

VSS UNIVERSITY OF TECHNOLOGY, BURLA, ODISHA
CIVIL ENGINEERING DEPARTMENT
CURRICULUM
For
B.TECH – 8TH SEM

THEORY

BCE406 - ESTIMATION & PROFESSIONAL PRACTICE (3-1-0) CR-04

Module – I

Quantity Estimation: Principles of estimation, methods and units, Estimation of materials in Buildings, Culverts and Bridges. Specifications of different items.

Module – II

Principles of general and detailed specification for various types building works.

Module – III

Analysis of rates: Description, Prime cost, Schedule of rates, Analysis of rates for various types of works.

Module – IV

Contract Management: Legal aspects, contract laws related to land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of tender operation, Evaluation of tenders and Award of work, Disputes and arbitration.

Valuation of Civil Engineering structures.

Text books :

1. Estimating and costing in Civil Engineering Theory & Practice, B.N.Dutta, UBS Publishers.
2. Construction Management and Planning, B. Sengupta & H Guha, Tata McGraw Hill

BCE407-CONSTRUCTION MANAGEMENT (3-1-0) CR-04

Module-I

Objectives and functions of construction management. Project Management: Project Planning, Scheduling and Controlling, Bar charts: Development of Bar charts and its shortcomings. Network techniques: Event, activity, Dummy activity. Network rules, Numbering of events. Critical Path Method, Critical activities, Slack. Project Evaluation and Review Techniques(PERT): Time estimates, Different types of Float of activity. Probability of meeting schedule date for the project.

Cost Model: Project cost, indirect and direct cost, slope of direct cost curve, optimum project duration, contracting the network for cost optimization. Introduction to updating, resources smoothing and resources leveling. (15)

Module-II

Construction equipments: Different types of construction equipments, earth moving, dewatering and pumping, grouting, pile driving equipments. Conveyors, cranes, concrete mixture, vibrators, Rollers, Compactors and other road construction equipments. Factors affecting selection of construction equipments., Safety and safety measures in construction works. Quality control (05)

Module-III

Introduction to optimization. Linear system: graphical method, simplex method. Sensitive analysis. Dynamic programming. (10)

Module-IV

Inventory management: Functional role of Inventory, factors involved in inventory problem Deterministic Inventory control model: single and multiple item inventory control model with and without shortage.

Equipment management: Replacement and maintenance model. Owning and hiring cost, depreciation. Work motion study. Multiple activity chart. (10)

Text books.

1. Construction planning, Equipments and Methods, R. L.Peurify. Tata McGraw Hill
2. Construction Management and Planning, B Sengupta & H Guha, Tata McGraw Hill
3. Construction Planning and Management, Mahesh Verma
4. PERT & CPM, L. S. Sreenath. East - West Press.
5. Optimization, S.S. Rao, Tata Mc Graw Hill

ELECTIVE-III (BCE408)

Open Channel Hydraulics (3-1-0): Credit-04

Module I

Basic Fluid flow concepts: Classification of open channels, classification of flow, basic equations, velocity distribution, pressure distribution, energy and momentum coefficients.

Uniform flow in rigid boundary channels: Shear stress on the boundary, flow over scattered roughness elements, Chezy's equation, Manning's equation, effect of channel shape on resistance equation, section factor curves for rectangular and trapezoidal channels, flow in a circular channel, relation between conveyance and depth.

Module II

Uniform flow in mobile boundary channels: Incipient motion condition, regimes of flow, resistance to flow in alluvial streams.

Design of channels: Rigid boundary channels, non-scouring erodible boundary channels, alluvial channels.

Specific energy: Specific energy, specific force, critical depth computations, control section, application of specific energy and critical depth concepts.

Module III

Gradually varied flow: Types of non uniform flow, governing equations, characteristics of surface curves, classification of water surface profiles, sketching of water surface profiles, discharge from reservoir, profiles in compound channels, computation of gradually varied flow in prismatic channels, gradually varied flow in non prismatic channels.

Module IV

Rapidly varied flow: Application of conservation laws, channel transitions, supercritical flow past weirs, spillways, hydraulic jumps

Unsteady flow: Waves and their classification, celerity of a wave, surges, equation of motion, method of characteristics, dam break problem.

Text Books

1. Flow through open channels - K. G. Ranga Raju
2. Open channel flow - M. Hanif Chaudhry
3. Open Channel Hydraulics - V. T. Chow
4. Flow in open channels - K. Subramanya

ENVIRONMENTAL GEOTECHNIQUE (3-1-0): CREDIT-04

Module- I

Introduction: Scope, importance, waste generation, subsurface contamination,
Geosynthetics: Types, manufacturing functions, applications and economics.

