



**Scheme of Instruction & Syllabi
of
Bachelor of Technology
3rd Year**

(Civil Engineering)

(Effective From 2012-2013)

Invertis Institute of Engineering & Technology

INVERTIS UNIVERSITY

Invertis Village

Bareilly-Lucknow NH-24, Bareilly



INVERTIS UNIVERSITY, BAREILLY

STUDY & EVALUATION SCHEME

B. Tech. Civil Engineering

(Effective from the academic year 2012-2013)

YEAR III, SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				SUBJECT TOTAL	Credits
						SESSIONAL EXAM.			E-SEM		
			L	T	P	CT	TA	TOTAL			
THEORY											
1	BCE-501	Geotechnical Engineering II	3	1	0	20	10	30	70	100	4
2	BCE-502	Structural Analysis I	3	1	0	20	10	30	70	100	4
3	BCE-503	Transportation Engineering I	3	1	0	20	10	30	70	100	4
4	BCE-504	Irrigation Engineering	3	1	0	20	10	30	70	100	3
5	BCE-505	Environmental Engineering I	2	1	0	10	5	15	35	50	3
6	BCE-506	Estimation Costing & Valuation	2	1	0	10	5	15	35	50	2
PRACTICAL/DESIGN/DRAWING											
7	BCE-551	Environmental Engineering Design Practice	0	0	2	-	-	10	15	25	1
8	BCE-552	Structural Analysis Lab	0	0	2	-	-	10	15	25	1
9	BCE-553	Geotechnical Engineering II Lab	0	0	2	-	-	10	15	25	1
10	BCE-554	Seminar	0	0	2	-	-	25	-	25	1
11	GP-501	General Proficiency	-	-	-	-	-	25	-	25	1
Total			16	6	8	100	50	230	395	625	25

INVERTIS UNIVERSITY, BAREILLY

STUDY & EVALUATION SCHEME

B. Tech. Civil Engineering

(Effective from the academic year 2012-2013)

YEAR III, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme						Credits
						SESSIONAL EXAM.			E-SEM/TOTAL			
			L	T	P	CT	TA	TOTAL				
THEORY												
1	BCE-601	Concrete Structure	3	1	0	20	10	30	70	100	4	
2	BCE-602	Structural Analysis II	3	1	0	20	10	30	70	100	4	
3	BCE-603	Transportation Engineering II	3	1	0	20	10	30	70	100	4	
4	BCE-604	Environmental Engineering II	2	1	0	10	5	15	35	50	2	
5		CE Elective-I	3	1	0	20	10	30	70	100	4	
6		CE Elective-II	2	1	0	10	5	15	35	50	2	
PRACTICAL/DESIGN/DRAWING												
6	BCE-651	Cement Concrete Lab	0	0	2	-	-	10	15	25	1	
7	BCE-652	Structural Detailing Lab	0	0	2	-	-	10	15	25	1	
8	BCE-653	Transportation Engineering Lab	0	0	2	-	-	10	15	25	1	
9	BCE-654	Environmental Engineering Lab	0	0	2	-	-	10	15	25	1	
10	GP-601	General Proficiency	-	-	-	-	-	25	-	25	1	
Total			16	6	8	100	50	215	410	625	25	

CE ELECTIVE-I

BCE-011 Matrix Analysis of
Structure

BCE-012 Advanced Foundation
Design

BCE-013 Environmental
Management for Industries

BCE-014 Principles of Town
Planning & Architectures

CE ELECTIVE-II

BCE-021 Disaster Management

BCE-022 Earth and Earth retaining
Structure

BCE-023 Transportation System Planning

BCE-024 Rural Water Supply & Sanitation

MODULE I**SITE INVESTIGATION AND SELECTION OF FOUNDATION**

Scope and objective methods of exploration and boring. sampling representative and undisturbed sampling sampling techniques split spoon sampler, thin tube sampler, stationary piston sampler Penetration tests (SPT and SCPT) Data interpretation (strength parameters and liquefaction potential) selection of foundation based on soil condition.

FOUNDATION

Introduction location and depth of foundation, Bearing capacity of shallow foundation on homogeneous deposits Terzaghi's formula and BIS formula factors affecting bearing capacity, allowable bearing pressure, settlement components of settlement, determination of settlement of foundations on granular and clay deposits, allowable settlements, methods of minimizing settlement ,differential settlement.

