CIVIL ENGINEERING
SYLLABUS FOR B.E.(CIVIL)- 3RD TO 8TH SEMESTERS
2013-2014

PANJAB UNIVERSITY, CHANDIGARH
## TEACHING SCHEME

### BACHELOR OF ENGINEERING (CIVIL) 3rd SEMESTER

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4-6 weeks Industrial training on site after 4th semester.
### BACHELOR OF ENGINEERING (CIVIL) 5th SEMESTER

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TOTAL: 700

### BACHELOR OF ENGINEERING (CIVIL) 6TH SEMESTER

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TOTAL: 700

4-6 weeks industrial training (related to design work) after 6th semester.
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### BACHELOR OF ENGINEERING (CIVIL) 8TH SEMESTER

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OPTIONAL : INDUSTRIAL TRAINING IN EIGHTH SEMESTER
THIRD SEMESTER

COURSE NAME : SURVEYING-I
COURSE NO. : CIV. 301
L P : 4 3
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of the subject is to study the maps and plans and also to learns the techniques for drawing maps in plane areas and in hilly areas using different instruments.

SECTION – A

INTRODUCTION

Basic principles of Surveying, Plans, Scales, Maps, Different types of surveys, Perspective of chain surveying.

COMPASS SURVEY

Principle, Traverses, Meridians, Bearings, Included angles from bearing and vice versa, Prismatic Compass, Surveyor’s compass, Magnetic declination, local attraction, Field work for compass traverse, Plotting and adjustment errors.

LEVELLING

Basic definitions, Dumpy level, Levelling staffs, Simple Levelling, Terms in Levelling, Precautions, Differential Levelling. Field Book for Levelling, Profile levelling, Cross-sectioning & Reciprocal levelling.

CONTOURING

Contour characteristics, direct and indirect methods of contouring, Contour gradients and automatic levels.

SECTION – B

PLANE TABLING

Plane Table and its accessories, Telescopic alidade, Principle, Basic definitions, setting and orienting the plane table, methods of plane tabling, Three point problem, Two point problem.

THEODOLITE TRAVERSING

Vernier Theodolite, Basic definitions, Temporary and permanent adjustments, Measuring horizontal and vertical angle, Optical Theodolites, Electronic Digital Theodolites, Selection and marking of stations for traversing, Angular measurements.

TRAVERSE ADJUSTMENTS

Balancing angles of the traverse, computation of latitudes & departures, consecutive & independent coordinates, Checks for open and closed traverses, Adjustment methods for a traverse, Gales traverse table, Omitted measurements.

TACHEOMETRIC SURVEY

BOOKS:
5. C. Venkatramaish Text Book of Surveying, University Press (India) Limited, Hydrabad

SURVEYING-I (Practical)
CIV 351

Marks: 50
Hours: 03

1. Measurement of distance, ranging a line, plotting of details in chain survey.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
3. Different methods of levelling, height of instrument, rise & fall methods.

COURSE NAME : BUILDING MATERIALS
COURSE NO. : CIV. 302
L   P   : 3    0
Total Lectures : 30
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i. e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objectives : To learn the various building materials and standardized laboratory techniques used to evaluate construction materials performance.

SECTION – A lectures

BUILDING STONES (04)
General, Qualities of a good building stone, Deterioration of stones, Preservation of stones, Common building stones of India & their Uses, Artificial stones.

BRICKS (04)
General, Constituents of bricks, desirable and harmful ingredients in brick earth, qualities of good bricks, testing of bricks, strength, Absorption, weathering of bricks. Varieties of fire bricks, sand lime bricks, building tiles- roofing; flooring and wall tiles.

LIME (04)
Cementing material, Characteristics of good quality lime, classification & testing of Lime, Hydraulic test, acid test, setting & slaking of lime, uses of different varieties of lime

TIMBER (04)
Advantages of timber construction, timber trees- exogenous and endogenous trees; soft and hard woods, structure of tree, felling of trees, defects in timber, characteristics of good timber, uses and testing of timber

SECTION - B

CEMENT AND CONCRETE (02)

 Constituents of concrete, different types of cements used and their strengths. Ingredients and manufacture of cements. Hydration and compounds of hydration. Properties and various tests of cement.

CONCRETE MIXES (03)


PRODUCTION OF CONCRETE (03)


PROPERTIES OF FRESH AND HARDENED CONCRETE (03)


MISCELLANEOUS MATERIALS (03)

 Paints and varnishes; Distempering; white and color washing; glass and glass products; Asphalt and Bitumen.

BOOKS:

5. Civil Engg. Materials: P. D. Kulkarni, TMH
7. Civil Engg. Materials: NITTTR Publication

COURSE NAME : STRUCTURAL ANALYSIS - I
COURSE NO. : CIV. 303

L P : 4 0
Total Lectures: 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objective: The objective of this course is to introduce the students with various types of structures and the concept of stability, determinacy and analysis of these structures.
SECTION- A

INTRODUCTION

(03)
Classification of structures, equations of static equilibrium, Free body diagrams, static determinacy and stability of structure, Principal of superposition

COMPLEX STRESSES

(03)
Introduction, rectangular block subjected to normal stresses along and across two planes, combination of normal and tangential stresses, pure shear, principal stresses and Principal planes, Mohr’s Circle, Principal strains, Computation of Principal stresses from Principal strains.

COLUMN & BUCKLING

(03)
Definitions and examples of instability of columns; criteria for stability of columns, Euler’s theory of columns buckling, Euler’s equation for various end restraints, Rankine formula.

DEFLECTION OF STATICALLY DETERMINATE BEAMS

(03)
Double Integration Method and Macaulay's Method, moment area method, conjugate beam method, unit method and strain energy method. Maxwel's reciprocal theorem, Deflection of Joints of plane frames by unit load method.

THIN CYLINDERS AND SPHERES

(03)
Introduction, stresses and strains in thin cylinders and spherical shell, volumetric change, thin vessels subjected to internal pressure.

ANALYSIS OF DETERMINATE TRUSSES

(05)
Introduction, determination of forces in member of trusses by method of joints, method of sections

SECTION- B

ANALYSIS OF DAMS AND RETAINING WALLS

(04)
Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule.

ROLLING LOADS

(05)
Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc.

INFLUENCE LINES

(06)
Construction of Influence lines for reaction, shear forces and bending moment for simply supported beams, Influence lines for forces in members of frames.

ARCHES

(05)
Introduction, Analysis of three hinged arches, Influence lines for horizontal thrust, shear force, bending moment, radial shear and normal thrust for three hinged arch.

CABLES AND SUSPENSION BRIDGES

(05)
Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, suspension bridge with two hinged and three hinged stiffening girders.
BOOKS:
5. Basic Structural Analysis : C.S. Reddy, TMH
6. Theory of Structures : S. Ramamurtham, TMH

COURSE NAME : TRANSPORTATION ENGINEERING - I
COURSE NO. : CIV. 304
L. P : 4 2
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of the subject is to study highway project planning and to design various elements of roads.

SECTION- A

HIGHWAY PLANNING

(04)

HIGHWAY GEOMETRIC DESIGN

(04)

HIGHWAY MATERIALS

(04)
Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.

HIGHWAY CONSTRUCTION

(04)
Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.

HIGHWAY DRAINAGE

(04)
Importance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas.

SECTION- B

HIGHWAY MAINTENANCE

(04)
HIGHWAY ECONOMICS & FINANCING

Total Transportation Cost, Economic Analysis, Sources of Highway Financing.

TRAFFIC CHARACTERISTICS

Road User Characteristics, Driver Characteristics, Vehicular Characteristics

TRAFFIC STUDIES

Volume and Speed Studies, O-D Survey, Parking Study

TRAFFIC SAFETY

Cause and Type of Accidents, Use of Intelligent Transport System

TRAFFIC CONTROL MEASURES

Signs, Markings, Islands, Signals

BOOKS:


TRANSPORTATION ENGINEERING– I LAB (Practical)
CIV- 354

Marks : 50
Hours : 02

AGGREGATE TESTS

1. Sieve Analysis of fine and coarse aggregates
2. Aggregate Crushing Value Test.
3. Aggregate Impact Value Test.
4. Los Angles Abrasion Value Test.
5. Aggregate Soundness Test.
6. Flakiness Index and Elongation Index Test.
7. Specific Gravity and Water Absorption Test.
8. Laboratory CBR Test.

BITUMEN TESTS

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Viscosity Test.
5. Flash Point and Fire Point Test.

REFERENCES

2. Relevant IS Standards
Objective: The objective of this course is to introduce the students with various types of Fluids and their properties, concept of Fluid Statics, Fluid Dynamics, and Various types of Flows.

