weight volume relationship, Index and engineering properties of soil, Classification of soil (IS and Unified Soil Classification System).

Unit –II

Compaction: Compaction, Concept of O.M.C. and zero Air Void Line, Standard and Modified proctor test, Factors affecting compaction, Effect of compaction on engineering soil properties, Field compaction methods their comparison of performance and relative suitability, Field control of compaction by proctor needle.

Permeability of Soil: Concept of effective stress principle, Critical hydraulic gradient and quick sand condition, Capillary phenomenon in soil, Darcy's law and its validity, Co-efficient of permeability and its determination by Constant Head Permeability test and Variable Head Permeability test, Average permeability of stratified soils, Factors affecting coefficient of permeability.

Unit-III

Consolidation: Consolidation, Difference between compaction and consolidation, Concept of various consolidation characteristics, Primary and secondary consolidation, Terzaghi's theory for one-dimensional consolidation, Consolidation test, Determination of coefficient of consolidation from curve fitting methods, Normally consolidated and over consolidated clays, Importance of consolidation settlement in the design of structures, e-logP curve.

Unit -IV

Shear Strength: Shear Strength, Stress analysis of a two - dimensional stress system by Mohr circle, Revised Mohr-Coulomb's law of shear strength, Relations between principle stresses at failure, Types of shear strength tests, Skempton's pore pressure parameters. .

Stability of Slopes: Slope failure, base failure and toe failure, Swedish circle and Frictional circle methods for c-φ-soils, Taylor's stability number, Stability charts.

Recommended Books

1. K.R. Arora, 'Soil Mech. & Foundation Engg', Standard Publishers Distributors.
2. P. Purshotama Raj, 'Geotechnical Engineering', Tata McGraw Hill.

3. V.N.S. Murthy, 'Soil Mech. & Foundation Engg', CBS Publishers & Distributors.
4. B.M. Das, 'Principle of Geotechnical Engineering', Cengage Publisher.
5. Gopal Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International Publishers.
6. Joseph E. Bowle 'Physical & Geotechnical Properties of Soil'.

NUMERICAL METHODS IN CIVIL ENGINEERING

Subject Code: BCIE1-627 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Equation: Roots of algebraic transcendental equation, Solution of linear simultaneous equations by different methods using Elimination, Iteration, Inversion, Gauss-Jordan and method, Homogeneous and Eigen Value problem, Non-linear equations.

UNIT-II

Finite Difference Technique: Initial and Boundary value problems of ordinary and partial differential equations, Solution of Various types of plates and other civil engineering related problems.

UNIT-III

Numerical Integration: Numerical Integration by trapezoidal and Simpson's rule.
Statistical Methods: Method of correlation and Regression analysis for fitting a polynomial equation by least square

UNIT-IV

Initial Value Problem: Galerkin's method of least square, Initial Value problem by collocation points, Runge-Kutta Method.
Interpolation: Newton's Backward, Forward and Lagrange's Interpolation methods.

Recommended Books

1. James B. Scarborough, 'Numerical Mathematical Analysis', Oxford and IBH Publishing,
2. S.S. Sastry, 'Introductory Methods of Numerical Analysis', PHI Learning, **2012**.
3. Xundong Jia and Shu Liu, Dubuque, Iowa, 'Introduction to Computer Programming and Numerical Methods', Kendall/Hunt Publishing Co.
4. J.B Dixit, 'Numerical Methods', USP, Laxmi Publication.
5. C.P. Gandhi, 'Numerical Methods'.

STRUCTURAL ANALYSIS-II

Subject Code: BCIE1-628 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit-I

ANALYSIS OF STATICALLY INDETERMINATE STRUCTURES: Degree of static and kinematic indeterminacies, analysis of indeterminate beams, rigid frames and trusses by method of consistent deformation, law of reciprocal deflections, method of least work, induced reactions on statically indeterminate beams & rigid frames due to yielding of supports.

FIXED & CONTINUOUS BEAMS: Introduction, Analysis of fixed beams by moment-area theorem and strain energy method, fixed end moments due to different types of loadings, sinking and rotation of supports, bending moment and shear force diagrams for fixed beams, slope and deflection of fixed beams, analysis of continuous beams by the Three moment equation (Clapeyron's theorem) due to different types of loadings, effect of sinking of supports, BMDs.

Unit-II

SLOPE-DEFLECTION METHOD: Introduction, slope-deflection equations, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.

MOMENT-DISTRIBUTION METHOD: Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements, symmetrical beams and frames with symmetrical, skew-symmetrical and general loading.

Unit-III

ROTATION CONTRIBUTION METHOD: Introduction, basic concept, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loadings and yielding of supports, symmetrical beams and frames, general case-storey columns unequal in height and bases fixed or hinged.

APPROXIMATE METHODS OF STRUCTURAL ANALYSIS: Introduction, Vertical and lateral load analysis of multistory frames, portal, cantilever and substitute-frame methods and their comparison.

