Total Credits= 23

Semester-V (B. Tech Civil Engg.)		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
BCIES1-521	Structural Analysis-II	3	0	0	40	60	100	3
BCIES1-522	Geotechnical Engineering	3	0	0	40	60	100	3
BCIES1-523	Environmental Engineering-II	3	0	0	40	60	100	3
BCIES1-524	Design of Steel Structures-I	3	0	0	40	60	100	3
Departmental Elective-II (Select any one)		3	0	0	40	60	100	3
BCIED1-551	Fluid Mechanics-II							
BCIED1-552	Maintenance of Building Structures							
BCIED1-553	Rural Water Supply and Onsite Sanitation Systems							
Departmental Elective-III (Select any one)		3	0	0	40	60	100	3
BCIED1-561	Construction Engineering & Management							
BCIED1-562	Repair & Rehabilitation of Structures							
BCIED1-563	River Engineering							
BCIES1-525	Geotechnical Engineering Lab	0	0	2	60	40	100	1
BCIES1-526	Engineering Geology Lab	0	0	2	60	40	100	1
BCIES1-527	Environmental Engineering Lab	0	0	2	60	40	100	1
BCIES1-528	Training-II*	0	0	0	60	40	100	2
Total		**-**	**-**	**-**	**480**	**520**	**1000**	**23**

*Internship will be imparted at the end of 4th semesteras per AICTE Internship Policy.

Total Credits= 22

Semester-VI (B. Tech Civil Engg.)		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
BCIES1-621	Design of Concrete Structures-II	3	0	0	40	60	100	3
BCIES1-622	Foundation Engineering	3	0	0	40	60	100	3
BCIES1-623	Professional Practice & Law	3	1	0	40	60	100	4
BCIES1-624	Irrigation Engineering	3	0	0	40	60	100	3
XXXXX	Open Elective**	3	0	0	40	60	100	3
Departmental Elective-IV (Select any one)		3	0	0	40	60	100	3
BCIED1-651	Matrix Methods of Analysis							
BCIED1-652	Solid & Hazardous Waste Management							
BCIED1-653	Pavement Design							
BCIED1-654	Ground Improvement Techniques							
BCIES1-625	Soil Mechanics& Foundation Engineering Lab	0	0	2	60	40	100	1
BCIES1-626	Concrete Technology Lab-II	0	0	2	60	40	100	1
BCIES1-627	Computer-aided Civil Engineering Drawing-II	0	0	2	60	40	100	1
BMNCC0-001	Constitution of India (Mandatory Course)	2	0	0	100	---	100	0
Total		**-**	**-**	**-**	**520**	**480**	**1000**	**22**

*There will be 4-6 weeks Internship as per AICTE Internship Policy after 6thsemester.

**Open Elective Subjects may also be chosen from the list of Open Electives-I, II and III offered by other departments of university.

STRUCTURAL ANALYSIS-II					
Subject Code: BCIES1-521	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

1. 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.

2. 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 (12 Hours)

3. 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.

4. 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 (11 Hours)

5. 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.

6. 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 (11 Hours)

7. 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.

8. 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 Text Books / Reference 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. Punmia, 'Theory of Structures'.

GEOTECHNICAL ENGINEERING

Subject Code: BCIES1-522	L	T	P	C	Duration: 45 Hrs.
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

Types of Soils, Their Formation and Deposition, Definitions: soil mechanics, soil engineering, geotechnical engineering. Scope of soil engineering. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity and their relationships, Determination of various parameters such as: Moisture content, oven dry method, Specific gravity by density bottle method, Unit weight by core-cutter method, sand-replacement method.

Plasticity Characteristics of Soil: Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Particle size classification, textural classification, Indian standard soil classification system.

UNIT-II (11 Hours)

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 (10 Hours)

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-logσ curve.

UNIT-IV (12 Hours)

Shear Strength: Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, tri-axial compression tests, test behavior of UU, CU and CD tests, pore-pressure parameters, computation of effective shear strength parameters. Unconfined compression test, vane shear test.

Stability of Slopes: Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.

Recommended Text Books / Reference 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.
6. Joseph E. Bowle 'Physical & Geotechnical Properties of Soil'.

ENVIRONMENTAL ENGINEERING-II

Subject Code: BCIES1-523 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (10 Hours)

Introduction: Terms & definitions, types of sewage, 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 (11 Hours)

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 (14 Hours)

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 (theory), Sludge Handling and disposal; thickening, stabilization, dewatering, drying and disposal.

UNIT-IV (10 Hours)

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

Wastewater Treatment Plants and Advanced Wastewater Treatment: Treatment Plants; site selection, operation and maintenance aspects, advanced wastewater treatment for nutrient removal, disinfection for sewage.

Recommended Text Books / Reference Books:

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

DESIGN OF STEEL STRUCTURES-I

Subject Code: BCIES1-524 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

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

UNIT-I (11 Hours)

Introduction: Properties of structural steel, I.S. rolled sections, I.S. specifications.
Connections: Riveted, bolted and welded connections for axial and eccentric loads (Type-I & II).

UNIT-II (12 Hours)

Tension Members: Introduction, Mode of Failure, IS Specifications, Design of members subjected to axial tension using bolts and welds.

Compression Members: Introduction, buckling, effective length, slenderness, effects of end supports, 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 (12 Hours)

Flexural Members: Plastic behavior, beam types, Shear in beam, bending, splices, Design of laterally restrained and un-restrained rolled and built-up sections using bolts and welds.
Foundation: Types, Anchor bolts, bearing plate, Design of slab base, gusseted base and grillage foundation using bolts and welds.

UNIT-IV (10 Hours)

Roof Truss: Introduction, Terminology, types & uses, types of load, purlins, Design of roof truss using bolts and welds.

Recommended Text Books / Reference Books:

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).

FLUID MECHANICS-II

Subject Code: BCIED1-551 | **L T P C** | **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Laminar Flow: Navier-stokes equations in Cartesian coordinates (no derivation), meaning of terms, Flow through circular section pipe, flow between parallel plates, stokes law. Flow through porous media, Transition from laminar to turbulent flow, Critical velocity and critical Reynold number.
Turbulent Flow: Turbulent flows and flow losses in pipes, Darcy equation minor head losses in pipe fitting, Hydraulic and energy gradient lines. Definition of turbulence, scale and intensity, Effects of turbulent flow in pipes. Equation for velocity distribution in smooth and rough pipes (no derivation). Resistance diagram.

UNIT-II (13 Hours)

Boundary Layer Analysis: Assumption and concept of boundary layer theory. Boundary- layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.
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.

UNIT-III (13 Hours)

Energy and Momentum 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.

Gradually Varied Flow: Different Equation of water surface profile; limitation, properties and classification of water and surface profiles with examples, computation of water surface profile by graphical, numerical and analytical approaches.

UNIT-IV (08 Hours)

Hydraulic Jump and Surges: Theory of Jump, Elements of jump in a rectangular Channel, length and height of jump, location of jump, Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges.

Recommended Text Books / Reference Books:

1. Fluid Mechanics : Dr. R.K. Bansal
2. Fluid Mechanics: Dr. Modi & Dr. Seth.
3. Fluid Mechanics : Dr. Jagdish Lal
4. Flow in open channels by S. Subraminayam, Tata McGraw Hill.