SECTION - A

FLUID AND THEIR PROPERTIES  

Concept of fluid, difference between solids, liquids and gases; ideal and real fluids; Continuum concept of fluid: density, specific weight and relative density; viscosity and its dependence on temperature; surface tension and capillarity, vapor pressure and cavitation: compressibility and bulk modulus; Newtonian and non-Newtonian fluids.

FLUID STATICS  

Concept of pressure, Pascal’s law and its engineering hydrostatic paradox. Action of fluid pressure on plane (horizontal, vertical and inclined) submerged surface, resultant force and center of pressure, force on a curved surface due to hydrostatic pressure. Buoyancy and floatation, stability of floating and submerged bodies, Metacentric height and its determination.

FLUID DYNAMICS  

Impulse momentum equation, kinetic energy and momentum correction factors, flow along a curved streamline, free and forced vortex motions.

DIMENSIONAL ANALYSIS AND SIMILITUDE  

Fundamental and derived units and dimensions, dimensional homogeneity, Rayleigh’s and Buckingham’s Pi method for dimensional analysis, dimension less number and their significance, geometric, kinematic and dynamic similarity, model studies.

SECTION -B

LAMINAR FLOWS  

Flow regimes and Reynolds number, critical velocity and critical Reynolds number, laminar flow in circular cross section pipes, Navier-stokes equations in Cartesian coordinates (no derivation), meaning of terms, flow between parallel plates, stokes law.

TURBULENT FLOWS  

Turbulent flows, scale and intensity. Effects of turbulent flow in pipes and flow losses in pipes, Darcy equation, Minor head losses in pipe fittings. Equation for velocity distribution in smooth and rough pipes (no derivation).

BOUNDARY LAYER ANALYSIS  

Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

BOOKS:

1. Fluid Mechanics : Dr. Baljeet S. Kapoor, New Age Publishers
2. Fluid Mechanics & Hydraulic Power Engineering: D.S Kumar, Kataria & Sons
6. Fluid Mechanics & Hydraulic Machines : S.C. Gupta, Pearson Education

COURSE NAME : CONCRETE TECHNOLOGY
COURSE NO. : CIV. 306
L P : 4 0
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

SECTION - A

PROPERTIES OF CONCRETE
Workability, strength, shrinkage and temperature effects, creep, permeability, fire resistance, thermal properties and durability of concrete, stress strain characteristics of concrete, sulphate attack, acid attack. Rheology of concrete, factors effecting Rheological properties.

CHEMICAL AND MINERAL ADMIXTURES

QUALITY CONTROL OF CONCRETE
Need of quality control, Factors causing variation in quality of concrete, field control, advantages of quality control, statistical quality control, quality management in concrete construction, tools for quality management

CONCRETING UNDER SPECIAL CIRCUMSTANCES
Hot weather concreting, cold weather concreting, under ground construction, under water construction.

SECTION –B

DETERIORATION OF CONCRETE AND ITS PREVENTION
Corrosion of reinforcement in concrete, factors influencing corrosion, damages caused by corrosion, preventive measures in construction, tests for existing structures, remedial measures

SPECIAL CONCRETES

SELF COMPACTING CONCRETE
Materials for SCC, Requirements for SCC, workability requirements for fresh SCC, production and placing, slump flow test, J-ring test, V-funnel Test, L box test, U box tests, full box test, oriment test

READY MIX CONCRETE
Advantages of RMC, components of RMC plant, process for central RMC plants, distribution, transport, handling and placing
FOURTH SEMESTER

COURSE NAME : REINFORCED CONCRETE DESIGN - I
COURSE NO.  : CIV. 401
L   P   :   4  2
Total Lectures : 45
Time : 3Hrs
EXTERNAL:  50
SESSIONAL:  50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.
Use of IS 456-2000, SP–16(Charts only) ,IS 1893:2002 is allowed.

Objective: To make the students well acquainted with the basics of RCC & RCC structures and design of various RCC structural components using appropriate CODES.

SECTION – A

INTRODUCTION TO RCC  lectures (06)

Reinforced concrete, definition, properties of materials, grades of concrete and reinforcing steel, stress-strain curves for concrete & steel, permissible stresses, design philosophies working stress design, ultimate strength and limit state design method.

LIMIT STATE DESIGN METHOD  lectures (04)

Introduction, Limit States, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads.

DESIGN OF BEAMS  lectures (09)

Design of singly reinforced & doubly reinforced rectangular beam sections in Flexure, Shear, Bond & Torsion using Limit State method, Development length & continuation of reinforcement beyond cut off points, Design of Flanged Sections (T-sections & L-sections), Check for Limit state of serviceability-deflection, Effective span to effective depth ratios, modification factors for singly reinforced, doubly reinforced and flanged beams, crack formation and its control.

DESIGN OF COLUMNS  lectures (06)

Limit State of Collapse (Compression) Columns and their classification, reinforcement in columns, assumptions, short and long (both tied and helical) columns subjected to axial load, short columns subject to axial, uniaxial and biaxial bending (using SP:16)

SECTION – B

DESIGN & DETAILING OF SLABS  lectures (07)
Design of one-way slab and two-way rectangular slab for various boundary conditions

**DESIGN OF ISOLATED FOOTINGS UNDER AXIAL & ECCENTRIC LOADS**

STAIRCASES

Introduction to various types of stairs, Terminology, design of Single flight and dog legged stairs

**EARTHQUAKE RESISTANT DESIGN**


**BOOKS:**

**REINFORCED CONCRETE DESIGN-I LAB (Practical)**

CIV. 451

Marks : 50
Hours : 02

1. To determine the Specific Gravity of cement.
2. To determine the Standard Consistency,
3. To determine Initial and Final Setting time of Cement.
4. To determine Soundness of Cement.
5. To determine the Compressive Strength of Cement.
6. To determine the Compressive Strength of Bricks.
7. To determine the Transverse Strength of Tiles.
8. To determine the Compressive Strength of Concrete.
9. To determine the Slump of Concrete
10. Non-Destructive Tests

**BOOKS:**
1. Laboratory Manual on Concrete Testing (Part-I) : V. V. Shastri and M. L. Gambhir
2. Laboratory Manual on Concrete Testing (Part-I) : C. B. Kukreja
3. Laboratory Manual on Concrete Technology :PD Kulkarni, LN Mittal & Hemant Sood

**RCC DRAWING - I (Practical)**

CIV. 457

Marks : 50
Hours : 02

Design and detailing of following structural components designed in RCC- I through AUTOCAD

1. Design and detailing of Singly reinforced beams and doubly reinforced beams along with the detailing of stirrups.
2. Design and detailing of columns with different types of reinforcements.
3. Cross sectional view and plan for one way slabs along with the detailing of reinforcement bars showing the clear distance between the bars, bent up bars and extra bars used for negative reinforcement.

4. Design and detailing of single flight and dog legged stair case along with the reinforcement details for the stair case inclined slab.

5. Ductile Detailing of beams & columns as per IS 13920:1993

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<tr>
<th>COURSE NAME</th>
<th>STRUCTURAL ANALYSIS - II</th>
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<td>COURSE NO.</td>
<td>CIV. 402</td>
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Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objective: To develop a technical competence in the fundamental concepts and application of displacement methods and force methods of statically indeterminate structures

SECTION –A

STATICALLY INDETERMINATE STRUCTURES

Introduction to statically indeterminate structures, Static and Kinematic indeterminacy, Equation of Equilibrium, Compatibility Equations, Principle of Superposition, Influence lines for indeterminate structures using Muller Breslau’s Principle. Methods of analysis,

FORCE METHOD OF ANALYSIS

Method of Consistent Deformation, Three moment theorem, Analysis of Fixed and Continuous beams subjected to different loading conditions, sinking and rotation of support.

DISPLACEMENT METHOD OF ANALYSIS - SLOPE-DEFLECTION METHOD

Introduction, slope-deflection equations, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.

DISPLACEMENT METHOD OF ANALYSIS - MOMENT-DISTRIBUTION METHOD

Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements.

SECTION –B

APPROXIMATE METHODS OF STRUCTURAL ANALYSIS

Lateral load analysis of multistory frames, portal method and cantilever method.

METHOD OF STRAIN ENERGY

Strain energy for linear elastic system, Castigliano’s first theorem and its application for deflection calculation in beams and rigid frames, minimum strain energy theorem, Castigliano’s second theorem and its application for analysis of beams and rigid frames, unit load method and its application for analysis of beams and frames.

REDUNDANT FRAMES

(04)
Analysis and deflection calculation using Minimum Strain Energy Theorem, Castigliano’s theorems and Unit load Method, Lack of fit of member, temperature stresses.