MODULE II**FOOTINGS AND RAFTS**

Types of foundation, contact pressure distribution below footings and raft Isolated and combined footings type proportioning, mat foundation types use proportioning.

PILES

Types of piles and their function, factors influencing the selection of pile carrying capacity of single pile in granular and cohesive soil , static formula dynamic formulae engineering news and Hiley's) capacity from in situ tests (SPT and SCPT), negative skin friction

MODULE III**RETAINING WALLS**

Plastic equilibrium in soils, active and passive states, Rankine's theory, cohesionless and cohesive soil, coloumb's wedge theory, condition for critical failure plane, earth pressure on retaining walls of simple configurations, graphical methods (Rebhann and Culmann) ,pressure on the wall due to line load, stability of retaining walls.

Text Books

1. Murthy, V.N.S., “Soil Mechanics and Foundation Engineering”, UBS Publishers Distribution Ltd, 1999.
2. Gopal Ranjan Rao, A.S.R., ”Basic and Applied Soil Mechanics”, Wiley Eastern Ltd., 2003.

References

1. Das, B.M., “Principles of Foundation Engineering, 5th Edition, Thomson Books, 2003.
2. Kaniraj, S.R., “Design Aids in Soil Mechanics and Foundation Engineering”, Tata McGraw Hill Publishing Company Ltd., 2002.
3. Bowles, J.E., “Foundation Analysis and Design”, McGraw-Hill, 1999

BCE:502 STRUCTURAL ANALYSIS –I

L T P C

3 1 0 4

MODULE I

Classification of Structures, stress resultants, degrees of freedom per node, static and Kinematic determinacy. Classification of Pin jointed determinate trusses, analysis of determinate plane and space trusses (compound and complex).

Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau’s principal & its application for determinate structures

MODULE II

Analysis of Arches, Linear arch, Eddy’s theorem, three hinged parabolic arch, spandrel braced arch, moving load & influence lines.

Strain Energy of deformable systems, Maxwell’s reciprocal & Betti’s theorem, Castigliano’s first theorem, unit load & Conjugate beam methods.

MODULE III

Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural section.

Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.

Text Books:

1. *Vazirani & Ratwani et al ,” Analysis of Structures “ , Khanna Publishers*
2. *S.S Bhavikatti, ”Structural Analysis II” Vikash publishing house*

References:

1. *Hibbler ,” Structural Analysis “, Pearson Education*
2. *T S Thandavmorthy ,” Analysis of Structures “, Oxford University Press*
3. *Wilbur and Norris, “Elementary Structural Analysis”, Tata McGraw Hill.*
4. *Reddy, C.S., “Basic Structural Analysis”, Tata McGraw Hill.*
5. *Jain, O.P. and Jain, B.K., “Theory & Analysis of Structures ”. Vol. I & II Nem Chand.*
7. *Coates, R.C., Coutie, M.G. & Kong, F.K., “Structural Analysis”, English Language Book Society & Nelson, 1980*

BCE:503 TRANSPORTATION ENGINEERING I

L T P C

3 1 0 4

MODULE I

Introduction: Role of Transportation, Modes of Transportation, History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types and pattern.

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

MODULE II

Traffic Engineering: Traffic characteristic, volume studies, speed study, capacity, density, traffic control devices, signs, signals, design of signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection.

Design of Highway Pavement: Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC: 37-2001), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design. (IRC: 58 – 2002).

MODULE III

Road Construction Methods: WBM, Surface dressing, bituminous carpeting, Bituminous Bound Macadam and Asphaltic Concrete, Cement Concrete road construction.

Airport Engineering: Air craft characteristics, types of airports, layout of airports, airport planning & design, runway orientation, wind-rose diagram, estimation of runway length & correction.

Text Books:

- 1. Highway Engineering by S. K. Khanna & C.E.G.Justo.*
- 2. Airport Planning & Design by S. K. Khanna, M. G. Arora & S. S. Jain.*

References:

- 1. Transportation Engineering by L. R. Kadiyali.*
- 2. Highway Engineering by S. K. Sharma*
- 3. Principles of Transportation Engineering by P. Chakraborty & A. Das.*

MODULE I

Introduction: Necessity of Irrigation in India, Advantages and disadvantages of Irrigation, Techniques of water distribution in farms. Quality of irrigation water, crops and crop season, Consumptive use, Irrigation requirements, Estimation of consumptive use of water by climatic approaches, Irrigation efficiencies, Soil moisture-irrigation relationship