MAINTENANCE OF BUILDING STRUCTURES

Subject Code: BCIED1-552	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Maintenance of Buildings: Introduction, Importance of maintenance, Types of Maintenance – Daily, Weekly, Monthly, Annually, General importance – Painting and home electricity system.

Repair Strategies: Causes of distress in structures Construction and design failures, Condition assessment and distress-diagnostic techniques, Inspection and evaluating damaged structure.

UNIT-II (12 Hours)

Durability and Serviceability of Concrete: 1. Quality assurance for concrete construction based on concrete properties like: (a) strength (b) Permeability (c) Thermal properties (d) cracking
2. Effects due to: (a) climate (b) temperature (c) chemicals (d) corrosion
3. Design and construction errors 4. Effects of cover and cracks.

UNIT-III (11 Hours)

Materials for Repair: Special concretes and mortar, concrete chemicals, construction chemicals, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete, Rust eliminators and polymers coating for rebar, foamed concrete, dry pack, vacuum concrete, asphalt sheeting.

Techniques for Repairs: Guniting, grouting and Shotcrete, Epoxy injection, Jacketing, shoring and underpinning. Methods of corrosion protection: (a) corrosion inhibitors (b) corrosion resistant steels (c) coating and Cathodic protection.

UNIT-IV (11 Hours)

Repair: Repair of – stone, brick and block masonry (Cracks, dampness, efflorescence, joint separation, etc.), Flooring, Roofs (sloping, flat, pitched, etc.), Concrete members due to Steel Corrosion, Lack of Bond & shear, tension, torsion, compression failure. Estimation of Repair.

Recommended Text Books / Reference Books:

1. A.C. Panchdari, 'Maintenance of Buildings', New Age International (P) Limited Publishers.
2. P. S. Gahlot, 'Building Repair and Maintenance Management', CBS Publishers and Distributors Pvt. Ltd.
3. B. L. Gupta, 'Maintenance & Repair of Civil Structures', Standard Publications.
4. W.H. Ransom, 'Building Failures: Diagnosis and Avoidance', New Age Publications (P) Ltd.
5. Housing Defects Reference Manual, 'The Building Research Establishment E. & F.N. Spon'.

RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEMS

Subject Code: BCIED1-553 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Sanitation in Rural Area: Concept of environmental and scope of sanitation in rural areas, Magnitude of problem of water supply and sanitation – population to be covered and difficulties National policy, Various approaches for planning of water supply systems in rural areas, Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source.

UNIT-II (12 Hours)

Water Treatment for Rural Areas: Specific problem in rural water supply and treatment e.g. iron, manganese, fluorides etc., Low cost treatment, appropriate technology for water supply and sanitation, Compact system of treatment of surface and ground waters such as MB settlers, slow and sand filter, chlorine diffusion cartridge etc.

UNIT-III (11 Hours)

Waste Water Treatment & Distribution: Planning of distribution system in rural areas, Water

supply during fairs, festivals and emergencies, Treatment and disposal of wastewater/sewage, various method of collection and disposal of night soil.

UNIT-IV (11 Hours)

Onsite Sanitation System for Rural Areas: On site sanitation system and Disposal of solids waste: Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tanks, soakage pits, surface drains, onsite sanitation systems etc., composting, land filling, Biogas plants.

Recommended Text Books / Reference Books:

1. Low cost on site sanitation option, Hoffman & Heijno Occasional Nov.1981 paper No. 21, P.O. Box 5500 2280 HM Rijswijk, the Netherlands offices, J.C. Mokeniaan
2. Rijswijk (the Haque), Wagner, E.G. and Lanoik, J.N. water supply for rural areas and Small communities, Geneva: W.H.O.1959.
3. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New Delhi.
4. Water Supply and Pollution Control by Warren Viessman Jr. And Mark J. Hammer, 7th Edition 2005, Pearson Education.
5. Wastewater Engineering; Treatment, Disposal, Reuse, by Metcalf & Eddy,Tata McGraw-Hill.

CONSTRUCTION ENGINEERING & MANAGEMENT

Subject Code: BCIED1-561 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (10 Hours)

Basics of Construction: Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution.

Brief Introduction of Construction Project Planning: Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules.

UNIT-II (12 Hours)

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-III (12 Hours)

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

Construction Methods Basics: Types of foundations and construction methods; Basics of

Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with block work walls; Modular construction methods for repetitive works.)

UNIT-IV (11 Hours)

Construction Equipment: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment for Productivities.

Contracts Management Basics: Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to precede, rights and duties of various parties, notices to be given, Contract Duration and Price; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods.

Recommended Text Books / Reference Books:

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.
3. Chudley, R., Construction Technology, ELBS Publishers, 2007.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education
7. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications.

REPAIR & REHABILITATION OF STRUCTURES

Subject Code: BCIED1-562 | **L T P C** | **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (09 Hours)

Maintenance and Repair Strategies: Definitions: Maintenance, Repair and Rehabilitation. Facets of Maintenance, Importance of Maintenance and Daily, Weekly, Monthly, Yearly Routine Maintenance, Various aspects of Inspection, stages of inspection, Assessment procedure for Evaluating a damaged Structure, Causes of deterioration.

UNIT-II (13 Hours)

Materials for Repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete.

Strength and Durability of Concrete: Quality assurance for Concrete: Strength, Durability and Thermal properties, Cracks: Different types, Causes, Effects due to climate, Temperature, Sustained elevated temperature, Corrosion – Effects of cover thickness.

UNIT-III (13 Hours)

Techniques for Repair and Protection Methods: Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques: Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, Cathodic protection.
Demolition Techniques: Engineered demolition methods and Case studies.

UNIT-IV (10 Hours)

Repair, Rehabilitation and Retrofitting of Structures: Evaluation of root causes, Under pinning & shoring some simple systems of rehabilitation of structures; Guniting, shortcreting, Non-destructive testing system; Use of external plates, carbon fibre wrapping and carbon composites in repairs. Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake.

Recommended Text Books / Reference Books:

1. A.C. Panchdari, 'Maintenance of Buildings', New Age International (P) Limited Publishers.
2. Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013.
3. Ravishankar.K., Krishnamoorthy.T.S, " Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. R. Chudley, 'Building Finishes, Fittings and Domestic Services', Longman Technical Services.
5. G. Szechy, D. SC; 'Foundation Failures', Concrete Publications Limited, 14 Dartmouth Street, London.
6. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
7. W.H. Ransom, 'Building Failures: Diagnosis and Avoidance', New Age Publications (P) Ltd.

RIVER ENGINEERING

Subject Code: BCIED1-563	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

River Morphology: Bars; Bends and Meanders, Thalweg; Braiding; Bifurcations etc.
Sediment Transport Mechanics: Incipient Motion of Sediment Particles, Critical tractive force, Ripple and dune regime, antidune regime, importance of regimes of flow, Bed forms, Bed Load transport, Transport of suspended sediment, Critical Shear stress, Sediment Transport Equations.

UNIT-II (11 Hours)

Aggradation and Degradation: Local Scour at Bridge Piers and other Hydraulic Structures.
Measurements in Rivers: Stage measurements, Channel geometry, Discharge, Sediment samplers and suspended and bed load measurement.

UNIT-III (13 Hours)

Physical River Models: fixed and movable bed models; sectional models, distorted Models, Mathematical models for aggradations, degradation and local scour.
River Protection and Training Works: Revetments, Dikes, Gabions, Spurs, Bank Protective measures and Bed control structures.