**TWO HINGED ARCHES**

(05)

Types of Arches, Analysis of two Hinged Arches, Shear Force and Normal Thrust, Effect of Rib Shortening, Parabolic Arch subjected to concentrated load and UDL, Temperature Stresses, Circular Arches, Reaction Locus, Influence lines.

**BOOKS**:

1. Indeterminate Structures : R. L. Jindal, S. Chand
3. Indeterminate Structural Analysis : Kinney, Edison Wesley
4. Indeterminate Structures : C.K. Wang, TMH
5. Basic Structural Analysis : C.S. Reddy, TMH
6. Indeterminate Structures : A.K. Jain, TMH
7. Structural Analysis (I&II) : S.S. Bhavikatti, Vikas Publishing House

**COURSE NAME** : SURVEYING-II

**COURSE NO.** : CIV. 403

**L P** : 4 3

**Total Lectures** : 45

**Time** : 3Hrs

**EXTERNAL**: 50

**SESSIONAL**: 50

**Note**: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

**Objective**: The objective of the subject is to study surveying with latest softwares and equipments.

**SECTION – A**

**CURVES**

(06)

Types of horizontal curves, Basic definitions, Degree of curve, elements of a curve, Peg interval, setting out curves with and without theodolite, Obstacles in curve setting

**TRANSITION CURVES**

(06)

Combined circular and Transition Curves and their setting out in field. Vertical curves, Setting out vertical curves by chord gradient and tangent correction methods.

**SURVEY ADJUSTMENTS**

(04)


**ELEMENTS OF PHOTOGRAMMETRY**

(06)

Introduction, types of photographs, types and geometry of aerial photograph, flying height and scale, relief (elevation) displacement in vertical photographs. Stereoscopy, measurement of parallax and height determination, flight planning
**GIS** (06)

Definition of GIS, Components of GIS, Application areas & advantages of GIS, Uses of GIS

**DIGITAL REPRESENTATION OF GEOGRAPHIC DATA** (05)

Raster & Vector data representation, acquiring & handling Raster geographic data, Raster based GIS data analysis, Characteristics of vector based GIS data processing.

**GPS** (06)

Introduction, working principle, various application of GPS related to civil Engg., components of GPS – point positioning and differential positioning.

**REMOTE SENSING** (06)

Introduction, principles of electromagnetic remote sensing, remote sensing system classifications, imaging characteristics, extraction of metric information from remotely sensed images, integration of remote sensing & GIS, Introduction of Total station instrument.

**BOOKS:**

5. Understanding GPS, Principles & Applications : Kaplan, E.D, Taylor & Francis

**SURVEYING –II LAB (Practical)**

**CIV- 453**

**Marks** : 50  
**Hours** : 03

1. Remote Sensing: Pocket and Mirror Stereoscopes, Stereo Vision test for 3-D studies, Study of aerial photograph under stereoscopes  
2. Triangulation using total station: Plotting of Traverse  
3. Use of GIS softwares: Vectorizing the scanned files and layering, Editing and projection systems of the data, analyzing the geographical data  
4. Use of GPS softwares: To determine the coordinates of a station by point positioning, To determine the area of a triangulation figure, to locate the alignment of a road  
5. Setting out a simple circular curve by offsets from long chord,  
6. Setting out a simple circular curve by offsets from tangents,  
7. Setting out a simple circular curve by Rankine’s method,  
8. Setting out a simple circular curve by Two theodolite method

**BOOKS:**

1. Surveying Vol. I & II : Dr. K.R. Arora  
2. Surveying Vol. II : Dr. B.C. Punmia

**COURSE NAME** : TRANSPORTATION ENGG. -II  
**COURSE NO.** : CIV. 404  
**L   P** : 4 0  
**Total Lectures** : 45  
**Time** : 3Hrs
Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: To provide knowledge about basics and design aspects of Railway tracks and Airports.

SECTION- A

INTRODUCTION TO RAILWAY ENGINEERING

Development of Indian Railway, Organisation of Indian Railway

RAILWAY GAUGES

Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

RAILWAY TRACK

Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways.

COMPONENTS OF RAILWAY TRACKS

Rails: functions, composition of rail steel, requirement, types of rail sections, selection of rails & buckling of rails, Sleepers; functions, requirement, classification, Ballast; functions, requirement & types, Subgrade material & its improvement, slopes of embankment or cutting & stability of embankments, Track Fixtures & Fastenings; purpose and types, Coning of Wheels, Tilting of Rails, Rail Joints; an ideal rail joint, types of rail joints, Creep of Rails.

GEOMETRIC DESIGN OF RAILWAY TRACK

Alignment, Gradients, Horizontal Curve, Super-elevation, Equilibrium Cant, Cant Deficiency, Transition Curves.

POINTS AND CROSSINGS

Functions, Working and Design of Turnout, Various types of Track Junctions and their layouts, Level-crossing.

RAILWAY STATIONS & YARDS

Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations.

SIGNALLING AND INTERLOCKING

Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signalling, Principal of Interlocking.

MODERNIZATION OF RAILWAY TRACKS

Development of High Speed Tracks, Ballastless Track, MAGLEV Track.

SECTION- B

AIRPORT PLANNING

Air Transport Scenario in India and Stages of Development Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport.
OBSTRUCTIONS AND ZONING LAWS
Imaginary Surfaces, Approach Zones and Turning Zones. (03)

RUNWAY ORIENTATION AND DESIGN
Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration, Aircraft Parking System. (05)

TAXIWAY DESIGN
Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons. (04)

VISUAL AIDS
Marking and Lighting of Runway, Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR. (02)

BOOKS:

COURSE NAME : BUILDING CONSTRUCTION
COURSE NO. : CIV.405
L P : 3 0
Total Lectures : 30
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objectives: To understand the various types of masonry works, causes and affects of dampness, various damp proofing methods, understand and utilize basic principles used in Building Construction such as site selection, orientation of buildings, acoustical design, fire proofing, joints, various building bylaws.

SECTION - A lectures

BRICK & STONE MASONRY (03)
Terms used; types of bonds; their merits and demerits; Rubble and ashlar joints in stone masonry, introduction to cement concrete hollow blocks, advantages and disadvantages of concrete block masonry over brick masonry.

WALLS AND FOUNDATION (03)
Load bearing and non-load bearing walls, estimation of load on walls and footings, Thickness considerations, partition and cavity walls design of masonry walls, pillars and footings.

DAMP PROOFING (04)
Sources, Causes of dampness in buildings, bad effects of dampness, methods of damp proofing.

ARCHES AND LINTELS (02)
Introduction to terms used in Arches; different types of arches; brick and stone arches, types and functions of lintels.

**ROOFS**

Introduction terms used types of roof trusses and roof coverings, details of rain proofing, rain water pipes.

**SECTION- B**

**DOORS AND WINDOWS**

Introduction terms used location of doors and windows, types of doors and windows, methods of fixing doors and window frames in walls. Ventilators.

**PLASTERING, POINTING AND PAINTING**

Introduction, objects and types, special materials for plastered surfaces, distempering, white washing and color washing of plastered surfaces.

**FLOORS**

Introduction, various types of floors commonly used and their suitability for different buildings, constructional details of concrete and Terrazzo floorings, marble flooring, anti-termite treatment.

**MISCELLANEOUS TOPICS**

1. Site selection; and orientation of building.
2. Principles of acoustical design of Building.
3. Fire proof construction methods.
4. Construction and expansion joints.
5. Building bylaws

**BOOKS:**

1. Building Construction: S.K. Sharma, S. Chand
2. Building Construction: Sushil Kumar, Standard Publishers

**COURSE NAME** : FLUID MECHANICS - II  
**COURSE NO.** : CIV. 406  
**L**  **P**  :  4 0  
**Total Lectures** : 45  
**Time** : 3Hrs  

**EXTERNAL:**  50  
**SESSIONAL:**  50  

**Note:** The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

**Objective:** The objective of the course is to give information about the application of different types of flows studied in F.M-I and also to study how the hydraulic energy can be used in hydraulic machines.

**SECTION –A**

**UNIFORM FLOW IN OPEN CHANNELS**

Flow classifications, basic resistance Equation for open channel flow, Chezy, Manning, Bazin and Kutter formulae. Variation of roughness coefficient, conveyance and normal depth, Velocity Distribution. Most efficient flow sections; rectangular, trapezoidal and circular.

**ENERGY AND MOMENTUM PRINCIPLES AND CRITICAL FLOW**

(05)
Energy and specific Energy in an open channel; critical depth for rectangular and trapezoidal channels. Alternate depths, applications of specific energy to transitions and Broads crested weirs. Momentum and specific force in open channel flow, sequent depths.

**GRADUALLY VARIED FLOW**

Different Equation of water surface profile; limitation, properties and classification of water and surface profiles with examples, computation of water surface profile by graphical, numerical and analytical approaches.