Canal Irrigation: Classification of canals, Canal losses, Alignment of canals. Design of Irrigation Canals: Design of stable channels using Kennedy's and Lacey's theory, Garret's diagram, Cross section of irrigation canals, Lining of Irrigation Canals: Advantages and economics of lining, various types of lining, Design of lined canals

MODULE II

Types of Cross-Drainage Works: Types of CD works, Selection of a suitable type to suite a particular condition, Design consideration for CD works, Canal Falls:

Necessity, Proper location, Types, Design and detailing of one type of fall; Weirs and Barrages:

Weirs and Barrages, Types of weirs and barrages, Layout of a diversion head work, Introduction

of different components of a diversion head works, Design of weirs and barrages: Bligh's creep

theory, design of weir using Bligh's theory, Lane's weighted creep theory, Khosla's theory,

Khosla's method of independent variables, exit gradient

MODULE III

Dams: Typical cross section, Various forces acting on gravity dam, Combination of forces for design, modes of failure and criteria for structural stability, High and low gravity dam, Design of high dam, Typical section of low gravity dam, Earth and Rock fill Dams: Types, Causes of failure, Preliminary section of an earth dam, Preliminary section of an earth dam, Seepage control in earth dams

Spillways: Descriptive study of various types of spillways; Reclamation of Water Logged and Saline Soils: Causes and control of water logging. Reclamation of saline and alkaline land, Surface and Sub-surface drainage.

Text Books:

1. S. K. Garg, *Irrigation Engineering and hydraulics structures*, Khanna Publishers, 16th Edition.
2. B. Singh, *Irrigation Engineering*, Nem Chand and Sons, Roorkee.

References:

1. Varshney & Gupta, *Theory and Design of Irrigation Structures*, Nem Chand and Bros, Roorkee.
2. I. E. Hook, *Irrigation Engineering*, John Wiley and Sons, New York.
3. J. D. Zimmerman, *Irrigation*, John Wiley and Sons, New York.

BCE:505 ENVIRONMENTAL ENGINEERING – I
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L T P C

2 1 0 3

MODULE I

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period.

Sources of water: Kinds of water sources and their characteristics, collection of surface and ground water; quality of surface and ground waters; factors governing the selection of a source of water supply.

MODULE II

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures.

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs and equivalent pipe method of pipe network analysis; rural water supply distribution system. Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation. Institutional and industrial water supply

MODULE III

Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.

Storm water: Collection and estimation of storm water by different formulae.

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines.

Air pollution: Composition and structure of atmosphere; units of measurement, sources of pollutants, classification of pollutants and their effects, air quality monitoring and standards. Noise pollution: Definition of decibel, sound power level, sound intensity level and sound pressure level; measurement of noise level; basic concept of community noise, transportation noise and industrial noise; acceptable outdoor and indoor noise levels; effects of noise and control measures.

Text books:

- 1. Peavy, Rowe and Tchobanoglous: Environmental Engineering*
- 2. Metcalf and Eddy Inc.: Wastewater Engineering*
- 3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)*

4. Garg: *Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II)*.

References:

1. *Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi*
2. *Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi*
3. *Steel and McGhee: Water Supply and Sewerage*
4. *Fair and Geyer: Water Supply and Wastewater Disposal*
5. *Arceivala: Wastewater Treatment for Pollution Control*
6. *Hammer and Hammer Jr.: Water and Wastewater Technology*
7. *Raju: Water Supply and Wastewater Engineering*
8. *Sincero and Sincero: Environmental Engineering: A Design Approach*
9. *Pandey and Carney: Environmental Engineering*
10. *Rao: Textbook of Environmental Engineering*
11. *Davis and Cornwell: Introduction to Environmental Engineering*

BCE :506 ESTIMATION COSTING & VALUATION
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L T P C
2 1 0 2

MODULE I

Estimation Fundamentals

Importance of estimation, different types of estimates, general and detailed specifications.
Methods of Estimation: Items of work for estimates, units and measurement of items.

Detailed Estimation of Buildings and Analysis of Rates

Detailed estimates of a single roomed and a two roomed single storey residential building.
Estimates of Steel Framed Industrial Building:, Analysis of rates, material and other cost

considerations. Resource planning through analysis of rates, market rates, P.W.D. Schedule rates, non scheduled items and cost indices for building material and labour.