UNIT-IV (10 Hours)

Design of River Training and Flood Protection Structures: Diversion and Cofferdams; River regulations systems; Dredging and Disposal, River restoration.

Recommended Text Books / Reference Books:

1. Irrigation & Water Power Engg. B.C. Punmia, Pande B.B.Lal.
2. Mechanics of Sediment Transportation and Alluvial Stream Problems, R.J.Garde, K.G. Ranga Raju.

GEOTECHNICAL ENGINEERING LAB

Subject Code: BCIES1-525	L	T	P	C	Duration: 30 Hrs.
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

Laboratory Experiments:

1. Determination of natural moisture content by oven drying method.
2. Determination of field dry unit weight using core cutter method.
3. Determination of field dry unit weight using sand replacement method.
4. Determination of specific gravity of Soils.
5. Grain size distribution analysis by sieve analysis.
6. Grain size distribution by hydrometer analysis.
7. Determination of liquid limit by Casagrande apparatus.
8. Determination of plastic limit
9. Determination of shrinkage limit.
10. Determination of coefficient of permeability using Constant-head test method.
11. Determination of coefficient of permeability using Falling-head method.
12. Compaction of soil by standard proctor test.
13. Compaction of soil by modified proctor test.
14. Determination of relative density of soil.
15. Consolidation Test.

16. Unconfined Compression Strength Test.
17. Direct Shear Test
18. Triaxial Test (UU)

Recommended Books / Manuals:

1. Soil Mechanics by Craig R.F., Chapman & Hall.
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons.
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall.
4. Principles of Geotechnical Engineering, by Braja M. Das, Cengage.
5. Learning Principles of Foundation Engineering, by Braja M. Das, Cengage Learning.

ENGINEERING GEOLOGY LAB

Subject Code: BCIES1-526 **L T P C** **Duration: 30 Hrs.**

0 0 2 1

Course Objectives: ----------

Course Outcomes: ----------

Laboratory Experiments:

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase, Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff; Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shale and its varieties.
7. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps, Identification of symbols in maps.

Recommended Books / Manuals:

1. Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.

2. Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
3. Geology for Geotechnical Engineers, J.C. Harvey, Cambridge University Press (1982).

ENVIRONMENTAL ENGINEERING LAB

Subject Code: BCIES1-527	L	T	P	C	Duration: 30 Hrs.
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

Laboratory 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 find chlorides in given samples of water and waste water.
10. To find acidity and alkalinity of water samples.
11. To determine the COD of a wastewater sample.

Recommended Books / Manuals:

1. Chemistry for Environmental Engg. & Science by Sawyer & McCarty, TMH, New Delhi.
2. Water & Waste Water Testing by Mathur, Nem Chand & Bros.
3. Manual on Sewage and Sewerage treatment by Central Public Health and Environmental Engineering Organisation (CPHEEO), GOI.
4. IS 10500: 2012, Code for Drinking Water by Bureau of Indian Standards (BIS), GOI.

6th SEMESTER

DESIGN OF CONCRETE STRUCTURES-II					
Subject Code: BCIES1-621	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

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

UNIT-I (12 Hours)

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

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

UNIT-II (11 Hours)

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 (12 Hours)

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

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

UNIT-IV (10 Hours)

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

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

Recommended Text Books / Reference 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.

FOUNDATION ENGINEERING					
Subject Code: BCIES1-622	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

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 & Westergaard analysis for a point load.

UNIT-II (10 Hours)

Earth Pressure: Terms and symbols used for a retaining wall, Movement of wall 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 soil, 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 (12 Hours)

Shallow Foundation: Type of shallow foundations, Factors affecting choice of foundation, Factors affecting the depth 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, 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 (12 Hours)

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 Text Books / Reference 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.

PROFESSIONAL PRACTICE & LAW

Subject Code: BCIES1-623	L	T	P	C	Duration: 60 Hrs.
	3	1	0	4	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (16 Hours)

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, cost sensitive index.

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 (15 Hours)

Specifications: Detailed specifications of the following: earth work in foundation, lean concrete in foundation, cement concrete, RCC, brick work, plastering, painting, C.C. floor, mosaic floor, white washing, distempering, varnishing, painting, doors and windows, DPC, centering and shuttering, cement mortar, brick ballast and sand.

UNIT-III (15 Hours)

Valuation: Gross income, net income, outgoing, scrap value, salvage value, obsolescence, annuity, capitalized value, year's purchase, sinking fund, depreciation, book value, valuation of building, determination of depreciation, method of valuation, life of various items of works, different types of lease, fixation of rates, plinth area required for residential & commercial building, Arbitration, Introduction to Acts pertaining to-Minimum wages, Workman's compensation.

UNIT-IV (14 Hours)

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, 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.

Recommended Text Books / Reference Books:

1. Estimating & Costing in Civil Engineering: Theory & Practice by B.N. Dutta, UBS Publishers Distributors Ltd.
2. Estimation and Costing in Civil Engineering, by Birdie, G.S., Dhanpat Rai Publishing Co. Ltd, New Delhi, 2011.
1. Estimation, Costing, Specifications and Valuation in Civil Engineering, Chakraborti M, National Halftone Co. Calcutta
4. Estimating and Costing for Building & Civil Engineering Works by P.L. Bhasin.
5. Standard Schedule of rates and standard data book by Public Works Department.
6. National building code of India.
7. I.S. 1200 (Parts I to XXV – 1974/method of measurement of building and Civil Engineering works – B.I.S.

IRRIGATION ENGINEERING

Subject Code: BCIES1-624 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------.

UNIT-I (10 Hours)

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, relation between delta, duty and base period, Soil crop relation-ship and soil fertility.

UNIT-II (16 Hours)

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, suspended and bed loads.

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 (10 Hours)

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.

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.

UNIT-IV (09 Hours)

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. Interference of tube wells with canal or adjoining tube-wells, optimum capacity, causes of failure of tubewells. Duty and delta of a tube well. Rehabilitation of tube well.

Recommended Text Books / Reference Books:

1. Principles & practice of Irrigation Engg. S.K. Sharma.
2. Irrigation & Water Power Engg. B.C. Punmia, Pande B.B. Lal
3. Fundamentals of Irrigation Engg. Dr. Bharat Singh
4. Irrigation Engg. & Hydraulic Structure S.R. Sahasrabudhe.
5. Irrigation Engg. & Hydraulic Structure Varshney, Gupta & Gupta
6. Irrigation Engg. & Hydraulic Structure Santosh Kumar Garg

MATRIX METHODS OF ANALYSIS

Subject Code: BCIED1-651 | **L T P C** | **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

Basic Concepts of Structural Analysis: Introduction, Types of Framed Structures, Deformations in Framed Structures, Equilibrium, Compatibility, Static and kinematic indeterminacies of beams, rigid-jointed plane and space frames, pin-jointed plane and space frames and hybrid structures, Structural Mobilities, Principle of Superposition, Equivalent Joint Loads, Energy Concepts and Virtual Work.

Flexibility & Stiffness Matrices: Actions and Displacements, Action and Displacement equations, Generalized System of Coordinates, Slope-Deflection equations in Generalized Coordinates, Axes and Coordinates, Flexibility and Stiffness Influence Coefficients, Flexibility Matrix, Stiffness Matrix, 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 (11 Hours)

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 (11 Hours)

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 (11 Hours)

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 Text Books / Reference 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'.

