CIVIL ENGINEERING

VII & VIII SEMESTER

With
Scheme of Teaching
& Examination

DEPARTMENT: CIVIL ENGINEERING
### DEPARTMENT OF CIVIL ENGINEERING

#### SCHEME OF TEACHING

**VII Semester**

<table>
<thead>
<tr>
<th>Sub-Code</th>
<th>Title</th>
<th>Teaching Dept</th>
<th>Contact Hours/week L-T-P-S</th>
<th>Duration of SEE</th>
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<th>Credits</th>
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<td>12CV701</td>
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**LIST OF ELECTIVES**

- 12CV711 Solid Waste Management
- 12CV712 Highway Geometric Design
- 12CV713 Advanced Concrete Technology
- 12CV714 Theory of Elasticity
- 12CV721 Design of Bridges
- 12CV722 Pavement Materials and Construction
- 12CV723 Numerical methods in Civil Engineering
- 12CV724 Open Channel Hydraulics
- 12CV725 Earth Retaining Structures
## DEPARTMENT OF CIVIL ENGINEERING
### SCHEME OF TEACHING
#### VIII Semester

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### LIST OF ELECTIVES
Syllabus of VII & VIII Semester B.E. / Civil Engg.

12CV811 Reinforced Earth Structures
12CV812 Ground Water Recharge & Water Conservation
12CV813 Air Pollution & Control
12CV814 Pavement Design
12CV815 Applied Hydrology
12CV816 Earthquake Resistant Structures
12CV821 Valuation of Real Properties
12CV822 Finite Element Methods of Structural Analysis
12CV823 Design of Hydraulic Structures
12CV8X07 Environmental Impact Assessment

HYDROLOGY AND IRRIGATION ENGINEERING

Subject Code : 12CV701 Credits : 04
Hrs/Week : 4 Total Hours : 52

Course Objectives: CO
At the end of the course student will be able to:
CO 1: Understand the concepts of hydrology and irrigation and hydraulic structures.
CO 2: Understand the basic concepts of hydrology and irrigation engineering
CO 3: Solve problems associated with the hydrology and Irrigation Engineering.
CO 4: Analyze the pattern of the rainfall, runoff & stream flow
CO 5: Apply the methods learn t in Hydrology and Irrigation engineering in solving practical engineering problems.
CO 6: Enable to design the new hydraulic structures

Pre-requisites of the course: - CV 305.

UNIT - 1
INTRODUCTION: Definition of hydrology, importance of hydrology, global water availability, practical applications of hydrology, hydrologic cycle, concept of catchment and water budget equation.
PRECIPITATION: Definition, forms and types of precipitation, measurement of rain fall. recording and non recording type of rain gauges, consistency of rainfall data (double mass curve method), computation of mean rainfall (arithmetic average, Thiessen’s polygon
and isohyetal methods), mass curve, rainfall hyetographs, intensity – 
duration - frequency curves.  

10 Hrs

UNIT-II
WATER LOSSES: Introduction, infiltration, factors affecting 
infiltration capacity, measurement (double ring infiltrometer), 
Horton’s infiltration equation, infiltration indices, evaporation-
process, factors affecting evaporation, evapotranspiration, PET, AET, 
factors affecting ET, estimation of ET.

RUNOFF: Components of runoff, factors affecting runoff, stream 
flow measurements, area velocity method and slope area method, 
rainfall - runoff relationship, peak runoff estimation using rational 
method.  

12 Hrs

UNIT -III
IRRIGATION: Benefits and ill effects of irrigation, Water logging, 
need for drainage, sources of water for irrigation, Systems and 
Methods of irrigation, Reference crop evapotranspiration, crop coefficients, crop water 
requirements, irrigation water requirements, leaching requirements, 
irrigation efficiency, frequency of irrigation.  

8 Hrs

UNIT -IV
CANALS: Types of canal, alignment of canals, design of rigid and 
mobile boundary canals- Lacey’s and Kennedy’s methods, description 
of canal drops, canal regulators, cross drainage works.  

10 Hrs

UNIT-V
RESERVOIRS: Types, investigation for reservoir sites, storage 
zones, determination of storage capacity and yield of a reservoir using 
mass inflow curve.

GRAVITY DAMS: Forces acting on gravity dam, modes of failure, 
elementary and practical profile, low and high gravity dams, simple 
design by single step method.

EARTHEN DAMS: Types of earthen dams, modes of failure of 
earthen dams.  

12 Hrs

TEXT BOOKS:


REFERENCE BOOKS:


QUANTITY SURVEYING & ESTIMATION

Subject Code : 12CV702
Credits : 04
Hrs/ Week : 4
Total Hours : 52

Course Outcome (CO):

At the end of the course student will be able to:

CO1: Understand the different types of estimates of building, able to rough estimate to know the approximate cost of building.

CO2: Understand the details of drawing and specifications of items of work.

CO3: Prepare detailed measurements and abstracts of buildings, earth work in embankment and cuttings, Trusses, Septic Tank, Manhole, etc.

CO4: Prepare the bar bending schedules of reinforcing bars of structural elements.
CO5: Know about the contract systems and to analyze the rates of different items of work by using CPWD, 2014, schedule of rates.

**Prerequisite of the course:** CV405, CV406

**UNIT-I**

**ESTIMATES:** Different type of estimates, study of various drawing attached with estimates, important terms, units of measurements, abstract, approximate methods of estimating buildings, cost from materials and labour, equations recommended by CBRI-examples.

**BUILDING ESTIMATES:** Methods of taking out quantities and cost, center line method, long and short wall method or crossing method, preparation of detailed and abstract estimates for the following - masonry structures and framed structures with flat sloped RCC roofs, beams, columns and column footings, RCC roof slabs.

20 Hrs

**UNIT-II**

**ESTIMATES OF CIVIL ENGINEERING WORKS:** Steel truss (Fink and Howe truss), RCC slab culverts manhole and septic tanks.

**SPECIFICATION:** Objective of writing specifications essentials in specifications, general and detail specifications of item of works in buildings, specifications of aluminum and wooden partitions, false ceiling, aluminum and fiber doors and windows, various types of claddings.

8 Hrs

**UNIT-III**

**RATE ANALYSIS:** Working out quantities and rates for following standard items of works-earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators.

8 Hrs

**UNIT-IV**

**COMPUTATION OF EARTH WORK FOR ROADS:** Methods for computation of earthwork, cross sections, mid section formula, trapezoidal formula, average end area or mean sectional area method, prismoidal formula, for different terrains.

8 Hrs

**UNIT-V**

**CONTRACTS:** Types of contract-essentials of contract agreement-legal aspects, penal provisions on breach of contract, definition of the
terms: tender, earnest money deposit, security deposit, tender forms, documents and types, comparative statements, acceptance of contract documents and issue of work orders, duties and liabilities, termination of contract, completion certificate, quality control, right of contractor, refund of deposit, administrative approval, technical sanction, nominal muster roll, measurements-preparation of bills.