Unit-IV

TWO HINGED ARCHES: Introduction, Analysis of two hinged arches for Horizontal Thrust, Bending Moment, Normal Thrust, and Radial Shear, Settlement (Foundation Yielding) and Temperature Effects, Rib Shortening and Shrinkage, Influence Lines for Two Hinged Arches.

INFLUENCE LINES FOR STATICALLY INDETERMINATE STRUCTURES: Muller-Breslau principle for statically determinate and indeterminate beams, trusses and rigid frames, influence lines for reactions, shear force and bending moment for statically indeterminate beams, trusses and rigid frames.

Recommended Books

1. C.S. Reddy, ‘Basic Structural Analysis’.
2. C.K. Wang, ‘Intermediate Structural Analysis’.
3. J. Sterling Kinney, ‘Indeterminate Structural Analysis’.
4. B.C. Punima, ‘Theory of Structures’.

ESTIMATING AND COSTING

Subject Code: BCIE1-629 **L T P C** **Contact Hrs. 36**

3 0 0 3

Unit-I

ESTIMATING: Different types of estimates, methods of estimating and scheduling quantities for the following works: Building, culverts, bridges, irrigation works, steel structures, road works, canal works, sanitary and water supply works, roofs, R.C.C. work.

ANALYSIS OF RATES: Schedule of rates (As per CSR Punjab-2016), Analysis of rates: earth work, brick masonry, stone masonry, cement concrete, RCC work, iron work, plastering, flooring, white washing, painting, wood work, Road work.

Unit–II

SPECIFICATIONS: Detailed specifications of the following: earth work in foundation, lean concrete in foundation, lime concrete in roof terracing, cement concrete, RCC, brick work, plastering, painting, C.C. floor, mosaic floor, white washing, distempering, varnishing, painting, doors and windows, DPC, cantering and shuttering, stone masonry, cement mortar, lime mortar, brick ballast, surkhi, cinder and sand.

Unit–III

ACCOUNTS PROCEDURES: Regular and work charged establishment, pay bill, ACR, classifications of works, contract, tender, tender notice, earnest money, security money, arranging contract, power of accepting tender, daily labour, muster roll, classification of contracts, penalty, measurement book, account procedures of stores, issue rate, stock accounting, Introduction to forms and bills, Advance payment, hand receipt, refund of security money, cash book, imprest, deposit works, temporary advances, treasury challan, inventory, administrative approval, competent authority, building bye laws.

Unit-IV

VALUATION: Gross income, net income, outgoing, scrap value, salvage value, obsolescence, annuity, capitalized value, year's purchase, sinking fund, depreciation, valuation of building, determination of depreciation, method of valuation, life of various items of works, mortgage lease, fixation of rates, plinth area required for residential building., Arbitration.

Recommended Books

1. B.N. Dutta, 'Estimating & Costing in Civil Engg.: Theory & Practice', UBS Publishers Distributors Ltd.
2. G.S. Birdie, 'Estimation and Costing in Civil Engineering', Dhanpat Rai Publishing Co. Ltd, New Delhi, **2011**.

Reference Books

1. M. Chakraborti, 'Estimation, Costing, Specifications and Valuation in Civil Engineering', National Halftone Co. Calcutta.
2. George H. Cooper, 'Building Construction Estimating'.
3. P.L. Bhasin, 'Estimating and Costing for Building & Civil Engg. Works'.
4. 'Standard Schedule of Rates and Standard Data Book', Public Works Department.
5. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)

SOFT SKILLS-IV

Subject Code: BHUM0-F94 **L T P C** **Contact Hrs. 25**
0 0 2 1

UNIT-1

ART OF SPEAKING- Introduction. Communication process. Importance of communication, channels of communication. Formal and informal communication. Barriers to communication. Tips for effective communication. tips for conversation. Presentation skills. Effective multi-

media presentation skills. Speeches and debates. Combating nervousness. Patterns and methods of presentation. Oral presentation, planning and preparation.

UNIT-2

GROUP DISCUSSION- Introduction. Importance of GD. Characters tested in a GD. Tips on GD. Essential elements of GD. Traits tested in a GD .GD etiquette. Initiating a GD. Nonverbal communication in GD. Movement and gestures to be avoided in a GD. Some topics for GD.

UNIT-3

PREPARING CV/RESUME-Introduction – meaning – difference among bio-data, CV and resume. CV writing tips. Do's and don'ts of resume preparation. Vocabulary for resume, common resume mistakes, cover letters, tips for writing cover letters.

UNIT-4

INTERVIEW SKILLS - Introduction. Types of interview. Types of question asked. Reasons for rejections. Post-interview etiquette. Telephonic interview. Dress code at interview. Mistakes during interview. Tips to crack on interview. Contextual questions in interview skills. Emotional crack an interview. Emotional intelligence and critical thinking during interview process.

Recommended Books

1. K. Alex, S. Chand Publishers.
2. Lucas, Stephen E., 'The Art of Public Speaking', 11th Edn., International Edn., McGraw Hill Book Co., **2014**.
3. Goleman, Daniel, 'Working with Emotional Intelligence', Banton Books, London, **1998**.
4. Thrope, Edgar and Showick Trope, 'Winning at Interviews', Pearson Education, **2004**.
5. Turk, Christopher, 'Effective Speaking', South Asia Division: Taylor & Francis, **1985**.