SOLID & HAZARDOUS WASTE MANAGEMENT

Subject Code: BCIED1-652	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

Sources and Composition of Solid Waste: Solid Waste Introduction, Sources of solid waste, types & classification of solid waste, Composition of solid waste & 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 (12 Hours)

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 (12 Hours)

Processing of Solid Waste: Processing of solid waste at residence e.g. Storage, conveying, compacting, Shredding, pulping, granulating etc., Processing of solid waste (Size & volume reduction)

Disposal & Treatment of Solid Waste: Combustion and energy recovery of municipal solid waste, effects of combustion, Sanitary landfill: Classification, planning, landfill processes, landfill design, landfill operation & bioreactors, Compositing, Incineration, Pyrolysis & gasification, Landfill leachate & gas management.

UNIT-IV (09 Hours)

Solid Waste Management: Solid waste (management and handling) rules, hazardous waste (management and handling) rules, biomedical waste handling rules, Fly ash management & handling rules, recycled plastics usage rules, e-waste management rules, batteries (management and handling) rules, solid waste management in rural area, Recent advances in solid waste management.

Recommended Text Books / Reference Books:

1. Environmental Engineering (Vol. II) by S.K. Garg, Khanna Publishers, New Delhi.
2. Vesilind P.A., Worrell W. And Reinhart D.R., "Solid Waste Engineering", Thomson Books.
3. Bhide A.D. and Sundaresan B.B., "Solid Waste Management, Collection, Processing and Disposal", Nagpur.
4. Tchobanoglous G., Theisen H. And Vigil S.A., "Integrated Solid Waste Management", McGraw-Hill International editions.
5."Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, Government of India.
6. Management and Handling Rules for: municipal solid waste, biomedical waste, hazardous

waste and radioactive wastes, Government of India Publications.

PAVEMENT DESIGN

Subject Code: BCIED1-653 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (10 Hours)

Introduction: Desirable characteristics of pavement, types and components, difference between highway and airfield pavement, functions of pavement components, comparison between rigid and flexible pavement.

Fundamentals of Design of Pavements: design life, traffic factors, climatic factors, subgrade strength and drainage, stresses and deflections; Burmister's two layered analysis.

UNIT-II (12 Hours)

Flexible Pavement Design Factors: Design wheel load, contact pressure, ESWL concept, determination of ESWL by equivalent deflection criteria, stress criteria, soil subgrade strength using CBR value.

Flexible Pavement Design Methods: Group Index method, McLeod method, Kansas method, California Resistance Value method, IRC: 37-2018 method.

UNIT-III (12 Hours)

Rigid Pavement Design: Principles, factors - wheel load and its repetition, properties of sub grade, properties of concrete. Westergaard's analysis – critical stresses, wheel load stresses, warping stress, frictional stress, and combined stresses.

Design Methods of Rigid Pavements: Design of cement concrete pavements by IRC:58-2015, PCA method, AASHTO method, reinforcement in slabs, requirements of joints, types of joints – expansion joint, contraction joint, warping joint, construction joint, longitudinal joint.

UNIT-IV (11 Hours)

Strengthening of Existing Pavements: Pavement overlays, types, design equations, flexible pavement overlay design as per IRC: 81-1997 using Benkelman beam.

Modern Pavement Design Concepts: Bituminous pavement with cemented base, interlocking concrete block pavement, roller compacted concrete pavement, full depth bituminous pavement, ultrathin white topping, perpetual pavement.

Recommended Text Books / Reference Books:

1. E.J. Yoder & M.W. Witczak, 'Principals of Pavement Design', Wiley Publication, New York.
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 & A. Das, "Principles of Transportation Engg", Prentice Hall India, New Delhi.

5. Yang H. Huang, 'Pavement Analysis and Design', Pearson Publishers.

GROUND IMPROVEMENT TECHNIQUES

Subject Code: BCIED1-654 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

General : Formation of rock, soils and soil profiles, soil distribution in India and other countries - marine, black cotton soils (expansive)., lateritic, alluvial, desert soils peat etc., factors affecting the alteration of ground after formation – natural and man-made – reclaimed soils – methods of Geotechnical processes.

Compaction Methods: moisture density relations – compactive efforts – field methods – surface compaction, deep compactions- vibro compaction methods, vibro-probes, stone columns, sand compaction, stone column piles, selection of methods – quality control – specifications for compaction process for solving field problems.

UNIT-II (11 Hours)

Drainage Methods: seepage, ground water seepage control – filter requirements methods of dewatering – well point methods of discharge computations – design of steps for dewatering – design of well screens selection of pumps and accessories – deep bored wells. Pre-compression methods: compressibility and consolidation properties of soils estimation of rate of consolidation settlements – accelerating methods monitoring compressions – design of vertical drains – consolidation by electro osmosis and vacuum compression methods.

UNIT-III (11 Hours)

Grouting and Injection Methods: principles, design methods, selection of methods and requirements. Aspects of grouts, types of grouts and chemical applications, seepage control, solidification and stabilization – equipment and accessories used – quality control – specifications for achieving satisfactory results.

UNIT-IV (11 Hours)

Stabilization Methods: Mechanical, cement, lime, chemical methods of stabilization of soils – use of admixtures – polymers – geosynthesis –reinforcements thermal slurry trenches, void filling – prewetting –improving rock stability methods – exercise quality control to achieve desired results.

Recommended Text Books / Reference Books:

1. J.E. Bowles – Foundation Design & Analysis, McGraw-Hill Edition.
2. Ground improvement techniques by P. Purushottam Raj, Laxmi Publication.
3. F. S. Fang Handbook of Foundation Engg. CBS Publication, 1985.

SOIL MECHANICS & FOUNDATION ENGINEERING LAB					
Subject Code: BCIES1-625	**L**	**T**	**P**	**C**	**Duration: 30 Hrs.**
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

Laboratory Experiments:

1. Determination of soaked and un-soaked CBR value of soil in laboratory
2. Determination of soaked and un-soaked CBR value of soil in field
3. Determination of shear strength by vane shear test
4. Determination of coefficient of permeability in the field by pumping in method.
5. Determination of bearing capacity of soil by standard penetration test.
6. Determination of bearing capacity of soil by dynamic cone penetration test.
7. Determination of bearing capacity of soil by plate load test.
8. Determination of vertical load carrying capacity of a pile.
9. Determination of lateral load carrying capacity of a pile.
10. Determination of uplift capacity of a pile.
11. Determination of coefficient of sub grade reaction for the design of pavements.
12. Determination of load carrying capacity of soil by static cone penetration test.

Recommended Books / Manuals:

6. Soil Mechanics by Craig R.F., Chapman & Hall.
7. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons.
8. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall,
9. Principles of Geotechnical Engineering, by Braja M. Das, Cengage.
10. Learning Principles of Foundation Engineering, by Braja M. Das, Cengage Learning.
11. Relevant IS Codes.