MODULE II

Establishments, Organization Structures and Standard Work Procedures

Organization set up for various works departments. Duties and responsibilities of officers. Administrative, Technical and Financial approvals, System of P.W. accounts, Cash and cash book, Temporary advance, Stores, Issue of stores, Material at site account, Measurement and standard measurement book. Release of payments. Defect Liability considerations.

Valuation of Assets

Standard Terminology, Factors affecting the values of property. Methods of valuation, years purchase, capitalized value and depreciation. Standard rent, free hold and lease hold propriety, Mortgage and easement.

MODULE III

Estimation for Mechanized Construction and Infrastructure Projects 07(L)

Estimation for mechanized construction including slip forming pumped concreting. Equipment costs and productivity analysis. Estimation of highways /irrigation/ airways projects including cross drainage structures.

Text Books:

1.B.N. Dutta "Estimating & Costing in Civil Engineering," UBS Publishers & Distributors Pvt. Ltd. New Delhi.

References:

- 1. Chakraborty M., "Estimating costing and valuation in Civil Engg., Principle and applications (Authors Publication, Kolkata)*
- 2. Frederick E. Gould. "Managing the Construction Process Estimating, Scheduling and Project Control", Pearson Education*

BCE:551 ENVIRONMENTAL ENGINEERING DESIGN PRACTICE
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L T P C

0 0 3 1

1. Design of river intake and pump house.

2. Design of water treatment plants.

Sedimentation tank.

Rapid gravity filter.

Wash water tank.

Under drainage system.

3. Design of effluent treatment plant.

Screening tank.

Grit chamber.

Primary clarifier.

Trickling filter.

Aeration tank.

Secondary clarifier.

4. Design of septic tank and soakage pit.

5. Design of Air pollution Control Systems.

Text Books:

1. A. P. Sincero & G. Sincero, *Environmental Engineering: A Design Approach*, Prentice Hall.

2. *H. S. Peavy, D. R. Rowe & G. Tchobanoglous, Environmental Engg, McGraw Hill.*

References:

1. *M. L Davis and D. A. Cornwell, Introduction to Environmental Engg, McGraw Hill.*

2. *G. Kiely, Environmental Engineering, McGraw Hill.*

3. *C. D. Cooper and F.C. Alley, Air Pollution Control: A Design Approach, McGraw Hill.*

BCE-552 STRUCTURAL ANALYSIS LAB
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L T P C

0 0 3 1

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell's Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

BCE : 553 GEOTECHNICAL ENGINEERING – II (LAB.)

L T P C

0 0 3 1

1. Methods of Soil Exploration
2. Free swell Index & Differential free swell Index
3. Swelling pressure test
4. Dynamic cone penetration test
5. Standard penetration test
6. Plate load test.

BCE: 554 SEMINAR

L T P C

0 0 2 1

BCE:601 CONCRETE STRUCTURE

L T P C

2 1 0 2

MODULE I

Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.

MODULE II

Behaviour of RC beams in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear.

Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

MODULE III

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note : All designs shall be conforming to IS : 456 – 2000.

Text Books:

1. *IS : 456 – 2000.*
2. *Reinforced Concrete – Limit State Design* by A. K. Jain, Nem Chand & Bros., Roorkee.
3. *Reinforced Concrete Design* by P. Dayaratnam.

References:

1. *Plain and Reinforced Concrete Vol. I & II* by O. P. Jain & Jai Krishna, Nem Chand & Bros.
2. *Reinforced Concrete Structures* by R. Park and Pauley.
3. *Reinforced Concrete Design* by S. Unnikrishna Pillai & D. Menon, Tata Mc-Graw Hill Book Publishing Company Limited, New Delhi.

BCE: 602 STRUCTURAL ANALYSIS II
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L T P C
2 1 0 2

MODULE I

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, Method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

Muller-Breslau's Principle and its applications for drawing influence lines for Indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

MODULE II

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Basics of Force and Displacement Matrix methods for beams and trusses

MODULE III

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Text Books:

- 1. Advanced Structural Analysis by A. K. Jain, Nem Chand & Bros., Roorkee.*
- 2. Structural Analysis by C. S. Reddy, Tata Mc Graw Hill Publishing Company Limited, New Delhi.*

References:

- 1. Theory and Analysis of Structures, Vol. I & II by O. P. Jain & B. K. Jain, Nem Chand & Bros., Roorkee.*
- 2. Theory of Structures by S. P. Timoshenko and D. Young, Mc-Graw Hill Book Publishing Company Ltd., New Delhi.*
- 3. Analysis of Statically Indeterminate Structures by P. Dayaratnam, Affiliated East West Press.*
- 4. Indeterminate Structural Analysis by C. K. Wang.*

5. *Introduction to Matrix Methods of Structural Analysis* by H. C. Martin, Mc-Graw Hill Book Publishing Company Ltd.