GEOTECHNICAL ENGINEERING LAB.

Subject Code: BCIE1-630 **L T P C** **Contact Hrs. 25**
0 0 2 1

1. Determination of in-situ density by core cutter method and Sand replacement method.
2. Determination of Liquid Limit & Plastic Limit.
3. Determination of specific gravity of soil solids by Pycono-meter method.
4. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
5. Determination of coefficient of permeability by Constant Head and Variable Head methods.
6. Determination of optimum moisture content and maximum dry unit weight by standard Proctor's test and Modified Proctor's Test.
7. Unconfined Compression Test for fine grained soil.
8. Determination of cohesion intercept and angle of shearing resistance by direct shear test.
9. Determination of cohesion intercept and angle of shearing resistance by tri-axial test.
10. Determination of co-efficient of consolidation.
11. Demonstration of Standard Penetration Test (SPT).

Recommended Books

1. Shamsher Prakash and P.K. Jain, 'Soil Testing Engineering, Manual', Nem Chand & Brother.

CONCRETE STRUCTURES DRAWING

Subject Code: BCIE1-631 **L T P C** **Contact Hrs. 25**
0 0 2 1

Structural Drawings of concrete elements such as Beams, Columns, Slabs, Stair Cases as per Reinforced Concrete Elements as per BTCIE1-625.

DESIGN OF STEEL STRUCTURES-II

Subject Code: BCIE1-732 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: IS: 800, General construction in Steel-Code of practice is permitted in examination

Unit-I

Plastic Analysis: Introduction, Design of Beams.
Plate Girder: Elements of a plate girder, design of a plate girder, curtailment of flanges, various type of stiffeners using bolts and welds.

Unit-II

Foot Bridge: Design of steel foot bridge with welded joints.

Unit-III

Industrial Buildings: Design of elements of industrial buildings: Gantry girder, Column bracket.

Unit-IV

Railway Bridge: Design of single track Railway Bridge with lattice girders having parallel chords (for B.G.)- Stringer, Cross girder, Main girders with welded joints, Portal sway bracings, Rocker and rollers bearing.

Recommended Books & Codes

1. S.K. Duggal, 'Limit State Design of Steel Structures'.
2. N. Subramanian, 'Design of Steel Structures'.
3. Ram Chandra, 'Design of Steel Structures', Vol. 2.
4. L.S. Negi, 'Design of Steel Structures'.
5. S.S. Bhavikatti, 'Design of Steel Structures (by limit state method as per IS: 800-2007).
6. IS 800: 2007 (General Construction in Steel-Code of Practice) *
7. SP: 6(1) (Handbook for Structural Engineers-Structural Steel Sections) *

FOUNDATION ENGINEERING

Subject Code: BCIEI-733 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: **Relevant data should provide by Paper Setter with respect to design problems; if any.**

Unit–I

Soil Investigation: Soil Investigation for new and existing structures. Depth of exploration for different structures, spacing of bore Holes, Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance, Essential features and application of various types of samplers, Geophysical exploration by

seismic and electrical resistivity methods, Standard Penetration Test and Plate load test, Bore hole log.

Stresses in Soil: Boussinesq's equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams, Isobars, New mark's chart and its construction, Approximate method of load distribution, Comparison of Boussinesq's and Westergaard analysis for a point load.

Unit-II

Earth Pressure: Terms and symbols used for a retaining wall, Movement of all and the lateral earth pressure, Earth pressure at rest, Rankine states of plastic equilibrium, Coefficient of active and passive earth pressures for horizontal backfills, Rankine's theory both for active and passive earth pressure for Cohesion-less and cohesive backfill with surcharge and fully submerged case, Coulomb's method for cohesion less backfill, Merits and demerits of Ranking and Coulomb's theories, Culmann's graphical construction (without surcharge load).

Unit-III

Shallow Foundation: Type of shallow foundations, Factors affecting choice of foundation, Definition of ultimate bearing capacity, safe bearing capacity and allowable bearing capacity, Terzaghi's analysis. Types of failures, Factors affecting bearing capacity, Skempton's equation, B.I.S. recommendations for shape, depth, inclination factors and water table corrections, Causes of settlement of structures, Comparison of immediate and consolidation settlement, calculation of settlement by plate load Test and Static Cone penetration test data, Allowable settlement of various structures according to I.S. Code, Introduction of rafts and floating foundation.

Unit-IV

Pile Foundations: Types, Necessity and uses of piles, Classification of piles, Types of pile driving hammers & their comparison, Determination of load carrying capacity of driven piles by dynamic formulae, Cyclic Pile Load Test, Determination of point resistance and frictional resistance of a single pile by Static formulas in sand and clay, Spacing of piles in a group, Group action of piles, Calculation of settlement of friction pile group in clay, Settlement of pile groups in sand, Negative skin friction.