CONCRETE TECHNOLOGY LAB-II					
Subject Code: BCIES1-626	**L**	**T**	**P**	**C**	**Duration: 30 Hrs.**
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

Laboratory Experiments:

1. To determine the workability of Concrete by Slump Cone & Vee-Bee Time Method.
2. To determine the workability of Concrete by Compaction Factor Method.
3. To test the different properties of Concrete Admixtures as per IS 9103.
4. Design Mixes of Concrete by IS methods.
5. Design Mixes of Concrete with admixture by IS methods.
6. To determine the Compressive Strength of Concrete by Cube test.
7. To determine the Compressive Strength of Concrete by Cylinder test.
8. To determine the Flexural strength of Concrete.
9. To determine the Split Tensile strength of Concrete.
10. To determine the Permeability of Concrete.
11. To determine the Compressive strength, Water Absorption & Specific Gravity of polished building stones (Granite).
12. Size & Load Test of Manhole Covers as per IS method.

Recommended Books / Manuals:

1. M.L. Gambhir, 'Building and Construction Materials: Testing and Quality Control', TMH.
2. Concrete Lab Manual by NITTTR Chandigarh.
3. Concrete Technology, Theory and Practice by M.S. Shetty, S. Chand & Company.

COMPUTER-AIDED CIVIL ENGINEERING DRAWING-II

Subject Code: BCIES1-627	**L**	**T**	**P**	**C**	**Duration: 30 Hrs.**
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

Laboratory Experiments:

1. Advanced Structural Drawings of concrete elements.
2. Advanced Structural Drawings of steel elements.
3. Hydraulic Structures: Canal sections, Guide Bank, Weir/Barrage, Head/ Cross regulators, Canal falls, Cross Drainage works.
4. Structural drawings of R.C.C. building (Single & multi storey).

Recommended Books / Manuals:

1. Engineering graphics with Auto CAD- R.B. Choudary, Anuradha Publishes.

2. Computer Aided Drafting & Modeling Lab by K. Venugopal, Raja, Scitech Publications.
3. Computer Aided Design Laboratory by M.N. Shesha Prakash, G.S. Suresh, Laxmi Publications.

CONSTITUTION OF INDIA

Subject Code: BMNCC0-001 **L T P C** **Duration: 30 Hrs.**

2 0 0 0

Course Objectives: ----------

Course Outcomes: ----------

Course Contents:

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of the fundamental Duties and its legal status.
6. The directive Principles of State Policy – its importance and implementation.
7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and the status of the president of India.
9. Amendment of the constitutional Powers and Procedure.
10. The historical perspectives of the constitutional amendments in India.
11. Emergency Provisions: National emergency, President Rule, Financial Emergency.
12. Local Self Government – Constitutional Scheme in India.
13. Scheme of the Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article 19.
15. Scope of the Right to Life and Personal Liberty under Article 21.

Recommended Text Books / Reference Books:

1. Our Constitution by Subhash C. Kashyap.
2. An Introduction to the Constitution of India by M.V. Pylee.
3. An Introduction to the Constitution of India by Dr. Durga Das Basu.
4. The Indian Constitution: Cornerstone of a Nation by Granville Austin.

Total Credits= 21

Semester-VII (B. Tech Civil Engg.)		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**		
BCIES1-721	Transportation Engineering-II	3	0	0	40	60	100	3
BCIES1-722	Earthquake Engineering	2	0	0	40	60	100	2
Departmental Elective-V (Select any one)		3	0	0	40	60	100	3
BCIED1-751	Water Recourses Engineering							
BCIED1-752	Air & Noise Pollution and Control							
BCIED1-753	Pipeline Engineering							
Departmental Elective-VI (Select any one)		3	0	0	40	60	100	3
BCIED1-761	Prestressed Concrete							
BCIED1-762	Pavement Construction and Management							
BCIED1-763	Soil Reinforcing Techniques							
XXXXX	Open Elective**	3	0	0	40	60	100	3
BCIES1-723	Software Lab	0	0	2	60	40	100	1
BCIES1-724	Project-I	0	0	6	60	40	100	3
BCIES1-725	Training-III*	0	0	0	60	40	100	3
Total		**-**	**-**	**-**	**380**	**420**	**800**	**21**

*Internship will be imparted at the end of 6thsemesteras per AICTE Internship Policy.

**Open Elective Subjects may also be chosen from the list of Open Electives-I, II and III offered by other departments of university.

Total Credits= 16

Semester-VIII (B. Tech Civil Engg.)		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**		
BCIES1-821	Design of Steel Structures-II	3	0	0	40	60	100	3
Departmental Elective-VII (Select any one)		3	0	0	40	60	100	3
BCIED1-851	Bridge Engineering							
BCIED1-852	Design of Industrial Structures							
BCIED1-853	Disaster Management							
Departmental Elective-VIII (Select any one)		3	0	0	40	60	100	3
BCIED1-861	Engineering Hydrology							
BCIED1-862	Port and Harbour Engineering							
BCIED1-863	Geotechnical Design							
XXXXX	Open Elective**	3	0	0	60	40	100	3
BCIES1-822	Project-II	0	0	6	60	40	100	3
BCIES1-823	Advanced Testing Lab	0	0	2	60	40	100	1
BMNCC0-006	Essence of Indian Knowledge Tradition(Mandatory Course)	2	0	0	100	---	100	0
Total		**-**	**-**	**-**	**400**	**300**	**700**	**16**

**Open Elective Subjects may also be chosen from the list of Open Electives-I, II and III offered by other departments of university.

Overall Marks / Credits

Semester	Marks	Credits
1st	900	19
2nd	900	20
3rd	1100	24
4th	900	20
5th	1000	23
6th	1000	22
7th	800	21
8th	700	16
Total	**7300**	**165**

7th SEMESTER

TRANSPORTATION ENGINEERING-II					
Subject Code: BCIES1-721	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

Railway Track: Rail gauge, alignment, engineering surveys, track stresses, rails, sleepers, ballast, formation, track fittings and fastenings, rail joints and welding of rails, creep of rails, track drainage, track maintenance, high speed tracks.

Geometric Design of Track: Curves and super-elevation, gradients, points and crossings, track junctions and simple track layouts, level crossing.

UNIT-II (11 Hours)

Railway Stations & Yards: Classification & layout of stations, Marshalling yard, Locomotive yard, equipment at railway stations & yards.

Signalling and Interlocking: Objectives, classification of signals, types of signals in stations and yards, principles of interlocking.

UNIT-III (11 Hours)

Airport Planning: Aircraft characteristics, airport 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.

UNIT-IV (11 Hours)

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 Text Books / Reference Books:

1. S. Chandra and M Aggarwal, 'Railway Engineering', Oxford University Press, New Delhi.
2. S.C. Saxena and S.P. Arora, 'A Textbook of Railway Engineering', Dhanpat Rai and Sons.
3. J.S. Mundrey, 'Railway Track Engineering', McGraw Hill Publishing Co, New Delhi
4. S.K. Khanna, M.G. Arora and S.S. Jain, 'Airport Planning and Design', Nem Chand & Bros.
5. R. Horenjeff, and F. McKelvey, 'Planning and Design of Airports', McGraw Hill Company.

EARTHQUAKE ENGINEERING

Subject Code: BCIES1-722 **L T P C** **Duration: 30 Hrs.**

2 0 0 2

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (05 Hours)

Introduction to Earthquakes: Causes of earthquakes, basic Terminology, Magnitude, Intensity, Peak ground motion parameters, Seismic Zoning Map of India, Seismograms and Accelerogram. Past earthquakes and Lessons learnt.