Module- II

Forms of waste and their properties: Municipal waste, mineral waste, industrial waste, hazardous waste, index properties, strength, compressibility and permeability of municipal and mineral waste.

Module- III

Selection of waste disposal sites, factors affecting site selection, siting criteria and siting rating method, Landfills for municipal and hazardous waste: components of land fills, layouts, daily cells, base lining systems, stability of slopes, constructing aspects.

Module- IV

Ash ponds and mine tailing impoundments: slurry deposition of mine tailing and coal ash in impoundments, layouts, components, design of tailing dam/ash dykes, slope stability.

Remediation: Principle of remediation: Planning, source control, soil gas extraction, soil washing, and bioremediation.

Reference books:

1. Geotechnology of waste management, I. S. Oweis and R. P. Khera, Butterwarths, London.
2. Engineering with geosynthetics, Ed. G. V. Rao and G.V.S.S. Raju, Tata McGraw Hill
3. Geotechnical practice for waste disposal, D. E. Daniel, Chapman and Hall, London.

Theory of Elasticity and Plasticity (3-1-0) Credits:04

Module- I

Plane stress and plane strain problems. General stress and strain equations (Equilibrium and compatibility equations). Two dimensional problems in rectangular coordinates.

Module- II

Stress and strain components, differential equation, equilibrium equations and compatibility equations in polar coordinate. Stress distribution for axisymmetric problems. Pure bending of curved bars, thick walled cylinder. Concentrated force at a point of straight boundary. Force acting on the end of a wedge. Concentrated force acting on a beam. Effect of circular holes on stress distributions in plates.

Module- III

Stress and strain in three dimensions: Principles stresses, maximum shearing stress, principal axes of strain. Stretching of prismatical bar by its own axis. Elementary problems of elasticity in three dimension.

Module- IV

Torsion of non-circular prismatic bars. Saint Venant's theory. Various analogies. Torsion of hollow and thin section. Application of energy methods.

Module- V

Introduction to the theory of plasticity., the yield criteria of metals, stress space representation of yield criteria. stress-strain relations plastic potential, flow rules and maximum work hypothesis. Two dimensional plastic flow problems. Incompressible two dimensional flow, stresses in plastic materials in condition of plane strain, equation of equilibrium the simplest slip-line fields.

Essential Reading

1. S P Timoshenko and J N Goodier, Theory of Elasticity, Mc Graw Hill
2. Hoffman and Sachs, Theory of plasticity

Supplementary Reading

1. N.Filonenko-Borodich, Theory of Elasticity, Mir Publishers, Moscow, 1965
2. W. Johnson and P B Meller, Plasticity of Mechanical Engineers
3. C.R. Calladine, 'Plasticity for Engineers', Ellis Herwood, Chichester, U.K., 1985

REMOTE SENSING AND GIS APPLICATIONS (3-1-0): CREDIT-04

Module – I

Remote Sensing : Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

Module – II

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

Module – III

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

Module – IV

Applications: Land use/Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development, Watershed characteristics. Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for Artificial Recharge Structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

TEXT BOOKS:

1. Remote Sensing and its applications - LRA Narayana [University Press 1999.]
2. Principals of Geophysical Information Systems – P. A. Burrough and R. A. Mc Donnell [Oxford Publishers 2004.]

REFERENCES:

1. Concepts & Techniques of GIS - C.P.Lo Albert, K.W. Yonng,[Prentice Hall (India) Publications.]
2. Remote Sensing and Geographical Information systems - M.Anji Reddy [B.S.Publications.]
3. GIS by Kang – tsung chang, [TMH Publications & Co.]
4. Basics of Remote sensing & GIS - S.Kumar [Laxmi Publications.]

Traffic and Transportation Planning (3-1-0): Credit-04

Module -I

Urban transportation planning process & concepts: Role of transportation and changing concerns of society in transportation planning; transportation problems and problem domain; objectives and constraints; flow chart for transportation planning process-inventory, model building, forecasting and evaluation stages, planning in system engineering framework; concept of travel demand and its modelling based on consumer behaviour of travel choices-Independent variables, travel attributes.

Module –II

Methods of Travel Demand Estimation: Assumptions in Demand Estimation-Sequential, Recursive and Simultaneous Process -Introduction to Transportation Planning Practices; Definition of Study Area, Zoning. Trip Generation Analysis: Trip Generation Models-Zonal Models, Category analysis, Household Models, Trip Attractions of Work Centres & Commercial Trips Trip Distribution Analysis: Trip End and Trip Interchange Models; Trip Distribution Models –Growth Factor Models, Gravity Models, Opportunity Models and their calibration; Estimation of Travel Demand based on link volume philosophy.

