

CODE: CE411

TRANSPORTATION ENGINEERING – I

Lectures : 4 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 3

UNIT – 1

Highway Development And Planning

Brief Introduction; necessity of highway planning surveys preparation of master plan highway planning in India.

Highway alignment

Factors controlling alignment; Engineering surveys, Drawing & report.

UNIT – II

Highway Geometric Design

Highway cross section elements; Sight distance; Design of horizontal alignment; Design of vertical alignment.

Highway materials

Sub grade soils- CBR tests; Stone aggregates; Bitumen materials; Paving mixes.

UNIT – III

Design Of Highway Pavements

Design factors; Design of flexible pavements – IRC method, IRC recommendations; Design of Rigid pavements - Westergard's stress equation for wheel loads and temperatures stress; IRC recommendations.

Highway construction and maintenance:

Construction of water bound macadam roads; Bituminous pavements and cement concrete pavements; Construction of joints in cement concrete pavements; Maintenance of highways- Water bound macadam roads, Bituminous pavements, Cement concrete pavements.

UNIT - IV

Highway Drainage

Importance of highway drainage; Requirements; Surface drainage; Sub-surface drainage; Road construction in water logged areas and black cotton soils.

Traffic engineering:

Introduction; Traffic characteristics- Road user, vehicular & travel pattern; Traffic operation-signal design; Types of intersections; Design of rotary intersection;

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

Highway Engineering by S. K. Khanna & C. E. G. Justo; Nemchand & Brothers, Roorke.

REFERENCE BOOKS

1. Principles of Transportation Engineering by Partha Chakroborty & Animesh Das, Prentice Hall of India, New Delhi.
2. Principles of Transportation Engineering and highway engineering by G. Venkatappa Rao, Tata Mc Graw-hill publishing company limited New Delhi.

CODE: CE412

STRUCTURAL ANALYSIS-II

Lectures : 4/1 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 4

UNIT – I

Curved Beams

Analysis for internal forces – circular beams supported on equally spaced columns – semicircular beams on three equally spaced supports.

Influence Lines For Indeterminate Structures

Muller - Breslau Principle with applications to continuous beams and framed structures to obtain the general shape of the influence lines; Influence lines for reactions, shear force at a point and bending moment at a section of a) Beam with fixed ends b) 2 - span continuous beam.

UNIT – II

Plastic Behaviour Of Structures

Idealized stress - strain curve for mild steel; Ultimate load carrying capacity of members carrying axial forces; Moment - Curvature relationship for flexural members; Evaluation of fully plastic moment; Shape factor; Collapse load factor; Upper and lower bound theorems; Collapse load analysis of indeterminate beams and single bay, single storied portal frames.

UNIT – III

Flexibility And Stiffness Matrices

Flexibility and stiffness; Flexibility matrix; Stiffness matrix; Relationship between flexibility matrix and stiffness matrix.

Flexibility Method (Matrix Approach)

Analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method with matrix approach.

UNIT – IV

Stiffness Method (Matrix Approach)

Analysis of continuous beams, rigid jointed plane frames (Single bay, single storey with vertical legs only) and pin jointed plane frames by stiffness method with matrix approach.

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Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1. For units 1 & 2: Structural Analysis, Vol. II by V. N. Vazirani & M. M. Ratwani; Khanna Publishers, Delhi.
2. For units 3 & 4 : Structural Analysis – A matrix approach by G. S. Pandit & S. P. Gupta; Tata Mc. Graw – Hill Publishing Co. Ltd., New Delhi.
3. For Unit 2: Limit Analysis of Structures by Manicka & Selvam.

REFERENCE BOOKS

1. Advanced structural analysis by Devdas Menon , Narosa Publishing House
2. Structural Analysis by Negi & Jangid

CODE: CE413

ESTIMATION & QUANTITY SURVEYING

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 3

UNIT – I

Procedure Of Estimating

Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

Methods of building estimates

Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

Estimate Of Buildings

Estimate of residential building; Estimate of a building from line plan.

UNIT – II

Estimate of RCC works

Standard hooks and cranks; Estimate of RCC slab; RCC beam; RCC T-beam slab and RCC column with foundation.

Road Estimating

Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads.

Canal estimate

Earthwork in canals–different cases; Estimate of earthwork in irrigation channels.