UNIT-II (10 Hours)

Introduction to Dynamics: Theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, spring action and damping, 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-III (08 Hours)

Lateral Force Analysis: Lateral Strength, stiffness, ductility and structural configuration, Floor Diaphragm action, Moment resisting frames, shear walls.
Codal Design Provisions: Review of the latest Indian seismic code IS:1893 (Part-I) provisions for buildings –Earthquake design philosophy.

UNIT-IV (07 Hours)

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, Design of Shear walls as per IS: 13920 –Detailing of reinforcements.

Recommended Text Books / Reference Books:

1. Earthquake Resistant Design of Structures, Pankaj Aggrawal, Manish Shrikhande, PHI Learning
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra, Prentice Hall
3. Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4. Structural Dynamics by Mario & Paz, Springer.
5. Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt. Ltd.
6. Elements of Earthquake Engg. by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra,
7. IS 1893-2016 Indian Standard Criteria for Earthquake Resistant Design of Structures
8. IS 4326-1993 Indian Standard for Earthquake Resistant Design and Construction of Buildings
9. IS 13920:2016- Ductile design and detailing of Reinforced Concrete Structures subjected to Seismic Forces

WATER RESOURCES ENGINEERING

Subject Code: BCIED1-751	L	T	P	C	Duration: 45 Hrs.
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

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 (13 Hours)

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.

Spillways: Components of spillways, types of gates for spillway crests, creagers profiles neglecting velocity of approach, profile taking velocity of approach into account, upstream lip and approach ramp, advantages of gated spillways, discharge characteristics of spillways.

UNIT-III (08 Hours)

Canal Regulators: Offtake alignment, cross-regulators – their functions and design, Distributory 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.

UNIT-IV (12 Hours)

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 and level crossing.

Canal Outlets: Essential requirements, classifications, criteria for outlet behaviors, flexibility, proportionality, sensitivity, sensitiveness, Details and design of non-modular, semi-modular and modular outlets.

Recommended Text Books / Reference Books:

1. Irrigation Engg. & Hydraulic Structures by Santosh Kumar Garg, Khanna Publishers.
2. Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub.
3. Irrigation Engg. & Hydraulics Structures by S.R. Sahasrabudhe, Katson Publishing.
4. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani. Oxford IBH Pub.

5. P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House.
6. Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons.

AIR & NOISE POLLUTION AND CONTROL

Subject Code: BCIED1-752 | **L T P C** | **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

Air Pollution: Composition and structure of atmosphere, global implications of air Pollution, Classification of air pollutants: Particulates, hydrocarbon, Carbon monoxide, Oxides of sulphur, Oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

Air Pollution Chemistry: Meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

UNIT-II (11 Hours)

Air Sampling & Measurement: Ambient air quality and standards, air sampling and measurements; ambient air sampling, Collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling, Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

UNIT-III (10 Hours)

Control of Gaseous Contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons, automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

UNIT-IV (12 Hours)

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure, Noise indices.

Recommended Text Books / Reference Books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering.
2. Environmental Engineering (Vol. II) by S.K. Garg, Khanna Publishers, Delhi

3. Martin Crawford: Air Pollution Control Theory.
4. Warkand Warner: Air Pollution: Its Origin and Control.
5. Rao and Rao: Air Pollution Control Engineering.
6. K Kant and R. Kant, "Air Pollution and Control Engineering", Khanna Publishers House.
7. Environmental Pollution Control Engineering-CS Rao, Wiley Eastern Ltd., New Delhi,
8. Environmental Noise Pollution – PE Cunniff, McGraw Hill
9. Nevers: Air Pollution Control Engineering.
10. M. P. Poonia and S C Sharma," Environmental Engineering, Khanna Publishing House.

PIPELINE ENGINEERING

Subject Code: BCIED1-753 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Designing and operating pipelines for transmission and distribution of water, Analysis of flow in water transmission and water distribution systems (pump & gravity), optimal design and operation of systems for achieving different goals (including latest tools available for optimization).

UNIT-II (12 Hours)

Extended period simulations, Software for WDN analysis and design, Rehabilitation of pipeline systems.

UNIT-III (11 Hours)

Water auditing, online monitoring and control, leak and burst detection, transient analysis and surge protection.

UNIT-IV (11 Hours)

Appurtenances (valves / flow meters etc.), Selection of pipe material, Jointing details, Pipe laying and testing, Structural design for buried and surface mounted pipes.

Recommended Text Books / Reference Books:

1. Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal.
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.
3. Hydraulics and Fluid Mechanics, P. N. Modi and S. M. Seth, Standard Book House.
4. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
5. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

PRESTRESSED CONCRETE					
Subject Code: BCIED1-761	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

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

UNIT-I (09 Hours)

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

UNIT-II (13 Hours)

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 (12 Hours)

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 (11 Hours)

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

Recommended Text Books / Reference Books:

1. N. Krishna Raju, Prestressed concrete, Tata McGraw Hill.
2. T.Y. Lin, Ned H. Burns, Design of Prestressed Concrete Structures, John Wiley & Sons.
3. P. Dayaratnam, Prestressed Concrete, Oxford & IBH.
4. R. Rajagopalan, Prestressed Concrete.
5. Code of Practice for Prestressed Concrete (IS 1343: 2012).

PAVEMENT CONSTRUCTION AND MANAGEMENT					
Subject Code: BCIED1-762	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Introduction: Types of highway construction, materials for construction, construction procedure of different highways: Earth roads, Gravel roads, WBM roads, Bituminous pavements, Cement

Concrete pavements. Equipment used for highway construction.

Soil Stabilization for Pavements: Principles of proportioning of soil-aggregate mixes and compaction, mechanical, soil-cement, soil-bitumen and soil-lime stabilization methods; construction control and quality control checks.

UNIT-II (12 Hours)

Bituminous Pavement Construction: Earthwork, compaction and construction of embankments, specifications of materials, construction methods and field control checks for various types of flexible pavement materials in sub-base, base, binder and surface course layers.

Cement Concrete Pavement Construction: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints, Construction of interlocking block pavements.

UNIT-III (11 Hours)

Pavement Maintenance: Need for maintenance, Pavement failures, causes and remedial measures. Types of highway maintenance, Materials used for maintenance of different pavements, Maintenance and rehabilitation techniques.

Pavement Evaluation: Pavement distresses, functional condition evaluation of pavements-Roughness, Skid Resistance. Structural evaluation of pavements – non-destructive testing, Benkelman beam and Falling Weight Deflectometer.

UNIT-IV (11 Hours)

Pavement Management Systems: Concept, components, structure, data requirements, Project level and Network level needs.

Pavement Performance Prediction: Modeling techniques – AASTHO, CRRI and HDM models, Budget forecasting for maintenance and rehabilitation, Ranking and optimization methodologies, life cycle costing.

Recommended Text Books / Reference Books:

1. S.K. Khanna and C.E.G. Justo, 'Highway Engineering', Nem Chand & Bros., Roorkee.
2. S.K. Sharma, 'Principles, Practice and Design of Highway Engineering', S. Chand & Co.
3. Ralph C. G. Haas, W. Ronald Hudson, 'Pavement Management Systems', McGraw-Hill Book Company.
4. M. Y. Shahin, 'Pavement Management for Airports, Roads, and Parking Lots' Kluwer Academic Publishers.