**HYDRAULIC JUMP AND SURGES**

Theory of Jump, Elements of jump in a rectangular Channel, length and height of jump, location of jump, Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges

**SECTION –B**

**FLOW PAST IMMERSED BODIES**

Drag and lift deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: lift-Magnus Effect and circulation, lift on a circular cylinder.

**IMPACT OF FREE JETS**

Force exerted by fluid jet on stationary flat plate, Force exerted by fluid jet on moving flat plate, Force exerted by fluid jet on stationary curved vane, Force exerted by fluid jet on moving curved vane

**HYDRAULIC TURBINES**

Head and efficiencies of hydraulic turbines, Work done and efficiencies of Pelton Wheel, Francis and Kaplan turbines, surge tanks

**RECIPIROTATING PUMPS**

Main components and working of reciprocating pumps, Work done by single and double acting pumps, Coefficients of discharge, slip, percentage slip and negative slip of reciprocating pumps.

**CENTRIFUGAL PUMPS**

Main components and working of centrifugal pumps, Work done by impeller Head of Pump, Losses and efficiencies, Specific speed, NPSH, Cavitation in centrifugal pumps.

**BOOKS :**

1. Hydraulic and Fluid Mechanics : Modi and Seth, Standard Book House, Delhi
5. Fluid Mechanics & Hydraulic Power Engineering: : D.S Kumar, Kataria & Sons
6. Fluid Mechanics & Hydraulic Machines : S.C. Gupta, Pearson Education

**FIFTH SEMESTER**

**COURSE NAME** : STEEL STRUCTURES DESIGN-I

**COURSE NO.** : CIV. 501

**L  T  P** : 4  2

**Total Lectures** : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 4 questions from part-A and one question from part-B. The students shall be required to attempt a total of 4 questions with at least 3 questions from part-A and one from part-B.

Use of IS-800-2007 & Steel Tables is allowed.

Objective: To make the students well acquainted with the basics and design of various components used in fabrication of Steel structures.

SECTION – A

BOLTED & WELDED JOINTS

Terminology, Specifications for bolted & welded connections, Types of joints, Efficiency of bolted joint, Framed Connections (Beam to Beam & Beam to Column, Types of welds & welded joints, stresses in welds, design of welds

TENSION MEMBERS

Types of tension members, net & gross areas, permissible stresses. Design of members subjected to axial loads, tension member splice

COMPRESSION MEMBERS

Failure modes of columns, end conditions & effective length of columns, various empirical formulae. IS code formula, General codal provisions for design of compression members. Built up compression members, lacing and battening of compression members, splicing of compression members.

COLUMN BASES AND FOUNDATIONS:

Types of column bases, design of slab base, Gusseted base & grillage foundations.

DESIGN OF FLEXURAL MEMBERS

Failure modes permissible stresses, design of laterally supported and unsupported beams.

SECTION - B

There will be one question either on
Design and Drawing details of a steel roof truss bolted with given forces in various members.

OR

Design and Drawing of welded plate girder with static load u.d.l. over whole span and concentrated load at fixed points.

BOOKS:

3. Design of steel structures N. Subramanian, Oxford University Press
4. Design of steel structures K.S.Sai Ram, Pearson Education
7. Steel Tables

STEEL DRAWING- I (Practical)
Detailed working drawing for using AUTOCAD

1. Steel roof truss.
2. Plate girder (welded)
3. Stanchion beam connections.
4. Grillage foundation.
5. Composite column with laccings

COURSE NAME : IRRIGATION ENGG. I
COURSE NO. : CIV. 502
L P : 4 0
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of this course is to introduce the students with various methods of Irrigation, regarding canal losses, tube wells, Irrigation projects & investigations and important concept of River training works.

SECTION- A

METHODS OF IRRIGATION  (08)
Advantages and disadvantages of irrigation, water requirements of crops, factors affecting water requirement, consumptive use of water, water depth or delta and crop relation, Duty of water, relation between delta, duty and base period, Soil crop relation-ship and soil fertility, sprinkler irrigation advantages & limitations. Planning and design of sprinkler irrigation, drip irrigation advantages & limitations, suitability.

CANAL IRRIGATION  (06)
Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories, suspended and bed loads.

LINED CANALS  (05)
Types of lining, selection of type of lining, Economics of lining, maintenance of lined canals, silt removal, strengthening of channel banks, measurement of discharge in channels, design of lined canals, methods of providing drainage behind lining.

LOSSES IN CANALS, WATER LOGGING AND DRAINAGE  (06)
Losses in canals-Evaporation and seepage, water logging, causes and ill effects of water logging-anti water logging measures. Drainage of land, classification of drains - surface and subsurface drains, Design considerations for surface drains, Advantages and maintenance of tile drains.

SECTION- B

INVESTIGATION AND PREPRRATION OF IRRIGATION PROJECTS  (06)
Classification of project, Project preparation-investigations, Design of works and drawings, concept of multi-purpose projects, Major, Medium and minor projects, planning of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

**TUBE - WELL IRRIGATION** (07)

Types of tube-wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well. Assumptions, Theim & Duputi’s formulae. Interference of tube wells with canal or adjoining tube-wells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tube well.

**RIVER TRAINING WORK:** (07)

Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Artificial cut-off objects and design Considerations River control - objectives and methods.

**BOOKS:**

3. Irrigation Engg. & Hydraulic Structure Varshney, Gupta & Gupta

**COURSE NAME : GEOTECHNICAL ENGINEERING**

**COURSE NO. : CIV. 503**

**L P : 4 2**

Total Lectures : 45

**Time : 3Hrs**

**EXTERNAL: 50**

**SESSIONAL: 50**

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

**Objective:** In civil engineering, study of soil strata, its properties & behaviour and methods of determining them prior to the construction of any structure on that soil strata, plays a vital role. This subject provides all this knowledge to the students.

**SECTION- A**

**BASIC CONCEPTS** (04)

Basic definitions in soil mechanics. Weight volume relationship, phase diagrams, Particle Size Analysis, Types of soil water, capillary action, Frost heave, frost boil, Prevention of frost action, Shrinkage & swelling of soils, Slaking of clay, Bulking of sand

**CLASSIFICATION AND CHARACTERISTICS OF SOILS** (06)

Indian Standard classification System, Consistency limits & their use and determination, various indices, shrinkage parameters, sensitivity, thixotropy & activity of soils

**COMPACTATION** (06)

**CONSOLIDATION**

Definition and object of consolidation difference between compaction and consolidation. Concept of various consolidation characteristics i.e. \(a, m, \text{ and } C_v\) primary and secondary consolidation. Terzaghi’s method for one-dimensional consolidation. Consolidation test. Determination of \(C_v\) from curve fitting methods. Normally consolidated and over consolidated clays importance of consolidation settlement in the design of structures.

**SECTION- B**

**EFFECTIVE STRESS PRINCIPLE**

Concept of effective stress principle, effect of water table fluctuations on effective stress, Seepage pressure, critical hydraulic gradient and quick sand condition.

**PERMEABILITY AND SEEPAGE**


**SHEAR STRENGTH**

Stress analysis of a two-dimensional stress system by Mohr circle, Coulomb - Mohr strength theory, Revised Mohr-Coulomb’s Equation, Relations between principle stresses at failure, Shear strength tests-Direct shear Test, Triaxial test, Unconfined Compression test, Different types of soils, Liquefaction of sands, Shear characteristics of Cohesive & Cohesionless soils

**EARTH PRESSURE**

Terms and symbols used for a retaining wall. Movement of wall and the lateral earth pressure. Rankine’s and Coulomb’s theory for lateral earth pressure. Culmann’s graphical construction and Rehbann’s graphical construction.

**BOOKS :**


**GEOTECHNICAL ENGINEERING LAB (Practicals)**

**CIV- 553**

**Marks : 50  
Hours : 02**

1. Determination of water content.
2. Determination of field density by Core cutter method
3. Determination of field density by Sand replacement method
4. Grain size Analysis by Mechanical Method.
5. Grain size Analysis by Hydrometer Method.
6. Determination of Specific Gravity by Pycnometer.
9. Determination of In-Situ California Bearing Ratio of soil.
Determination of optimum moisture content & maximum dry density of soil by Standard Proctor Compaction Test (SPCT).

REFERENCES
1. Laboratory Manual in soil engineering by A.K.Duggal, NITTTR, Chandigarh
2. Engineering soil testing by Shamsheer Prakash & P.K.Jain, Nem Chand & Bros, Roorkee

COURSE NAME : ENVIRONMENTAL ENGINEERING - I
COURSE NO. : CIV. 504
L   P   : 4  2
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective of this subject is to make aware the students about science and engineering principles to study & improve the sources, quality, supply and treatment of water.

