

**VSS UNIVERSITY OF TECHNOLOGY, BURLA, ODISHA**  
**CIVIL ENGINEERING DEPARTMENT**  
**CURRICULUM**  
**For**  
**B.TECH – 5<sup>TH</sup> SEM**  
**THEORY**

**BCE301-STRUCTURAL DESIGN (3-1-0) CR-04**

(IS: 456-2000 and other related codes are permitted in the examination)

**Module-I**

Properties of concrete and reinforcing steel, Philosophy, concept and methods of reinforced concrete design, Introduction to limit state method: Limit state of collapse and limit state of serviceability. Application of Limit state method to rectangular beams for flexure, shear, bond and torsion.

**Module-II**

Design of doubly reinforced beams. Design of T-and L-beams. Design of one way and two way slabs, Design of staircases.

**Module-III**

Design of short and long columns with axial and eccentric loading, design of isolated column footing.

**Module-IV**

Design principle of masonry structures: Brick and stone masonry. Design of masonry short and long walls, columns and retaining walls.

**Reference Books:**

1. Limit state design of reinforced concrete by P.C. Verghese, PHI
2. Reinforced concrete: Limit state by A.K. Jain
3. Reinforced concrete by B.C. Punmia, A.K. Jain and A.K. Jain
4. SP-16 and SP-32.

## **BCE302-WATER RESOURCE ENGINEERING (3-1-0) CR-04**

### **Module – I**

Hydrologic cycle, availability of water on earth, importance of hydrology and its applications in engineering.

Precipitation: Forms & types, measurement of rainfall, optimum number of rain gauge stations, consistency of rainfall data, presentation of precipitation data, mean aerial rainfall, depth – area-duration curve, design storm, lossess from precipitation, evaporation, infiltration.

### **Module – II**

Run off : Computation, factors affecting runoff, Design flood: Rational formula, Empirical formulae, Stream flow: Discharge measuring structures, approximate average slope method, area-velocity method, stage-discharge relationship.

### **Module – III**

Hydrograph; Concept, its components, Unit hydrograph: use and its limitations, derivation of UH from simple and complex storms, S-hydrograph, derivation of UH from S-hydrograph. Synthetic unit hydrograph: Snyder’s approach, introduction to instantaneous unit hydrograph (IUH).

### **Module – IV**

Reservoir management: Fixation of reservoir capacity, Ripple’s mass curve, sequent peak algorithm, allocation of storage space for various uses, reservoir sedimentation and tis control, determination of sediment yield at a reservoir site.,

### **Module – V**

Folod frequency analysis: Gumbel’s method. Flood routing: Hydrologic channel routing, Muskingum equation, hydrologic reservoir routing: Modified Puls method, flood control measures.

### **Text Books**

1. Irrigation Engineering and Hydraulic Structures by S.K. Garg, Khanna Publication
2. Engineering Hydrology by K. Subramanyam. Tata Mc Graw Hill Publication
3. Irrigation Engineering by N.N. Basak.

## **BCE303-GEOTECHNICAL ENGINEERING – I (3-1-0) CR-04**

### **Module –I**

Introduction: Origin of soils, formation of soils, clay mineralogy and soil structure, basic terminology and their relations, index properties of soils.

Soil classification: Particle size distribution, use of particle size distribution curve, Particle size classification, textural classification, HRB classification, Unified classification system, Indian standard soil classification system, Field identification of soils.

Soil moisture: Types of soil water, capillary tension, capillary siphoning.  
Stress conditions in soil: Total stress, pore pressure and effective stress.

### **Module – II**

Permeability: Darcy's law, permeability, factors affecting permeability, determination of permeability (laboratory and field methods), permeability of stratified soil deposits. Estimation of yield from wells.

Seepage analysis: Seepage pressure, quick condition, laplace equation for two –dimensional flow, flow net, properties and methods of construction of flow net, application of flow net, seepage through anisotropic soil and non-homogenous soil, seepage through earth dam.

### **Module – III**

Soil compaction: Compaction mechanism, factors affecting compaction, effect of compaction on soil properties, density moisture content relationship in compaction test, standard and modified proctor compaction tests, field compaction methods, relative compaction, compaction control.

Soil consolidation: Introduction, spring analogy, one dimensional consolidation, Terzaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation.

### **Module –IV**

Shear strength of soils: Mohr's stress circle, theory of failure for soils, determination of shear strength (direct shear test, tri-axial compression test, unconfined compression test, van shear test), shear characteristics of cohesionless soils and cohesive soils.

Stabilization of soil: Introduction, mechanical stabilization, cement stabilization, lime stabilization, bituminous stabilization, chemical stabilization, thermal stabilization, electrical stabilization, stabilization by grouting, use of geo-synthetic materials, reinforced earth.

### **Reference Books:**

1. Geotechnical Engineering, C. Venkatramaiah, New Age International publishers.
2. Geotechnical Engineering, T.N. Ramamurthy & T.G. Sitharam, S. Chand & Co.
3. Soil Mechanics, T.W. Lambe & Whitman, Wiley Eastern Ltd, Nw Delhi.

## **BCE304-ENVIRONMENTAL ENGINEERING (3-1-0) CR-04**

### **Module I (10 Hours)**

Quantity of water: Per capita demand, design period, population forecast, fluctuation in demand.

General requirement for water supply: Sources, Types of intakes, Pumping and Transportation of water.

Quality of water: Physical, chemical and biological characteristics of water and their significance. Water quality criteria and standards.