8 Hrs

TEXT BOOKS:


REFERENCE BOOKS:


DESIGN OF STEEL STRUCTURES

Subject Code : 12CV703  
Credits : 04  
Hrs/ Week : 4  
Total Hours : 52

Course Outcomes (CO):

CO1: Students should be able to have the knowledge of importance of steel structures, general guidelines for the design of steel structures as per IS 800:2007 and the characteristics of steel as a structural material.

CO2: They should be able to have a clear knowledge about the connections, mainly bolted and welded ones, the load transfer mechanism and design of simple connections.
CO3: They should be able to design tension members as per the code with proper connections by understanding the mechanism of failure of such members.

CO4: They must design simple and built-up compression members as per the code using various types of practical sections available along with proper lacings, battens and splices with proper connections.

CO5: They should be able to design simple footings like slab base and gusset base for the columns with suitable connections.

CO6: They must understand the modes of failure of flexural members and design laterally restrained and unrestrained beams with proper checks.

CO7: They should design some of the simple types of beam-beam and beam-column connections, viz., framed, unstiffened seat, stiffened connections using bolts and welds.

CO8: They should have the knowledge of fundamental concepts of steel design and exposure to IS 800:2007 and steel tables which will be the basis for learning advanced topics in steel design.

**Prerequisites:** CV303, CV402, CV501

**UNIT -I**

**INTRODUCTION:** Advantages and disadvantages of steel structures, loads and load combinations, Design considerations, Limit State Method (LSM) of design, failure criteria for steel, IS code provisions, section classification, fire resistance and ductility of steel.

**BOLTED CONNECTIONS:** Advantages and disadvantages, Design strength of HSFG bolts, design of simple bolted connections (lap and butt), bracket connections.

**WELDED CONNECTIONS:** Advantages and disadvantages, Types of welds, defects in welds, strength of welds, design of simple welded connections, bracket connections.  
12 Hrs

**UNIT-II**

**DESIGN OF TENSION MEMBERS:** Modes of failure, design of axially loaded tension members and their connections, concept of lug angles.

**DESIGN OF COMPRESSION MEMBERS:** Modes of failure, Design of single angle struts, compression members.  
10 Hrs
UNIT-III
DESIGN OF COMPRESSION MEMBERS: Design of built up compression members, Laced and battened systems, splicing.
COLUMN BASES: Design of simple slab base, gusseted base. 10 Hrs

UNIT –IV
DESIGN OF FLEXURAL MEMBERS: Types of beams, Modes of failure, Design strength of laterally supported and unsupported beams in bending and shear, Maximum deflection, Design of laterally supported and unsupported beams. 10 Hrs

UNIT –V
TYPES OF CONNECTIONS: Beam to beam, beam to column – bolted and welded, framed and seated, stiffened and unstiffened connections (moment resistant connections not included). 10 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
2. IS – 800: 2007, Steel tables (to be supplied in examination).
Hrs/ Week : 3  
Total Hours : 39

Course Outcome (CO):

CO1: Students will be able to understand material properties and Basic fundamentals of load balancing concept and pre-tensioned and post tensioned members.

CO2: At the end of the course students will be capable to calculate the stresses in concrete member and to encounter the various losses in the tensioned members.

CO3: Students will be able to determine Short term and long term deflections and creep effects under different loads.

CO4: Design for flexure, shear and limit state of serviceability for pre-tensioned and post tensioned structural members.

CO5: Students will be able to Design of pre-tensioned and post tensioned beam components of structural member.

Pre-requisites of the course: CV 402, CV 405

UNIT -I
MATERIALS: High strength concrete and steel, stress-Strain characteristics and properties.
BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, load balancing concept, Stress concept, centre of thrust. Pre-tensioning and post-tensioning systems, tensioning methods and end anchorages.  
7 Hrs

UNIT-II
ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, cable profiles.
LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.  
8 Hrs

UNIT-III
DEFLECTIONS : Deflection of a pre-stressed member – Short term and long term deflections, elastic deflections under transfer loads and due to different cable profiles, Deflection limits as per IS 1343, effect of creep on deflection, load verses deflection curve, methods of reducing deflection  
8 Hrs

UNIT-IV
LIMIT STATE OF COLLAPSE: Flexural strength of sections, Shear-
IS Code recommendations, shear resistance of sections, shear
reinforcement, limit state of serviceability – control of deflections and
cracking.  

UNIT – V
DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned
symmetrical and asymmetrical sections. Permissible stress, design of
prestressing force and eccentricity.  

TEXT BOOKS:
5. N. Krishna Raju, “Pre-stressed Concrete”, Tata Mc.Graw
and IBH Publishing Co.

REFERENCE BOOKS:
4. A.E. Naaman, “Prestressed Concrete Analysis and Design:
of Indian Standard, New Delhi.
8. N. Rajgopalan, “Pre-stressed Concrete”, Narosa Publishing house,
2005.

CONCRETE AND HIGHWAY MATERIALS
LABORATORY
Subject Code : 12CV705   Credits : 02
Hrs/ Week : 03
1. Normal Consistency Test for cement paste.
2. Setting time test for cement
3. Compressive strength test for cement
4. Specific gravity test for cement
5. Slump test
6. Compaction factor test
7. Vee Bee test
8. Compressive strength on concrete cubes
9. Split tensile test on concrete cylinders
10. Flexural strength test on concrete beams
11. Aggregate Crushing value test
12. Los Angeles Abrasion test
13. Aggregate Impact value test
14. Shape tests (Flaky and Elongation)
15. Specific Gravity test of aggregate
16. Water absorption test
17. Specific gravity test on bitumen
18. Penetration test on bitumen
19. Ductility test on bitumen
20. Softening point test on bitumen
21. Flash and Fire point test on bitumen
22. Viscosity test on bitumen

Demonstration of
1. Soundness test for cement by autoclave method
2. Air permeability test for cement

REFERENCE BOOKS:
1. Highway material testing laboratory manual
3. Relevant IS Codes and IRC Codes

SOLID WASTE MANAGEMENT

Subject Code : 12CV711
Hrs/ Week : 3
Credits : 03
Total Hours : 39

Course Outcomes (CO):
Upon successful completion of this course student will be able to:
CO1: Classify solid wastes and explain functional elements of solid waste management
CO2: Explain waste generation, composition and the factors affecting them
CO3: Discuss the physical and chemical characteristics of solid wastes
CO4: Explain the processing techniques for reducing the volume and size of wastes
CO5: Explain various incineration technologies
CO6: Identify emissions from incinerators and their control
CO7: Explain the design, operation and maintenance of sanitary landfill.
CO8: Determine the most viable disposal option for your locality

Pre-requisites of the course: CV 505, CV 604

UNIT -I
INTRODUCTION- Definition, land pollution- scope and importance of solid waste management, functional elements of solid waste management, sources - classification and characteristics- municipal, commercial & industrial, methods of quantification. 8 Hrs