SOIL REINFORCING TECHNIQUES

Subject Code: BCIED1-763 | **L T P C** | **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (10 Hours)

Reinforced Earth Retaining Wall: Principles, concepts and mechanism of reinforced earth – design consideration of reinforced earth retaining wall.

UNIT-II (12 Hours)

Geo-membrane: Physical, mechanical, chemical, biological, thermal and identification properties.
Designing with Geo-membranes: Liquid containment liners, covers for reservoirs, canal liners, landfill liners, caps & closures, underground storage tanks etc.

UNIT-III (11 Hours)

Geotextile: Physical, mechanical, hydraulic, endurance and degradation properties, designing with geotextiles, geotextile functions and mechanisms, designing for separation, designing for reinforcement, designing for stabilization, designing for filtration, designing for drainage, designing for multi functions.

UNIT-IV (12 Hours)

Geogrid: Physical, mechanical, endurance and environmental properties, designing for geogrid reinforcement
Geonets: Physical, mechanical, hydraulic, endurance and environmental properties, designing for geonet drainage
Geo-composites: Geo-composites for separation, reinforcement, filtration, drainage, liquid, vapour barriers.

Recommended Text Books / Reference Books:

1. Hausman, M. R. (1990). " Engineering Principles of Ground Modification" McGraw-Hills
2. Moseley, M.P. (1193), "Ground Improvement" Chapman and Hall.
3. Koener, R.M. (2012), "Designing with Geo-synthetics, Vol.1 & 2, Xlibriss Corporation.
4. Rao, G.V. and Raju, G.V.S.S. (1995) "Engineering with Geo-synthetics", TMH.
5. Purushothama Raj, P. (2014). "Ground Improvement Techniques". Laxmi Publishers.

SOFTWARE LAB

Subject Code: BCIES1-723	**L**	**T**	**P**	**C**	**Duration: 30 hrs.**
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

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

PROJECT-I					
Subject Code: BCIES1-724	**L**	**T**	**P**	**C**	**Duration: 90 hrs.**
	0	0	6	3	

Course Objectives: ----------

Course Outcomes: ----------

PROJECT WORK:

Students are required to work on practical projects in the field of Civil Engineering (Project work, seminar and internship in industry or at appropriate work place). The students have to work for 6 hrs per week with his / her supervisor(s).

8th SEMESTER

DESIGN OF STEEL STRUCTURES-II					
Subject Code: BCIES1-821	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

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

UNIT-I (12 Hours)

Plastic Analysis: Introduction, flexural behavior, shape factor, plastic moment capacity of beams, Design of Beams.

Plate Girder: Elements of a plate girder, economical depth, IS recommendations, design of a plate girder, curtailment of flanges, various types of stiffeners using bolts and welds.

UNIT-II (11 Hours)

Foot Bridge: Elements of Foot Bridge, types, moving load behaviour, Design of steel foot bridge with welded joints.

UNIT-III (11 Hours)

Industrial Buildings: Introduction, Terminology, types & uses, types of load, Design of elements of industrial buildings: Gantry girder, Column bracket using weld.

UNIT-IV (11 Hours)

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 bearings.

Recommended Text Books / Reference Books:

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)

BRIDGE ENGINEERING					
Subject Code: BCIED1-851	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Introduction: Definition and components of a bridge, Classification of bridges, Choice of a bridge type, Investigation for bridges, Selection of bridge site, design discharge for river bridge, linear waterway, economical span, vertical clearance, scour depth, afflux.

Standard Specifications for Road Bridges: IRC Bridge Codes, Width of carriageway, 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 forces.

UNIT-II (12 Hours)

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, Prestressed 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 (12 Hours)

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: Importance of Bearings, Different types of bearings, Expansion Bearings, Fixed Bearings, Elastomeric Bearings.

UNIT-IV (10 Hours)

Joints & Appurtenances: Expansion joints, Wearing Course, Approach Slab, Footpath, Handrails.

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 Text Books / Reference 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.

DESIGN OF INDUSTRIAL STRUCTURES

Subject Code: BCIED1-852	L	T	P	C	Duration: 45 Hrs.
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (05 Hours)

Introduction: Role of Design Engineer, properties of structural steel, merits and demerits of structural steel over reinforced concrete structures.

UNIT-II (15 Hours)

Steel Structure Design: Design of tension members, compression members, and flexure members and beam-columns junctions, adopting Codal provisions of IS: 800 components & its terminology, load estimation, choice of sections, analysis and design for gantry girders.
Industrial structures with steel trusses and portal frames. Typical configuration with various elements, load assessment (deal load, live load, wind load and earthquake load).

UNIT-III (15 Hours)

Industrial Design: Different roofing and cladding alternatives and their design, types of purlins and their design, analysis and design of a trusses and portal frames, design of base plate, pedestal and footing considering both hinged and fixed support conditions, design of bracing and preparation of construction drawings.

UNIT-IV (10 Hours)

Welded Connections: Advantages of welding, fundamentals and methods of welding, types of joints, welding symbols and inspection of welding, Codal provisions, and design of typical welded connections. Bolted connections, Types of bolts, Codal provisions, design of typical bolted connections.

Recommended Text Books / Reference Books:

1. Design of Steel Structures by Bresler & Lin.
2. Theory of Modern Steel Structures by Linton Grinter.
3. Design of Steel Structures by P. Dayaratnam.
4. Reinforced Concrete Structural Elements (behavior, analysis & design) by P. Purushothoman.
5. Practical Design of Reinforced Concrete by Russell S. Fling.
6. Design of Reinforced Concrete Structures by Ashok Kumar Gupta.
7. Structural Condition assessment by Robert T. Ratay.
8. Repairs and rehabilitation of concrete structures by P. I. Modi & C. N. Patel, PHI Publication.

DISASTER MANAGEMENT

Subject Code: BCIED1-853 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (11 Hours)

Introduction: Concepts and definitions -disaster, hazard, vulnerability, risks-severity, frequency and details, capacity, impact, prevention, mitigation, Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT-II (11 Hours)

Disaster Impacts: Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT-III (12 Hours)

Disaster Risk Reduction (DRR): Disaster management cycle –its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT-IV (11 Hours)

Disasters, Environment and Development: Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.),sustainable and environmental friendly recovery; reconstruction and development.

Recommended Text Books / Reference Books:

1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill Publisher.
2. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester 92.
3. Singh B.K., Handbook of disaster management: Techniques & Guidelines, Rajat Publications.
4. Disaster Management, R.B. Singh (Ed), Rawat Publications.
5. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction.

ENGINEERING HYDROLOGY

Subject Code: BCIED1-861	**L**	**T**	**P**	**C**	**Duration: 45 Hrs.**
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (10 Hours)

Introduction: Hydrologic cycle, History of hydrology, water budget equation, World Water

balance, applications in engineering sources of data.

Precipitation: Forms of Precipitation, characteristics of precipitation in India, measurement of precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth-Area-Duration Relationships, Maximum Intensity / Depth-Duration-Frequency Relationship, Probable Maximum Precipitation (PMP), Rainfall Data in India.

UNIT-II (11 Hours)

Abstractions from Precipitation: Evaporation process, Evaporimeters, Analytical methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Evapo-transpiration, Interception, Depression storage.

Infiltration: Definition, Infiltration capacity, measurement of infiltration, Modeling infiltration capacity, Classification of Infiltration capacities, Infiltration Indices.