### **Module II (10 Hours)**

Engineering system for water purification: Aeration, Coagulation and Flocculation, Sedimentation, Softening, Filtration, Disinfection, Water distribution systems.

Methods of treatment: Removal of color, tastes and odour control, algicidal treatment, removal of iron and manganese, fluoridations.

### **Module III (10 Hours)**

Generation and collection of wastewater, sanitary, storm and combined sewerage systems, quantities of sanitary wastes and storm water, design of sewerage system.

Engineered system for wastewater treatment: Primary treatment, Screening, Grit removal, Sedimentation, Sedimentation aided with coagulation.

Secondary treatment: Basis of microbiology, Growth and food utilization, Suspended-culture systems, Attached-culture systems, Secondary clarification, Disinfections of effluents.

Sludge treatment and disposal: Sludge characteristics, thickening, disposal

### **Module IV (10 Hours)**

Air pollution: Units of measurement, Sources and Classification of air pollutants.

Influence of meteorological phenomena on air quality: Lapse rate and dispersion, Pressure systems and dispersion, Winds and dispersion, Moisture and dispersion, Gaussian dispersion equation, Determination of stack heights.

Engineered systems for air pollution control: Gravitational settling chamber, cyclone, ESP, Bag filter and scrubbers, National Ambient air quality standards.

### **Text Books**

1. Environmental Engineering (Volume I and II) by S. K. Garg-Khanna Publishers
2. Environmental Engineering (Volume I and II) by B. C. Punmia-Khanna Publishers
3. Environmental Engineering by H. S. Peavy, D.R. Rowe and G. Tchobanoglous, MGH.
4. Environmental Impact Assessment by Larry W. Canter, Mc Graw Hill.

## **BCE305-TRANSPORTATION ENGINEERING-I (3-1-0) CR-04**

### **Module-I**

Transportation by roads, railways, water ways & air ways – their importance & limitation. Road development & planning in India. Financing, Highway alignment & engineering surveys for highway location.

Geometric design-Cross section elements, Design speed, sight distance, super elevation, horizontal & vertical alignment including curves.

### **Module-II**

Traffic Engineering – Traffic studies & their importance.

Highway materials – Their properties & tests, selection, requirements of bituminous mixes, Marshall test.

Earthwork – measurement & rates, setting out of earth work, computation of areas & volumes-Prismoidal & Trapezoidal methods.

### **Module-III**

Pavement design-Use of CBR method for design of flexible pavement, IRC recommendation for design of rigid pavement.

Highway drainage, pavement failure, Evaluation, Maintenance & Strengthening of existing pavement.

### **Module-IV**

Classification of bridges, Consideration of location of bridge site, Investigation & data collection, Calculation of run off under bridge, Determination of water way, Choice of bridge span-economic span, Determination of maximum scour depth.

Bridge Superstructure-types, suitability.

Bridge foundation-Types, Sinking of well.

### **Books for Reference:**

- (1) Highway Engineering-By Khanna & Justo (Nemchand & Bros., Roorkee (U.A))
- (2) Principles & Practice of Highway Engineering – By Dr. L.R. Kadiyalli (Khanna publisher)
- (3) Bridge Engineering – By S.P. Bindra (Dhanpat Rai publication)
- (4) Bridge Engineering-By D.J. Victor

## SESSIONAL

### BCE391-FLUID FLOW LAB (0-0-3) CR-02

1. Hydraulic Ram
2. Reciprocating Pump
3. Centrifugal Pump
4. Francis Turbine with Generator loading
5. Francis Turbine with brake loading
6. Pelton Turbine with Generator loading
7. Kaplan Turbine with brake loading
8. Study of different runners and impellers of various turbines and Pumps
9. Study on Hydraulic jump.
10. Testing of PVC pipe.

### BCE392-GEOTECHNICAL ENGINEERING LABORATORY (0-0-3) CR-02

1. Determination of specific gravity of soil grains
2. Determination of grain size distribution of soil: (a) sieve analysis; (b) Hydrometer/pipette test
3. Determination of Atterberg limits of soil: (a) liquid limit, (b) plastic limit, (c) shrinkage limit
4. Measurement of soil compaction in the field: (a) Cure cutter method, (b) Sand replacement method
5. Determination of Density-water content relationship of soil: Proctor compaction tests.
6. Determination of relative density of granular soil
7. Determination of shear strength of soil: (a) Direct shear test (b) Tri-axial shear test, (c) Unconfined compression test (d) Vane shear test
8. Determination of consolidation characteristics of soil using fixed ring Oedometer
9. Determination of California Bearing Ratio (CBR) of soaked and un-soaked soil samples
10. Determination of coefficient of permeability of soil: (a) Constant head permeameter (b) Falling head permeameter

### BCE393-ENVIRONMENTAL ENGINEERING DESIGN (0-0-3) CR-02

1. Design of conventional water supply system for a city. The system must include design of intake well, clariflocculators, filtration unit, disinfection, aeration & distribution network etc including underground & overhead tank.
2. Design of waste treatment system (suspended growth process & attached growth process) for the city.
3. Design of septic tank & soak pit.
4. Design of aerobic, facultative & anaerobic ponds.

**BCE394-TRANSPORTATION ENGINEERING LABORATORY (0-0-3) CR-02**

Test on Soil-CBR Test

Tests on Aggregate:

- (1) Crushing Value Test
- (2) Impact Value Test
- (3) Los Angeles Abrasion Value Test
- (4) Shape Test

Tests on Bitumin-

- (1) Penetration Test
- (2) Softening Point Test
- (3) Ductility Test
- (4) Specific gravity Test

Test on Bituminous Mix by Marshall Test