UNIT -II
COLLECTION AND TRANSPORTATION: Systems of collection, collection equipment, garbage, chutes, transfer stations- bailing and compacting, route optimization techniques and problems.
TREATMENT/PROCESSING TECHNIQUES: Components separation, volume reduction, size reduction, chemical reduction and biological processing. 7 Hrs

UNIT -III
INCINERATION: Process- 3 T’s factors affecting incineration process, incinerators- types prevention. air pollution.
COMPOSTING: Aerobic and anaerobic composting; factors affecting composting; Indore and Bangalore processes; mechanical and semi mechanical composting processes; Vermi composting. 8 Hrs

UNIT -IV
SANITARY LAND FILLING: Different types, trench area, ramp and pit method, site selection, basic step involved, cell design, prevention of site pollution, leachate & gas collection and control methods, geosynthetic fabrics in sanitary land fill. 8 Hrs
UNIT-V

DISPOSAL METHODS: Open dumping –selection of site, ocean disposal, feeding to hogs, biomedical waste and disposal, pyrolysis
RECYCLE: Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse.

8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
5. Manual on “Municipal Solid Waste Management”, CPHEEO, Ministry of Urban Development Of India

HIGHWAY GEOMETRIC DESIGN

Subject Code : 12CV712 Credits : 03
Hrs/ Week : 3 Total Hours : 39

Course Outcomes (CO):
CO1: To impart the Knowledge on Road geometrics as per IRC & AASTHO guidelines.
CO2: To know the different cross-sectional elements of highway as per IRC guidelines
CO3: To study the design aspects of sight distance for Indian highways
CO4: To impart the Knowledge on designing various components in highway horizontal and vertical alignments
CO5: To study the various types of intersection and significance of highway drainage

Pre-requisite of the course: CV403, CV 504

UNIT -I
INTRODUCTION: Elements of geometric design control factors like topography-design speed, design vehicle, traffic capacity, volume, environment and other factors-IRC and AAHO standards and specification, PCU concept for design. 7 Hrs

UNIT-II
CROSS SECTION ELEMENTS: Pavement surface characteristics – friction, skid and skid resistance, pavement unevenness, light reflecting characteristics, camber and its shapes, providing camber in the field, pavement width computation, kerbs and its types, medians, shoulders, foot paths, parking lanes, service roads, cycle- tracks, driveways, guard rails, width of formation, right of way, design of road humps as per IRC Specification. 9 Hrs

UNIT-III
SIGHT DISTANCES: Stopping and over taking sight distances, sight distances at Intersections, set back distances at curves (single lane and multiple lane). 7 Hrs

UNIT-IV
HORIZONTAL ALIGNMENT: Design elements, super elevation, extra widening of pavements at curves transition curves types and ideal curve; vertical alignment: gradient, vertical curve design criteria, types of summit and valley curves, design of vertical curves, design standards for hill roads. 8 Hrs

UNIT –V
INTERSECTION DESIGN: Elements of an intersection, maneuver area, speed lanes-various types of intersection, flyovers, grade separators, subways, under pass, suitability of each types and their design principles, grade separations, intersections at grade-islands, rotary and its design only.
HIGHWAY DRAINAGE: Importance, surface and subsurface drainage, design of cross sections. 8 Hrs
TEXT BOOKS:

REFERENCE BOOKS:
3. Relevant IRC publications.

ADVANCED CONCRETE TECHNOLOGY
Subject Code : 12CV713 Credits : 03
Hrs/ Week : 3 Total Hours : 39

Course Outcomes (CO):
CO1: Student will be able to understand the importance of hydrated cement paste, types of admixtures and its properties in fresh and hardened state of concrete.
CO2: Student will be able to know the concept and to design cement concrete by different methods.
CO3: Student will be able to know the durability of hardened concrete when subjected to atmospheric and chemical Attacks and also the importance of RMC, HVFAC.
CO4: Student will be able to understand different properties, casting mechanisms and tests on self compacting concrete, fiber reinforcing concrete.
CO5: Student will be able to know and understand different properties of LWC, HDC and HPC.
CO6: Student will be able to know properties and types of Non Destructive testing on hardened concrete.
Prerequisites: This subject requires the student to know about fundamentals of Concrete technology.

UNIT- I
INTRODUCTION: Importance of Bogue’s compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete.
CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticiser.
MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state. 8 Hrs

UNIT –II
MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS: 10262-2009. 8 Hrs

UNIT-III
DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability. RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix 7 Hrs

UNIT-IV
SELF COMPACTING CONCRETE: Concept, materials, tests, properties, application and typical mix.
FIBER REINFORCED CONCRETE - Fibers types and properties, Behavior of FRC in compression, tension including pre-cracking stage and post-cracking stages, behavior in flexure and shear, Ferro cement - materials, techniques of manufacture, properties and application. 8 Hrs

UNIT-V
LIGHT WEIGHT CONCRETE: Materials, properties and types, typical light weight concrete mix.
HIGH DENSITY CONCRETE AND HIGH PERFORMANCE CONCRETE: Materials, properties and applications, typical mix.
TEST ON HARDENED CONCRETE: Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition.
Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts- Rebound hammer, pulse velocity methods.

**TEXT BOOKS:**
3. P.K. Mehta, P J M Monteiro, “Concrete microstructure and properties”, Prentice Hall, New Jersey (Special Student Edition by Indian Concrete Institute, Chennai).

**REFERENCE BOOKS:**
1. ACI Code for Mix Design
2. IS 10262-2009 “Concrete mix proportioning guidelines”.
3. N. Krishna Raju, “Concrete Mix Design”, Sehgal Publishers

**THEORY OF ELASTICITY**

Subject Code : 12CV714
Credits : 03
Hrs/ Week : 3
Total Hours : 39

**Course Outcomes (CO):**

CO1: To understand the concept of plane stress and plane strain problems.
CO2: Use of polynomial function in solving civil engineering problems.
CO3: To drive the expressions for stress and deformation using polynomial function and to understand the compatibility relation for plane stress and plane strain problems.
CO4: Understand the concept how stresses and strains related in polar co-ordinates and to study axisymmetric problems.
CO5: Understand the effect of circular hole on the stress distribution.