6. *Matrix Analysis of Framed Structures* by Weaver and Gere.

7. *Theory of Structures Vol. II* by Vazirani & Ratwani.

BCE:603 TRANSPORTATION ENGINEERING II
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L T P C

2 1 0 2

MODULE I

Indian railways: Development and organization of Indian Railways. Permanent way: Sub-grade, formation, embankment and cutting, track drainage.

Rails: Rail gauges, types of rails, defects in rails, rail failure, creep of rail. Rail Fastenings: Fish plates, spikes, chairs, keys, bearing plates.

Sleepers: Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density.

MODULE II

Ballast: Ballast materials, size of ballast, screening of ballast, specification of ballast, tests on ballast.

Railway Track Geometry: Gradients, horizontal curves, super-elevation, safe speed on curves, cant deficiency, negative super elevation, and compensation for curvature on gradients, track resistance and tractive power.

Points & Crossings : Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out.

MODULE III

Stations & Yards: Site selection for a railway station, layout of different types of stations, classification of stations, types of railway yard, functions of Marshalling yards. Signalling &

Interlocking: Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station.

Introduction to Steel Bridges: Types of Steel Bridges, Economical Span, Loads, Permissible Stresses, Fluctuation of Stresses, Secondary stresses in trusses, Design of Plate Girder Bridges. Design of Truss Bridges, General arrangement, Economic proportions, Types of Bridge trusses, Wind Forces on Lattice Girder Bridge, Top lateral bracing, Bottom lateral bracing, and Brief introduction to Bearing.

Text Books:

1. *A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena*
2. *IS : 800 – 1984.*
3. *Design of Steel Structures by A. S. Arya & J. L. Ajmani, Nem Chand & Bros., Roorkee.*

References:

1. *Railway Engineering by M. M. Aggrawal.*
2. *Railway Engineering by Vasvani*
3. *Bridge Engineering by Algia*
4. *Railway Engineering by B. L. Gupta & Amit Gupta*
5. *Roads, Railway, Bridge & Tunnel Engineering by B. L. Gupta*
6. *Essentials of Bridge Engineering by D. J. Victo*

MODULE I

Introduction: Beneficial uses of water and quality requirements, standards. concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater. Water borne diseases and their control

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc

MODULE II

Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling. Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators.

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations; slow sand, rapid sand and pressure filters, backwashing; brief introduction to other filters; design of filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals. Adsorption.

MODULE III

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design, sedimentation and chemical treatment to be given.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B. C. etc.

Anaerobic digestion of sludge: Design of low and high rate anaerobic digesters and septic tank. Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor. Disposal of wastewater on land and in water bodies.

Text books:

- 1. Peavy, Rowe and Tchobanoglous: Environmental Engineering*
- 2. Metcalf and Eddy Inc.: Wastewater Engineering*
- 3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)*
- 4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).*

Reference books:

- 1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi*
- 2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi*
- 3. Steel and McGhee: Water Supply and Sewerage*
- 4. Fair and Geyer: Water Supply and Wastewater Disposal*
- 5. Arceivala: Wastewater Treatment for Pollution Control*
- 6. Hammer and Hammer Jr.: Water and Wastewater Technology*
- 7. Raju: Water Supply and Wastewater Engineering*
- 8. Sincero and Sincero: Environmental Engineering: A Design Approach*
- 9. Pandey and Carney: Environmental Engineering*

10. Rao: *Textbook of Environmental Engineering*

11. Davis and Cornwell: *Introduction to Environmental Engineering*

BCE: 651 CEMENT CONCRETE LAB

L T P C

0 0 3 1

Cement:

1. Test for fineness
2. Test for setting times including normal consistency test
3. Mortar cube preparation and testing

Aggregates:

1. Sieve analysis test - Grade Curves
2. Crushing Value - Test
3. Test on Aggregates - Los Angeles Abrasive Testing Machine

Concrete:

1. Cube compression test
2. Destructive and Non-Destructive testing on concrete
3. Mix design using test parameters and assessing the strength of concrete

BCE:652 STRUCTURE DETAILING LAB
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L T P C

0 0 3 1

Preparation of working drawings for the following _

1. RC Beams- Simply supported, Continuous, Cantilever
2. T – beam / L-beam floor
3. Slabs – Simply supported, Continuous, One way and two way slabs.

