

# **COURSE STRUCTURE & SYLLABUS OF BACHELOR OF TECHNOLOGY (B.TECH)**

*In*

**Civil**

**Course Structure**

**Third Year**

**Sixth Semester**

<b>Paper Code</b>	<b>Subject</b>
BTC6	Design of Steel Structures
BTC7	Advanced Structural Analysis
BTC8	Environmental Engineering
BTC9	Advanced Foundation Engineering
BTC10	Industrial Economics & Management

## **BTC 6 : DESIGN OF STEEL STRUCTURES:**

### **1. General Construction**

Introduction, Advantages of steel as a structural material, Disadvantages of steel as a structural material, Structural steel, Stress-strain curve for mild steel, Rolled steel sections, Loads, Permissible stresses, Working stresses, Factor of safety, Minimum thickness of structural members, Design methods.

### **2. Structural Fasteners**

Riveting, Bolted joints, Types of riveted and bolted joints, Definition, Failure of a riveted joint, Strength of riveted/bolted joint, Assumptions in the theory of riveted joints, Efficiency of a joint, Design of riveted joints for axially loaded members, Welded joints, Advantages of welded joints, Disadvantages of welded joints, Types of welds and their symbols, Design of fillet welds, Design of butt weld, Design of plug and slot welds.

### **3. Compression Members**

Introduction, Effective length, Slenderness ratio, Column design formula, Types of sections, Assumptions, Design of axially loaded compression members, Built-up columns (lattice columns), Lacing, Batten, Compression members composed of two components back-to-back, Encased column, Eccentrically loaded columns, Solved examples.

### **4. Tension Members**

Introduction, Net sectional area, Permissible stress, Design of axially loaded tension member, Lug angle, Tension splice.

### **5. Column Bases & Footings**

Introduction, Types of column bases, Slab base, Gusset base, Welded column bases, Design of hold-down angles and base plates, Grillage footing, Solved examples.

## **6. Beams**

Introduction, Design procedure, Built-up beams, Plate thickness, Simple beam end connections.

## **7. Industrial Buildings**

Introduction, Planning, Structural framing, Types, Roof and side coverings, Elements of an industrial building, Design steps of industrial building, Solved examples.

## **8. Beams Column**

Introduction, Eccentricity of load, Eccentrically loaded base plates.

## **9. Elementary Plastic Analysis & Design**

Introduction, Idealized stress-strain curve for mild steel, Scope of plastic analysis, Ultimate load carrying capacity of tension members, Ultimate load carrying capacity of compression members, Flexural members, Shape factor, Load factor, Mechanism, Plastic collapse, Conditions in plastic analysis, Principle of virtual work, Theorems of plastic analysis, Methods of analysis, Cancellation of hinge in the combined mechanism [beam + panel], Design, Limitations of plastic analysis, Plastic design vs elastic design, Solved examples.

## **10. PLATE GIRDER**

Introduction, Economical depth and self-weight of plate girder, Design of web, Design of flanges, Curtailment of flange plates, Riveted connections, Web stiffeners, Web splice, Flange splice.

### **BTC 7 : ADVANCED STRUCTURAL ANALYSIS**

#### **1. FUNDAMENTAL CONCEPTS:**

Introduction, historical background, outline of presentation, stresses and equilibrium, boundary conditions, strain-displacement relations, stress-strain relations, temperature effects, potential energy and equilibrium, Galerkin's method, von Mises stress, computer programs, historical references.

#### **2. ONE-DIMENSIONAL PROBLEMS**

Introduction, finite element modeling, coordinates and shape functions, the potential-energy approach, the Galerkin approach, assembly of the global stiffness matrix and load vector, the finite element equations; treatment of boundary, quadratic shape functions, temperature effects.

#### **3. TWO-DIMENSIONAL PROBLEMS USING CONSTANT STRAIN TRIANGLES:**

Introduction, finite element modeling, constant-strain triangle (CST), orthotropic materials, meshgen input file.

#### **4. BEAMS AND FRAMES:**

Introduction, finite element formulation, load vector, boundary considerations, shear force and bending moment, beams on elastic supports, plane frames, some comments, three-dimensional problems in stress analysis, finite element formulation, stress calculations, mesh preparation, hexahedral elements and higher order elements, problem modeling, frontal method for finite element matrices.

#### **5. DYNAMIC CONSIDERATIONS:**

Introduction, element mass matrices, evaluation of eigenvalues and eigenvectors, interfacing with previous finite element programs and a program for determining critical speeds of shafts, Guyan reduction, rigid body modes.

### **BTC 8 : ENVIRONMENTAL ENGINEERING**

#### **1. MAN, ENVIRONMENT, ECOSYSTEMS & THEIR INTER RELATIONSHIP**

Introduction, Effects Of Pollutants On Living System, Some Pollution Syndromes

#### **2. TYPES OF ENVIRONMENT POLLUTANTS AND THEIR SOURCE OF EFFECTS**

Natural Pollution, Agricultural Pollution, Mining Pollution, Municipal Pollution, Industrial Pollution, Classification Of Pollution And Pollutants, Devising Technological Abatement Processes, Effects Of Pollutants On Living System, Fire Management, Rangelands, Parks And Nature Preserves, Case Study Reintroducing Wolves To Yellowstone, World Parks And Preserves

### **3. INDOOR POLLUTION, AIR POLLUTION, SOURCE & THEIR EFFECTS AND CONTROL TECHNOLOGIES**

Introduction, Air Pollution Episodes, Air Pollution And Its Abatement, *Effects Of Air Pollution*, National Air Pollution Control Administration, Air Pollution Control, Clean Air Legislation, Sources Of Air Pollution, Control Of Air Pollution, *Types Of Gas Changing Device*

### **4. NOISE POLLUTION & ITS ABATEMENT**

Introduction, Noise Pollution Sources, Effect Of Noise On Physical Health, Noise Control

### **5. INDUSTRIAL WASTE TREATMENT AND DISPOSAL**

Pollution Characteristics Of Wastes, Physical Characteristics, Chemical Characteristics, Biological Characteristics, Treatment Of Industrial Effluents, Physical Treatment, Chemical Treatment, Biological Treatment, Disposal Of Industrial Effluents, Treatment Of Industrial Effluents, Physical Treatment, Air Pollution Problems In Industry, Nuclear Wastes, Health And Environmental Effects, Refinery And Fuel Fabrication Wastes, Biomedical Wastes, Control Of Biomedical Wastes, Identifying A Hazardous Waste, Role Of The Wastes Exchange, Treatment And Disposal Of Chemical Wastes

### **6. SOLID WASTE DISPOSAL**

Introduction, Characteristics Of Solid Wastes, Characteristics, Considerations In Solid Waste Management, Collection Systems

### **7. ENVIRONMENTAL IMPACT ASSESSMENT AND AUDITING**

Historical Perspective, Elements Of The Environmental Impact, Project Design And Construction, Project Operations, Site Characteristics, Institutional And Sociopolitical Framework, Possible Impacts, Socioeconomic Analysis, Alternatives Availability Of Information, Availability Of Resources, Environmental Pollution And Its Control In The Pulp And Paper Industry, NEPA And EIS, Introduction, Sustainable Development, Environment Impact Assessment, Project Operations, Site Characteristics, Institutional And Sociopolitical Framework, Socioeconomic Analysis, Alternatives, Availability Of Information, Availability Of Resources

### **8. INTRODUCTION TO ENVIRONMENTAL LAWS AND POLICIES**

Environmental Policy, NEPA And EIS, Environmental Law, International Treaties And Conventions

### **9. GLOBAL ISSUES**

Best Practicable Means (BPM), Devising Technological Abatement Processes, Environmental Standards, State Of World Environment, International Treaties And Conventions, Dispute Resolution And Community-Based Planning, The Dilemma Of Industrialization And Urbanization

## **BTC 9 : ADVANCED FOUNDATION ENGINEERING**

### **1. MAT FOUNDATIONS:**

Introduction, combined footings, common types of mat foundations, differential settlement of mats, field settlement observations for mat foundations, compensated foundation, structural design of iv/at foundations.

## **2. SHEET PILES WALLS:**

Introduction, construction methods, cantilever sheet pile walls, special cases for cantilever walls penetrating a sandy soil, cantilever sheet piling penetrating clay, special cases for cantilever walls penetrating clay, anchored sheet pile walls, free earth support method for penetration of sandy soil, moment reduction for anchored sheet pile walls, computational pressure diagram method for penetration into sandy soil, free earth support method for penetration of clay, holding capacity of anchor plates in sand, ultimate resistance of tiebacks, field observations for anchored sheet pile walls.

## **3. BRACED CUTS:**

Introduction, pressure envelope for braced-cut design, pressure envelope for cuts in layered soil, design of various components of a braced cut, bottom heave of a cut in clay, stability of the bottom of a cut in sand, lateral yielding of sheet piles and ground settlement.