UNIT-III (14 Hours)

Runoff: Run-off volume, SCS-CN method of estimating runoff volume, flow-duration curve, flow-mass curve, hydrograph, factors affecting run-off hydrograph, components of hydrograph.

Hydrographs: Base flow separation, effective rainfall, unit hydrograph, S-curve hydrograph, Snyder's synthetic unit hydrograph, surface water resources of India.

UNIT-IV (10 Hours)

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

Flood Routing: Definition, Introduction to hydraulic and hydrologic routing- The Saint- Venant equations for open channel flow, flood wave propagation, kinematic diffusion wave approximations.

Recommended Text Books / Reference Books:

1. Engineering Hydrology - J. Nemec, Prentice Hall.
2. Engineering Hydrology by K Subramanya.
3. Engineering Hydrology by Stanley Buttler, John. Wiley.
4. Ground Water Hydrology by TODD, John Wiley.
5. Engineering for Dams Vol. II & III by Creager Justin & Hinds. John. Wiley
6. Hydrology by. S.K. Garg, Khanna Publications.
7. Hydrology Principles, Analysis and Design by. Raghunath, H M, New Age Int. Publications.

PORT AND HARBOUR ENGINEERING

Subject Code: BCIED1-862	L	T	P	C	Duration: 45 Hrs.
	3	0	0	3	

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (09 Hours)

General: History, Advantages and disadvantages of water transportation, Modern trends in water transportation, Elements of water transportation, Historical development in India.
Natural Phenomena: Tides, Wind, Water waves, Currents phenomena, Characteristics and effects on marine structures, Littoral drift.

UNIT-II (12 Hours)

Marine Structures: General design aspects, Breakwaters - function, types general design principles, Wharves, Quays, Jetties, Piers, Pier heads, Dolphin, Fenders, Mooring Accessories.
Harbours: Classification of harbours, Selection of site and planning of harbours, Ship characteristics, Characteristics of good harbour, Size of harbour.

UNIT-III (12 Hours)

Docks and Repair Facilities: Harbour docks, Wet docks, Repair docks, Lift docks, Floating docks, Slipways
Port Facilities: Port building facilities, Transit sheds, Warehouses, Cargo handling facility, Services for shipping terminals, Inland port facilities planning.

UNIT-IV (12 Hours)

Dredging: General, Classification of dredging works, Types of dredgers, Uses of dredged material, Execution of dredging work.
Navigation Aids: Necessity, Types of navigation aids, Requirement of signals, Fixed and floating navigation aids.

Recommended Text Books / Reference Books:

1. S. P. Bindra, 'A Course in Docks and Harbour Engineering', Dhanpat Rai & Sons, New Delhi.
2. R. Srinivasan and S. C. Rangwala, 'Harbour, Dock and Tunnel Engineering', Charotar Publishing House, Anand.
3. Alonzo Quinn, 'Design and Construction of Ports and Marine Structure', McGraw Hill Book Company, New York.

GEOTECHNICAL DESIGN

Subject Code: BCIED1-863 **L T P C** **Duration: 45 Hrs.**

3 0 0 3

Course Objectives: ----------

Course Outcomes: ----------

UNIT-I (12 Hours)

Sheet Piles: Introduction, sheet pile structures, free cantilever sheet pile walls, cantilever sheet pile, depth of embedment of cantilever walls in sandy soils, depth of embedment of cantilever walls in cohesive soils, anchored bulkhead: free-earth support method, depth of embedment of anchored sheet piles in granular soils, design charts for anchored bulkheads in sand, moment reduction for anchored sheet pile walls, anchorage of bulkheads.

UNIT-II (11 Hours)

Braced Cuts and Coffer Dams: Lateral earth pressure distribution on braced-cuts, stability of braced cuts in saturated clay, Bjerrum and Eide method of analysis, piping failures in sand cuts, arching action of soil and its application, coffer dams.

UNIT-III (11 Hours)

Drilled Pier Foundations: Introduction, types of drilled piers, load transfer mechanism, vertical bearing capacity of drilled piers, the general bearing capacity equation for the base resistance, bearing capacity equations for cohesive soil and granular soil, ultimate skin resistance of cohesive cohesion-less soil and gravelly sands, ultimate side and total resistance in rock, estimation of settlements of drilled piers at working loads, uplift capacity of drilled piers, lateral bearing capacity of drilled piers.

UNIT-IV (11 Hours)

Well Foundations: Forces acting on wells, components of well foundation, bearing capacity, settlement and lateral resistance, tilts and shifts design and construction, types of caissons, advantages and disadvantages of each type of caisson, forces acting on the caissons and design of caissons.

Recommended Text Books / Reference Books:

1. J.E. Bowles – Foundation Design & Analysis, McGraw-Hill Edition 1995.
2. Ground improvement techniques by P. Purushottam Raj, Laxmi Publication.
3. F. S. Fang Handbook of Foundation Engg. CBS Publication, 1985.

PROJECT-II

Subject Code: BCIES1-822	**L**	**T**	**P**	**C**	**Duration: 90 hrs.**
	0	0	6	3	

Course Objectives: ----------

Course Outcomes: ----------

PROJECT WORK:

Students are required to work on practical projects in the field of Civil Engineering (Project work, seminar and internship in industry or at appropriate work place) (May be continued from VII Semester, Project work, seminar and internship in industry or at appropriate work place). The students have to work for 6 hrs per week with his / her supervisor(s).

ADVANCED TESTING LAB

Subject Code: BCIES1-823	**L**	**T**	**P**	**C**	**Duration: 30 hrs.**
	0	0	2	1	

Course Objectives: ----------

Course Outcomes: ----------

Laboratory Experiments:

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. Bitumen Extraction Test
9. Standard Penetration Test (SPT)

Recommended Books / Manuals:

1. M.L. Gambhir, 'Building and Construction Materials: Testing and Quality Control', TMH.
2. Concrete Lab Manual by NITTTR Chandigarh.
3. Concrete Technology, Theory and Practice by M.S. Shetty, S. Chand & Company.
4. Khanna S.K. and Justo, C.E.G. "Highway Material & Pavement Testing", Nem Chand.

ESSENCE OF INDIAN KNOWLEDGE TRADITION

Subject Code: BMNCC0-006	L	T	P	C	Duration: 30 Hrs.
	2	0	0	0	

Course Objectives: ----------

Course Outcomes: ----------

COURSE CONTENTS:

UNIT – I

Introduction to Indian Philosophy: Basics of Indian Philosophy, culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian culture, Ancient Indian, Medieval India, Modern India.

Indian Philosophy & Literature: Vedas Upanishads, schools of Vedanta, and other religion Philosophical Literature. Philosophical Ideas the role of Sanskrit, significance of scriptures to current society, Indian Philosophies, literature of south India.

UNIT – II

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – III

Indian Fine Arts & Its Philosophy(Art, Technology & Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in Indian, development of science in ancient, medieval and modern Indian.

UNIT – IV

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

RECOMMENDED BOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition'', ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN-13:978-8187276333,2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre'', ISBN 81-7450-494-X, 2006
4. S. Narain, "Examination in Ancient India", Arya Book Depot, 1993
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
6. M.Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN-13: 978-8120810990,2014
7. Chatterjee. S & Dutta "An Introduction to Indian Philosophy".