

## 6<sup>th</sup> SEM

### **B. Tech. VI Semester (Civil) CE-302E DESIGN OF STEEL STRUCTURES-II**

L T P/D Total  
3 - 2 5

Max.Marks: 150  
Theory: 100 marks  
Sessional: 50 marks  
Duration: 3 hrs,

#### **UNIT-I**

##### **Elementary Plastic Analysis and Design:**

Introduction, Scope of plastic analysis, ultimate load carrying capacity of tension members and compression members, flexural members, shape factor, mechanisms, plastic collapse, analysis, plastic analysis applied to steel beams and simple portal frames and design.

#### **UNIT-II**

##### **Design of Water Tanks:**

Introduction, permissible stresses, design of circular, rectangular and pressed steel tanks including staging.

##### **Design of Steel Stacks:**

Introduction, various loads to be considered for the design of steel stacks, design of steel stacks including foundation.

#### **UNIT-III**

##### **Towers:**

Transmission line towers, microwave towers, Design loads, classification, design procedure and specification.

##### **Cold Formed Sections:**

Introduction and brief description of various types of cold formed sections, local buckling, concepts of effective width and effective sections, elements with stiffeners, design of compression and bending elements.

#### **UNIT-IV**

##### **Industrial Buildings:**

Loads, general arrangement and stability, design considerations, design of purlins, design of roof trusses, industrial building frames, bracings and stepped columns.

**Note for Paper-setter:** EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

##### **Books:**

1. Design of Steel Structures, A.S.Arya & J.L.Ajmani, Nem Chand & Bros., Roorkee.
2. Design of Steel Structures, P.Dayartnam, Wheeler Pub. Allahabad.

3. Design of Steel Structures, Gaylord & Gaylord, McGraw Hill, Newyork/International Students Edn., Toyo Kogakusha, Tokyo.
4. IS:800-1984, Indian Standard Code of Practice for General Construction in Steel.
5. IS-801-1975, Indian Standard Code of Practice for Use of Cold formed light gauge steel structural members in general building construction.

**B. Tech. VI Semester (Civil)**  
**CE-304E IRRIGATION ENGINEERING-I**

L	T	P/D	Total
3	2	-	5

Max.Marks:150  
Theory: 100 marks  
Sessionals: 50 marks  
Duration: 3 hrs.

**UNIT-I**

**Introduction:**

Irrigation-necessity, advantages, disadvantages, impact of irrigation on human environment , need and development of irrigation in India, crops and crop seasons, ideal cropping pattern and high yielding varieties of crops.

**Soil-water relationship and irrigation methods:**

Soil-water relationship, root zone soil water, infiltration, consumptive use, field capacity, wilting point, available moisture in soil, GCA, CCA, intensity of irrigation, delta, base period, Kor depth, core period, frequency of irrigation, duty of water, relation between delta, duty and base period, irrigation requirement, flooding methods, border strip method, check basin and furrow method, assessment of irrigation water, sprinkler irrigation, favorable conditions, sprinkler systems, hydraulics of sprinkler irrigation, planning, design and maintenance of sprinkler systems, drip irrigation-components parts, advantages and limitations, suitability of drip irrigation.

**UNIT-II**

**Canal irrigation:**

Component of canal distribution system, alignment of channels, losses in irrigation channels, design discharge, silt theories and design of alluvial channels, comparison of Kennedy's and Lacey's theories, canal section and design procedure, Garrets and Lacey's diagrams.

**UNIT-III**

**Water logging and land reclamation:**

Water logging-effects, causes and measures of prevention, lining of irrigation channels, types of lining, design of lined channel land drainage, open drains, design considerations, advantages of tile drains, depth of tile drains, layout of closed drains, discharge and spacing of closed drains, diameter of tile drain, outlets for tile drains, maintenance of tile drains, purpose of land reclamation and methods of land reclamation.

**UNIT-IV**

**River Training:**

Classification of rivers, river training and its objectives, classification of river training works, methods of river training, marginal embankments, guidebanks, spurs, cutoffs, bank pitching and launching apron.

**Canal outlets:**

Classification, requirements of a good outlet, design of pipe, APM and open flume outlet, flexibility proportionality, setting and sensitivity of outlet.