SECTION – A

SOURCES OF WATER SUPPLY

Measurement of rainfall and runoff variations; mass diagram; Definition and Design factors, Groundwater and springs Definition - various types of wells - well construction and development - specific yield and various tests - Infiltration wells and galleries; choice of source of water supply.

QUALITY OF WATER

Testing of various physical-chemical and biological characteristics and their significance; standards of quality for different uses of water

WATER SUPPLY SYSTEMS

Municipal water demands and demand variations, Population forecasting and water demand estimations; Intakes and transmission systems, pipes for transporting water and their design, water distribution systems and appurtenances; Data and background information for the design of water supply system; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems.

SECTION – B

PUMPS AND PUMPING

Necessity of pumping, classification of different type of pumps and their characteristics and selection criteria, economical diameter of the rising main, pumping stations

WATER TREATMENT

Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration: slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and defluoridation, and water desalinization and demineralization.

TOOLS FOR CLEAN PRODUCTIONS

(05)
Reuse, recycle, recovery, source reduction life cycle analysis; environmental cost accounting, EIA. Air and Noise pollution (source, effects and control), noise level standards.

Small scale and household level water purification system and water fixtures

BOOKS:

7. Waste water Engineering : S.N. Paul & Arvind Kumar, APH Publishing House

ENVIRONMENTAL ENGINEERING – I LAB (Practical)

CIV- 554

Marks : 50
Hours : 02

1) Determination of Color & Turbidity.
2) Determination of Solids: Total, Dissolved and Suspended solids.
3) Determination of Alkalinity and its species.
4) Determination of pH, and Acidity and its species.
5) Determination of Hardness (different types)
6) Determination of Chlorides.
7) Determination of Fluorides.
8) Jar test for optimum coagulant dose estimation.
9) Determination of residual chlorine and chlorine dose.

COURSE NAME : ESTIMATING AND COSTING

COURSE NO. : CIV. 505

L. P : 3 0
Total Lectures : 30

Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i. e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objective: To estimate the quantity of materials in a building and its probable cost

SECTION – A

ESTIMATES

Method of building estimates, types, site plan index plan, layout plan, plinth area, floor area, Technical sanction, administrative approval, estimate of buildings, roads, earthwork, R.C.C. works, sloped roof, roof truss, masonry platform, complete set of estimate

ANALYSIS OF RATES

For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork, Door and windows, whitewashing, painting
SECTION- B

SPECIFICATIONS (04)
For different classes of building and Civil engineering works.

CONTRACTS, WORKS AND TENDER (04)
Tenders, tender form, submission and opening of tenders, Classification of contracts, Classification of workss measurement book, muster roll, piecework agreement and work order

ACCOUNTS (04)

BUILDING BYELAWS (04)
Building Byelaws, Definitions, Procedure for submission of building application and execution of works, Siting Planning and Architectural control

BOOKS:
3. P.W.D. Accounts : Chief Engineer, B & R, Punjab

SIXTH SEMESTER
COURSE NAME : REINFORCED CONCRETE DESIGN - II
COURSE NO. : CIV. 601
L   P   : 4   2
Total Lectures : 45
Time         : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objective : To understand the fundamental principles and procedures of reinforced concrete design of continuous beams, slabs, foundations, retaining walls, water retaining structures.

SECTION – A

CONTINUOUS BEAMS (06)
Design of continuous beams using I.S. Code method.

BEAMS CURVED IN PLAN (06)
Introduction, Design of circular and semicircular beams

YIELD LINE ANALYSIS OF SLABS (06)
Introduction, Assumption, Locations of Yield lines, Method of Analysis, Analysis of one way slabs and two way slabs, Rectangular Slab simply supported at three edges and free at the upper edge.

**SECTION – B**

**DESIGN OF FOUNDATIONS** (08)

Design of isolated footing (axial & eccentric loading), Design of Combined footings (rectangular and trapezoidal), strap footings, raft footing. Design of Deep foundations.

**RETAINING WALLS** (06)

Types, behaviour, stability requirements, design of cantilever and counterfort type retaining walls.

**DOMES** (06)

Design of Spherical and conical domes,

**WATER TANKS** (07)

Design of water tanks on no crack basis, circular and rectangular tanks resting on ground, underground water tanks.

**BOOKS:**

2. Limit State Design: Punmia, Luxmi Publications
5. Reinforced Concrete Structures: Syal and Goel, Wheeler Publishers Allahabad

**RCC DRAWING – II (Practical)**

CIV. 651

MARKS: 50

Hours: 02

**DETAILED WORKING DRAWINGS OF FOLLOWING (USING AUTOCAD)**

1. Drawing and detailing of reinforcement in Isolated, combined rectangular and trapezoidal and strap footing.

2. Drawing and detailing of reinforcement in continuos beam with typical Sections.

3. Drawing and detailing of reinforcement in curved beam with typical Sections.

4. Drawing and detailing of retaining walls (cantilever and counter fort type).

5. Drawing and detailing of reinforcement in Rectangular and Circular water tanks resting on ground.

6. Drawing and detailing of Spherical and conical domes with a typical cross section.

**COURSE NAME**: CONSTRUCTION PLANNING AND MANAGEMENT

**COURSE NO.**: CIV. 602

L P: 30

Total Lectures: 30

EXTERNAL: 50

SESSIONAL: 50

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Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of the course is to apprise the students about planning the project, works management and knowledge about various types of construction equipments.

SECTION- A

WORKS MANAGEMENT  lectures

INTRODUCTION

Need for project planning and management, Three phases of project planning, Bar Chart, Milestone Chart, Uses and Drawbacks, Evolution of networks, Terminology.

PERT PROGRAMME (EVOLUTION AND REVIEW TECHNIQUE)

Brief History of Evolution of PERT Salient features, construction of PERT network, multiple time estimates and network analysis, earlier events time, latest even time, forward pass and backward pass, event slack, concept of critical path and its identification, data reduction, Application of statistics to probability of achieving a target data, suitability of PERT for research projects.

CPM (CRITICAL PATH METHOD)

Definitions, network construction. Fundamental rules, assignment of duration of activities, determination of project schedule, activity time estimates earliest start and earliest finish, latest start and latest finish time-float types-free float, independent float, Interfering float -0 their significance in project control, identification of critical path, Updating.

PROJECT COST ANALYSIS

Types of project costs direct and indirect cost-time relationships, cost slopes straight-line and segmented approximations, optimum cost and optimum duration, examples on crashing, Comparison of CPM and PERT.

SECTION- B

CONSTRUCTION ENGINEERING

FACTORS AFFECTING SELECTION OF CONSTRUCTION EQUIPMENT

Types of equipment; cost of owning and operating equipment depreciation cost; obsolescence cost; investment cost; operating cost; economic life of equipment; maintenance and repair cost.

EARTH MOVING MACHINERY

Tractor and related equipment; bulldozers; angle dozers; rippers; scrappers; power shovels; dragline; slack line; clamshells hoes; trenching machines.

CONSTRUCTION EQUIPMENTS

Cement concrete plants for grading, batching, mixing, types of mixers, handling and transporting concrete, concrete pumps, placing concrete, compacting concrete, bituminous mix plants, pavers and finishers.

HOISTING AND TRANSPORTING EQUIPMENT

Hoists winches, cranes, belt conveyors, ropeways trucks and wagons, balancing the capacity of hauling units with the size of excavator.

BOOKS:

3. Construction Equipment, Planning and Application : Mahesh Verma
COURSE NAME                :  ADVANCED STRUCTURAL ANALYSIS
COURSE NO.                 :   CIV. 603
L   P                    :    4   0
Total Lectures                :     45

EXTERNAL:  50
SESSIONAL:  50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

SECTION- A

BASIC CONCEPTS (05)
Equations of static Equilibrium, Degree of static Indeterminacy, Degree of kinematic Indeterminacy, Actions and Displacements, equilibrium, compatibility, principle of superposition, Equivalent joint loads.

FLEXIBILITY AND STIFFNESS MATRICES (06)
Flexibility and stiffness, Flexibility matrix, Stiffness Matrix, Relationship between Flexibility matrix and Stiffness Matrix, Force and displacement Methods.

CONTINUOUS BEAMS (04)
Force method, Displacement Method, Comparison of Methods

SECTION- B

RIGID JOINTED PLANE FRAMES (08)
Force method, Displacement Method, Comparison of Methods.

PIN JOINTED PLANE FRAMES (08)
Displacement of a Pin jointed Plane frame, Stiffness of a Pin joint, Member forces, Force method, Displacement Method, Comparison of Methods.