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4. Columns – Tied Columns and Spirally reinforced columns.
 5. Isolated footings for RC Columns.
 6. Combined rectangular and trapezoidal footings.

BCE: 653 TRANSPORTATION ENGINEERING LAB
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L T P C

0 0 3 1

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate.
4. Penetration Test of Bituminous Sample
5. Softening Point Test of Bituminous Sample
6. Stripping Test of Bituminous Sample
7. Ductility Test of Bituminous Sample
8. Flash & Fire Point Test of Bituminous Sample

References

1. *Highway Material Testing* by S. K. Khanna & C. E. G. Justo
2. *Highway Material Testing* by A. K. Duggal

BCE:654 ENVIRONMENTAL ENGINEERING LAB
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L T P C

0 0 3 1

1. Determination of turbidity, colour, and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine and chlorine demand.

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5. Determination of dissolved oxygen.
 6. Determination of most probable number of coliforms.
 7. Measurement of air pollutants with high volume sampler.
 8. Measurement of sound level with sound level meter.
 9. Determination of total suspended and dissolved solids.
 10. Determination of BOD of sample.
 11. Determination of COD of sample

Text Books:

1. *Sawyer, McCarty and Parkin: Chemistry for Environmental Engineering*
2. *Mathur: Water and Wastewater Testing.*

References:

1. *Standard Methods for the Examination of Water and Wastewater, A. P. H. A., New York*
2. *W. H. O.: Selected Methods of Measuring Air Pollutants*
3. *Cunniff: Environmental Noise Pollution.*

DEPARTMENTAL ELECTIVES:

BCE – 011 MATRIX ANALYSIS OF STRUCTURE

L T P C

3 1 0 4

MODULE I

Introduction of Flexibility and stiffness method, hand computation of problems on beam, Hand computation of problems on trusses, frames and grids.

MODULE II

Generalized computer oriented treatment of stiffness method, method of assembling the stiffness matrix, substructure technique for solving very large structures.

MODULE III

Analysis for imposed deformation, temperature, support settlement, etc. Transfer matrix method of analysing framed structure.

References:

1. Weaver & Gere , *Matrix Analysis of Framed structures*.
2. H.C. Matrix, *Introduction to Matrix Methods, of structural Analysis, McGraw Hill, New York*.

BCE 012 ADVANCED FOUNDATION DESIGN

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3 1 0 4

MODULE I

Vertical pressures under surface loads: Elastic Solution, Boussinesq and New Mark Charts, Westergaard's equation, approximate solution.

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, DeBeer and Schmertman's methods of settlement prediction in non cohesive soil.

MODULE II

Classification of piles: load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group. Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under reamed piles. Elements of well foundation, Shape, Depth of scour, Well sinking, Tilt, shift and their prevention.

MODULE III

Stability of slopes: Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Machine foundation: classification, definitions, design principle in brief Barken's method.

Text Books:

1. *K. R. Arora – Soil Mechanics & Foundation Engineering.*
2. *Alam Singh – Modern Geotechnical Engineering.*
3. *Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics*

References:

1. *J. E. bowles – Analysis and Design of Foundation.*
2. *V. N. S. Murthy – Soil Mechanics and Foundation Engineering.*
3. *B. M. Das – Foundation Engineering , CENGAGE Learning*

BCE-013 ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES
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MODULE I

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Defining the industrial activity: Location, approach, manufacturing processes, raw materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological environment and socio-economic environment.

MODULE II

Detailing of the local environment: Physical environment- water, air, land resources & solid wastes, noise emissions, radiation emissions etc.; Biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

MODULE III

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC): Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Text Books:

1. C. J. Barrow, *Environmental Management: Principles and Practice (Routledge Environmental Management Series) Routledge, 1st edition, 1999.*
2. R. Sullivan, Hugh, Wyndham, *Effective Environmental Management: Principles and Case Studies, Allen & Unwin Academic, 2001.*

References:

1. F. B. Friedman, *Practical Guide to Environmental Management, Environmental Law Institute, USA, 9th edition 2003.*
2. G. Burke, Ben R. Singh and L. Theodore, *Handbook of Environmental Management and Technology, Wiley-Interscience, 2nd edition, 2000.*
3. B. Taylor, *Effective Environmental, Health, and Safety Management Using the Team Approach, Wiley-Interscience, 2005.*
4. D. L. Goetsc

BCE – 014 PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE

L T P C

3 1 0 4

MODULE I

Principles of town planning, Land use patterns, Population survey, Density concepts, and transportation planning, Concept of habitat including environmental pollution, problems of metropolis, Satellite town concepts, Garden city movement, Neighbourhood planning, Brief history of architecture,

MODULE II

Impact of development of materials through ages, Evolution of architectural forms, Anesthetics and functional proportions, Principles of architecture Design, Building ByeLaws, Scale, Forms, Texture, Colour, Balance, Composition of Space, Role of architects and town planners,

MODULE III

Architectural Drawing, Different symbols used in building industry, Design of typical buildings such as school, hospital, residential and commercial complex, etc.

BCE-021 DISASTER MANAGEMENT

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2 1 0 2

MODULE I

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

MODULE II

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

MODULE III

Cyclones: Formation, Cyclonic precipitation, anti-cyclones, flood: flood and its estimation, **Flood warning,** Flood protection measures. **Earthquake:** Causes of earthquake, plate tectonics, seismic zoning map, Characteristics of strong ground motions & attenuation, damage assessment, rehabilitation and retrofitting of structures. **Environmental disaster:** Impact assessment studies, computation and preparedness.

Text Books:

1. *K. C. Patra, Hydrology and Water Resources Engineering, CRC Press, Florida, USA, 2nd Edition.*
2. *N. Sharma, Earthquake resistant building construction, S. K. Kataria & Sons, New Delhi.*

References:

1. *K. Subramanian, Engineering Hydrology, Tata McGraw Hill, New Delhi.*
2. *V. P. Singh, Elementary Hydrology, Prentice Hall of India.*
3. *P. C. Sinha, Disaster Mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd.*
4. *D. P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann.*
5. *F. B. Friedman, Practical Guide to Environmental Management, McGraw Hill*

MODULE I

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability.

MODULE II

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design. Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design procedure.

MODULE III

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Text Books:

1. *V N S Murthy – Soil Mechanics and Foundation Engg*
2. *Swami Saran – Reinforced Soil and its Engineering Application*
3. *J. E. Bowles – Analysis and Design of Foundation*

BCE – 023 TRANSPORTATION SYSTEM PLANNING

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2 1 0 2

MODULE I

Introduction: Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning, Type of transportation system: Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

MODULE II

Travel demand: Estimation and forecasting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment. Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

MODULE III

Transportation Facilities: Pedestrian facilities, Bicycle facilities, parking and terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

Text Books/References:

- 1. Introduction to Transportation Engineering: William W. Hay.*
- 2. Introduction to Transportation Engineering planning – E.K. Mortak.*
- 3. Metropolitan transportation planning – J.W. Dickey.*
- 4. Traffic Engineering, L.R. Kadiyali*

BCE-024 : RURAL WATER SUPPLY & SANITATION
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2 1 0 2

MODULE I

Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties. National policy. Water supply: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas. Development of proffered sources of water springs. Wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

MODULE II

Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS), diatomaceous earth filter, cloth filter, slow sand filter, chlorine diffusion cartridges. Pumps, pipe materials, appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas. Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas. Treatment and Disposal of waste water.

Compact and simple waste water treatment units and systems in rural areas such as stabilization ponds, septic tanks, Imhoff tank, soak pit etc. Disposal of waste water soakage pits and trenches.

MODULE III

Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, Rural health. Other specific issues and problems encountered in rural sanitation

References:

1. *'Water Treatment and Sanitation – Simple Method for Rural Area'* by Mann H.T. and Williamson D.
2. *'Water Supply for Rural Areas & Small Communities'* by Wanger E.G. and Lanoix J.N., WHO
3. *'Water Supply and Sewerage'*, by E.W.Steel & T.J.McGhee, McGraw Hill.
4. *'Manual on Water Supply and Treatment'*, CPHEEO, Mini. Of Urban Development, Govt. of India.
5. *'Manual on Sewerage and Sewage Treatment'*, CPHEEO, Mini. Of Urban Development, Govt. of India
6. *'Environmental Engineering'* by D. Srinivasan, PHI Learning Pvt. Ltd. 2009