

Semester-VI

Course Title: Transportation Engineering-I

Course Code: CE-621

Duration of Exams: 3 hours

Max. Marks: 100

External Examination: 60

Internal Assessment: 40

Objective: The objective of this course is to provide basic knowledge to the students pertaining to roads, their construction material and bridges.

UNIT I

Elements of Traffic Engineering: Road user, vehicle and road way .Vehicle Characteristics, IRC Standards- Design Speed ,Traffic Volume, Highway Capacity. Road user facilities -Parking facilities, cycle tracks and pedestrian studies.

UNIT II

Elements of Design: Alignment, Cross sectional elements- stopping and passing distance. Horizontal and Vertical curves. Design Problem – hill roads. Introduction to traffic regulation and control, traffic signal.

UNIT III

Highway Materials and Construction: Properties of road aggregates and bituminous materials, design of bituminous concrete mix, methods of preparing sub grade functions of significance of sub grade properties, Base course and construction of various types of surface covers.

UNIT IV

Pavement Analysis and Design: Types and Component parts of Pavements. Factors affecting design and performance of pavements. Analysis and design methods of rigid and flexible pavements.

UNIT V

Bridges: Components and classification of bridges. Standard specifications for bridge design. RC Bridge code, different load and forces on bridges, Introduction to design of RCC and prestressed concrete bridges.

Course outcome: The students will be able to:

1. carry out surveys involved in planning and highway alignment
2. design the geometric elements of highways and expressways
3. Know about the different highway materials and construction methodologies.
4. characterize pavement materials and design flexible and rigid pavements as per IRC
5. Understand the bridge components and their design

Books Recommended:

1. **Victor**, DJ Essentials of Bridge Engineering, H Oxford and IBH Publishers, New Delhi

2. **Bindra, S.P** Principles and Practice of Bridge Engineering”, Dhanpat Rai and Sons, New Delhi.
3. **Bhanot, K. L** "Highway Engineering", S. Chand and Company Pvt. Ltd. New Delhi
4. **Khanna, S & Justo**, Highway Engineering, Nem Chand Brothers Roorke.
5. **Ponnuswamy S. & H. Toto**, Bridge engineering, Mc Graw Hill, New Delhi.
6. **R.J Salter & N.B Hounsel**, Highway Traffic Analysis and
7. Design, Macmillan Press ltd. 1996

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Semester-VI

Course Title: Water Resource Engineering

Course Code: CE-622

Duration of Exams: 3 hours

Max. Marks: 100

University Examination: 60

Sessional Assessment: 40

Objective: The aim of the course is to provide basic knowledge to the students about measurement and occurrence of water and water resource planning.

UNIT I

Hydrology: Scope and applications of hydrological cycle, Precipitation-Measurement by rain gauges, gauge networks, hyetographs, methods of determining mean rainfall. Evaporation, Transpiration, Interception, Depression storage Infiltration.

UNIT II

Stream Flow and Flood Estimation: Factors affecting runoff, Rainfall-runoff relationships, Unit hydrograph, peak flow, low flows, requirements for hydrological design, velocity and discharge measurements. Occurrence and distribution of floods various methods of flood estimation viz. Rational method, Unit Hydrograph method etc.

UNIT III

Ground Water: Occurrence and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, safe yield of a basin, steady flow in a well for confined and unconfined aquifers.

UNIT IV

Reservoir Design Studies: Area-volume curves, types of reservoirs and zones of storage, storage capacity of reservoirs, Mass curve technique, Reservoir flood routing, sedimentation of reservoirs.

UNIT V

Water Resources Planning and Development: Role of water in National development, Single purpose and multipurpose development, Integrated River basin development, Economy resulting from integrated multipurpose development, Basic principles of water resources development policy, International and interstate aspects of basin development.

Course Outcomes: At the end of the course, the student will be able to:

1. Analyse hydro-meteorological data
2. Estimate abstractions from precipitation
3. Compute yield from surface and subsurface basin
4. Develop rainfall-runoff models
5. Formulate and solve hydrologic flood routing models

Text Books

1. **Subramanaya K**, Engineering Hydrology, Tata McGraw Hill, New Delhi.