TRANSFORMATION MATRICES-ELEMENT APPROACH (05)

BOOKS:
1. Matrix Methods in structure analysis: Pundit & Gupta, TMH

COURSE NAME : ENVIRONMENTAL ENGG.- II
COURSE NO. : CIV. 604
L P : 4 2
Total Lectures : 45

EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

SECTION – A

INTRODUCTION
Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions.

DESIGN OF SEWER
Quantity of sanitary and storm sewage flow, forms of sewers. Conditions of flow in Sewers, sewers of equivalent section, self cleansing and limiting velocity, hydraulic formulae for flow of sewerage in sewers and their design.

CONSTRUCTION & MAINTENANCE OF SEWERS
Sewer appurtenances, Materials for sewers. Laying of sewers, joints in sewers, testing of sewers pipes. Maintenance, operation and precaution before entering a sewer.

HOUSE DRAINAGE
Principles of House drainage, traps, Inspection chamber Indian and European type W.C. Flushing cisterns, soil-waste and anti-syphorage pipes, plumbing system.

CHARACTERISTICS & TESTING OF SEWAGE
Composition of sewage, sampling, physical & chemical analysis of sewerage, biological decomposition of sewage, kinetics of organic waste stabilization.

SECTION - B

TREATMENT OF SEWAGE
Unit processes of waste water treatment, screens, grit-chambers, detritus tank, skimming tank, grease traps, sedimentation, chemical treatment, aerobic biological treatment, trickling filter (LRTF & HRTF), activated sludge processes, anaerobic treatment, units-sludge digesters and biogas plant.

INDUSTRIAL WASTE TREATMENT
Nature and characteristics of industrial wastes; Control and removal of specific pollutants in industrial wastewaters, i.e., oil and grease, cyanide, fluoride, toxic organics, heavy metals.

GROUND WATER CONTAMINATION
Waste containment principles; environmental control through liners, covers, leachate management and gas management, control and remedial measures for contaminated sites; pollution control regulations.

LOW COST WASTE WATER TREATMENT UNITS
Oxidation's Ponds, Lagoons, ditches, septic tanks and imhoff tanks, Theory, design, advantages & disadvantages.

BOOKS :
1. Determination of DO.
2. Determination of BOD.
3. Determination of COD.
4. Determination of Sulphates.
5. Determination of Nitrite and Nitrate nitrogen.
7. Determination of phosphorus (total and available).
8. Determination of SVI (including MLSS and MLVSS estimations).

COURSE NAME : FOUNDATION ENGINEERING

COURSE NO. : CIV. 605

L T P   :  4  2
Total Lectures :  45

EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

SECTION – A

STABILITY OF SLOPES  
Necessity, causes of failure of slopes. Stability analysis of infinite and finite slopes in sand and clay. Taylor’s stability number and its utility.

SHALLOW FOUNDATION 

MACHINE FOUNDATIONS 
Basic definition of theory of vibration terms, Analysis of theory of single degree system for :- Free vibrations, Damped Free vibrations, Forced vibrations with constant Harmonic Excitation (Frequency response curves) Dynamic soil properties (Equivalent spring constants) Determination of Cu by cyclic plate load test and Block
vibration test. Natural frequency of foundation-soil system by Barkans Method, Co-relation between Cu and other dynamic properties of soil. Type of machine Foundations - Neat sketches and brief description.

**STRESS DISTRIBUTION**


**SECTION – B**

**SOIL INVESTIGATION**

Objective of soil investigation for new and existing structures, Depth of exploration for different structures, Spacing of bore holes, Methods of soil exploration and relative merits and demerits.

**PILE FOUNDATION-I**

Necessity and uses of piles, classification of piles, Types of pile driving hammers & their comparison, Effect of pile driving on adjacent ground. Use of Engineering news formula and Hiley’s formula for determination of allowable load, Pile Load Test, separation of skin friction and point resistance using cyclic pile load test data. Related Numerical problems.

**PILE FOUNDATION-II**

Determination of point resistance and frictional resistance of a single pile by static formula, Piles in clay, safe load on a friction and point bearing pile. Pile in sand spacing of piles in a group, factors affecting capacity of a pile group. Efficiency of pile group bearing capacity of a pile group in clay, Settlement of pile groups in clay and sand Negative skin friction.

**CAISSONS AND WELLS**


**BOOKS:**


**FOUNDATION ENGG. LAB (Practicals)**

**CIV 655**

**Marks : 50**

**Hours : 02**

1. Determination of Unconfined Compressive Strength of soil.
2. Determination of shear parameters by Direct Shear Test.
3. Determination of shear parameters by Triaxial Test.
4. Determination of undrained shear strength of cohesive soils by Vane Shear Test.
5. Determination of void ratio of cohesionless soil in loosest & densest state by Relative Density apparatus.
7. To collect data about bearing capacity and frictional resistance of soil by Static Cone Penetration Test.
8. Determination of Consolidation parameters.

REFERENCES
1. Laboratory Manual in soil engineering by A.K. Duggal, NITTTR, Chandigarh
2. Engineering soil testing by Shamsher Prakash & P.K. Jain, Nem Chand & Bros, Roorkee

SOFTWARE LAB
CIV-656

MARKS: 50
Hours: 02

Civil Engineering Softwares like STAAD PRO, Auto Civil 3D, ANSYS Etc.

1. Analysis of Beams with different support conditions and loading conditions.
2. Analysis of 2-D Portal Frame for vertical and horizontal loading (Multi storeyed and Multi Bay)
3. Design of foundations using STAAD Foundation.
5. Analysis and Design of Water Tank.
7. Analysis and Design of 3-D frame (Multi storeyed and Multi Bay)

SEVENTH SEMESTER

COURSE NAME: STEEL STRUCTURES DESIGN -II
COURSE NO.: CIV. 701
L  P: 4  2
Total Lectures: 45

Time: 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of this course is to introduce the students with the design of advanced steel structures.

SECTION –A

DESIGN OF ROUND TUBULAR STRUCTURES (08)

Introduction, round tubular sections, permissible stresses, tube columns and compression members, tube tension members, tubular roof trusses, Design of tubular beams, Design of tubular purlins.

DESIGN OF STEEL FOOT BRIDGE (07)

Introduction, design of flooring, cross girders, analysis of N-type truss, design of various members of truss, design of joints, design of bearings.

DESIGN OF COMPLETE INDUSTRIAL BUILDING WITH DESIGN OF (15)

Gantry Girder
Column bracket,
Mill bent with constant moment of inertia
Lateral and longitudinal bracing for column bent etc.
SECTION –B

DESIGN OF A SINGLE TRACK THROUGH TYPE RAILWAY BRIDGE WITH LATTICE GIRDERS HAVING PARALLEL CHORDS

Design of stringers
Design of cross girders
Design of connection between stringer and cross girder
Design of main girders
Design of bottom lateral bracing and top lateral bracing
Design of portal bracing and sway bracing
Design of bearings

BOOKS:
3. Raz S A “Structural Design in Steel” New Age International (P) Ltd., New Delhi, 2002

STEEL DRAWING- II

CIV- 751

MARKS: 50
HRS: 02

DETAILED WORKING DRAWINGS FOR (USING AUTOCAD)
(i) Industrial Building
(ii) Railway Bridge
(iii) Foot Bridge

COURSE NAME : IRRIGATION ENGINEERING -II
COURSE NO. : CIV. 702
L  P : 4 2
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objective: The objective of this course is to introduce the students with various theories of seepage and design of various important irrigation based structures.

SECTION A

THEORIES OF SEEPAGE

Seepage force and exit gradient, salient features of Bligh’s Creep theory, Lane’s weighted Creep theory and Khosla’s theory, Determination of uplift. Pressures and floor thickness.

DESIGN OF WEIRS

Weirs versus barrage, design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.
ENERGY DISSIPATION DEVICES

Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

DIVERSION HEAD WORKS

Functions and investigations: component parts of a diversion head work and their design considerations, silt control devices.

SECTION- B

DISTRIBUTORY REGULATORS

Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape.

CANAL FALLS

Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

CROSS-DRAINAGE WORKS

Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.

CANAL OUTLETS

Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

BOOKS:


IRRIGATION DRAWING- II

CIV- 752

MARKS: 50
HRS: 02

DESIGN AND DRAWING OF THE FOLLOWING (USING AUTOCAD)

1. Design and detailing of both lined and unlined canals with typical sections of both types of canals clearly indicating the stone pitching etc.
2. Design and detailing of Guide bank along with the cross sections at the u/s and d/s end of guide banks.
3. Design and detailing of Weir or barrage along with the various cross sections.
4. Design and detailing of any one type of cross head regulator with a typical cross section.
5. Design and detailing of A.P.M. Outlet along with a typical cross section.
6. Design and detailing of siphon aqueduct along with a typical cross section.

COURSE NAME : HYDROLOGY AND DAMS
Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of this course is to introduce the students with general Hydrological study & various types of Dams, spillways their design considerations along with seepage determination and control.

SECTION- A

PRECIPITATION

Importance of hydrological data in water resources planning. The hydrologic cycle, Mechanics of precipitation, types and causes, measurement by rain gauges, gauge networks. Hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves, depth area-duration curves.

INTERCEPTION, EVAPORATION AND INFILTRATION


RUNOFF

Factors affecting runoff, runoff hydrography, unit hydrograph theory, S-curve hydrograph, Synder’s S synthetic unit hydrograph. Principles of flood routing through a reservoir by I.S.D. method (description only).

PEAK FLOWS

Estimation of Peak flow-rational formula, use of unit hydrograph, frequency analysis, Gumble’s method, design flood and its hydrograph.

SECTION- B

INTRODUCTION TO DAMS

Choice of type of dam, site selection, investigation, foundation treatment.

GRAVITY DAMS

Non-over flow and over flow section, forces acting, stability factors, stresses on the faces of dam. Design of profile by the method of zoning. Elementary profile of a dam, upstream lip and approach ramp. Discharge characteristics of spillways. General principles of design of spillways - Ogee, Chute, side channel and siphon.

EARTHEN DAMS

Components of earthen Dams and their functions; Phreatic line determination by analytical and graphical methods. Seepage determination and control.

ARCH AND BUTTRESS DAMS

Classification of arch dams constant, radius, constant angle and variable radius types, cylinder theory, Expression relating central angle and cross-sectional area of arch. Types of buttress dams, Advantages of buttress dams.

BOOKS:

3. Earth Dams : Bharat Singh, Nem Chand and Bros., Roorkee
6. Applied Hydrology : Linsley, Kohler, Paul H., Tata McGrawhill,

**COURSE NAME** : BRIDGE ENGINEERING  
**COURSE NO.** : CIV. 704  
**L P** : 3 0  
**Total Lectures** : 30  
**Time** : 3Hrs  
**EXTERNAL**: 50  
**SESSIONAL**: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

**Objective**: The objective of course is to teach students about bridge engg, design.

### SECTION A

**INTRODUCTION**: (08)

Definition, components of a bridge, Investigation of Bridges: Need for investigations, selection of bridge site, choice of bridge type, preliminary data of be collected, design discharge and its determination, linear waterway, choice of span, economical span, vertical clearance above HFL, afflux, Scour depth

**STANDARD SPECIFICATIONS** (08)

Classification of bridges, balanced cantilever bridges For road bridges, I.R.C. loadings, Code provisions on width of carriage way, clearances, loads considered etc. standard specifications for Railway bridge code.

**REINFORCED CONCRETE BRIDGES**: (08)

Design of R.C.C. Box culvert, Courbon’s theory for load distribution, illustrative examples, pre-stressed concrete bridges,

### SECTION B

**SUB STRUCTURE**: Types of piers and abutments, design forces, design of piers and abutments. (09)

**BEARING AND JOINTS** : (04)

Various types of expansion bearing and fixed bearings, elastomeric bearings, joints and their types.

**MAINTENANCE**: (03)

Introduction to construction, Inspection and maintenance of bridges.
**BOOKS:**

6. I.R.C Codes

**COURSE NAME :** ADVANCED TRANSPORTATION ENGINEERING  
**COURSE NO. :** CIV. 705  
**L  P   :** 3 0  
**Total Lectures :** 30  
**Time   :** 3Hrs  
**EXTERNAL:** 50  
**SESSIONAL:** 50  

Note: The examiner shall set 8 questions i. e 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

**Objective:** The objective of this course is to give knowledge about design of flexible & rigid pavements and basic knowledge of docks, harbours & tunnels.

**SECTION A**

**INTRODUCTION**  
(04)
Types of pavements, Importance and functions of various components of pavement structures, design factors-design wheel load, Equivalent single wheel load, Repetition of loads, climatic variations.

**DESIGN OF FLEXIBLE PAVEMENTS**  
(04)
Flexible pavement design methods: CBR method, Group Index method, IRC method of design of flexible pavements.

**DESIGN OF RIGID PAVEMENTS**  
(05)
General design considerations, Wheel load stresses, Westergaard’s stress equation for wheel loads, evaluation of wheel load stresses, temperature stresses, design of joints, design of dowel and tie bars, IRC method of design of rigid pavements, CRCP(Continuously Reinforced concrete pavements), FRC( Fibre reinforced concrete pavements) and Pre-stressed concrete pavements.

**BITUMINOUS MIX DESIGN**  
(04)
Requirement of bituminous mixes , Marshall method of bituminous mix design.

**SECTION B**

**HARBOURS**  
(04)
Harbours & Ports, Water Transportation, Natural phenomenon; Tides, wind & waves, Classification, Facilities at a major port, Protection facilities: wall type & special breakwater, Planning & layout of ports
DOCKS  
General, Classification of Docks, Docking facilities, Repairing facilities-Fixed Form & Movable Form, Approach facilities, loading and unloading facilities. Guiding facilities-Light house & Signals, Storing Facilities

TUNNELS  
General, Basic definitions, Advantages & Disadvantages of tunnels & open cuts, Selection of alignment of tunnels, Classification of tunnels, Tunnel approaches,

PROBLEMS IN TUNNELING  
Introduction to various stages in tunnel construction, Methods of Tunnelling in Soft soils & Rocks, Tunnel Lining-Necessity & Materials used, Drainage in Tunnels, Health protection in tunnels.

BOOKS:

EIGHTH SEMESTER

COURSE NAME : ADVANCED ENVIRONMENTAL ENGG.
COURSE NO. : CIV. 801
L P : 4 0
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objectives: To make student updated about the recent environmental trends and global environmental issues that comes across in domestic and industrial life.

SECTION A

ENVIRONMENTAL ISSUES IN INDIA  
Forest and agricultural degradation of land, resource depletion (water, mineral, forest, sand, rocks etc.), environmental degradation, public health, loss of biodiversity, loss of resilience in ecosystems, Land pollution, Greenhouse emissions, Environmental issues and Indian law, Conservation, Specific issues

BIOLOGICAL ENVIRONMENT  
Community health-significance, disease transmission, Health Education, occupational health, hazards, plan prevention and control, Water borne disease.
SOIL & AGRICULTURAL POLLUTION (04)

Top soil, pollution, parameter of soil analysis, remedial measures, related disease.

GLOBAL ISSUES (04)

Green construction & Eco renovation, CO2 Pollution and Global Warming, Compact Fluorescent Lights (CFLs), radiation /nuclear/radioactive pollution.

EIA & ENVIRONMENTAL AUDIT (04)

Environmental Impact Assessment, social and economic aspects, Brief study of Environmental audit, audit items, audit procedure, Safety audit.

SECTION B

INDUSTRIAL POLLUTION (05)

Paper and pulp, cane sugar and distilleries, dairy plant, petrochemical and refineries, and other industrial units.

WASTE WATER FROM INDUSTRIES (04)

Waste characteristics, harmful effects, Pre treatment of industrial waste, reduction of waste strength and volume equalization and neutralization.

LEGAL REQUIREMENTS (04)

Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; Rules related to recycled plastics, used batteries, fly ash, etc. function of pollution control board and legal aspects

SOLID WASTE MANAGEMENT (05)

Properties of solid wastes, management of solid wastes in India, disposal of wastes, sanitary land filling including leachate collection and treatment, recovery of methane from landfill sites for power generation.

BOOKS :

1. Waste Water Engineering : Metcalf and Eddy Inc. TMH.
4. Industrial Wastewater Treatment: A Guidebook : Joseph D. Edwards

COURSE NAME : COMPUTATIONAL METHODS

COURSE NO. : CIV. 802

L P : 4 0

Total Lectures : 45

Time : 3Hrs

EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of this course is to make students aware of how to use various computational techniques in solution of problems related to civil engineering.

SECTION A

MATRICES AND LINEAR SYSTEM OF EQUATIONS (15 lectures)


SEQUENCES AND SERIES (12)

Sequences, limits of sequences, infinite series, series of positive terms, integral test, comparison test, ratio test, root test, Alternating series, Absolute and conditional Convergence, Leibnitz test, Power series: radius of convergence of power series, Taylor’s and Maclaurin’s series, Formulæ for remainder term in Taylor and Maclaurin series, Formulæ for remainder term in Taylor and Maclaurin series, Error estimates

SECTION B

NUMERICAL METHOD (18)


BOOKS:


Advantages of RMC, components of RMC plant, process for central RMC plants, distribution, transport, handling and placing

BOOKS:

2. Concrete technology : A.S. Santhakumar

COURSE NAME : MAINTENANCE OF BUILDINGS
COURSE NO. : CIV. 803
L P : 4 0
Total Lectures : 45
Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50
Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objectives: To understand the importance of maintenance, maintenance management, repair materials, investigation and diagnosis for repair of structures, problems and root causes and remedial measure

SECTION- A

PRINCIPLES OF MAINTENANCE

Importance of maintenance, deterioration and durability, factors affecting decision to carryout maintenance, maintenance and GNP, agencies causing deterioration, effect of deterioration agencies on materials.