**Pre-requisites:** CV303, CV402

**UNIT -I**
Introduction to mathematical theory of elasticity, definition of continuum, stress and strain at a point, constitutive laws, Generalized
Hooke’s law, Strain-displacement relations, Stress tensor, Stress transformation, Stress invariants, Strain tensor, Strain invariants, Plane stress and plane strain, Principal stresses and strains. 8 Hrs

UNIT-II
Measurement of surface strains, Strain rosettes, Mohr’s circle, Analytical method, Differential equations of equilibrium, Boundary conditions, Compatibility equations, Airy’s stress function, Stress polynomials, Saint Venant’s principle, Problems. 8 Hrs

UNIT –III
Two dimensional problems in Cartesian coordinates, Relationship between plane stress and plane strain, Stress function, Bending of a cantilever beam subjected to end load, Pure bending of beam, Effect of shear deformation in beams, Simply supported beam subjected to udl, Numerical problems. 7 Hrs

UNIT-IV
Two dimensional problems in polar coordinates, Strain-displacement relations, Equilibrium equations, Compatibility equations, Airy’s stress function, Axisymmetric problems, Rotating discs of uniform thickness, Lame’s problem-thick cylinder. 8 Hrs

UNIT-V
Effect of circular holes on stress distribution in plates subjected to tension, compression and shear, stress concentration factor. Torsion: General solution, Boundary conditions, torsion of circular and elliptical sections, Membrane analogy of rectangular sections. 8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

DESIGN OF BRIDGES

Subject Code: 12CV721
Credits: 03
Hrs/ Week: 3
Total Hours: 39

Outcome of the course (CO):
At the end of the course the students will be able to:
CO1: Apply various IRC code provisions for bridge design.
CO2: Design a slab culvert and pipe culvert.
CO3: Design a T-beam bridge.
CO4: Design a welded plate girder.
CO5: Design a P.S.C. girder.

Pre-requisites of the course: CV 601

UNIT-I
BRIDGES: Types of Bridges, Components of Bridges, Selection of site for bridge, linear waterway.
LOADS AND STRESSES: Various loads to be considered while designing bridges, IRC loading standards, impact factor. 7 Hrs

UNIT-II
SLAB CULVERT: Design of slab culvert for IRC class AA and class-A loading, design of pipe culvert, empirical design of bank connections. 8 Hrs

UNIT-III
DESIGN OF T-BEAM BRIDGE: Design of T-beam bridge for class AA tracked vehicle, design of interior deck slab panel by Piegaude's theory.
Design of longitudinal girder by Courbon's theory, approximate design of cross girder. 8 Hrs
UNIT –IV
DESIGN OF WELDED PLATE GIRDER BRIDGE: Design of main section, intermediate stiffener, bearing stiffener, cross bracings. **8 Hrs**

UNIT-V
DESIGN OF PRESTRESSED BRIDGES: Design of girders only **8 Hrs**

TEXT BOOKS:
2. Krishna Raju, “Design of Bridges”, Oxford IBH publications

REFERENCE BOOKS:

PAVEMENT MATERIALS AND CONSTRUCTION

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<th>Credits</th>
<th>Hrs/ Week</th>
<th>Total Hours</th>
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<tr>
<td>12CV 722</td>
<td>03</td>
<td>3</td>
<td>39</td>
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**Course Outcomes (CO):**
After the course, the students will able to:

CO1: Understand the various types of pavements, component layers, their functions, their importance, and the various materials used for the construction.

CO2: Know the properties, requirements, preparation and uses of aggregates, Bitumen and Tar, bituminous emulsions and cutbacks in the construction of pavement.

CO3: Select suitable aggregate mix and design bituminous mix as per Marshall Method.

CO4: Select the suitable equipment for the construction of pavement based on necessity and their working principle.
CO5: Describe the different steps involved in preparing sub-grade and tests used to check its quality.

CO6: Narrate the specifications, construction methods and quality control checks used for different layers of flexible pavement.

CO7: Know the specifications, construction methods and quality control checks used for cement concrete pavement.

CO8: Construct the different types of joints in cement concrete pavements.

**Prerequisites:** CV503, CV602

**UNIT - I**

AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates. Concepts of size and gradation, design gradation. Maximum aggregate size, aggregate blending to meet the specification using Rothfutch’s method.

BITUMEN AND TAR: Origin, preparation, properties and chemical constituents of Bitumen and Tar, Requirements for pavement construction.  

**8 Hrs**

**UNIT –II**


BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness (excluding Hveemstabilometer&Hubbar – field tests). Bituminous mix design by Marshall method and specification using different criteria- voids in mineral aggregate, voids in total mix, density, flow, stability and voids filled with bitumen.  

**10 Hrs**

**UNIT –III**

EQUIPMENT IN HIGHWAY CONSTRUCTION: Different types of equipment for excavation, grading and compaction, their working principle, advantages and limitations. Equipment for the construction of bituminous and cement concrete pavement and stabilized soil road.

SUB GRADE: Earthwork grading, construction of embankments and cuts for roads. Preparation of sub grade, quality control tests.  

**7 Hrs**

**UNIT-IV**

FLEXIBLE PAVEMENTS: Introduction, Brief discussions on following: Interface treatment-Prime coat and tack coat, Penetration
Syllabus of VII & VIII Semester B.E. / Civil Engg.

macadam, Built-up spray Grout, Bituminous Macadam and Dense Bituminous Macadam.

Specifications of materials, construction methods and quality control checks during construction for typical Wet mix Macadam base and Bituminous Concrete surface course as per BIS only.

Field quality control tests after the construction of flexible pavement. (Specifications of materials, construction method and field control checks for different types of flexible pavement layers.)

**UNIT-V**

CEMENT CONCRETE PAVEMENTS: Specifications of materials and method of construction of cement concrete pavements, Quality control tests. Different types of joints used and their construction method.

**TEXT BOOKS:**


**REFERENCE BOOKS:**


NUMERICAL METHODS IN CIVIL ENGINEERING

Subject Code : 12CV723  Credits : 03
Hrs/ Week : 3  Total Hours : 39

Course Outcomes (CO):

CO1: The students should understand the formation of linear equations in solving problems related to civil engineering and solve them by different techniques.

CO2: They must know to solve problems in various fields of civil engineering by developing nonlinear equations from the given data.

CO3: They should be able to find the area of bending moment diagram for different problems on statically determinate structures by adopting numerical integration techniques.

CO4: They must calculate the slope and deflection of statically determinate structures by numerical technique.

CO5: They should be able to develop ordinary differential equations for solving problems in civil engineering.

CO6: They must have the knowledge of finite difference technique and its applications in solving problems in structural mechanics.

CO7: They must possess the basic knowledge about the different numerical techniques that can be adopted in developing equations and solving problems related to civil engineering.

Pre-requisites: CV404, CV501, CV505, CV604.

UNIT- 1

INTRODUCTION, SCOPE AND IMPORTANCE OF THE SUBJECT:
Solution of linear simultaneous equations by the following methods:
(i) Gaussian elimination, (ii) Gauss-Jordan matrix inversion, (iii) Gauss-Siedel, (iv) Factorization.
Application of the above methods in solving problems by slope-deflection method applied to beams and frames, problems in construction planning.  

**UNIT-II**

Finding the roots of nonlinear algebraic and transcendental equations by (i) Bisection method, (ii) Newton-Raphson method. Application of the above methods to solve problems in structural engineering, hydraulics, geotechnical engineering and environmental engineering.  