**Note for Paper-setter:** EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

**Books:**

- 1 Irrigation, Water Resources and Water Power Engg. by P.N.Modi.
- 2 Fundamentals on Irrigation Engg. by Bharat Singh.
- 3 Irrigation Engg & Hydraulic Structures by S.K.Garg.
- 4 Irrigation Engg. by S.K.Sharma.
- 5 Irrigation-Theory & Practice by A.M. Michael.
- 6 Irrigation – Theory & Practice by G.L. Asawa

**B. Tech. VI Semester (Civil)**  
**CE-306E WATER RESOURCES & SYSTEMS ENGINEERING**

L	T	P/D	Total
3	2	-	5

Max.Marks:150  
Theory: 100 marks  
Sessional: 50 marks  
Duration: 3 hrs.

**UNIT-I**

**Water Resources Planning:**

Role of water in national development, assessment of water resources, planning process, environmental consideration in planning, system analysis in water planning, some common problems in project planning, functional requirements in multipurpose projects, multipurpose planning, basinwise planning, long term planning.

Reservoir planning-dependable yield, sedimentation in reservoir, reservoir capacity, empirical-area reduction method.

**UNIT-II**

**Economic and Financial Analysis:**

Meaning and nature of economic theory, micro and macro economics, the concept of equilibrium, equivalence of kind, equivalence of time and value, cost benefit, discounting factors and techniques, conditions for project optimality, cost benefit analysis, cost allocation, separable and non-separable cost, alternate justifiable and remaining benefit methods, profitability analysis.

**UNIT-III**

**Water Resources Systems Engineering:**

Concept of system's engineering, optimal policy analysis, simulation and simulation modeling, nature of water resources system, analog simulation, limitations of simulation, objective function, production function, optimality condition, linear, non-linear and dynamic programming, applications to real time operations of existing system, hydrologic modeling and applications of basic concepts.

**UNIT-IV**

**Applications of System Approach in Water Resources:**

Applications of system engineering in practical problems like hydrology, irrigation and drainage engineering, distribution network, mathematical models for forecasting and other water resources related problems.

**Note for Paper-setter:** EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

**Books:**

- 1 Water Resources Engineering by Linseley and Franzini
- 2 Economics of Water Resources Engineering by James and Lee.
- 3 Optimisation Theory and Applications by S.S.Roy
- 4 Water Resources Systems Planning & Economics by R.S.Varshney.
- 5 Operational Research-An Introduction by Hamdy A.Taha.

**B. Tech. VI Semester (Civil)**  
**CE-308E GEOTECHNOLOGY-II**

L	T	P/D	Total
3	2	-	5

Max.Marks:150  
Theory: 100 marks  
Sessionals: 50 marks  
Duration: 3 hrs.

**UNIT-I**

**Earth Dams:**

Introduction, types of sections, earth dam foundations, causes of failure and criteria for safe design, control of seepage through the embankment, control of seepage through the foundation, drainage of foundations, criterion for filter design. Introduction to rock fill dams.

**Stability of slopes:**

Causes of failure, factors of safety, stability analysis of slopes-total stress analysis, effective stress analysis, stability of infinite slopes types of failures of finite slopes, analysis of finite slopes-mass procedure, method of slices, effect of pore pressure, Fellenius method to locate center of most critical slip circle, friction circle method, Taylor's stability number, slope stability of earth dam during steady seepage, during sudden draw down and during and at the end of construction.

**UNIT-II**

**Braced Cuts:**

Depth of unsupported vertical cut, sheeting and bracing for deep excavation, movements associated with sheeting and bracing, modes of failure of braced cuts, pressure distribution behind sheeting.

**Cofferdams:**

Introduction, types of cofferdams, design and lateral stability of braced cofferdams, design data for Cellular cofferdams, stability analysis of cellular cofferdams on soil and rock, inter-lock stresses.

**UNIT-III**

**Cantilever Sheet Piles:**

Purpose of sheet piles, cantilever sheet piles, depth of embedment in granular soils-rigorous method, simplified procedure, cantilever sheet pile, penetrating clay and limiting height of wall.

**Anchored Bulkheads:**

Methods of design, free earth support method in cohesionless and cohesive soils, fixed earth support method in cohesionless soils-Blum's equivalent beam method.

**UNIT-IV**

**Soil Stabilization:**

Soil improvement, shallow compaction, mechanical treatment, use of admixtures, lime stabilization, cement stabilization, lime fly ash stabilization, dynamic compaction and consolidation, Bituminous stabilization, chemical stabilization, pre-compression, lime pile and column, stone column, grouting, reinforced earth.

**Basics of Machine Foundations:**

Terminology, characteristics elements of a vibratory systems, analysis of vibratory motions of a single degree freedom system-undamped free vibrations, undamped forced

vibrations, criteria for satisfactory action of a machine foundation, degrees of a freedom of a block foundation, Barken's soil spring constant, Barken's method of a determining natural frequency of a block foundation subjected to vertical oscillations.

**Note for Paper-setter:** EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

**Books Recommended:**

- 1 Analysis and Design of Foundation and Retaining Structures by S. Prakash, Gopal Ranjan & S.Saran, Sarita Prakashan.
- 2 Analysis and Design of Sub Structures by Swami Saran, IBH Oxford
- 3 Basic and Applied Soil Mechanics by Gopal Ranjan and ASR Rao, Newage Int.Pub.
- 4 Soil Dynamic by Shamsher Prakash, McGraw Hill
- 5 Foundation Design by Teng, Prentice Hall
- 6 Soil Mechanics & Foundation Engineering by Bharat Singh, Shamsher Prakash, Nem Chand & Bros, Roorkee.
- 7 Soil Mechanics and Foundation Engineering by Alam Singh

**B. Tech. VI Semester (Civil)**  
**CE-310E TRANSPORTATION ENGINEERING -I**

L	T	P/D	Total
3	1	-	4

Max.Marks:150  
Theory:100 marks  
Sessional: 50 marks  
Duration: 3 hrs.

**UNIT-I**

**Introduction:**

Transportation and its importance. Different modes of transportation. Brief review of history of road development in India and abroad: Roman, Tresagne, Telford and Macadam constructions. Road patterns. Classification of roads, Objectives of highway planning, Planning surveys. Saturation system of planning.

**Highway Plans, Highway Alignment and Surveys:**

Main features of 20 years road development plans in India. Requirements of an ideal highway alignment. Factors affecting alignment. Surveys for highway alignment.

**UNIT-II**

**Cross Section Elements and Sight Distance Considerations:**

Cross section elements: friction, carriageway, formation width, land width, camber, IRC recommended values. Types of terrain Design speed. Sight distance, stopping sight distance, overtaking sight distance, overtaking zones, intermediate sight distance, sight distance at intersections, head light sight distance, set back distance. Critical locations for sight distance.

**Design Of Horizontal and Vertical Alignment:**

Effects of centrifugal force. Design of superelevation. Providing superelevation in the field. Radius of circular curves. Extra-widening. Type and length of transition curves. Gradient, types, values. Summit curves and valley curves, their design criterion. Grade compensation on curves.

**UNIT-III**

**Traffic Characteristics And Traffic Surveys:**

Road user and vehicular characteristics. Traffic studies such as volume, speed and O & D study. Parking and accident studies. Fundamental diagram of traffic flow. Level of service. PCU. Capacity for non-urban roads. Causes and preventive measures for road accidents.

**Traffic Control Devices:**

Traffic control devices: signs, signals, markings and islands. Types of signs. Types of signals. Design of an isolated fixed time signal by IRC method. Intersections at grade and grade separated intersections. Design of a rotary. Types of grade separated intersections.

**UNIT-IV**

**Highway Materials:Soil And Aggregates:**

Subgrade soil evaluation: CBR test, plate bearing test. Desirable properties of aggregates. Various tests, testing procedures and IRC/IS specification for suitability of aggregates. Proportioning of aggregates for road construction by trial and error and Routhfuch method.

**Bituminous Materials and Bituminous Mixes:**



Types of bituminous materials: bitumen, tar, cutback and emulsions. Various tests, testing procedures and IRS/IS specifications for suitability of bituminous materials in road construction. Bituminous mix, desirable properties. Marshall' method of mix design. Basic concept of use of polymers and rubber modified bitumen in bituminous mixes.

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**Books:**

1. Highway Engg. by S.K.Khanna & C.E.G.Justo, Nem Chand & Bros,Roorkee.
2. Principles of Transportation and Highway Engg. by G.V.Rao,Tata McGraw Hill Pub., N.Delhi.
3. Traffic Engg. And Transport Planning by L.R.Kadiyali,Khanna Pub.Delhi.
4. Traffic Engg. by Matson, T.M.,Smith,W.S. and Hurd,P.W.McGraw Hill Book Co., New York.

**B. Tech. (Civil) VI Semester**  
**CE 312E WATER SUPPLY AND TREATMENT**

**L T P/D T**  
3 1 - 4

Max. Marks: 150  
Theory: 100 marks  
Sessional: 50 marks  
Duration: 3 Hours

**UNIT-I**

**Water Quantity:**

Importance and necessity of water supply scheme. Water demands and its variations. Estimation of total quantity of water requirement. Population forecasting. Quality and quantity of surface and ground water sources. Selection of a source of water supply. Types of intakes.

**UNIT-II**

**Water Quality:**

Impurities in water and their sanitary significance. Physical, chemical and bacteriological analysis of water. Water quality standards.

**UNIT-III**

**Water Treatment:**

Objectives, treatment processes and their sequence in conventional treatment plant, sedimentation – plain and aided with coagulation. Types, features and design aspects. Mixing basins and Flocculation units. Filtration – mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects). Disinfection principles and aeration.

**UNIT-IV**

**Water Distribution:**

Distribution system – Gravity system, Pumping System, Dual system, Layout of Distribution System – Dead End System, Grid Iron System, Ring System, Radial System, their merits and demerits. Distribution Reservoir-functions & determination of storage capacity.

**Note for Paper-setter:** EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

**Books:**

1. Water Supply and Sewerage: E.W. Steel.
2. Water Supply Engineering: S.R. Kshirsagar.
3. Water Supply Engineering: S.K. Garg.
4. Water Supply Engineering: B.C. Punmia.
5. Manual on Water Supply and Treatment: Ministry of Urban Dev., New Delhi.

**B. Tech. VI Semester (Civil)**  
**CE-314E TRANSPORTATION ENGINEERING-I (P)**

L	T	P/D	Total
-	-	2	2

Max.Marks:75  
Viva/Pract: 25 marks  
Sessional: 50 marks  
Duration: 3 hrs.

**LIST OF EXPERIMENTS**

1. Aggregate Impact Test.
2. Los-Angeles Abrasion Test on Aggregates.
3. Dorry's Abrasion Test on Aggregates.
4. Deval Attrition Test on Aggregates.
5. .Crushing Strength Test on Aggregates.
6. Penetration Test on Bitumen.
7. Ductility Test on Bitumen.
8. Viscosity Test on Bituminous Material
9. Softening Point Test on Bitumen.
10. .Flash and Fire Point Test on Bitumen.

**B. Tech. VI Semester (Civil)**  
**CE-316E ENVIRONMENTAL ENGINEERING-I (P)**

L	T	P/D	Total
-	-	2	2

Max.Marks:75  
Pract: 25 marks  
Sessional: 50 marks  
Duration: 3 hrs.

1. To determine the pH value of a given sample of water waste water.
1. To determine the turbidity in given water waste water sample.
2. To determine the acidity of given sample of water waste water.
3. To determine the alkalinity of given sample of water waste water.
4. To determine temporary and permanent hardness in a given water sample.
5. To determine the chlorine does required for a given water sample.
6. To determine total suspended, suspended, dissolved settable solids in a sewage sample.
7. To determine the chloride concentration in a given sample of waste water.
9. To determine the sulphate concentration in given water sample.

**B. Tech. VI Semester (Civil)**  
**CE-318E COMPUTER APPLICATION-I (P)**

L	T	P/D	Total
-	-	3	3

Max.Marks:100  
Pract : 50 marks  
Sessional: 50 marks  
Duration: 3 hrs.

1. Computation of a roots of a polynomial using.  
a) Bisection method, (b) Newton-Raphson method
2. Solution of linear simultaneous equation using Gauss Elimination / Gauss Jordan / Triangulation factorization method.
3. Solution of system of non-linear equation using fixed point / Newton Raphson / modified Newton-Raphson method.
4. Analysis of multispan Beam and frames using stiffness matrix method.
5. Analysis of Plane frame and space Frame using automated software.
6. Analysis of a three storeyed and ten storeyed building using automated software.
7. Introduction to Auto CAD.

Students should be encouraged to write computer programs to solve different civil engineering problems.