DESIGN AND ECONOMIC CONSIDERATION IN MAINTENANCE

Factors to reduce maintenance at design stage, consideration if maintenance aspects in preparing tender document and specifications, sources of error in design which enhances maintenance and its importance at design stage. Economic consideration in maintenance: physical life, functional life, economic life of different types of buildings, discounting technique for assessment of economic life.

MAINTENANCE MANAGEMENT

Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance.

MATERIALS FOR MAINTENANCE

Compatibility of repair materials, durability and maintenance, types of materials, their specification and application, criteria for selection of material, use of commercial available materials in maintenance.

SECTION- B

INVESTIGATION AND DIAGNOSIS FOR REPAIR OF STRUCTURES

Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis, and confirmation and repair steps.

MAINTENANCE PROBLEMS AND ROOT CAUSES

Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes.

REMEDIAL MEASURES FOR BUILDING DEFECTS

Preventive maintenance and special precautions – considerations, preventive maintenance for floors, joints, wet areas, water supply and sanitary systems, termite control, common repair techniques, common methods of crack repair.
- Repair of existing damp proofing systems in roofs, floors and wet areas.
- Protection, repair and maintenance of RCC elements.
- Repair of finishes.
- Repair of building joints.
- Repair of water supply and sanitary systems, under ground and over head tanks.
- Common strengthening techniques.

MAINTENANCE OF MULTISTOREY BUILDINGS

Specials features for maintenance of multi-storeyed buildings, including fire protection system, elevators, booster pumps, generator sets.
Leakage detection techniques in pipes, cleaning of pipes, replacement of pipes, clogging of sewer pipes, cleaning and their repairs, special precaution required in sewer pipe maintenance, maintenance of septic tanks, maintenance of AC and electrical system in buildings.

BOOKS:

3. Repair and Rehabilitation of Concrete Structures, ACI Compilation 10.
4. Gahlot & Sharma, CBS, Publications
8. W.H. Ransom; Building Failures: Diagnosis and Avoidance, New Age Publications (P) Limited

CONCRETE TECHNOLOGY LAB

CIV- 853

MARKS: 50
HRS: 02

To determine quality of hardened concrete by ultrasonic pulse velocity method.
To determine the size and location of bars using profometer.
To determine flexural strength of concrete.
Mix design of M20 concrete.
Mix design of M20 concrete using admixtures
Mix design of M20 using fly ash.
To determine the permeability of concrete.
To determine the workability of SCC by slump flow test.

Books:

1. Laboratory Manual on Concrete Testing (Part-I) : V. V. Shastri and M. L. Gambhir
2. Laboratory Manual on Concrete Testing (Part-I) : C. B. Kukreja
3. Laboratory Manual on Concrete Technology :PD Kulkarni, LN Mittal & Hemant Sood

COURSE NAME : HYDROPOWER ENGINEERING

COURSE NO. : CIV. 804

L. P : 4 0

Total Lectures : 45

Time : 3Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i. e 4 from each part and students shall be required to attempt a total of 5 questions with atleast 2 questions from each part.

Objective: The students will be made conversant with the hydrology of hydro power projects, power generation and distribution methodology and types of hydropower stations. They shall know the constraints and opportunities in hydro power generation. They shall be conversant with all the components of power station, operation and maintenance of power house. They shall be able to broadly analyze and design such components.

SECTION A

INTRODUCTION
Waterpower Development – its types, distribution and use World’s largest hydropower generating plants, Potential of hydropower in India- its development and future prospect.

**ANALYSIS OF STREAM FLOW AND DEMAND** (4)

Flow duration curve, firm power, Secondary power, Load factor and Load duration curves, firm capacity, reservoir capacity, capacity factor etc.

**TYPES OF HYDRO POWER PLANTS** (5)

Classification of hydro power plants, Run-of-river plants, Valley dam plants, High head diversion plants, Diversion Canal Plants, Pumped storage plants, Tidal power plants

**WATER CONVEYANCE SYSTEM** (4)


**SPILLWAYS** (5)


**SECTION B**

**INTAKE STRUCTURES** (5)

functions, location, intake type, trash rack, dimension, design, spacing of bars, method of cleaning, shape of inlet, power canal, location, site, forebay, size, capacity, gates and valves.

**TUNNELS.** (5)

geometric and hydraulic design, penstock, location, type, Economical diameter of penstock

**SURGE TANK** (4)

Functions, type, Design of Surge tank, methods of surge analysis, restricted orifice and differential surge tanks, downstream surge tanks.

**POWER HOUSE DETAILS** (6)

Location, site and general arrangements, draft tubes, tail trace and their hydraulic design, turbines, number, make, size, type, characteristics and efficiency, pumps, Generators, exciters, switchboard, transformers and other accessories.

**TRANSMISSION SYSTEMS** (3)

General introduction, financial implications of Hydro Power plants

**BOOKS:**
6. Hydro Power an Indian Perspective, Author-Cum-Editor Dr. B.S.K. Naidu, Director General, NPTI.

**COURSE NAME** : PRESTRESSED CONCRETE DESIGN
Objective: The objective of course is to teach students methods of prestressed concrete design.

SECTION A

INTRODUCTION

Basis concepts, Materials used, advantages of prestressed Concrete, Applications of prestressed concrete.

MATERIALS FOR PRESTRESSED CONCRETE

High strength concrete, strength requirements permissible stresses in concrete, creep & shrinkage, deformation characteristics, high strength steel, strength requirements, permissible stress in steel.

PRESTRESSING SYSTEMS

Introduction, prestressing systems, post-tensioning systems, chemical prestressing.

LOSS OF PRESTRESS

Nature of losses, different types of losses and their assessment.

ANALYSIS OF PRESTRESS & BENDING STRESS

Basic assumptions, Resistant stresses at a section, pressure line, and concept of land balancing, stresses in grading moment.

SECTION B

FLEXURAL SHEAR STRENGTH OF PRESTRESSED CONCRETE SECTIONS

Types of flexural failure, strain compatibility method, code procedures, shear and principal stresses, ultimate shear resistance of prestressed concrete members, prestressed concrete members in torsion.

TRANSFERS OF PRESTRESS IN PRE-TENSIONED AND POST-TENSIONED MEMBERS

Transmission Length, bond structures, Transverse tensile stress End-zone reinforcement, stress distribution in end block.

DESIGN PRESTRESSED CONCRETE SECTIONS

Design of section for flexure, Axial tension compression & bending, shear, bond and torsion

BOOKS:

COURSE NAME: TOWN PLANNING & ARCHITECTURE
COURSE NO.: CIV. 806
L P: 30
Total Lectures: 30
Time: 3 Hrs
EXTERNAL: 50
SESSIONAL: 50

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Objective: The objective of this course is to make students aware of the various elements of planning and architectural elements of it.

SECTION A

ELEMENTS OF DESIGN (03)
Line direction. Shape, size, texture, value and colour, balance, scale and proportion.

PRINCIPLES OF DESIGN (03)
Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions.

THE INDUSTRIAL REVOLUTION (03)
The age of revivals, the emergence of engineer, new materials and techniques and the evolution of balloon frame and steel frame.

ORIGIN OF MODERN ARCHITECTURE (03)
definition and concept of modern architecture, various pioneers of modern architecture.

TOWN PLANNING (03)
Definition and meaning, age of planning, scope and motives of planning, brief history of town planning – its origin and growth, historically development of town planning in ancient valley civilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planning.

SECTION B

NEW CONCEPTS (03)
Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburn, La-cite industrille, Radiant city to present day planning.

PLANNING PRINCIPLES (03)
Types of town and their functions, types of town planning – Grid Iron, Radial, Spider webs, Irregular and Mixed, their advantages and disadvantages.

PLANNING PRACTICE AND TECHNIQUES (04)
Zoning – its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – city rehabilitation and slum clearance.

BUILDING SERVICES (05)
Water Supply, Sewerage and drainage systems, sanitary fittings and fixtures, Plumbing systems, principles of internal & external drainage systems, Principles of electrification of buildings, Intelligent buildings, elevators
and escalators, their standards and uses, air-conditioning systems, fire-fighting systems, building safety and security systems.

**BOOKS:**