**8 Hrs**

**UNIT –III**

NUMERICAL INTEGRATION TECHNIQUES: (i) Trapezoidal rule, (ii) Simpson’s one third rule. Application of the above methods for computing the area of BMD for statically determinate beams. Computation of slope and deflection in statically determinate beams by New Marks method.  

**8 Hrs**

**UNIT –IV**

Solution of ordinary differential equations by (i) Euler’s method, (ii) 4th order Runge-Kutta method. Application of the above methods to solve civil engineering problems.  

**7 Hrs**

**UNIT-V**

Finite difference techniques to solve problems in structural mechanics. Analysis of statically determinate and indeterminate beams, buckling of columns.  

**8 Hrs**

**TEXT BOOKS:**


**REFERENCE BOOKS:**


OPEN CHANNEL HYDRAULICS

Subject Code : 12CV724  
Credits : 03  
Hrs/ Week : 3  
Total Hours : 39

Course Outcomes (CO):

CO1: The students should understand the governing equations of flow in open channels.

CO2: They must know the concept of uniform flow, related equations and design of channels for uniform flow.

CO3: They should be able to analyze problems on critical flow in channels and its importance.

CO4: They must have the idea of gradually varied flow with practical illustrations and types of flow profiles and its computation.

CO5: They must analyze problems related to hydraulic jump in channels and know its significance as energy dissipater.

CO6: They should be in a position to estimate the sediment load in channels and take up problems on design of stable channels.

CO7: They must gain the knowledge of reservoir sedimentation and suitable measures to rectify it.

CO8: They should be able to understand the mechanics of open channels with practical applications.

UNIT- I

INTRODUCTION: Difference between pipe flow and open channel flow, classification of flow, energy equation, momentum equation, kinetic energy and momentum factors.

UNIFORM FLOW: Concepts, uniform flow equations, conveyance and hydraulic exponent for uniform flow, design of channels for uniform flow.  
8 Hrs

UNIT -II
CRITICAL FLOW: Concept of specific Energy – Classification of flow, Section Factor, Hydraulic exponent for critical flow, critical depth as a flow measurement.  

UNIT-III  

UNIT-IV  
RAPIDLY VARIED FLOW: Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jump – length location, height, application of hydraulic jump, Hydraulic jump in sloping channels, Jump in nonrectangular channels.  

UNIT-V  
SEDIMENT TRANSPORT: Sediment related problems, Sediment properties, Modes of sediment transport, Regimes of flow, Initiation of motion, Bed forms, Shield’s criteria, Sediment Load, Design of stable channels, Regime Channels, reservoir sedimentation, catchment sediment yield.  

TEXT BOOKS:  

REFERENCE BOOKS:  

EARTH RETAINING STRUCTURES

Subject Code : 12CV725  Credits : 03
Hrs/Week : 3  Total Hours : 39

Course Outcomes (CO):

CO1: Students come to know about types of retaining wall, the force acting on earth type wall and possible mode of failure of each type. They will know how to analyze the stability of gravity type, cantilever type and counter fort type retaining walls against sliding, overturning and bearing capacity failure.

CO2: Different types of sheet pile walls will be understood by the students. They will know about the situation under which, cantilever sheet pile walls are used and how to determine the embedment of sheet pile walls under different soils i.e., cohesion less soil and cohesive soil.

CO3: Students will acquire the knowledge about anchored sheet pile walls, its advantage over cantilever sheet pile wall and how to design an anchored sheet pile for the given soil and water level conditions.

CO4: Students come to know about lateral earth pressure distribution on sheeting of braced system for earth trench in different soil types. Different components of the braced system will be known to them. Students will be in a position to select a suitable bracing system for the given soil condition and depth of trench. They also will be knowing how to design the selected bracing system.

CO5: Students will come to know about different types of coffer dams and situations in which each type is useful. Advantages of cellular coffer dam over other types will be known to the students. They will know different modes of designing the cellular coffer dam to have required factor of safety against the modes of failure.

Pre requisite: Students should have studied 12CV 103, CV 303, CV503 and CV602.
UNIT – I
RETAINING WALLS: Types of retaining wall and forces on each type of wall. Modes of failure of retaining walls - sliding, overturning and bearing. Stability analysis and principles of the design of retaining walls – Gravity retaining walls, Cantilever retaining walls, counter fort retaining walls (no structural design). Drainage from the backfill. 8 Hrs

UNIT – II
BULK HEADS: Cantilever sheet pile walls Types of sheet pile walls. Cantilever sheet pile wall in cohesion-less soils. Cantilever sheet pile wall in clay. Design problem in each case. 7 Hrs

UNIT –III
BULK HEADS: Anchored Sheet Pile Walls: Anchored sheet pile with free earth support in cohesion-less and cohesive soil. Anchored sheet pile with fixed earth support method. Design problems using free earth and fixed earth support method. Types, locations and design of anchors. Description of Relieving platform, its use and advantages. 8 Hrs

UNIT – IV
BRACED CUTS: Introduction. Lateral earth pressure on sheeting, Different types of sheeting and bracing systems. Design of various components of bracings. 7 Hrs

UNIT- V

TEXT BOOKS:
REFERENCE BOOKS:
1. **Soil Mechanics and Foundation Engineering**: Dr. B.C. Punmia (2005), Pub: Laxmi Publications Ltd.,

**ENGINEERING MANAGEMENT**

Subject Code: 12CV801  
Credits: 04  
Hrs/ Week: 04  
Total Hours: 52

Course outcome (CO):
At the end of the course the students will be able to:

CO1: Understand various concepts related to management and economics.

CO2: Analyze the project feasibility conditions.

CO3: Compare various projects on the basis of present worth, future worth etc.,

CO4: Manage labour and material.

CO5: Award contracts.

CO6: Understand the needs of planning and updating project schedule through project management tools such as CPM, PERT.

CO7: Prepare and analyze the various cost related to project through financial statements.

CO8: Identify various equipment’s used in construction industry and analyze their suitability and implement-ability in various projects.

CO9: Analyze the various optimization techniques and their uses in solving engineering problems.

**UNIT- I**

**INTRODUCTION TO ENGINEERING ECONOMICS**- Basic Concepts of economic analysis, Micro and Macro analysis, project feasibility, economic and financial feasibility, benefit cost ratio,
interest formula, present worth, future worth, Annual equivalent, Basis for comparison of alternatives, rate of return method, break even analysis, planning methods.  

**UNIT –II**
CONSTRUCTION INDUSTRY AND MANAGEMENT: Introduction, Value engineering, time management, labor and Material management, Contract and contractor, organization and administration, industrial financial management.  

**UNIT –III**
CONSTRUCTION PLANNING - Introduction, time estimates, planning methods of projects, Bar and Milestone charts, PERT and CPM network analysis, cost model, direct cost, indirect cost, total cost, optimum cost optimum duration of project problems, CPM network analysis, Line of Balance Technique, Resource Allocation and Updating.  