Caissons and Wells: Major areas of use of caissons, advantages and disadvantages of open box and pneumatic caissons, Essential part of a pneumatic caisson, Components of a well foundation, Calculation of allowable bearing pressure, Conditions for stability of a well, Forces acting on a well foundation, Computation of scour depth.

Recommended Books

1. K.R. Arora, 'Soil Mech. & Foundation Engg,', Standard Publishers Distributors.
2. V.N.S. Murthy, 'Soil Mech. & Foundation Engg.'.
3. Gopal Ranjan and A.S.R. Rao, 'Basic and Applied Soil Mechanics', New Age International.
4. Muni Budhu, 'Soil Mech. & Foundations', Wiley, John Wiley & Sons.
5. Gulhati and Datta, 'Geotechnical Engineering', Tata McGraw Hill Education.

IRRIGATION ENGINEERING-II

Subject Code: BCIE1-734 **L T P C** **Contact Hrs. 45**
3 1 0 4

Unit-I

Head Works: Types of head works, Functions and investigations of a diversion head work: component parts of a diversion head work and their design considerations, silt control devices.
Theories of Seepage: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

Unit-II

Design of Weirs: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.
Energy Dissipation Devices: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipaters and their hydraulic design.

Unit-III

Canal Regulators: Offtake alignment, cross- regulators – their functions and design, Distributary head regulators, their design, canal escape.
Canal Falls: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls and level crossing.

Unit-IV

Cross-Drainage works: Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons.
Canal Out-lets: Essential requirements, classifications, criteria for outlet behaviors, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

Recommended Books

1. Santosh Kumar Garg, 'Irrigation Engineering & Hydraulic Structure', Khanna Publishers.
2. R.K. Sharma, 'Design of Irrigation Structures', Oxford IBH Publishers.
3. S.R. Sahasrabudhe, 'Irrigation Engineering and Hydraulics Structures', Katson Publishing.
4. K.B. Khushlani, 'Irrigation Practice and Design', Vol. I to VII, Oxford IBH Publishers.
5. P.N. Modi, 'Irrigation with Resources and with Power Engineering', Standard Book House.
6. Ivan E. Houk, 'Irrigation Engineering', Vol. I, II, John Wiley and Sons.

PRESTRESSED CONCRETE

Subject Code: BCIE1-756 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: IS 1343 Code of Practice is permitted in the examination.

UNIT-I

Materials for Pre-stressed Concrete and Pre-stressing Systems:
High strength concrete and high tensile steel, tensioning devices, pre-tensioning systems, post tensioning systems.

UNIT-II

Analysis of Pre-stress and Bending Stresses:
Analysis of pre-stress, resultant stresses at a sector, pressure line or thrust line and internal resisting couple, concept of load balancing, losses of pre-stress, deflection of beams.

UNIT-III

Strength of Pre-stressed Concrete Sections in Flexure, Shear and Torsion:
Types of flexural failure, strain compatibility method, IS:1343 code procedure, design for limit state of shear and torsion.

UNIT-IV

Design of Pre-stressed Concrete Beams and Slabs:
Transfer of prestress in pre tensioned and post tensioned members, design of anchorage zone reinforcement, design of simple beams, cable profiles, Design of slabs.

Recommended Books

1. N. Krishna Raju, 'Pre-stressed Concrete', Tata McGraw Hill.
2. T.Y. Lin, Ned H. Burns, 'Design of Pre-stressed Concrete Structures', John Wiley & Sons.
3. P. Dayaratnam, 'Prestressed Concrete', Oxford & IBH.
4. R. Rajagopalan, 'Pre-stressed Concrete'.
5. IS 1343 2012 Code of Practice for Pre-stressed Concrete.

BRIDGE ENGINEERING

Subject Code: BCIE1-757 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Introduction: Definition and components of a bridge, Classification of bridges, Choice of a bridge type. Investigation for bridges, Selection of bridge site, Determination of design discharge for River Bridge, Linear waterway, Economical span, Vertical clearance, scour depth, Afflux, Traffic projection.

Standard Specifications for Road Bridges: IRC Bridge Codes, Width of carriageway, Clearances, Dead load, I.R.C. standard live loads, Impact effect, Wind load, Longitudinal forces, Centrifugal forces, Horizontal forces due to water current, Buoyancy effect, Earth pressure, Deformation stresses, Erection stresses, Temperature effects, and Seismic force.

UNIT-II

Reinforced Concrete Bridges: Types of RCC bridges; Culverts - Box Culvert, Pipe Culvert, Solid slab bridge, T-beam girder bridges, Hollow girder bridges, Balanced

cantilever bridges, Continuous girder bridges, Rigid frame bridges, Arch bridges, Pre-stressed concrete bridges.

Steel Bridges: Types of Steel bridges; Beam bridges, Plate girder bridges, Box girder bridges, Truss bridges, Arch bridges, Cantilever bridges, Cable stayed bridges, Suspension bridges.

UNIT-III

Sub-structure and Foundation: Piers and abutments, materials for piers and abutments, Types of foundations; Shallow, Pile, and Well foundations. Relative merits of piles and well foundations, Pneumatic Caissons, Box Caissons.