UNIT – III

Specifications

Purpose and method of writing specifications; General specifications. Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring; R.R.Stone Masonary.

Analysis Of Rates

Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work:

- i) Concrete
- ii) RCC Works
- iii) Brick work in foundation and super structure
- iv) Plastering
- v) CC flooring
- vi) White washing.

UNIT – IV

PWD Accounts and Procedure Of Works

Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

Valuation

Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for Estimating cost depreciation; Valuation of building.

Miscellaneous Topics

Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1. Estimating & Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers & Distributors, New Delhi.
2. Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand.

CODE: CE414

PRE-STRESSED CONCRETE

Lectures : 4/1 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 4

UNIT – I

INTRODUCTION

Basic concepts of prestressing; Historical development; Need for High strength steel and High strength concrete; Advantages of prestressed concrete.

Materials For Prestressed Concrete

High strength concrete; High tensile steel

Prestressing Systems

Tensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; Detailed study of Freyssinet system , Lee-McCall System and Gifford – Udall system

Analysis Of Prestress And Bending Stresses

Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.

UNIT – II

Losses Of Prestress

Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

Deflections Of Prestressed Concrete Members

Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members

UNIT-III

Flexural strength of prestressed concrete sections:

Types of flexural failure; Flexural strength of prestressed concrete sections as per IS1343: 1980

Design of sections for flexure as per IS1343 : 1980

Introduction ; Design loads and strengths; Strength and serviceability limit states; Minimum section modulus; Prestressing force ; Limiting zone for the prestressing force; Design of rectangular and I sections sections for the limit state of collapse in flexure.

UNIT – IV

Shear Resistance

Shear and Principal Stresses; Ultimate shear resistance of prestressed concrete members and design of shear reinforcement as per IS1343 : 1980

Transfer Of Prestress In Pre-Tensioned Members & Flexural Bond Stresses

Transmission of prestressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre – tensioned and post – tensioned grouted beams.

Anchorage Zone Stresses In Post-Tensioned Members

Stress distribution in end block; Anchorage zone stresses and Anchorage zone reinforcement as per IS1343 : 1980.

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

Prestressed Concrete by N. Krishna Raju; Tata Mc Graw - Hill Publishing Company Limited, New Delhi.

REFERENCE BOOKS

1. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns; John Wiley & Sons
2. Prestressed Concrete by Pandit & Gupta , CBS Publishers
3. Pre-stressed concrete by P. Dayaratnam , Oxford & IBH
4. Prestressed Concrete by N.Raja Gopalan , Narosa Publishing House

CODE: CE415

DESIGN OF STEEL STRUCTURES - II

Lectures : 4/1 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 4

UNIT – I

Gantry girder

Introduction ; Loads on gantry girder ; Web buckling and Crippling ; Deflection Check ; Design of gantry girder

Welded Plate girder

Introduction ; Behaviour of transversely stiffened plate girder panels in shear ; Design methods for transversely stiffened web panels ; Design of end panels ; Other design specifications ; Design of stiffeners ; Design of welded plate girder

UNIT - II

Welded connections

Introduction ; Bracket connections ; Simple beam end connections ; Moment resistant beam end connection

Bolted connections

Introduction; Bracket connections; Simple beam end connections; Moment resistant beam end connection; Splicing of beams /girders

UNIT - III

Light-gauge steel sections

Introduction ; Types of sections ; Design of light gauge sections ; Design specifications

Composite Construction

Introduction ; Composite beam ; Method of construction ; Limit states of collapse; Limit states of serviceability – Deflection

UNIT - IV

Roof Trusses

Components of a trussed roof; Types of trusses; Dead, Live and wind loads on trussed roof; Design of purlins ; Design of members of a roof truss ; Design of connections ; Design of end bearings

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

Design of steel structures by K.S.Sai Ram, Pearson Education, 2010.

REFERENCE BOOKS

1. Steel Structures - Design and Practice by N. Subramanian, Oxford University Press
2. Limit state design of steel structures by M.R.Shiyekar , PHI Learning

CODE: CE416 MOOC ELECTIVE - II

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 3

CODE: CE451 INTERNSHIP

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 2

CODE: CE452

COMPUTER AIDED DETAILING AND STRUCTURES

Lectures : 4 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 2

Students are required to detail different structural elements using software packages like Auto CAD/Micro station/Rivet etc.