## **4. PILE FOUNDATION:**

Introduction, types of piles and their structural characteristics, estimating pile length, installation of piles, load transfer mechanism, equations for estimating pile capacity, meyerhof's method for estimating  $q_p$ , vesic's method for estimating  $q_p$ , janbu's method for estimating  $q_p$ , coyle and castello's method for estimating  $q_p$  in sand, other correlations for calculating  $q_p$  with spt and cpt results, frictional resistance ( $q_s$ ) in sand, frictional (skin) resistance in clay, general comments and allowable pile capacity, point bearing capacity of piles resting on rock, pile load tests, comparison of theory with field load test results, elastic settlement of piles, laterally loaded piles, pile-driving formulas, stress on piles during driving, pile capacity for vibration-driven piles, negative skin friction, group efficiency, ultimate capacity of group piles in saturated clay, piles in rock, elastic settlement of group piles, consolidation settlement of group piles,

## **5. DRILLED SHAFT FOUNDATIONS:**

Introduction, types of drilled shafts, construction procedures, other design considerations, load transfer mechanism, estimation of load-bearing capacity, drilled shafts in sand: load-bearing capacity, settlement of drilled shafts at working load, lateral load-carrying capacity, drilled shafts extending into rock.

## **6. FOUNDATIONS ON DIFFICULT SOILS:**

Introduction, definition -and types of collapsible soil, physical parameters for identification, procedure for calculating collapse settlement, foundation design in soils not susceptible to wetting, foundation design in soils susceptible to wetting, case histories of stabilization of collapsible soil, general nature of expansive soils, laboratory measurement of swell, classification of expansive soil on the basis" of index tests, foundation considerations for expansive soils, construction on expansive soils, general nature of sanitary landfills, settlement of sanitary landfills.

## **7. SOIL IMPROVEMENT AND GROUND MODIFICATION:**

Introduction, general principles of compaction, correction for compaction of soils with oversized particles, field compaction, compaction control for clay hydraulic barriers, vibroflotation, precompression, sand drains, an example of a sand drain application, prefabricated vertical drains, cement stabilization, fly-ash stabilization, stone columns, sand compaction piles, dynamic compaction.

## **BTC10: INDUSTRIAL ECONOMICS AND MANAGEMENT**

**Chapter - 1: Nature and Significance of Economics:** Science, Engineering and Technology and their relationship with economics development, appropriate technology for development countries

**Chapter - 2: Demand and Supply Analysis:** Elasticity, Competition, Monopoly, Oligopoly, Monopolistic competition, Price Discrimination, Equilibrium of firm .

**Chapter - 3: Function of Money:** Supply and Demand for money, Inflation, Black Money.

**Chapter - 4: Functions of Commercial Bank:** Multiple credit creation, Banking systems in India.

**Chapter - 5: Central Banking:** Functions of Central Banking, monetary policy.

**Chapter - 6: Sources of Public Revenue:** Principles of taxation, Direct and Indirect taxes , reform of tax system .

**Chapter - 7: Theory of International Trade:** Balance of trade and payment, Theory of protection, Exchange control, Devaluation.

**Chapter - 8: New Economics Policy:** Liberalization, Extending , Privatization, Globalization, Market-Friendly state, Export led growth.

**Chapter - 9: Causes of Underdevelopment:** Determinants of economic development, stages of economics growth, Strategy of development, Critical minimum effort strategy.

**Chapter - 10: Management Functions:** Developments of management thought, Contribution of F.W. Taylor, Henri Fayol, Elton-Mayo, System Approach to Management.

**Chapter - 11: Nature of Planning:** Decision making process, MBO.

**Chapter - 12: Organization:** Line and Staff relationships, Decentralization of delegation of authority .

**Chapter - 13: Communication Process:** Media Channels and barriers to effective communication .

**Chapter - 14: Theory of Motivation:** Maslow, Herzberg and McGregor Theory of motivation, McClelland's achievement theory.

**Chapter - 15 : Production Management:** Production Planning and control, inventory control, quality control, total quality management.

**Chapter - 16 : Project Management:** Project Development life cycle, project feasibility, CPM, PERT.

**Chapter - 17: Cost Accounting and Finance:** Techniques of Financial Control, Financial Statements Financial Ratios, Break-even analysis, Budgeting and budgetary control.

**Chapter - 18 : Marketing Functions:** Management of Sales and advertising, Marketing research .

**Chapter - 19: Human Resource Management:** Functions, Selection, Training.

**Chapter - 20 : Engineering Economics:** Investment Decisions, Payback time .

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