**UNIT-IV**
CONSTRUCTION EQUIPMENT- Introduction, various earth moving equipments, hoisting equipments, concrete mixer and plants, conveyors and rollers, trenching machines, equipment for Highway construction, factor for selecting equipment, special equipment, economic analysis. Work study in construction, safety measures, bidding.  

**UNIT-V**

**TEXT BOOKS:**
REFERENCE BOOKS:
1. Mahesh Varma, “Construction planning and management”, Metropolitan Book Co., Delhi

DESIGN AND DRAWING OF STEEL STRUCTURES

Subject Code : 12CV802  
Credits : 03
Hrs/ Week : 02 (L) + 03 (D)  
Total Hours : 52

Course Outcomes(CO):
CO1: Students should be able to draw the drawings of some simple types of beam-beam and beam-column bolted and welded connections with the given details to proper scale adopted in steel constructions

CO2: They should be capable of drawing laced columns and batten columns with built-up sections and column splices with the given details along with the connections

CO3: They must prepare the drawings for the given details of slab base and gusset base with proper connections

CO4: They should understand the design of the axial members of a plane truss and connections with the forces in the members given and draw the drawings as per the design

CO4: They must understand the design procedure for a welded plate girder with and without stiffeners along with the connections with proper checks on the design and draw the sketches to proper scale

CO5: They should design and draw the details of a gantry girder for the given data

CO6: They should have the vision of understanding the components of a steel structure along with the relevant connections

Pre-requisites of the course: CV303, CV402, CV501, CV703

PART – A
(Drawings to be prepared for given structural details)
UNIT 1
Connections: Bolted and welded, beam-beam, Beam-column, seated, stiffened and un-stiffened.

UNIT-II
Columns: Splices, Column-column of same and different sections. Lacings and battens.

UNIT –III
Column Bases: Slab base and gusseted base (bolted and welded) 22 Hrs

PART – B

UNIT-IV
Design and drawing of
i. Welded plate girder (with and without stiffeners)  
ii. Roof Truss (Forces in the members to be given)  
iii. Gantry girder 30 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
2. IS – 800: 2007, Steel tables (to be supplied in examination).

PROJECT WORK
Subject Code : 12CV803
Credits : 09
Hrs/ Week : 15

The problem (analytical/ computational/ experimental / design oriented / statistical) shall be selected after detailed discussion with the guide and H.O.D. The project shall have following features:
i. Synopsis.
ii. Definition/Objective of the problem.
iii. Exhaustive literature survey.
iv. Analysis based on type of problem (as given above)
v. Conclusions, scope for further work.
vi. References.

The project shall be submitted in the prescribed standard format and two copies shall be submitted to the H.O.D, after certification by the concerned Guide and H.O.D.

**REINFORCED EARTH STRUCTURES**

Subject Code: 12CV811  
Credits: 03
Hrs/ Week: 03  
Total Hours: 39

Course outcome (CO):

CO 1: Basic principles and mechanism of reinforced earth will be known to students. They understand effects of reinforcement on behavior of soil. They come to know the application of reinforced earth in the form of anchors, tie bars and soil nailing techniques. Structural and economic advantages of reinforced earth over other similar structures will be clearly understood by the students.

CO 2: Students will know about classification of geo-synthetic based on raw materials and manufacturing process involved. Types of geo-synthetics, their properties and methods of evaluating each properties will be understood properly.

CO 3: Students will acquire the knowledge on five functions of geo-synthetics namely separation, reinforcement, filtration, drainage and containment, when two examples of field applications (case studies) are explained.

CO 4: Students come to know what are the components of reinforced earth retaining wall i.e., soil reinforcement and facing elements, properties governing the selection of soil type and requirements of reinforcement, material, type and required properties of facing elements are clearly understood by the students. They will know about the internal and external stability of reinforced earth retaining wall and will be able to design a reinforced earth wall using Tieback wedge method.
CO 5: Students will be able to improve the stability of earth embankment slope using suitable reinforcement. They understand the modes of failure of reinforced earth foundation and able to design a foundation to have required bearing capacity and specified settlement using suitable reinforcements. The concepts and principles of soil nailing will be understood by the students. They will come to know about grouted and driven soil nail system, and the situation in which each is used.

UNIT- I
Historical background, principles of reinforced earth, mechanism of reinforced earth. Effect of reinforcement on soil. Application of reinforced earth, anchors, tiebacks, and soil nailing technique. Structural and economic advantages of reinforced earth structure over similar structures. 7 Hrs

UNIT –II
GEOSYNTHETICS: Introduction and an overview. Historical development. Classification based on material and method of manufacturing process. Types of Geosynthetics, their properties and determination. 6 Hrs

UNIT-III
FUNCTIONS OF GEOSYNTHETICS: Separation, reinforcement, filtration, drainage and containment. Two examples of application in the field (case histories) for each function are to be explained. 7 Hrs

UNIT-IV
REINFORCED EARTH RETAINING WALL: Component materials: Soil, important properties governing the selection. Reinforcement: requirements for the use, types of reinforcements, metallic and Geosynthetic in the form of bars, strips, mats and grids. Facing elements: materials, types and important properties. External and internal stability applied to Reinforced earth structures, Coherent gravity and Tieback wedge methods, design of typical reinforced earth retaining wall using Tieback wedge method. 10 Hrs

UNIT-V
REINFORCED EARTH EMBANKMENT AND SLOPES: Improving the stability of a typical earth embankment slope using Geo-fabric reinforcement, numerical examples.
REINFORCED EARTH FOUNDATION: Modes of failure, improvement of bearing capacity with the introduction of Geo-textile or Geo-grid reinforcements, typical example of a spread footing on reinforced earth.

SOIL NAILING SYSTEM: concept and principles, driven and grouted nail system, advantages and limitations.  

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**GROUNDWATER RECHARGE AND WATER CONSERVATION**

Subject Code : 12CV812  
Credits : 03
Hrs/ Week : 3  
Total Hours : 39

**Course Outcomes:**

CO 1: Equip the students to understand the proper water management and water conservation

CO 2: To understand the techniques through rainwater harvesting, conservation and artificial recharging of groundwater.

CO 3: Understand the methods of reuse and recycle of water

CO 4.: Application of RS and GIS for water conservation

CO 5: Study of ground water Pollution

**Pre-requisites of the Course:** CV306, CV 701

UNIT- I
INTRODUCTION: Water for life, rainwater harvesting and groundwater recharge: concepts, basics of groundwater geology and water conservation techniques, importance.  

UNIT –II 
WELLS AND WELL INVENTORIES: Definition, types, aquifer parameters, well inventories, ground water quality, groundwater pollution, significance of geology in recharging.  