CYCLE-1

(At least SEVEN of the following)

1. Detailing of continuous beam with both ends fixed
2. Detailing of continuous beam with one end overhang.
3. Detailing of pile cap
4. Detailing of isolated footing.
5. Detailing of two way and one way slab.
6. Detailing of Flat slab interior panel.
7. Detailing of cantilever Retaining wall.
8. Typical detailing of R.C.C footing with steel column.

CYCLE-2

(At least THREE of the following)

1. Detailing of beam to column framed connection (using bolts).
2. Detailing of beam to column moment resistant connection (using bolts).
3. Detailing of welded plate girder.
4. Detailing of welded column base

CYCLE-3

(At least ONE of the following)

1. Typical Reinforcement detailing of different elements in Two-storied R.C.C. Framed Building
2. Typical detailing of Industrial steel building.

CODE: CE453

TRANSPORTATION ENGINEERING LABORATORY

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 2

Note: A minimum of twelve (12No) shall be done and recorded

Tests On Aggregates

1. Aggregate Crushing value test.
2. Aggregate impact value test.
3. Los Angeles' abrasion test.
4. Deval's attrition value test.
5. Shape test a) Flakiness index test b) Elongation index test c) Angularity number test. .
6. Specific gravity Test.

Tests On Bituminous Materials

1. Penetration test.
2. Softening point test.
3. Flash and fire point test.
4. Ductility test.
5. Viscosity test.
6. Bitumen Extractions Test.
7. Specific gravity of Bitumen.

Test On Bituminous Mixes

1. Marshall stability test.

Test On Soil Subgrade

1. California bearing ratio test.

CODE: CE454

PROJECT

Lectures : 4 Periods/Week
University Exam : 0 Hours

Sessional marks : 0
University Exam. Marks : 0

Credits: 0

CODE: CE421

TRANSPORTATION ENGINEERING – II

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 3

UNIT – I

RAILWAY ENGINEERING

Introduction

Role of railways in transportation, Comparison of railway and highway transportation: Development of railway systems with particular reference to India, Classification of railways.

Railway Track

Permanent way: Gauges in Railway track, railway track cross- sections; Coning of wheels.

Rails & Rail Joints

Functions of rails; Requirements of rails; types of rails sections; standard rail sections; length of rails; Rail failures; Wear on Rails Welding of rails,

Sleepers

Function of sleepers; Requirements of sleepers, Classification of sleepers – timber sleepers. Metal sleepers & concrete sleepers, comparison of different types of sleepers.

Fish Plates

Fish plates, section of fish plates, and failure of fish plates.

Ballast

Functions and requirements of ballast, Types of ballast, Renewal of ballast.

UNIT-II

Geometric Design Of Track

Necessity; Gradients & Gradient Compensation; Elements of horizontal alignment; Super-elevation; Cant deficiency and cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve.

Points And Crossings

Functions of components of turnout; Crossings.

Stations And Yards

Site selection for railway station; Requirements of railway station; Classifications; Station yards; Level crossing.

Signalling

Objects of signaling; Classification of signals; Controlling- absolute block system. Standards of inter locking.

UNIT – III

AIRPORT PLANNING AND DESIGN

Introduction

Development of air transportation system with particular reference to India; Aeroplane components; Air-craft characteristics.

Airport planning and layout

Selection of site; Apron; Hanger; Typical airport layouts; Airport marking; Airport lighting; Drainage systems.

Airport Obstruction

Zoning laws; Classification of obstructions; Imaginary surfaces; Approach zone; Turning zone.

Runway Design

Runway orientation; Basic runway length; Corrections for elevation; Temperature and gradient; Runway geometric design.

Specifications For Structural Design Of Airport Pavement

Design factors methods for flexible and rigid pavements; LCN system of pavement design.

UNIT – IV**DOCKS AND HARBOUR ENGINEERING****Introduction**

Types of water transportation; Economics and advantages of water transportation.

Planning And Design Of Port Facilities

General layout and design considerations; Pier and wharf structures; Fender systems; Transit sheds and Apron; Container ports; Docks; Dredging; Light Houses.

NOTE

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TEXT BOOKS

UNIT I & II: Railway Engineering by S.C.Saxena and S.Arora Dhanpat Rai & sons.