Module –III

Mode Split and Route Split analysis: Mode Split Analysis-Mode Choice Behaviour, Competing Modes, Mode Split Curves, Probabilistic Models and Two Stage Mode Split Analysis; Route Split Analysis-Elements of Transportation Networks, Coding, Minimum Path Trees, Diversion Curves, All-or-Nothing Assignment, Capacity Restrained Assignment, Multipath Assignment

Module – IV

Landuse-Transportation Models: Location models -Opportunity Models, Lowry based Landuse-Transportation Models – Allocation Function, Constraints, Travel Demand Estimation – Iterative Solutions, Matrix Formulation, Dynamic and Disaggregated extensions.

References

1. Hutchinson, B.G., Principles of Urban Transportation System Planning, Mc-Graw Hill 1974.
2. Khisty, C J., Transportation Engineering – An Introduction, Prentice-Hall, NJ
3. Dickey, J.W., Metropolitan Transportation Planning, Tata Mc-Graw Hill 1980
4. ITE (1982), 'Transportation and Traffic Engineering Hand Book', Chapters 10,12, and 17, Prentice Hall, New Jersey
5. Kanafani, A., Transportation Demand Analysis, McGraw-Hill.
6. Oppenheim, N., Applied Models in Urban and Regional Analysis, Prentice-Hall, NJ.
7. Bruton M.J., Introduction to Transportation Planning, Hutchinson of London.
8. Oppenheim N., Applied Models in Urban and Regional Analysis, Prentice-Hall.
9. Dickey J.W., et. al., Metropolitan Transportation Planning, Tata McGraw-Hill.
10. Gallion A.B and Eisner S., The Urban Pattern, Affluated East-West Press, New Delhi.
11. Wilson, A.G, Urban and Regional Models in Geography and Planning, John Wiley and Sons.

6. River Engineering (3-1-0): Credit-04

ELECTIVE-IV (BCE409)

Prestressed Concrete (3-1-0): Credits-04

(Relevant IS Codes are permitted in the examination)

Module –I

Different systems of prestressing, Characteristics of concrete and steel, Other suitable materials, Losses in prestress.

Analysis and design of section for flexure, shear and torsion. Design of flexural member. Limit state design as per IS code.

Module –II

Deflection of prestressed structures- short term as well as long term deflections of uncracked and cracked members.

Module –III

Stress distribution in end-block of post tensioned section. Magnel's method, Guyen's method, Rowe's method and IS code method.

Module –IV

Indeterminate structures- Principles of design of prismatic continuous beams of two equal, unequal spans with same and variable moments of inertia, Cap cable, Design concept of concordancy of cable, Secondary design consideration.

Design of Pre-tensioned and Post-tensioned beam

Reference Books:

1. E. W. Bennet- "Prestressed concrete theory & design"- Chapman & Hall, London-1962.
2. T. Y. Lin & H. Burns Ned,- "Design of prestressed concrete structures", Johnwiley & Sons, New York-1982.
3. N. Krishnaraju- "Prestressed concrete"- Tata McGraw-Hill, New Delhi-2004.
4. S. K. Mallik & A. P. Gupta- "Prestressed concrete"- Oxford & IBH, New Delhi-1982

Composite Materials and Structures (3-1-0) Credits:04

Module –I

Classification and characteristics of Composite materials, advantages and limitations,

Basic Concepts and characteristics: Homogeneity and Heterogeneity, Isotropy, Orthotropy and Anisotropy; Characteristics and configurations of lamina, laminate, micromechanics and macromechanics. Constituent materials and properties.

Module –II

Elastic behaviour of unidirectional lamina, Strength of unidirectional lamina, Macromechanical failure theories : Maximum stress theory, maximum strain theory, Deviatoric strain energy theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu)

Module –III

Elastic Behaviour of multidirectional laminates: Basic assumptions, Stress-strain relations, load deformation relations, symmetric and balanced laminates, laminate engineering properties,

Module –IV

Bending of laminated plates: Governing equations, Deflection of simply supported rectangular symmetric angle-ply, specially orthotropic, anti-symmetric cross-ply laminates.

Reference Books:

1. Robert M. Jones, "Mechanics of Composite materials", McGraw-Hill Book Company
2. I M Daniel and O. Ishai, "Engineering mechanics of Composite materials", Oxford university press
3. P.K. Mallick , "Fiber-reinforced Composites", Marcel Dekker inc
4. D. Hull and T W Clyne, "An introduction to composite materials", Cambridge university press
5. J N Reddy, Mechanics of laminated composite plates and shells: theory and analysis, CRC Press

Pavement Design (3-1-0) Credit: 04

Module –I

Classification of pavements : Difference between Highway and Airport pavements, Geometric and structural design requirements of pavements. Factors affecting pavement – design principles and criteria for design of flexible pavements.

Wheel loads on Pavements : Different configurations, contact area, equivalent single wheel load (ESWL) and equivalent wheel load (EWL)

Module - II

Design methods for flexible pavements : Main aspects of group index, North Dakota. Kansas, U.S.Navy/C.B.R. and Wyoming Highway methods, Design of flexible pavements and IRC, CBR design curves, Burmister's layer theory and its application in flexible pavement design.

Module – III

Rigid Pavements : Critical loading regions, Formulas for corner stresses by Older, Pickett and others- Westergard's theory for stresses in concrete pavements for corner, Edge and interior loadings.

Module – IV

Temperature stresses in rigid pavements, Westergard, Bradbury and concepts.

IRC for guide lines for design of rigid pavements.

Joints in rigid pavements, Their design requirements.

Pavement over lays – flexible and rigid types.

General principles of design – IRC recommendations.

Books for reference :

1. Pavement design – By – E.J. Yoder and Warwich
2. Highway Engineering – By – S.K.Khanna and C.E.G. Justo
3. I.R.C. Codes

GROUND IMPROVEMENT TECHNIQUES (3-1-0): CREDIT-04

Module – I

Introduction, Necessity of ground improvement, Dewatering, methods, Analysis and design of dewatering systems.

Grouting types, Properties, Method of grouting, Ground selection and control.

Module – II

Compaction, Methods of compaction, Engineering properties of compacted soil, Field compaction and its control.

Module – III

Soil stabilization, Use of chemical additives, Stone columns, Principle, design and method of installation.

Module – IV

Reinforced earth, Concept, Materials, Application and design, Use of geo-synthetics and geo-cells in construction work.

Textbooks :

1. Foundation Design and Construction, M.J. Tomlinson
2. Foundation Engineering, G.A. Leonard, Tata McGraw Hill
3. Modern Geotechnical Engineering, Alam Singh, IBT Publishers

Soil Dynamics and Earthquake Engineering (3-1-0): Credit-04

Introduction: Dynamic loading and dynamics of vibrations, Earthquake records, Earthquake records of India

Seismology: Plate tectonics, Causes of Earthquake, seismic waves, faults, earthquakes magnitude and intensity, seismographs.

Seismic hazards in India: Earthquake hazards in India, Earthquake records in north-eastern region, Earthquake hazard zoning, risk evaluation and mitigation, awareness campaign.

Dynamic soil properties: Introduction, soil properties for dynamic loading, measuring dynamic soil properties.

Seismicity: site seismicity, seismic soil response and design earthquake.

Liquefaction: introduction, factors affecting liquefaction, liquefaction analysis, anti-liquefaction measures.

Earthquake resistant design of shallow and deep foundations.

Analysis of retaining walls and slope stability for earthquakes.

REFERENCE BOOKS

1. Fundamentals of Soil Dynamics & Earthquake Engineering by B.B. Prasad, PHI Learning Pvt. Ltd
2. Basic Geotechnical Earthquake Engineering: Kamalesh Kumar, New Age International Publishing
3. Geotechnical Earthquake Engineering: S. L. Kramer, Prentice Hall International Publishing
4. Geotechnical Earthquake Engineering Hand Book: R. W. Day, © 2002 McGraw-Hill

WATER RESOURCES PLANNING AND MANAGEMENT (3-1-0) CREDIT: 04

Module I

Introduction, Role of water in national development, assessment of water resources of country, scope of water resources development in context of environment

Module II

Water resources planning process, planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives, cost-benefit analysis. Introduction to optimization techniques and systems approach.

Module III

Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation, flood control and power generation, inter-basin transfer of water.

Module IV

Conjunctive use of surface and groundwater, water quantity and quality modeling, evaluation of impacts of water resources projects on river regimes and environment, reservoir sedimentation and watershed management.

TEXT BOOKS:

1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd.
2. Water Resources Economics - James & Lee. , Oxford Publishers.

REFERENCES:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing House.

SESSIONAL

BCE 495 - COMPREHENSIVE VIVA VOCE(0-0-2): CR-02

BCE 496 - MAJOR PROJECT (0-0-3): CR-06