UNIT-III 
GROUNDWATER RECHARGING: Objectives, recharge, water balance, traditional, artificial, induced methods, hydro fracturing, roof top harvesting, site selection for groundwater recharging, quality of recharging water, coastal aquifers and recharging, benefits and problems.  

UNIT –IV 
WATER CONSERVATION AND MANAGEMENT: Water conservation for commercial and industrial facilities, water quality management, management of freshwater and wastewater, recycling and reuse of water, water conservation, need of ensuring quality and cost-effectiveness of water harvesting.  

UNIT –V 
RS & GIS application in groundwater conservation, harvesting, artificial recharging and management of water resources.  

TEXT BOOKS:  

REFERENCE BOOKS:  

AIR POLLUTION AND CONTROL

Subject Code : 12CV813
Credits : 03
Hrs/ Week : 3
Total Hours : 39

Course outcome (CO)

At the end of the course the students will be able to:

CO1: Characterization of air pollution with suitable case studies.

CO2: Understand general characteristics and meteorological models of air pollution.

CO3: Study the Sampling, analysis and control of air pollution.

CO4: Study the various elements of air pollution and their control measures.

CO5: Learn the Air quality and emission standards, legislation and regulation, air pollution index.

Pre-requisites of the course: CV 113

UNIT -I

INTRODUCTION: Classification and characterization of air pollutants. Emission sources, behavior and fate of air pollutants, chemical reaction in atmosphere, photo chemical Smog, coal induced smog, examples: London smog, Los Angeles smog & Bhopal gas tragedy. 8 Hrs

UNIT –II
METEOROLOGY: Meteorological variables, primary and secondary lapse rate, inversions, stability conditions, wind rose diagrams, stack plumes - general characteristics and meteorological models.  

UNIT-III
SAMPLING, ANALYSIS AND CONTROL: Sampling and measurement of gaseous and particulate matter stack sampling, analysis of air pollutants, smoke and smoke measurement.  

UNIT-IV
CONTROL METHODS: Particulate, emission control, gravitational settling chambers, cyclone separators, fabric filters, electrostatic precipitators, wet scrubbers. selection of a particulate collecting Equipment, control of gaseous emission, adsorption by liquids, adsorption by solids, combustion odors and their control.  

UNIT-V
AIR POLLUTION DUE TO AUTOMOBILES: Effects, direct and indirect method of control, environmental issues: acid rain, global warming, ozone depletion in stratosphere, indoor air pollution,  
STANDARDS AND LEGISLATIONS: Air quality and emission standards, legislation and regulation, air pollution index.  

TEXT BOOKS:

REFERENCE BOOKS:
8. Biomedical waste handling rules - 2011
PAVEMENT DESIGN

Subject Code : 12CV814  
Credits : 03  
Hrs/ Week : 03  
Total Hours : 39

Course Outcomes (CO):
After the course, the students will able to:

CO1: Know the design aspects and analysis of various types of stresses in flexible and rigid pavements.

CO2: Design the thickness of the highway and airport pavements by different methods.

CO3: Design the flexible pavement by various methods and as per IRC-37:2001.

CO4: Design various components of the rigid pavement as per IRC-58-2002.

CO5: Know the guidelines for the design as per latest modified version of pavement design codes (IRC-37:2012 and IRC: 58-2011).

Pre-requisite of the course: Transportation Engineering I (12CV504), Geotechnical Engineering II (12CV602).

UNIT-I
PAVEMENT DESIGN: Desirable characteristics and requirements of a well-designed Pavement, Difference between highway and air field pavements, Functions of various components and comparison of flexible and rigid pavements, objects of pavement design, Factors affecting design and performance of flexible and rigid pavements. (Factors affecting design and performance of pavements).  
7Hrs

UNIT- II
STRESSES AND DEFLECTIONS IN FLEXIBLE PAVEMENTS: Stresses and deflections, Principle-Assumptions-limitations, applications of Boussinesq’s single layered theory and Burmister’s two layered theories in pavement design and problems. Various factors in traffic design wheel load-Contact pressure-ESWL concept for dual and tandem wheel load assembly (Boyd and Foster method), repeated loads and EWL concept-Problems. (Stresses and deflections in homogenous masses, wheel load stresses, various factors in traffic wheel loads; ESWL of multiple wheels, repeated loads and EWL factors).  
9Hrs
UNIT-III
FLEXIBLE PAVEMENT DESIGN:
Methods for highways and airport pavement design – Introduction to CBR method-Advantages and limitations, Flexible pavement design only as per IRC: 37-2001- design factors and recommendations-design steps and Problems.
Major Flexible pavement design guidelines as per IRC: 37-2012(excluding design problems).
McLeod method, Burmister’s method and Kansas (triaxial) method-principle, design steps and problems. (Methods for highways and airports - McLeod, Kansas, CBR method, development, principle, design steps, advantages and IRC methods of pavement design). 7Hrs

UNIT-IV
STRESSES IN RIGID PAVEMENTS: Factors to be considered in traffic wheel load during the design life of a CC pavement. Basic principle and concepts in analysis of stresses in rigid pavements. Westergaard’s analysis- Assumptions, Modified Westergaard’s (IRC) equations- Concept of Wheel load stresses-Warping stresses-Frictional stresses-Combined stresses (Using charts/equations)-Problems. (Types of stresses and causes, factors influencing stresses, general considerations in rigid pavement analysis, EWL, wheel load stresses, warping stresses, frictional stresses, combined stresses). 7 Hrs

UNIT -V
RIGID PAVEMENT DESIGN: Design of CC pavements for roads and runways, types of joints in cement concrete pavements and their functions, joints details for longitudinal joints, contraction joints and expansion joints.
Design of Dowel bars at load transfer joints, Design of Tie bars at longitudinal joints-design steps and problems as per IRC: 58-2002.
Rigid pavement design as per IRC: 58-2002- Guidelines for thickness design of CC slab, design steps and problems.
Major Rigid pavement design guidelines as per IRC: 58-2011(excluding design problems). 9Hrs

TEXT BOOKS:

REFERENCE BOOKS:

APPLIED HYDROLOGY

Subject Code : 12CV815
Credits : 03
Hrs / Week : 3
Total Hours : 39

Course Outcomes (CO):

CO1. The students should understand the processes of a hydrological cycle and the concept of hydrological modeling.