UNITIII & IV: Airport Planning and Design by S. K. Khanna & M. G. Arora; Nemchand & Bros, Roorkee.

REFERENCE BOOKS

1. Railway Engineering by M.M.Agarwal; Prabha & Co, New Delhi.
2. Airport Engineering by G.V.Rao; Tata Mc Graw Hill, New Delhi.

CODE: CE422

CONSTRUCTION ENGINEERING AND MANAGEMENT

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 3

UNIT – I

Introduction

Significance of Construction Management, Objectives and functions of construction management.

Planning And Scheduling

Planning techniques - Bar charts; Limitations of Bar Charts; Mile stone charts.

UNIT – II

Project Management Through Networks

Objectives of network techniques; Events; Activities; Time estimates; Float and Slack; Critical path, near critical path; CPM and PERT and their use in Construction Planning; Difference between CPM and PERT; Probability of completion time for a project.

Cost Control

Direct cost; Indirect cost; Total project cost; Optimization of cost through networks.

Resource Management (Manpower)

Introduction; Resource smoothing; Resource leveling.

UNIT – III

Construction Equipment

Different types of construction equipment and their use in Construction Industry; Factors affecting selection of Equipments; Owning and operating the equipment; Equipment maintenance.

UNIT – IV

Quality Control

Importance of quality; Elements of quality; Quality assurance techniques; Documentation; Total quality management.

Safety Management

Importance of safety; Approaches to improve safety in construction industry; Safety benefits to employers, employees and customers.

Project Economics

Time value of money; discounted cash flow analysis; Payback period; Return on investment; Benefit cost analysis, replacement analysis, Inflation.

TEXT BOOKS

1. Fundamentals of PERT/CPM and Project Management by S. K. Bhattacharjee; Khanna Publishers, Nai Sarak; Delhi.
2. PERT & CPM Principles and applications by L. S. Srinath; Affiliated East West Press.

REFERENCE BOOKS

1. Construction Engineering and Management by Dr. S. Seetharaman; Umesh Publications, Nai Sarak, Delhi.
2. Construction Planning, Equipment & Methods by Peurifoy R. L.; Mc Graw – Hill International Book Company.

CODE: CE423/1

ELECTIVE – III

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Lectures : 4/1 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 4

UNIT- I

Elements of structural dynamics

Sources of vibrations; Types of vibrations; Degrees of freedom; Spring action and damping; Free vibration of undamped system having single degree of freedom; Free vibration of viscous damped system having single degree of freedom; Forced vibration of a viscous damped single degree freedom system subjected to harmonic excitation; Earthquake excitation (Base excitation) of a single degree freedom system.

UNIT-II

Elements of Earthquake Ground motion

Earthquake size – Intensity and magnitude; Seismic Zoning-Introduction; Strong Motion Earthquakes - Introduction; Response spectrum (elastic); Local site effect (Effect of type of soil).

Seismo-resistant building architecture

Introduction; Lateral load resisting systems- moment resisting frame, Building with shear wall or bearing wall system, building with dual system; Building configuration – Problems and solutions; Building characteristics – Mode shape and fundamental period, building frequency and ground period, damping, ductility, seismic weight, hyperstaticity/redundancy, non-structural elements, foundation soil/ liquefaction. Foundations; Quality of construction and materials – quality of concrete, construction joints, general detailing requirements

UNIT III

Analysis of single storey and single bay RCC Plane Frame (Columns vertical) :

(As per IS:1893(part-I)-2002)

Calculation of lateral force due to earthquake using equivalent static method ; Analysis for different load combinations; Design forces and moments in beam and columns.

UNIT-IV

Design of single storey and single bay RCC plane frames (Columns vertical)(As per IS:456-2000 and IS13920-1993)

Design of column; Design of beam; Design of footing ; Detailing of entire frame

Elements of Geotechnical Earthquake Engineering

Liquefaction – Definition and types, Effect of liquefaction on built environment, Evaluation of liquefaction susceptibility, Liquefaction hazard mitigation ; Seismic slope stability – Introduction, Pseudo-static analysis, Sliding block methods

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1. Earthquake Resistant Design of Structures by Pankaj Agarwal, and Manish Shrikhande , Prentice Hall of India Private Ltd., New Delhi .
2. Geotechnical Engineering by S.K.Gulati & Manoj Datta, Tata McGraw-Hill Publication Company Ltd.

REFERENCE BOOKS

1. Elements of Earthquake Engineering by Jai Krishna, A.R.Chandrasekaran and Brijesh Chandra, Second Edition(1994), South Asian Publishers, New Delhi.
2. Dynamics of Structures by A.K.Chopra,, Prentice Hall India

CODE: CE423/2

ELECTIVE – III

FINITE ELEMENT METHOD

Lectures : 4/1 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 4

Unit -I

The standard discrete system and origins of the finite element method

Introduction ; The structural element and the structural system; Assembly and analysis of a structure ; The boundary conditions; Electrical and fluid networks ; The general pattern; The standard discrete system

A direct physical approach to problems in elasticity : plane stress

Introduction ; Direct formulation of finite element characteristics; Generalisation to the whole region ; Displacement approach as a minimization of total potential energy; Convergence criteria; Finite element solution process; Numerical examples

Unit -II

Generalisation of the finite element concepts

Weighted residual methods – Integral or weak statements equivalent to the differential equations ; Approximation to integral formulations ; the Galerkin method ; Partial discretisation ; Convergence

Variational principles – What are variational principles ? ; Natural variational principles and their relation to governing differential equations ; Establishment of natural variational principles for linear , self-adjoint , differential equations ; Maximum, minimum or saddle point

Unit -III

Standard and hierarchical element shape functions

Standard and hierarchical concepts; Rectangular elements – some preliminary considerations ; Completeness of polynomials ; Lagrange family ; Serendipity family

Triangular element family; Line elements

Mapped elements and numerical integration

Use of shape functions in the establishment of coordinate transformations ; Geometrical conformity of elements; Variation of the unknown function within distorted, Curvilinear elements – continuity requirements; Evaluation of element matrices – transformation in local natural and area/volume coordinates; Order of convergence for mapped elements ; Numerical integration – One-dimensional and two-dimensional ; Required order of numerical integration

Unit -IV

Problems in linear elasticity

Governing equations; Finite element approximation; Displacements , strains and stresses; Numerical examples

Field problems – Heat conduction, electric and magnetic potential and fluid flow

General quasi-harmonic equation ; Finite element solution process ; Partial discretisation - transient problems ; Numerical examples – an assessment of accuracy

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

The finite element method – Its basis & Fundamentals by Zienkiewicz , Taylor and Zhu , Elsevier India Private Ltd.

REFERENCE BOOKS

1. The finite element method in engineering by S. S.Rao, Butterworth-Heinemann, New Delhi, 1999.
2. Introduction to the finite element method by C.S. Desai and J.F.Abel, CBS Publishers and distributors, 1987.

CODE: CE423/3

ELECTIVE – III

BRIDGE ENGINEERING

Lectures : 4/1 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 4

UNIT – 1

Introduction & Investigation For Bridges

Components of a Bridge; Classification; Standard Specifications; Need for Investigation; Selection of Bridge Site; Preliminary Data to be Collected; Preliminary Drawings; Determination of Design Discharge; Economical Span; Location of Piers and Abutments; Vertical clearance above HFL; Scour depth; Traffic Projection; Choice of Bridge type; Importance of Proper Investigation.

UNIT – II

Concrete Bridges

Various types of bridges; I. R. C. Specifications for road bridges.

Culverts

Design of R. C. slab culvert.

UNIT – III

T – Beam Bridge

Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; Design of simply supported T – beam bridge.

UNIT – IV

Sub Structure For Bridges

Pier and abutment caps; Materials for piers and abutments; Design of pier; Design of abutment; Backfill behind abutment; Approach slab.

UNIT – V

Bearings For Bridges

Importance of bearings; Bearings for slab bridges; Bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

Foundations For Bridges

Scour at abutments and piers; Grip length; Types of foundations; Design of well foundation.

NOTE

Two questions of 14 marks each will be given from each unit, out of which one is to be answered.

TEXT BOOK

Essentials of Bridge Engineering by Dr. Johnson Victor; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

REFERENCE BOOK

Design of bridge structures by Jagadeesh and Jayaram, PHI Learning

CODE: CE423/4

ELECTIVE – III

ADVANCED REINFORCED CONCRETE DESIGN

Lectures : 4/1 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 4

UNIT – I

Water tanks resting on ground (Working stress method)

Introduction, Circular and Rectangular tanks

UNIT – II

Elevated circular water tank (Working stress method)

Introduction; Design of elevated circular water tank

UNIT – III

Design of Intze tank (Working stress method)

Calculation of dimensions ; Design of top dome; Design of top ring beam ; Design of cylindrical wall ; Design of bottom ring beam

UNIT -IV

Raft Foundations (Limit state method)

Soil design ; Design of slab ; Design of beams

Pile Foundations (Limit state method)

Introduction ; Loads on pile groups ; Soil design of a pile; Structural design of a pile

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

Reinforced concrete , Vol.1 & 2 by H. J. Shah, Charotar publishing house Pvt. Ltd.

REFERENCE BOOK

RCC Designs by BC Punmia et.al. Laxmi Publications (P) Ltd

CODE: CE424 /1

ELECTIVE – IV

ADVANCED ENVIRONMENTAL ENGINEERING

Lectures : 4 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 3

UNIT – I

Stream Sanitation

Introduction; Self-purification in streams; factors affecting self-purification; Dissolved Oxygen Balance in streams; Streeter-Phelps's Dissolved Oxygen Model; Zones of Self-purification; Impact of pollutants on stream waters and usage of stream water with special reference to flora and fauna.

New Concepts in Biological Waste Treatment

Introduction; Nitrogen removal by biological nitrification and de-nitrification; Phosphate removal from the activated sludge process; Rotating Disc Biological Contactor; Anaerobic filters; U-Tube aeration systems.

UNIT – II

Industrial Wastewater Treatment

Introduction to Industrial Wastewater treatment.

Sugar Plant: Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

Dairy Industry: Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

Pulp and Paper Industry: Quantity of liquid waste; Characteristics of liquid waste; Methods of its treatment and disposal.

UNIT – III

Sources and Classification of Air Pollution

Stationary and mobile sources; Primary and secondary pollutants; Natural contaminants; Particulate matter; Aerosols; Gaseous pollutants.

Effects Of Air Pollution

Global Effects: Global warming; Ozone depletion; Acid rains; Effects of air pollutants on human health; Effects on plants; Economical effects.

Meteorology And Air Pollution

Atmospheric stability and temperature inversions; Maximum Mixing Depth; Wind direction and speed; Plume behaviour; Gaussian Dispersion Model; Plume rise; Wind rose.

UNIT – IV

Control of Air Pollution

Objectives; Types of collection equipment: Settling chamber; Inertial separators; Cyclones; Filters; Electrostatic Precipitators; Scrubbers.

Noise Pollution

Introduction; Levels of noise; Noise rating systems; Measurement of noise; Sources of noise and their noise levels; Acceptable noise levels; Effects of noise; Control of noise.

Urban Solid Waste Management

Sources; Quantities and characteristics; Classification; Collection and transportation; Recovery and reuse; Treatment methods such as composting, incineration, sanitary landfill and pyrolysis.

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1. Wastewater Treatment by M.N. Rao and A.K. Datta; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Environmental Pollution Control Engineering by C.S. Rao; Wiley Eastern Ltd., New Delhi.
3. Air Pollution by M.N. Rao and H.V.N. Rao; Tata Mc Graw – Hill Publishing Co. Ltd., New Delhi.

REFERENCES

1. Wastewater Engineering, Treatment, Disposal and Reuse by Metcalf & Eddy Inc.; Tata Mc Graw – Hill Publishing Co. Ltd., New Delhi.
2. Water Supply and Wastewater Disposal by G.M. Fair et al; John Wiley & Sons.
3. Sewage Disposal and Air Pollution Engineering by S.K. Garg; Khanna Publications, Delhi.
4. Sewage and Sewage Treatment by S.K. Kshirasagar; Roorkee Publishing House, Roorkee.

CODE: CE424 /2

ELECTIVE – IV

GROUND IMPROVEMENT TECHNIQUES

Lectures : 4 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 3

Course Objectives:

To introduce engineering properties of soft, weak and compressible □ deposits, principles of treatment for granular and cohesive soils and various stabilization techniques. □ To bring out concepts of reinforced earth. □ Applications of geotextiles in various civil engineering projects.