2. **Wilson E.M**, Engineering Hydrology, ELBS, English Language book *Sodetyl* Macmillam Education Ltd., London.

Reference Books

1. **Arora K.R**, Irrigation, Water Power and Water Resources Engineering, Standard Publishers Distributors, Delhi.
2. **Garde R.J and Ranga Raju K.G**, Mechanics of Sediment Transportation and Alluvial Stream Problems, New Age International (P) Ltd. Publishers, New Delhi.
3. **Linsely K, Kohler A and Paulhus L. H**, Hydrology for Engineers, McGraw Hill Book Company Inc. New York.
4. **Ragunath H. M**, Hydrology-Prindples, Analysis and Design, New Age International (P) Ltd Publishers, New Delhi.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Semester-VI

Course Title: Design of structures-II

Course Code: CE-623

Duration of Exams: 3 hours

Max. Marks: 100

University Examination: 60

Sessional Assessment: 40

Objective: The objective of this course is to acquaint the students about design of steel structures utilized in civil engineering like roof trusses, compression, tension and flexural members. Design of timber structures has also been emphasized.

UNIT I

Introduction to steel structure: Common steel structure, advantages and disadvantages of steel structures, type of steel, rolled steel sections, special considerations in steel design, design philosophy, limit state design, design strength, deflection and serviceability limits, stability checks.

UNIT II

Design of Connections: Riveted, bolted and welded connections, classification of bolts and types of bolted connections, **IS 800-2007** specifications for design of bolted connections, worked examples on design of bolted joint, shear capacity and tension resistance of bolts (**IS-1364**), design examples of fillet and butt weld connections, design of eccentric bolted and welded connections.

UNIT III

Design of Tension members: Design strength of tension member due to yielding of gross section, rupture strength of critical section and block shear, tension splices and lug angles; design of bolted and welded connections for ties subjected to both bending and axial tension.

UNIT IV

Design of Compression members: Shape of compression members, buckling class of cross-section, slenderness ratio, design compressive stresses and strengths, use of **IS800-2007** tables for design stresses, design of compression members, design of laced and battened columns, design of column splices; Column bases: design of slab base and gusseted base.

UNIT V

Design of Beams: Behavior of beam in flexure, section classification, plastic moment carrying capacity of a section, bending and shear strengths of laterally supported beams, design of laterally supported beams, deflection limits, web buckling and web crippling, design of built-up beams, purlins, plate girders.

Course Outcomes: After studying the course student will-

1. Understand the different type of steel structures and different design philosophies.
2. Able to design the connection between different steel sections.
3. Able to design the steel tension members.
4. Able to design the compression members.
5. Understand the behavior of beams in flexure and design them.

Text Books:

1. **Arya A. S and Ajmani J. L**, Design of Steel Structures, Nem Chand, Roorke.
2. **Duggal S. K**, Design of Steel Structures, Standard Publishers and distributors Delhi.

Books Recommended:

1. **Chandra Ram**, Design of steel structures, Standard Publishers and Distributors Delhi.
2. **Kazmi and Jindal**, Design of Steel Structures, Prentice Hall of India New Delhi.
3. **Negi L.S**, Design of Steel Structures, Tata McGraw Hill, New Delhi.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Semester-VI

Course Title: Geotechnical Engineering-II

Course Code: CE-624

Duration of Exams: 3 hours

Max. Marks: 10

University Examination: 60

Sessional Assessment: 40

Objective: The course aims at acquainting students with the behavior of soil and acquire knowledge about foundations, earth pressure and stability of slopes.

UNIT I

Shear Strength: Shear strength concept. Mohr's Coulomb equation. Laboratory determination, Different tests and drainage conditions, Direct shear test, Triaxial test under different drainage conditions i.e. undrained, drained and consolidated, Direct compression test, Vane shear test.

UNIT II

Earth Pressure: Lateral earth pressure. Rankine's theory, Active and Passive States. Coulomb's Wedge theory, Lateral earth pressure under various conditions like surcharge, sloping backfill and high water table behind the wall. Earth pressure diagrams, total thrust, tension, Friction circle method.

UNIT III

Bearing Capacity: Basic definitions and methods of determination of bearing capacity, Rankine's analysis, Prandtl's analysis, Terzaghi's bearing capacity theory, Shear failure, Effect of water table, Effects of rigidity of footings, Plate load test. Bearing capacity from SPT.

UNIT-IV

Foundations: Importance and types of foundations. Design principles for footing and rafts. Foundations on clays and sands. Foundations - types and applications, Pile foundation necessity and types, Negative skin friction, Determination of load carrying capacity by dynamic and static formulae, Pile load test, Groups action of piles, Efficiency of pile groups.

UNIT-V

Soil Stabilization & Stability of Slopes: Methods of soil stabilization. Brief introduction to each method of stabilization, Stabilization by Geotextiles, Reinforced earth Infinite slopes, Types of slope failures, Stability number, Swedish and Friction circle methods. Improving stability of slopes, Dynamic behavior of soils i.e. liquefaction of soils.

Course outcome: The students will be able to :

1. Understand and various tests done to find the shear strength of soils.
2. Calculate the active and passive pressure of soils.
3. Calculate the bearing capacity of soils.
4. Know the different type of foundations and their design principles.
5. Understand the methods of soil stabilization and find the stability of slopes.

Text Books

1. Arora K. R, **Soil Mechanics and Foundation Engineering**, Standard Publications, Delhi.
2. Dutta K. Manoj & Gulati Shashi, **Geotechnical Engineering**, Tata Mc Graw Hill, Delhi.

Reference Books

1. Conduto P. Donald, **Geotechnical Engineering**, Prentice Hall India Ltd.
2. Punimia B. C, **Soil Mechanics and Foundation Engineering**, Laxmi Publications Ltd.
3. Varghese P. C, **Foundation Engineering**, PHI Learning Pvt. Ltd.

Note for Paper Setter: - The Question paper shall comprise 10 questions, two questions from each unit. The students are required to attempt five questions, one from each unit.

Semester-VI

Course Title: Geology & Earthquake Engg.

Course Code: CE-625

Duration of Exams: 3 hours

Max. Marks: 100

University Examination: 60

Sessional Assessment: 40

Objective: The aim of this course is to make the students aware about the earth, its constitution, rocks and soil, impact of wind and precipitation. Earthquakes has also been incorporated to be studied.

Unit –I

Introduction, Definition and Scope of Engineering Geology with its importance in Civil Engineering. Physical properties of Rock forming Minerals, introduction of Rocks, mode of formation and classification of sedimentary and igneous rocks, agents of metamorphism and zone of metamorphism, physical and engineering properties of some important rocks.

Unit- II

Weathering; mechanical and chemical weathering. Erosion; Erosion by running water and wind fold; study of various types of folds, faults; study of various types of faults, joint; study of various types of joints, civil engineering significance of folds, faults and joints.

Unit –III

Application of rocks as an engineering materials, building stone, groundwater, concepts of zone of aeration and saturation, land-slides, land subsidence, earthquake, classification of earthquake zones in India and its civil engineering significance.

Unit IV

Physical properties of Rock Forming Minerals, Engineering Properties of Igneous Sedimentary and Metamorphic Rocks. Impact of Rock properties on properties of concrete. Mineral Composition of Rocks affecting the properties of Concrete at its Fresh Stage.

Unit- V

Geological investigation techniques. Geological investigations of Dam site and reservoir, bridges, highways, buildings and tunnels. Application of software for the solution of engineering geologic problems. Application of software for interpretation of sub-surface geological strata.

Course outcome: The students will be able to

1. Understand the role of geology in construction process and different types of rocks.
2. Understand about types of weatherin, fault, fold, joints in rock.
3. Understand about ground water recharge and also about the seismic zones in India.
4. Know about the engineering properties of different rocks and its mineralogy.
5. Use the geologic literature to establish the geotechnical framework needed to properly design and construct heavy civil work projects.

Text Books

1. Parbin Singh, Engineering Geology.
2. Arthur Holmes, Physical Geology.

Books Recommended:

1. Shilling P.B, Structural Geology.

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit.

Semester-VI

Course Title: Environmental Engineering II

Course Code: CE-626

Duration of Exams: 3 hours

Max. Marks: 100

University Examination: 60

Sessional Assessment: 40

Objective: Water is the divine fluid, important for life. This course has been kept in the syllabi in order to study its treatment, quantity required and the way of supplying water to the user.

UNIT-I

Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater. Water borne diseases and their control. Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets.

UNIT-II

Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, different classes of settling; design of primary and secondary settling tanks; removal efficiency for discrete and flocculent settling. Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators.

UNIT-III

Filtration: Theory of filtration; hydraulics of filtration; slow sand, rapid sand and pressure filters, backwashing; brief introduction to other filters; design of filters. Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals. Adsorption.

UNIT-IV

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design, sedimentation and chemical treatment to be given. Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches.

UNIT-V

Anaerobic digestion of sludge: Design of low and high rate anaerobic digesters and septic tank. Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor. Disposal of wastewater on land and in water bodies.

Course Outcomes: At the end of the course, students will be able to-

1. Analyze physical chemical and biological characteristics of waste water.
2. Understand the sedimentation process and design of sedimentation tanks.
3. Design Various component of slow sand and rapid sand filters.
4. Understand and design the different unit processes (Trickling filter, grit chamber etc.)
5. Design of low and high rate anaerobic digesters and septic tank.

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol.– I)

Reference books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Steel and McGhee: Water Supply and Sewerage
3. Fair and Geyer: Water Supply and Wastewater Disposal

Note for Paper Setter: The question paper shall comprise of 10 questions. Two questions will be set from each Unit. The student has to attempt five questions at least one from each Unit

Semester-VI

Course Title: Transportation Engg. Lab.

Course Code: CE-631

Duration of Exams: 2 hours

Max. Marks: 50

University Examination: 25

Internal Assessment: 25

List of Practical's:

(A) Tests on Aggregate:

- (1) Aggregate grading and determination of specific gravity.
- (2) Determination of crushing value.
- (3) To carry out Los Angels abrasion test.
- (4) To carry out Impact test.
- (5) Shape tests: Flakiness and elongation index determination.

(B) Tests on Bitumen:

- (1) Determination of Penetration value.
- (2) To find out ductility of a bitumen sample.
- (3) Determination of Flash & Fire-point.

(C) Tests on Subgrade:

- (1) Determination of sub-grade modulus.
- (2) Determination of California bearing ratio.

Course Outcomes: The students will be able to find out

1. Different properties of aggregate, bitumen and subgrade soil.
2. Penetration value of bitumen
3. Flash and fire point of bitumen
4. California bearing ratio of sub grade

Semester-VI

Course Title: Geotechnical Engineering–II Lab

Course Code: CE-632

Duration of Exams: 2 hours

Max. Marks: 50

University Examination: 25

Internal Assessment: 25

List of Practicals:

- 1) Determination of shear strength parameters of soil by:
 - (a) Direct Shear Test
 - (b) Triaxial compression Test
 - (c) Unconfined Compression Test
 - (d) Vane Shear Test
- 2) Conduct of Standard penetration test.
- 3) Conduct of Dynamic cone penetration test.
- 4) Determination of bearing capacity by Plate load test.
- 5) Rapid moisture content determination by calcium carbide method.
- 6) Exposure to Static cone Penetrometer.
- 7) Subsoil exploration by electric resistivity method.

Course Outcomes: The students will be able to find out :

the techniques to determine index properties and engineering properties.

1. the shear strength, compressibility and permeability by conducting appropriate tests.
2. Rapid moisture content of soil
3. Subsoil exploration

Semester-VI

Course Title: Survey Camp
Course Code: CE-633
Duration of Exams: 3 hours

Max. Marks: 50
University Examination: 25
Internal Assessment: 25

A. TWO WEEK DURATION

1. Triangulation:
 - i. Ordinary Methods
 - ii. On the basis of Global positioning system (GPS)

Shifting of Horizontal and Vertical Controls:

2. Setting out of works
4. Setting out of Curves
5. Contouring:
 - i. Contouring of a Dam Reservoir/Railway line
 - ii. Preparing a contour plan by various methods
 - iii. Setting out of Contour lines of an appropriate site.

Course Outcomes: The students will be able to find

1. Transition curves and prepare a contour map.
2. Horizontal and vertical angles.
3. Bearing of line
4. Setting out of traverse.