Bearings, Joints & Appurtenances: Importance of Bearings, Different types of bearings-Expansion Bearings, Fixed Bearings, Elastomeric Bearings, Expansion joints, Wearing Course, Approach Slab, Footpath, Handrails.

UNIT-IV

Construction and Maintenance of Bridges: Methods of construction of concrete and steel bridges. Formwork and false work for concrete bridges, Causes of Bridge failures, Inspection and maintenance, Bridge Management System.

Recommended Books

1. Johnson, Victor, 'Essentials of Bridge Engineering', Oxford University Press.
2. C.H. Khadilkar, 'A Text book of Bridge Construction', Allied Publishers.
3. S.C. Rangwala, 'Bridge Engineering', Charotar Publishing House Pvt. Ltd.
4. V.K. Raina, 'Concrete Bridges Handbook, Shroff Publishers and Distributors.
5. S. Ponnuswamy, 'Bridge Engineering', McGraw Hill Education.

SOLID WASTE MANAGEMENT

Subject Code: BCIE1-758 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT-I

Sources and Composition of Municipal: Solid Waste Introduction, Sources of solid waste, Types of solid waste, Composition of solid waste and its determination, Types of materials recovered from MSW.

Properties of Municipal Solid Wastes: Physical properties of Municipal Solid Waste, Chemical properties of Municipal Solid Waste, Biological properties of Municipal Solid Waste, Transformation of Municipal Solid Waste.

UNIT-II

Solid Waste Generation and Collection: Quantities of Solid Waste, Measurements and methods to measure solid waste quantities, Solid waste generation and collection, Factors affecting solid waste generation rate, Quantities of materials recovered from MSW.

Handling, Separation and Storage of Solid Waste: Handling and separation of solid waste At site, Material separation by pick in, screens, float and separator magnets and electromechanical separator and other latest devices for material separation, Waste handling and separation at Commercial and industrial facilities, Storage of solid waste at the sources.

UNIT-III

Processing of Solid Waste: Processing of solid waste at residence e.g. Storage, conveying,

compacting, Shredding, pulping, granulating etc., Processing of solid waste at Commercial and industrial site.

Disposal of Municipal Solid Waste: Combustion and energy recovery of municipal solid waste, effects of combustion, Landfill: Classification, planning, sitting, permitting, landfill processes, landfill design, landfill operation, Differentiate sanitary land fill and incineration as final disposal system for solid waste

UNIT-IV

Solid Waste Management: Municipal solid waste (management and handling) rules, hazardous waste (management and handling) rules, biomedical waste handling rules, Fly ash rules, recycled plastics usage rules, batteries (management and handling) rules.

Recommended Books

1. P.A. Vesilind, W. Worrell and D.R. Reinhart, 'Solid Waste Engineering', Thomson Books.
2. A.D. Bhide and B.B. Sundaresan, 'Solid Waste Management, Collection, Processing and Disposal', Nagpur.
3. G. Tchobanoglous, H. Theisen and S.A. Vigil, 'Integrated Solid Waste Management', McGraw Hill International Editions.
4. 'Manual on Municipal Solid Waste Management', CPHEEO, Ministry of Urban Development, Government of India.
5. 'Management and Handling Rules for: Municipal Solid Waste, Biomedical Waste, Hazardous Waste and Radioactive Wastes', Government of India Publications.

GROUND IMPROVEMENT TECHNIQUES

Subject Code: BCIE1-759 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

Introduction to Soil Improvement without the addition of Materials: Dynamic compaction equipment used - application to granular soils - cohesive soils - depth of improvement – environmental considerations - induced settlements - compaction using vibratory probes - vibro techniques vibro equipment - the vibro compaction and replacement process - control of verification of vibro techniques
- vibro systems and liquefaction - soil improvement by thermal treatment - preloading techniques - surface compaction introduction to bio technical stabilization

UNIT-II

Introduction to Soil Improvement with the addition of Materials - lime stabilization - lime column method - stabilization of soft clay or silt with lime - bearing capacity of lime treated soils – settlement of lime treated soils - improvement in slope stability - control methods - chemical grouting – commonly used chemicals - grouting systems - grouting operations - applications - compaction grouting - introduction - application and limitations - plant for preparing grouting materials - jet grouting – jet grouting process - geometry and properties of treated soils - applications - slab jacking - gravel - sand - stone columns.

UNIT-III

Soil Improvement using Reinforcing Elements - introduction to reinforced earth - load transfer mechanism and strength development - soil types and reinforced earth - anchored earth nailing

reticulated micro piles - soil dowels - soil anchors - reinforced earth retaining walls.

UNIT-IV

Geotextiles - Behavior of soils on reinforcing with geotextiles - effect on strength, bearing capacity, compaction and permeability - design aspects - slopes - clay embankments - retaining walls – pavements.

Reference Books

1. Moseley, 'Text Book on Ground Improvement', Blackie Academic Professional, Chapman & Hall.
2. R. Boweven, 'Text Book on Grouting in Engineering Practice', Applied Science Publishers Ltd.
3. R.A. Jewell, 'Text Book on Soil Reinforcement with Geotextiles', CIRIA Special Publication, Thomas Telford.
4. W.E. Van Impe, 'Text Book on Soil Improvement Technique & their Evolution', Balkema Publishers.
5. Donald. H. Gray & Robbin B. Sotir, 'Text Book On Bio Technical & Soil Engineering Slope Stabilization', John Wiley.
6. G.V. Rao & G.V.S. Rao, 'Text Book on Engineering with Geotextiles', Tata McGraw Hill.
7. Korener, 'Construction & Geotechnical Methods in Foundation Engineering', McGraw Hill.
8. S.K. Shukla and J.H. Yin, 'Fundamental of Geosynthetic Engineering', Taylor & Francis.
9. Swamisaran, 'Reinforced Soil and its Engineering Application', New Age Publication.
10. S.K. Gulati and M. Datta, 'Geotechnical Engineering', TMH.

STEEL STRUCTURES DRAWING

Subject Code: BCIEI-735 **L T P C** **Contact Hrs. 24**
0 0 2 1

Structural Drawings of Steel Elements such as Connections, Tension Members, Compression Members, Beams, Foundations and Roof Trusses as BCIE1-732.

HYDRAULIC STRUCTURES DRAWING

Subject Code: BCIEI-736 **L T P C** **Contact Hrs. 24**
0 0 2 1

1. Unlined canal sections
2. Lined canal sections
3. Guide Bank
4. Weir/Barrage
5. Head/ Cross regulator
6. Canal Fall (Sarda/Inglis/Straight Glacis/Baffle Type)
7. Syphon Aqueduct
8. APM Outlet

TRAINING-III

Subject Code: BCIEI-737 **L T P C** **Contact Hrs. --**
0 0 0 2

Software Training or Industrial Training as per the interest of students. Field to be covered during;
Software Training: Relevant to Civil Engineering Fields.
Industrial Training: All type of Construction Projects of Civil Engineering
Note: Minimum period for training is 6-8 weeks.

TRANSPORTATION ENGINEERING-II

Subject code: BCIE1-838 **L T P C** **Contact hrs. 45**
3 1 0 4

UNIT-I

Introduction to Railway Engineering: History of Railways, Development of Indian Railway, Organization of Indian Railway, Important Statistics of Indian Railways. Railway Gauge, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.
Railway Track: Requirements of a Good Track, Components of Railway Track: Rails, Sleepers, Ballast, Sub-grade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

UNIT-II

Geometric Design of Railway Track: Track Specifications on Indian Railways, Cross-Section of Single/Double Track, Alignment, Gradients, Horizontal Curve, Cant, Equilibrium Cant, Cant Deficiency, Cant Excess, Transition Curves.
Points and Crossings: Necessity, Functions, Layout and Working of a Turnout, Various types of Track Junctions and their layouts, Level-crossing.

UNIT-III

Railway Stations & Yards: Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations & Yards
Signaling and Interlocking: Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signaling, Principal of Interlocking.
Modernization of Railway Tracks: High Speed Tracks, Improvement in existing track for high speed, Ballast less Track, MAGLEV, TACV.

UNIT-IV

Airport Planning: Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport, Approach Zones and Turning Zones,
Runway Orientation and Design: Head Wind, Cross Wind, Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration.
Taxiway and Aircraft Parking: Aircraft Parking System. Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.
Visual Aids: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

Recommended Books

1. S. Chandra and Aggarwal, 'Railway Engineering', M.M. Oxford University Press, New Delhi, **2007**.
2. S.C. Saxena and S.P. Arora, 'A Text Book of Railway Engineering', Dhanpat Rai and Sons, Delhi, **1997**.
3. J.S. Mundrey, 'Railway Track Engineering', McGraw Hill Publishing Co., **2009.**
4. S.K. Khanna, M.G. Arora and S.S. Jain, 'Airport Planning and Design', Nem Chand & Bros., Roorkee, **1999**.
5. R. Horenjeff, and F. McKelvey, 'Planning and Design of Airports', McGraw Hill Company, New York, **1994**.
6. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, 'Airport Engineering: Planning, Design and Development of 21st Century', Wiley Publishers, **2011.**

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Subject code -BCIE1-839 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: IS: 1893, IS: 4326 and IS: 13920 Code of practice is permitted in examination.

UNIT–I

Introduction to Structural Dynamics: – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Concept of response spectrum. Multi-Degree of Freedom (MDOF) Systems: - Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

UNIT–II

Earthquake Analysis: - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multistoried buildings – Use of response spectra. Codal Design Provisions: Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion.

UNIT–III

Earthquake Engineering: - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology –Source, Focus, Epicentre etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes– Seismic waves – Seismic zones – Seismic Zoning Map of India – Seismograms and Accelegrams. Codal Detailing Provisions: - Review of the latest Indian Seismic codes IS: 4326 and IS: 13920 provisions for ductile detailing of R.C buildings – Beam, column and joints

UNIT–IV

Aseismic Planning: - Plan Configurations – Torsion Irregularities – Re-entrant corners – Nonparallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path –

Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of Adjacent Buildings. Shear walls: Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements**.**

Recommended Books

1. Clough & Penzien, 'Dynamics of Structures', International Edition, McGraw Hill.
2. Pankaj Agarwal & Manish Shrikhande, 'Earthquake Resistant Design of Structures', Prentice Hall of India, New Delhi.

Reference Books

1. A.K. Chopra, 'Dynamics of Structures', Pearson Education, Indian Branch, Delhi.
2. C.V.R. Murty, 'Earthquake Tips', I.I.T. Kanpur.
3. Mario Paaz, 'Structural Dynamics', IS Codes: IS:1893, IS:4326 and IS:13920.

HYDROLOGY & DAMS

Subject Code: BCIE1-860 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT -I

Precipitation: Importance of hydrological data in water resources planning. The hydrologic cycle. Mechanics of precipitation, types and causes, measurement by rain gauges, Gauge net-works, hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves and depth area-duration curves.

UNIT -II

Interception, Evapotranspiration and Infiltration: Factors affecting interception, evaporation from free water surfaces and from land surfaces, transpiration, Evapotranspiration. Infiltration Factors affecting infiltration, rate, Infiltration capacity and its determination.

UNIT -III

Runoff: Factors affecting runoff, run-off hydrograph, unit hydrograph theory, S-curve hydrograph, Synder's synthetic unit hydrograph.

Peak Flows: Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumbel's method, design flood and its hydrograph.

UNIT -IV

Gravity Dams-Non Overflow Section: Forces acting, Stability factors, stresses on the faces of dam, Design of profile by the method of zoning, elementary profile of a dam.

Arch and Buttress Dams: Classification of arch dam- constant radius, constant angle and variable radius, Cylinder theory, Expression relating central angle and Cross-Sectional area of arch. Types of buttress dams, Advantages of buttress dams.

Earth Dams: Components of earth dams and their functions, Phreatic line determination by analytical and graphical methods.

Recommended Books

1. J. Nemec, 'Engineering Hydrology', Prentice Hall.
2. 'Engineering Hydrology', Stanley Buttler, John. Wiley.
3. TODD, 'Ground Water Hydrology', John Wiley.
4. Creager Justin & Hinds, 'Engineering for Dams', Vol. -II, -III, John Wiley.

5. S.K. Garg, 'Hydrology', Khanna Publishers.
6. H.M. Raghunath, 'Hydrology Principles, Analysis and Design', New Age Int. Publishers.

PAVEMENT DESIGN

Subject Code: BCIE1-861 **L T P C** **Contact Hrs. 45**
3 1 0 4

Note: Use of IRC: 37-2012 and IRC: 58-2011 shall be allowed in the examination.

UNIT-I

Introduction: Types of pavement structure. Functions of pavement components, Factors affecting pavement design, Design wheel load, Strength characteristics of pavement materials. Comparison of flexible and rigid pavements.

UNIT-II

Design of Flexible Pavements: General design considerations, Methods for design of flexible pavements – Group Index Method, Triaxial Test Method, Hveem Stabilometer Method, McLeod's Method, Indian Roads Congress Method.

Design of Bituminous Mixes: Mix Design Approaches, Marshall Method of Bituminous Mix Design, Super pave.

UNIT-III

Design of Rigid Pavements: General design considerations, Wester Gard's Analysis, Methods for design of rigid pavements - PCA method, AASHTO Method, Indian Roads Congress Method, Types and design of Joints in cement concrete pavements.

UNIT-IV

Modern Design Concepts: Reinforced Concrete Pavement, Airport Pavement Design, Bituminous Pavement with Cemented Base, Interlocking Concrete Block Pavement, Full Depth Bituminous Pavement, Ultrathin White Topping, Perpetual Pavement, Pavement Overlays.

Recommended Books

1. E.J. Yoder and M.W. Witczak, 'Principals of Pavement Design', Wiley Publication.
2. S.K. Khanna and C.E.G. Justo, 'Highway Engineering', Nem Chand & Bros., Roorkee.
3. S.K. Sharma, 'Principles, Practice and Design of Highway Engineering', S. Chand & Co.
4. P. Chakraborty and A. Das, "Principles of Transportation Engineering", Prentice Hall India.
5. Yang H. Huang, 'Pavement Analysis and Design', Prentice Hall.

ADVANCED STRUCTURAL ANALYSIS

Subject Code: BCIE1-862 **L T P C** **Contact Hrs. 45**
3 1 0 4

UNIT-I

BASIC CONCEPTS OF STRUCTURAL ANALYSIS: Static and kinematic indeterminacies of beams, rigid-jointed plane and space frames, pin-jointed plane and space frames and hybrid structures, actions and displacements, action and displacement equations, generalized system of coordinates, slope-deflection equations in generalized coordinates, relation between flexibility and stiffness matrices, Basic definitions and types of matrices, matrix operations, matrix inversion, solution of linear simultaneous equations, matrix partitioning.

UNIT-II

FLEXIBILITY MATRIX (PHYSICAL APPROACH): Development of flexibility matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using physical approach.

STIFFNESS MATRIX (PHYSICAL APPROACH): Development of stiffness matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using physical approach, reduced stiffness matrix, total stiffness matrix, translational or lateral stiffness matrix.

UNIT-III

FLEXIBILITY MATRIX (ELEMENT APPROACH): Transformation of system forces to element forces through force transformation matrix, Development of flexibility matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using Element Approach.

STIFFNESS MATRIX (ELEMENT APPROACH): Transformation of system displacements to element displacements through displacement transformation matrix, Development of stiffness matrices for statically determinate and indeterminate beams, rigid-jointed plane frames and pin-jointed plane frames using Element Approach.

UNIT-IV

FLEXIBILITY METHOD OF ANALYSIS: Analysis of continuous beams, rigid-jointed plane frames and pin-jointed plane frames using the physical and element approaches, effect of support settlements, temperature stresses and lack of fit.

STIFFNESS METHOD OF ANALYSIS: Analysis of continuous beams, rigid-jointed plane frames and pin-jointed plane frames using the physical and element approaches, effect of support settlements, temperature stresses and lack of fit, comparison of flexibility and stiffness methods of analysis.

Recommended Books

1. G.S. Pandit and S.P. Gupta, 'Structural Analysis, A Matrix Approach'.
2. William Weaver, Jr. James M. Gere, 'Matrix Analysis of Framed Structures'.
3. C.S. Reddy, 'Basic Structural Analysis'.
4. C.S. Krishnamurthy, 'Finite Element Analysis'.
5. O.C. Zeincwicz, 'Finite Element Methods'.

ADVANCED REINFORCING TECHNIQUES IN SOILS

Subject Code: BCIE1-863 **L T P C** **Contact Hrs. 45**

3 1 0 4

UNIT-I

Geosynthetics: An overview of Geosynthetics, Description of Geotextiles – Geogrids – Geonets – Geomembranes –Geocomposites – Geocells – Designing with Geotextiles – Geotextile properties and test methods –Functions of Geotextile – Design methods for separation – stabilization – filtration – Drainage, Soil anchors.

UNIT-II

Reinforced Earth: The mechanisms of the reinforced earth techniques – Design principles – Materials used for construction – Advantages of reinforced earth – Reinforced earth construction with GI sheets and strips.

UNIT-III

Soil Anchors: Inclusions and Installation Techniques, Design of Soil Anchors, Application Criteria: Advantages and Limitations, Soil Nailing- concept, uses, applications and design methodology.

UNIT-IV

Coffer Dam: Braced cuts, Arching action of soil and its application, coffer dam's analysis and design.

Recommended Books

1. B.M. Das, 'Advanced Soil Mechanics', Taylor and Francis.
2. R.F. Scott, 'Principles of Soil Mechanics', Addison & Wesley.
3. R.O. Davis and A.P.S. Selvadurai, 'Elasticity and Geomechanics', Cambridge University Press, New York.
4. James K. Mitchell, 'Fundamentals of Soil Behaviour', John Wiley and Sons.
5. D.M. Wood, 'Soil Behaviour and Critical State Soil Mechanics', University of Glasgow.
6. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall – 1989
7. G.V. Rao & G.V.S. Suryanarayana Raju, Engineering with Geosynthetics, Tata McGraw Hill Publishing Co. New Delhi.
8. Korener, 'Construction & Geotechnical Methods in Foundation Engineering', McGraw Hill.
9. S.K. Shukla and J.H. Yin, 'Fundamental of Geosynthetic Engineering', Taylor & Francis.
10. Swamisaran, 'Reinforced Soil and its Engineering Application', New Age Publication.

SOFTWARE LAB.

Subject code -BCIE1-840 **L T P C** **Contact Hrs. 24**
0 0 2 1

Student can choose anyone software according to their choice.

1. STAAD-PRO
2. E-TAB
3. ARC VIEW GIS
4. MX ROAD
5. PLAXIS
6. PRIMA VERA

ADVANCED TESTING LAB.

Subject Code: BCIEI-841 **L T P C** **Contact Hrs. 24**
0 0 2 1

1. Rebound Hammer Test
2. Ultrasonic Pulse Velocity Test
3. Reinforced Bar Locator Test

4. Cut and Pull Out (CAPO) Test
5. Fifth Wheel Bump Integrator Test
6. Benkelman Beam Deflection Test
7. Vehicular Speed Radar Test
8. Static Cone Penetration Test (SCPT).

Lab Manuals

1. M.L. Gambhir, 'Concrete Manual', Dhanpat Rai & Sons, Delhi.
2. M.S. Shetty, 'Concrete Technology, Theory & Practice', S. Chand & Company.
3. S.K. Khanna and C.E.G. Justo, 'Highway Material & Pavement Testing', Nem Chand.

MAJOR PROJECT

Subject code -BCIE1-842 **L T P C** **Contact Hrs. 45**
0 0 6 2

Students are required to work on practical projects in the field of Civil Engineering. The students have to work for 6 hrs per week with his / her supervisor(s).