Course Outcomes :

Will gain competence in properly devising alternative solutions to difficult and earth construction problems and in evaluating their effectiveness before, during and after construction. □ A study of the many different approaches to the ground modification □ broadens the mind of any engineer and inspires creativity and innovation in Geotechnical construction and related fields.. □

UNIT-I

Introduction to Engineering ground modification:

Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique; objectives of improving soil.

UNIT-II

Mechanical Modification:

Terminology and aims of mechanical modification, compaction purposes and strategies, Methods of compaction: Laboratory procedures-Dynamic compaction, kneading compaction, static compaction; shallow surface compaction-static rollers, impact and vibratory equipment, operational aspects of shallow compaction; Deep compaction techniques: precompression, explosion, heavy tamping, vibration, compaction grouting; Hydromechanical compaction-hydraulic fill, dry fill with subsequent spraying or flooding, compaction of rock fill with water jets.

UNIT-III

Hydraulic Modification:

Objectives and techniques, traditional dewatering methods-open sumps and ditches, vacuum dewatering wells; Filtration, drainage and seepage control with geosynthetics-Geotextiles definition and types, geotextile applications, Basic functions of geotextiles; Preloading and use of vertical drains- Purpose of preloading and vertical drains, Methods of providing vertical drains-cylindrical sand drains, geosynthetic drains, Pre loading with vertical drains-radial consolidation, combined radial and vertical consolidation.

UNIT-IV

Physical and chemical modification:

Terminology, construction techniques, and typical uses; Types of admixtures and their effect on soil properties-Granular admixtures, Cement stabilization and cement columns, Lime stabilization and lime columns, Stabilization using bitumen and emulsions, Stabilization using industrial wastes.

UNIT-V

Modification by inclusions and confinement:

Concept of soil reinforcement; Reinforced soil as a homogeneous composite material-Elastic theory, strength theories; Discrete soil-reinforcement action; Reinforced earth and other strip reinforcing methods-standard materials and dimensions, failure modes; Development of design procedures-Original standard analysis, Tieback analysis-Rankine type analysis, Coulomb type analysis.

Retaining walls with metallic strip reinforcement; step-by-step-design procedure using metallic strip reinforcement; Retaining walls with geotextile reinforcement; Retaining walls with Geogrid reinforcement-General, design procedure for geogrid-reinforced retaining wall.

In situ Ground reinforcement: Ground Anchors-Typical applications, types and components; Rock bolts- Typical applications, types and components; Soil nailing-Different soil nailing systems and applications, The importance of construction sequence, Analysis of nailed soil, Special considerations for slope stabilization.

NOTE

Two questions of 10 marks each will be given from each unit out of which one is to be answered. Ten questions of one mark each will be given from entire syllabus which is a compulsory question.

LEARNING RESOURCES

1. Hausmann M.R(1990) Engineering Principles of ground modification, McGraw-Hill Education(India) Private Limited, New Delhi.
2. Ground improvement Techniques, P.Purushothama Raju, Laxmi Publications Pvt. Ltd., New Delhi.

CODE: CE424 /3

ELECTIVE – IV

PAVEMENT ANALYSIS AND DESIGN

Lectures : 4 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 3

UNIT – I

Types of pavements – Functions of individual layers, design factors -wheel loads, tyre pressure, contact pressure, Material characteristics, Environmental and other factors. Traffic factors- ADT, AADT, Lane distribution factor, Vehicle damage factor.

UNIT-II

Stresses in flexible pavement- layered systems concept-one layer system-Boussinesq Two layer system. IRC method of flexible pavement design.

UNIT-III

Westergaard's Theory and assumptions, Stresses in rigid pavement- relative stiffness of slab, modulus of sub-grade reaction- stresses due to loads, temperature and friction. Stresses in dowel bars and tie bars

UNIT-IV

IRC method of flexible pavement design, PCA method of rigid pavement design of joints-Dowel & Tie bar. Over lay- methods of overlay design by Benkelman Beam Deflection method.

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1. Highway Engineering-S.K.Khanna & C.J.Justo, Nemchand & Bros.,7th Edition (2000).
2. Principles and Practices of highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers- (2003).

REFERENCE BOOKS

Principles of Pavement Design-Yoder & Wit Zorac- John Willey & Sons. 2. Pavement analysis & design by Y.H. Huang, Pearson Education.

INDIAN STANDARD CODES

1. IRC Code for Flexible pavement-IRC-37-2001.
2. IRC Code for Rigid pavement-IRC-58-2002.
3. Rural Roads Manual - IRC Sp. 20 -2002.

CODE: CE424 /4

ELECTIVE – IV

REPAIR AND REHABILITATION OF STRUCTURES

Lectures : 4 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 3

UNIT-I

Introduction

Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures.

Cracks in R.C. buildings

Various cracks in R.C. buildings, causes and effects

Maintenance

Maintenance importance of maintenance, routine and preventive maintenance.

Damages to masonry structures

Various damages to masonry structures and causes

UNIT:II

Repair materials

Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials

Special mortars and concretes

Polymer Concrete and Mortar, Quick setting compounds

Grouting materials

Gas forming grouts, Sulfaluminate grouts, Polymer grouts, Acrylate and Urethane grouts.

Bonding agents

Latex emulsions, Epoxy bonding agents.

Protective coatings

Protective coatings for Concrete and Steel

FRP sheets

UNIT-III

Damage diagnosis and assessment

Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement

Substrate preparation

Importance of substrate/surface preparation, General surface preparation methods and procedure, Reinforcing steel cleaning.

UNIT-IV

Crack repair

Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks.

Corrosion of embedded steel in concrete

Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns)

Jacketing

Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing.

Strengthening

Strengthening, Beam shear strengthening, Flexural strengthening

TEXT BOOKS

1. "Repair and protection of concrete structures" by Noel P.Mailvaganam, CRC press London.
2. "Concrete repair and maintenance Illustrated" by Peter.H.Emmons, Galgotia publishers.
3. "Earthquake resistant design of structures" by Pankaj agarwal, Manish shrikande, PHI.

REFERANCES

1. "Failures and repair of concrete structures" by S.Champion, John wiley and sons.
2. "Diagnosis and treatment of structures in distress" by R.N.Raikar Published by R & D centre of structural designers and consultants pvt.ltd, Mumbai.
3. "Handbook on repair and rehabilitation of RCC buildings", CPWD, Government of India.
4. "Handbook on seismic retrofit of buildings", CPWD, Indian buildings congress, IIT Madras, Narosa Publishing House.

CODE: CE461

QUANTITY ESTIMATION & PROJECT MANAGEMENT

Lectures : 4 Periods/Week

Sessional marks : 40

University Exam : 3 Hours

University Exam. Marks : 60

Credits: 2

Note: A minimum of twelve (12No) shall be done and recorded

CYCLE-1

Quantity Surveying

*(At least **SIX** of the following using softwares like MS Excel/ Qty./Road Estimate/Super Rate analysis etc.)*

1. Quantity estimation of a single storey residential building (different items).
2. Cost estimation of a single storey residential building.
3. Quantity estimation of a B.T.Road (different items).
4. Cost estimation of a B.T.Road.
5. Quantity estimation of a Canal (different items).
6. Cost estimation of a Canal.
7. Find out the labour requirement and preparing the Rate Analysis for different items of work.
 - a) C.C
 - b) R.C.C
 - c) Brick work
 - d) Flooring

CYCLE-2

Project Management

*(Any **THREE** of the following using softwares like MS Project / Primavera etc.)*

1. Preparing the Project management report for a single storey residential building/Road/Canal by using the Bar Chart/Mile stone chart.
2. Preparing the Project management report for a single storey residential building by using the network technique (PERT/CPM).
3. Preparing the Project management report for a B.T.Road by using the network technique (PERT/CPM).
4. Preparing the Project management report for a Canal by using the network technique (PERT/CPM).

CYCLE-3

*(At least **THREE** of the following by using softwares like MS Excel)*

1. Quantity estimation of RCC roof slab and preparing schedule of bars
2. Quantity estimation of RCC beam and preparing schedule of bars
3. Quantity estimation of RCC Column with foundation footing and preparing schedule of bars
4. Quantity estimation of RCC retaining wall and preparing schedule of bars

CODE: CE462

PROJECT WORK

Lectures : 6 Periods/Week
University Exam : 3 Hours

Sessional marks : 40
University Exam. Marks : 60

Credits: 10