CO2. They should be able to solve problems related to precipitation using statistical analysis

CO3. They must be in a position to understand the stream networks and compute the abstractions from precipitation

CO4. They must draw unit hydrographs for a given catchment by different methods

CO5. They should learn to apply various probability distributions to hydrological problems

CO6. They must carry out frequency analysis and estimate the errors in the hydrological analysis
Pre-Requisites: Basics of Hydrology, Fundamentals of Probability and Statistics (CV401, CV701)

UNIT-I

Introduction - Hydrologic cycle, Systems concept, Hydrologic model classification, Hydrological processes. 3 Hrs

Design storm – Design precipitation depths, Intensity-Duration-Frequency relationships, Design Hyetographs, Probable Maximum Precipitation – Related Problems. 4 Hrs

UNIT-II

Surface water – Sources, Stream flow hydrograph, Base flow separation, Excess Rainfall and Direct runoff, SCS (Soil Conservation Service) method for abstractions, Flow depth and velocity, Travel time, Stream networks – Related Problems. 8 Hrs

UNIT-III

Unit Hydrograph – Assumptions, Derivation, Applications, Synthetic Unit Hydrographs, Unit Hydrographs for different rainfall durations – Related Problems. 7 Hrs

UNIT-IV

Hydrologic Statistics – Frequency and Probability functions, Statistical Parameters, Fitting a probability distribution, Probability distributions for hydrologic variables – Normal, Lognormal, Gamma, and Exponential Distributions – Related Problems. 9 Hrs

UNIT-V

Frequency Analysis – Return Period, Extreme Value Distribution, Frequency Factors, Probability Plotting, Reliability of Analysis, Confidence Limits, Standard Error of Estimate – Related Problems. 8 Hrs

TEXT BOOKS:


REFERENCE BOOKS:

EARTH QUAKE RESISTANT STRUCTURES

Subject Code : 12CV816
Credits : 03
Hrs / Week : 3
Total Hours : 39

COURSE OUTCOME (CO)

After finishing the course successfully, the student shall able to

CO 1: Understand theory involved with earthquake and seismic zones of India
CO 2: Suggest the suitable building plan and building configuration for an Earthquake prone area;
CO 3: One can able to analyse Earthquake forces in a multistory building
CO 4: One can able to provide Earthquake resistant detailing of RCC buildings and understand the concepts of geotechnical earthquake engineering.
CO 5: Analyze earthquake forces in masonry building and able to design Earthquake resistant detailing in masonry & earthen buildings

Pre-Requisites: CV306, CV405, CV502

UNIT-I

Seismic Hazard Assessment
Engineering Seismology – Definitions, Classification of Earthquakes, Causes of Earthquakes, Internal structure of earth, Seismic waves,
Theory of plate tectonics and seismic zoning of India, Intensity of earthquake and Magnitude of earth quake, Seismographs.  

UNIT-II
Lessons Learnt From Past Earthquakes on the Performance of the Buildings
Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems, Seismo resistant building architecture – lateral load resistant systems, building configuration, Continuous load path, Building characteristics, and other cause of damages. Local site effects on behavior of building during earthquake, Response to ground acceleration – response analysis by mode superposition.

UNIT-III
Earthquake Resistant Design Concepts:

UNIT-IV
Geotechnical Earthquake Engineering:

UNIT-V
Study of Earthquake Resistant low strength earthen buildings as per IS:13827 – 1993, lessons learnt from past earthquakes on the

08 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

VALUATION OF REAL PROPERTIES

Subject Code : 12CV 821 Credits : 03
Hrs/ Week : 3 Total Hours : 39

COURSE OUTCOMES (CO):
After finishing the course successfully, the student shall be
CO1 : Able to classify properties and understand various forms of value.
CO2 : Determine depreciation using different methods
CO3 : Apply various techniques of valuation of lands
CO4 : Understand different forms of rent and determine standard rent
CO5 : Adopt various techniques of valuation of lands with buildings
Pre-requisites of the course: CV 403, CV 405

UNIT-I
COST, PRICE AND VALUE: Nature and essential characteristics of value, forms of value, valuation and its purpose, classification of property- Freehold and leasehold. 9 Hrs

UNIT-II
Sinking fund, amortization, depreciation and obsolescence, methods of depreciation-straight line method, constant percentage method, sum of years digit method, sinking fund method and declining balance method. 9 Hrs

UNIT-III
VALUATION OF LAND: Comparative method, abstractive method, belting method, development method, flat rate technique and hypothetical building scheme or land residual method. Valuation for Land Acquisition. 8 Hrs

UNIT-IV
RENT AND FORMS OF RENT: Outgoings, gross income and net income, year’s purchase, rate of interest, standard rent and its computation, estimating the future life of buildings. 8 Hrs

UNIT-V
VALUATION OF LAND WITH BUILDINGS: Direct comparison, land and building method, rental method, profit method, Valuation for Capital Gains. 8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

**FINITE ELEMENT METHODS OF STRUCTURAL ANALYSIS**

Subject Code : 12CV822  
Credits : 03  
Hrs/ Week : 3  
Total Hours : 39

**COURSE OUTCOMES (CO):**
At the end of the course the student will be able to:
- CO 1: Understand the basics of finite element method of structural analysis
- CO 2: Select the type of finite element to be used in structural analysis
- CO 3: Develop shape functions for different elements
- CO 4: Analyze plane truss and continuous beams by FEM
- CO 5: Develop the algorithm of computer program for Finite Element Analysis.

**Pre-requisites:** CV303, CV402, CV501, CV511, CV714

**UNIT-I**
**8 Hrs**

**UNIT-II**
FINITE ELEMENT METHOD: Fundamentals, Displacement function, Natural coordinates, Boundary conditions, Construction of displacement functions for 2 D truss and beam elements. Application of FEM for the analysis of plane truss and continuous beams.  
**8 Hrs**

**UNIT-III**
ANALYSIS OF 2 D CONTINUUM PROBLEMS: elements and shape functions, Triangular, rectangular and quadrilateral elements, other types of elements, their characteristics and suitability for application.
UNIT-IV
Polynomial shape functions, Lagrange’s and Hermitian polynomials, compatibility and convergence requirements of shape functions. 7 Hrs

UNIT-IV
Isoparametric, sub-parametric and super-parametric elements, characteristics of isoparametric quadrilateral elements. Algorithm of computer program for Finite Element Analysis. 8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

DESIGN OF HYDRAULIC STRUCTURES
Subject Code : 12CV823 Credits : 03
Hrs/ Week : 3 Total Hours : 39

Course Objectives (CO):
At the end of the course student will be able to:
CO1. Study the various Hydraulic structures.
CO2. Learn how to design different cross drainage works
CO3. Understand the Analysis of stability of gravity dams
CO4. Study of types of failures of Dam
CO5. Management of floods using Spillways

Pre-requisites: CV701

UNIT-I
CROSS DRAINAGE WORKS
Introduction, Types of cross drainage works. Design of an aqueduct – Design of waterway for the stream. Fluming of canal: Mitra’s
hyperbolic transition formula. Design of protection works (hydraulic design only)  8 Hrs

UNIT-II

GRAVITY DAM

UNIT-III

EARTHEN DAM

UNIT-IV

SPILLWAYS
Introduction, components of a spillway, types of spillway. Design of oggee spillway. Down stream and up stream profile of the crest of an Ogee spillway.  8 Hrs

UNIT-V

CANAL REGULATORY WORKS

TEXT BOOKS:

REFERENCE BOOKS: