CIVIL ENGINEERING
SYLLABUS FOR B.E.(CIVIL)- 3RD TO 8TH SEMESTERS
2011-2012

PANJAB UNIVERSITY, CHANDIGARH
## TEACHING SCHEME
### 3\(^{rd}\) SEMESTER

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<th>Hrs./week</th>
<th>credits</th>
<th>Sess</th>
<th>Exam</th>
<th>Total</th>
<th>Marks</th>
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Marks of vocational Training based on workshop after 2\(^{nd}\) semester TOTAL: 650

### 4\(^{th}\) SEMESTER

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<th>Course Code</th>
<th>Subject</th>
<th>Hrs./week</th>
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<th>Marks</th>
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<tr>
<td>1</td>
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<td>Reinforced Concrete Structures - I</td>
<td>4</td>
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<td>CIV 402</td>
<td>Structural Analysis II</td>
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<td>CIV 403</td>
<td>Surveying II</td>
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<td>4</td>
<td>CIV 404</td>
<td>Rock Mechanics &amp; Engg. Geology</td>
<td>3</td>
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TOTAL: 650

Four weeks survey camp after 4\(^{th}\) semester.
### BACHELOR OF ENGINEERING (CIVIL) 5TH SEMESTER

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<th>Course Code</th>
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<th>Sess</th>
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<td>CIV 502</td>
<td>Earthquake Engineering</td>
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<td>CIV 503</td>
<td>Fluid Mechanics-II</td>
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**TOTAL:** 1250

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

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**TOTAL:** 1250

Four weeks practical training after 6th semester
### BACHELOR OF ENGINEERING (CIVIL) 7TH SEMESTER

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**TOTAL:** 1250

### BACHELOR OF ENGINEERING (CIVIL) 8TH SEMESTER

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<td>Construction planning &amp; Management</td>
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**TOTAL:** 1250

**OPTIONAL : INDUSTRIAL TRAINING IN EIGHTH SEMESTER**
THIRD SEMESTER

COURSE NAME : SURVEYING-I
COURSE NO. : CIV. 301
L  P                 : 3   3
EXTERNAL: 50
SESSIONAL: 50

Note: 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

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Section</th>
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<tbody>
<tr>
<td>INTRODUCTION TO SURVEYING</td>
<td>(03)</td>
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<tr>
<td>Basic principles of Surveying, Plans, Scales, Maps, Different types of surveys, Perspective of chain surveying.</td>
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<tr>
<td>COMPASS SURVEY</td>
<td>(05)</td>
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<tr>
<td>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.</td>
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<tr>
<td>LEVELLING</td>
<td>(04)</td>
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<tr>
<td>Basic definitions, Dumpy level, Levelling staffs, Simple Levelling, Terms in Levelling, Precautions, Differential Levelling. Field Book for Levelling, Profile levelling, Cross-sectioning &amp; Reciprocal levelling.</td>
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<tr>
<td>CONTOURING</td>
<td>(03)</td>
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<tr>
<td>Contour characteristics, direct and indirect methods of contouring, Contour gradients and automatic levels.</td>
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SECTION – B

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<tr>
<td>PLANE TABLING</td>
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<tr>
<td>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.</td>
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<tr>
<td>THEODOLITE TRAVERSING</td>
<td>(05)</td>
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<tr>
<td>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.</td>
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<tr>
<td>TRAVERSE ADJUSTMENTS</td>
<td>(05)</td>
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<tr>
<td>Balancing angles of the traverse, computation of latitudes &amp; departures, consecutive &amp; independent coordinates, Checks for open and closed traverses, Adjustment methods for a traverse, Gales traverse table, Omitted measurements.</td>
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<tr>
<td>TACHEOMETRIC SURVEY</td>
<td>(05)</td>
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BOOKS:

SURVEYING-I (Practical)
CIV 351
Marks : 50

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
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
lectures

BUILDING STONES
General, Qualities of a good building stone, Deterioration of stones, Preservation of stones, Common building stones of India & their Uses, Artificial stones. (03)

BRICKS
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. (04)

LIME
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 (03)

TIMBER
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 (03)

SECTION - B

CONCRETE
 Constituents of concrete, different types of cements used in concrete, brief introduction to ingredients and manufacture of cements. Hydration and compounds of hydration. Properties and testing of cement. (03)

CONCRETE MIXES
Design of concrete mixes by ISI method and ACI method. Design of concrete mix for flexural strength. (04)

PRODUCTION OF CONCRETE
 (04)

**PROPERTIES OF FRESH AND HARDENED CONCRETE**  
(05)

**MISCELLANEOUS MATERIALS**  
(04)
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 :** 40

**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**  
lectures

**INTRODUCTION**

Structure, classification of structures, equations of static equilibrium, Free body diagrams, static determinacy of structures, stability, Principal of superposition, Shear Force and Bending Moment Diagrams for beams and frames under different types of loading.

**COLUMN & BUCKLING**  
(03)
Definitions and examples of instability; criteria for stability of equilibrium, Euler’s theory of columns, buckling, Euler’s equation for various end restraints, Rankine formula, eccentrically loaded struts, struts with initial curvature, lateral stability of beams; struts with lateral loading.

**DEFLECTION OF STATICALLY DETERMINATE BEAMS**  
(04)

**THIN CYLINDERS AND SPHERES**  
(04)
Introduction, stresses and strains in thin cylinders and spherical shell, volumetric change, wire wound thin cylinders, thin vessels subjected to internal pressure.

**ANALYSIS OF DETERMINATE TRUSSES**  
(04)
Introduction, determination of forces in member of trusses by method of joints, method of sections, Deflection of Joints of plane frames by castigliano’s first theorem and unit load method.
SECTION- B

ANALYSIS OF DAMS, CHIMNEYS AND RETAINING WALLS  (04)
Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule, wind pressure on chimneys.

ROLLING LOADS         (04)
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         (04)
Construction of Influence lines for reaction, shear forces and bending moment for simply supported, overhauling and compound beams, influence lines for girders with floor beams, Influence lines for forces in members of frames. Influence lines for deflection.

ARCHES             (04)
Introduction, Analysis of three hinged, spandrel braced arches, Influence lines for horizontal thrust, shear force and bending moment for three hinged.

CABLES AND SUSPENSION BRIDGES        (04)
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, influence lines.

BOOKS:
5. Basic Structural Analysis : C.S. Reddy, TMH

COURSE NAME : TRANSPORTATION ENGINEERING - I
COURSE NO. : CIV. 304
L P : 4 2
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

HIGHWAY PLANNING        (06)

HIGHWAY GEOMETRIC DESIGN         (03)
HIGHWAY MATERIALS (04)
Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.

HIGHWAY CONSTRUCTION (03)
Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements.

HIGHWAY DRAINAGE (03)
Importance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas.

SECTION- B

HIGHWAY MAINTENANCE (03)

HIGHWAY ECONOMICS & FINANCING (03)
Total Transportation Cost, Economic Analysis, Sources of Highway Financing.

TRAFFIC CHARACTERISTICS (03)
Road User Characteristics, Driver Characteristics, Vehicular Characteristics

TRAFFIC STUDIES (02)
Volume and Speed Studies, O-D Survey, Parking Study

TRAFFIC SAFETY (03)
Cause and Type of Accidents, Use of Intelligent Transport System

TRAFFIC CONTROL MEASURES (08)
Signs, Markings, Islands, Signals

BOOKS:

TRANSPORTATION ENGINEERING LAB – I (Practical)
CIV- 354

Marks : 50

AGGREGATE TESTS
Sieve Analysis of fine and coarse aggregates
Aggregate Crushing Value Test.
Aggregate Impact Value Test.
Los Angles Abrasion Value Test.
Aggregate Soundness Test.
Flakiness Index and Elongation Index Test.
Specific Gravity and Water Absorption Test.
Laboratory CBR Test.

BITUMEN TESTS
Penetration Test.
Ductility Test.
Softening Point Test.
Viscosity Test.
Flash Point and Fire Point Test.

REFERENCES
2. Relevant IS Standards

COURSE NAME : FLUID MECHANICS – I
COURSE NO. : CIV. 305
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 at least 2 questions from each part.

SECTION - A

FLUID AND THEIR PROPERTIES (04)
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 KINEMATICS (04)
Continuity equation in Cartesian co-ordinates.
Rotational flows- Rotational velocity and circulation, stream & velocity potential functions.

BOUNDARY LAYER ANALYSIS (05)
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.

SECTION - B

DIMENSIONAL ANALYSIS AND SIMILITUDE (04)
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.

LAMINAR AND TURBULENT FLOWS (05)

FLOW PAST IMMERSED BODIES (03)
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.

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
VOCATIONAL TRAINING
CIV-356

Marks: 50

Each student shall attend 4 weeks vocational training in the workshop after 2\textsuperscript{nd} semester.
FOURTH SEMESTER

COURSE NAME : REINFORCED CONCRETE DESIGN - I
COURSE NO. : CIV. 401
L   P   :   4  2
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

INTRODUCTION (04)
Reinforced concrete, definition, properties of materials, grades of concrete and reinforcing steel, stress-strain curves, permissible stresses, concrete structural systems-slabs, beams, columns and foundations, design philosophies working stress design, ultimate strength and limit state design method.

LIMIT STATE DESIGN METHOD (04)
Introduction, Limit States, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads.

DESIGN OF BEAMS (04)
Limit State of Collapse (Flexure) Types of failures, assumptions for analysis and design of singly reinforced, doubly reinforced sections, and flanged sections.
Limit State of Collapse (Shear, bond and torsion) Introduction - Design for shear, structural components subjected to torsion, design of rectangular beam section for torsion, development length, continuation of reinforcement (beyond cut off points).

DESIGN OF COLUMNS (04)
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

LIMIT STATE OF SERVICEABILITY (04)
Deflection, effective span to effective depth ratio, modification factors for singly reinforced, doubly reinforced and flanged beams, crack formation and its control.

DESIGN OF SLABS (04)
Design of one-way slabs and two-way rectangular slabs

DESIGN OF STAIRCASES (04)
Single flight and dog legged

DESIGN OF ISOLATED FOOTINGS UNDER AXIAL LOADS (03)

DETAILING OF REINFORCEMENT USING SP: 34 ALL STRUCTURAL COMPONENTS.

BOOKS:
1. Plain & Reinforced Concrete: Jai Krishna & O.P. Jain (vol I & II), Nem Chand & Bros. Roorkee
6. Relevant IS Codes
1. To determine the Specific Gravity of cement.
2. To determine the Standard Consistency, Initial and Final Setting Times of Cement.
3. To determine Soundness of Cement.
4. To determine the Compressive Strength of Cement.
5. To determine the Compressive Strength of Bricks/Tiles.
6. To determine the Slump of Concrete.
7. Mix Design of Concrete.
8. To determine the Compressive Strength of Concrete.
9. To determine the Compressive Strength of hardened Concrete by Non-Destructive 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 : STRUCTURAL ANALYSIS - II
COURSE NO. : CIV. 402
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 at least 2 questions from each part.

SECTION –A

LECTURES

STATICALLY INDETERMINATE STRUCTURES (02)
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 (07)
Method of Consistent Deformation, Three moment theorem, Analysis of Fixed and Continuous beams subjected to different loading conditions, sinking and rotation of support.

DISPALCEMENT METHOD OF ANALYSIS - SLOPE-DEFLECTION METHOD (05)
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.

DISPALCEMENT METHOD OF ANALYSIS -MOMENT-DISTRIBUTION METHOD (05)
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 (04)
Lateral load analysis of multistory frames, portal method and cantilever method.

METHOD OF STRAIN ENERGY (08)
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**
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**
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 Analusis (I&II) : S.S. Bhavikatti, Vikas Publishing House

**COURSE NAME** : SURVEYING - II
**COURSE NO.** : CIV. 403
**L P** : 4 3
**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**

**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, compound curves, Reverse curves.

**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.

**GEODETIC TRIANGULATION**
(06) Triangulation figures, Classification, Shape of triangles, Field work, Selections of stations, Intervisibility of stations, Signals, Phase correction, Reduction of Centre, Baseline site, selection Baseline measurement, Baseline corrections, Baseline Extension, Survey of India Top Sheet numbering system.

**SURVEY ADJUSTMENTS**
(06)

SECTION – B

TRIANGULATION ADJUSTMENTS (06)
Station adjustments, conditions for Figure adjustment of Plane triangles, Chain of triangles, two connected triangles, Braced Quadrilaterals, Triangle with a central station, Method of equal shifts, Setting out buildings

GIS (04)
Introduction, concepts and terminology, utility of GIS, essential components of a GIS, data acquisition through scanners and digitizers, data storage, data manipulation and analysis applications of GIS

GPS (04)
Introduction, working principle, various application of GPS related to civil engg., components of GPS – point positioning and differential positioning.

REMOTE SENSING (04)
Introduction, interaction of EMR with earth surface working principles and instrumentation.

INTRODUCTION OF TOTAL STATION (03)
Measuring horizontal and vertical angle, Angular measurements, measurement of distance

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

SURVEYING LAB - II (Practical)
CIV- 453
Marks : 50

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 : ROCK MECHANICS & ENGINEERING GEOLOGY
COURSE NO. : CIV. 404
L P : 3 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 at least 2 questions from each part.

SECTION – A

GENERAL GEOLOGY (04)
Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.

ROCKS & MINERALS (04)
Minerals, their identification igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (RQD)

STRUCTURAL GEOLOGY (04)
Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints : definition, classification relation to engg. Operations.

ENGINEERING GEOLOGY (04)

SECTION – B

ENGINEERING PROPERTIES OF ROCKS AND LABORATORY MEASUREMENT (04)
Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, influence of effect of pore fluid type unsaturated and temperature.

IN-SITU DETERMINATION OF ENGG. PROPERTIES OF ROCK MASSES (04)
Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses bore hole technique-bore hole deformation gauges.

IMPROVEMENT IN PROPERTIES OF ROCK MASSES (02)
Pressure grouting for dams and tunnels, rock reinforcement rock bolting.

BOOKS:
Introduction to Rock Mechanics : Richard E. Goodman., Willey
Engineering Geology : Parbin Singh, Katson Publishing House

COURSE NAME : BUILDING CONSTRUCTION
COURSE NO. : CIV. 405
L P : 3 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 at least 2 questions from each part.

SECTION - A

BRICK & STONE MASONRY (04)
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**
Sources, Causes of dampness in buildings, bad effects of dampness, methods of damp proofing.

**ARCHES AND LINTELS**
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 ant 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** : RCC DRAWING - I
**COURSE NO.** : CIV. 456
**L. P** : 0 2
**Marks** : 50

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 isolated footings (stepped and sloped) along with the detailing of reinforcement in footings.
5. Design and detailing of single flight and dog legged stair case along with the reinforcement details for the stair case inclined slab.
FIFTH SEMESTER

COURSE NAME : REINFORCED CONCRETE - II
COURSE NO. : CIV. 501
L T P : 3 1 0
EXTERNAL: 100
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

BEAMS CURVED IN PLAN (04)
Introduction, Design of circular beams loaded uniformly and supported on symmetrically placed columns, semi-circular beams simply supported on 3 supports equally spaced using shear, moment and torsion coefficients, provision for torsion reinforcement.

CONTINUOUS BEAMS (03)
Design of continuous beams using I. S. Code method.

DESIGN OF FOOTINGS (06)
Isolated footings subjected to eccentric loading, combined footings: Different types, design of rectangular, trapezoidal, strap.

SECTION – B

RETAINING WALLS (03)
Types, behaviour, stability requirements, design of cantilever and counterfort type retaining walls.

WATER TANKS (04)
Introduction, general design requirements on no crack basis, circular and rectangular tanks resting on ground, Overhead tanks, intze type tanks and their design including staging and foundation.

DOMES (05)
Design of spherical and conical domes.

BOOKS:
1. Concrete Structure : V. N. Vazirani and M. M. Ratwani, Khanna Publishers
2. Plain and Reinforced Concrete : Jai Krishna and O. P. Jain, Nem Chand & Bros, Volumes I and II
4. Reinforced Concrete Structures : Syal and Goel, Wheeler Publishers Allahabad

COURSE NAME : EARTHQUAKE ENGINEERING
COURSE NO. : CIV. 502
L T P : 3 1 0
EXTERNAL: 100
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

lectures
INTRODUCTION TO EARTHQUAKES (06)
Structure of the Earth, History of the Earth, Earthquake Mechanism, Propagation of Seismic Waves, Earthquake Phenomena, Earthquake Measurements, Seismicity-Global and Local, Seismic hazards

PAST EARTHQUAKES AND LESSONS LEARNT (06)
Significant Historical Earthquakes, Earthquake Damages to Various Civil Engineering Structures

EARTHQUAKE VIBRATIONS (06)

SECTION – B

EARTHQUAKE DESIGN PROCEDURE & DESIGN CODES (06)

SOIL RESPONSE TO EARTHQUAKES (06)
Liquefaction, liquefaction susceptibility, landslides, seismic slope stability analysis, soil improvement for remediation of seismic hazards.

BOOKS:
2. Elementary Earthquake Engineering: Jai Krishna & Chander Shekran, South Asian Publishers Delhi.
5. Earthquake Resistant Design of Structures, Pankaj Aggarwal & Manish Srikhande, Prentice Hall of India.

COURSE NAME: FLUID MECHANICS - II
COURSE NO. : CIV. 503
L  T  P   : 3 1 0
EXTERNAL:  100
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

UNIFORM FLOW IN OPEN CHANNELS (03)

ENERGY AND MOMENTUM PRINCIPLES AND CRITICAL FLOW (04)
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 (04)
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 (04)
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

**IMPACT OF FREE JETS** *(04)*
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** *(04)*
Head and efficiencies of hydraulic turbines, Work done and efficiencies of Pelton Wheel, Francis and Kaplan turbines, surge tanks

**RECIPIROCATING PUMPS** *(04)*
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** *(04)*
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

**COURSE NAME** : GEOTECHNICAL ENGINEERING
**COURSE NO.** : CIV. 504
**L T P** : 3 1 3
**EXTERNAL**: 100
**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**  *lectures*

**BASIC CONCEPTS** *(04)*
Definition of soil and soil mechanics common soil problem in Civil Engineering field. Principal types of soils. Important properties of very fine soil i.e. adsorbed water, base exchange and soil structure. Characteristics of main clay mineral groups. Basic definitions in soil mechanics. Weight volume relationship physical properties of soils.

**INDEX PROPERTIES** *(03)*
Determination of Index properties, classification of coarse grained soils and fine grained soils.

**COMPACtion** *(06)*

**CONSOLIDATION** *(06)*
Definition and object of consolidation difference between compaction and consolidation. Concept of various consolidation characteristics i.e. a, m, n and C, primary and secondary consolidation. Terzaghi’s method for one-dimensional consolidation. Consolidation test. Determination of C, from curve fitting methods. Normally consolidated and over consolidated clays importance of consolidation settlement in the design of structures.
SECTION- B

PERMEABILITY AND SEEPAGE (06)

SHEAR STRENGTH (06)

EARTH PRESSURE (06)
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 Rebhan’s graphical construction.

BOOKS:

GEOTECHNICAL ENGINEERING (Practicals)
CIV- 554

EXTERNAL: 40
SESSIONAL: 60

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.
8. Determination of Permeability by constant head permeameter.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Determination of compressibility characteristics of fine grained soils by Consolidation test.
12. Determination of shear strength of dry and saturated sands by Tri-axial shear test

COURSE NAME : ENVIRONMENTAL ENGINEERING - I
COURSE NO. : CIV. 505
L T P : 3 1 2
EXTERNAL: 100
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

lectures
SOURCES OF WATER SUPPLY (06)
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 (06)
Testing of various physical-chemical and biological characteristics and their significance; standards of quality for different uses of water.

WATER SUPPLY SYSTEMS (06)
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 (06)
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 (06)
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 desalination and demineralization.

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 (Practical)
CIV- 555

EXTERNAL: 40
SESSIONAL: 60
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 chloride dose.

COURSE NAME : RCC DRAWING - II
COURSE NO. : CIV. 506
L T P : 0 0 2
EXTERNAL: 40
SESSIONAL: 60

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 continuous 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 counterfort 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.

SURVEY CAMP
CIV – 507

EXTERNAL:  50
SESSIONAL: 150

The students will be required to make a topographic map of an undulating hilly terrain measuring about 250 acres. The work will be as under:

Reconnaissance, selection of main stations, measurement of horizontal and vertical angles, measurement of base line, determination of R.L. of main station by double leveling from B.M., measurement of bearing of any one line, computation of coordinates of station points, plotting of details, interpolation of contours.
SIXTH SEMESTER

COURSE NAME : NUMERICAL ANALYSIS AND STATISTICAL METHODS
COURSE NO. : ASC. 601
L T P : 3 1 0
EXTERNAL: 100
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

FLOATING-POINT NUMBERS: Floating-point representation, Rounding, Chopping, Error analysis, Condition and instability. (03)

NON-LINEAR EQUATIONS: Bisection, Fixed-point iteration and Newton-Raphson methods, Order of convergence. (03)

LINEAR SYSTEMS AND EIGEN-VALUES: Gauss-elimination method (using Pivoting strategies) and Gauss-Seidel Iteration method. Rayleigh’s power method for eigen-values and eigen-vectors. (03)

INTERPOLATION: Lagrange’s formula with error, Divided difference, Newton’s divided difference formula. (03)

NUMERICAL INTEGRATION: Newton-Cote’s quadrature formula (with error) and Gauss-Legendre quadrature formula. (03)

DIFFERENTIAL EQUATIONS: Solution of initial value problem using Taylor Series, Euler’s and Runge-Kutta (up to fourth order) methods. (03)

SECTION – B

RANDOM VARIABLES: Definition, Probability distribution, Distribution functions, pdf and cdf, Expectation and Variance. (03)

SPECIAL PROBABILITY DISTRIBUTIONS: Binomial, Poisson, Geometric, Uniform, Normal and Exponential distributions. (03)

SAMPLING DISTRIBUTIONS: Population and samples, Concept of sampling distributions, Sampling distribution of mean, Chi-square, t and F distributions (pdf only). Tests of Hypotheses: Basic ideas, Important tests based on normal, Chi-square, t and F distribution. (03)

CURVE FITTING: Method of least squares, Fitting of simple curves using this method, Regression and Correlation: (Two variables case only) (03)

BOOKS:
1. Numerical Methods, Dr. B.S. Grewal, Khanna Publishers
2. Introductory Methos of Numerical Analysis, S.S. Shastri, PHI
4. Probability and Statistics for Engineers, Miller & Freund, Pearson

COURSE NAME : DESIGN OF STEEL STRUCTURES-II
COURSE NO. : CIV. 602  
L T P : 3 1 0  
EXTERNAL: 100  
SESSIONAL: 50

SECTION – A  

DESIGN OF ROUND TUBULAR STRUCTURES  
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  
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  
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

COURSE NAME : QUANTITY SURVEY  
COURSE NO. : CIV. 603  
L T P : 3 1 0  
EXTERNAL: 100  
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  

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  
(08)
For earthwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork

SECTION- B

SPECIFICATIONS
For different classes of building and Civil engineering works.

TYPES OF CONTRACTS
Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order

ACCOUNTS
Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure, arbitration, arbitration act.

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

COURSE NAME : ENVIRONMENTAL ENGG.- II
COURSE NO. : CIV. 604
L  T  P : 3  1 2
EXTERNAL: 100
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

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.

SECTION - B

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

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.

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

**BOOKS:**
1. Waste Water Engineering : Metcalf and Eddy Inc. TMH.

**ENVIRONMENTAL ENGG: - II (practical)**
**CIV- 654**

**EXTERNAL:** 40  
**SESSIONAL:** 60

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** : 3 1 0  
**EXTERNAL:** 100  
**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**  

**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**  

**STRESS DISTRIBUTION**  

**MACHINE FOUNDATIONS**  
Theory of vibrations, foundations subjected to vibrations, determination of dynamic properties of soil, Dynamic analysis of block foundations.

**SECTION – B**  

**SOIL INVESTIGATION**  
(04)
Object 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**  
(06)  

**PILE FOUNDATION-II**  
(06)  
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**  
(05)  

**BOOKS:**


**STEEL DRAWING -II**

**COURSE NO.** : CIV- 606  
**L T P** : 0 0 2  
**EXTERNAL:** 50  
**SESSIONAL:** 150

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

1. Drawing the plan view of gantry girder showing various components of crane system.
2. Drawing the sectional elevation of gantry girder showing components of crane system.
3. Drawing the plan view of foot bridge deck showing all its components.
4. Drawing the sectional elevation of foot bridge truss showing proper connections for joints.
5. Drawing the plan view of Railway bridge deck showing all its components.
6. Drawing the side elevation of roller or rocker bearings having circular or segmental rollers.

**SEMINAR AND DEPARTEMNTAL INSTRUCTIONS**

**CIV -607**

Visits to various Civil Engineering sites, Construction sites, technical films, library, corporate activities, participation in seminars, industries etc.
SEVENTH SEMESTER

COURSE NAME : HYDROLOGY AND DAMS
COURSE NO. : CIV. 701
LT P : 3 1 0
EXTERNAL: 100
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

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, EVAPO-TRANSPIRATION 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 Mc Grawhill,

COURSE NAME : STRUCTURAL ANALYSIS- III
COURSE NO. : CIV. 702
L  T  P : 3 1 0
EXTERNAL: 100
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 OF STRUCTURAL ANALYSIS
Actions and Displacements, equilibrium, compatibility, static and kinematic indeterminacy, principle of superposition, flexibility and stiffness matrices, Equivalent joint loads.

FUNDAMENTALS OF FLEXIBILITY METHOD
Flexibility methods, Joint displacements, Member end actions and support reactions, flexibility of prismatic member, formalization of flexibility method.

SECTION- B

FUNDAMENTALS OF STIFFNESS METHOD
Stiffness method, stiffness of prismatic members, formalization of stiffness method
Global stiffness matrix, partitioning of global stiffness matrix.

DIRECT STIFFNESS METHOD
Complete member stiffness matrix, formulation of joint stiffness matrix, formation of load vector, rearrangement of stiffness and load arrays, Analysis of continuous beams, Rigid frames and pin jointed frames.
Comparison between stiffness and flexibility methods.

INTRODUCTION TO FINITE ELEMENT METHOD
Concept, Generalized Procedure, minimum potential energy, intrinsic coordinates, Shape functions, Analysis of One dimensional bar elements, Plane Truss Elements and Plane Beam Elements.

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

COURSE NAME : TRANSPORTATION ENGG. II
COURSE NO. : CIV. 703
L  T  P : 3 1 0
EXTERNAL: 100
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 TO RAILWAY ENGINEERING (03)
History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways.

**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, Sleepers, Ballast, Subgrade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, 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**
High Speed Tracks, Improvement in existing track for high speed, Ballastless Track, MAGLEV Track.

**SECTION- B**

**INTRODUCTION TO AIRPORT ENGINEERING**
Air Transport Scenario in India and Stages of Development, National and International Organisations.

**AIRPORT PLANNING**
Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport.

**OBSTRUCTIONS AND ZONING LAWS**
Imaginary Surfaces, Approach Zones and Turning Zones.

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

**TAXIWAY DESIGN**
Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.

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

**BOOKS:**
COURSE NAME : IRRIGATION ENGG. I  
COURSE NO. : CIV. 704  
L T P : 3 1 0  
EXTERNAL: 100  
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

METHODS OF IRRIGATION
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
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
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
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 PREPRARATION OF IRRIGATION PROJECTS
Classification of project, Project preparation-investigations, Design of works and drawings, concept of multi - purpose projects, Major, Medium and miner projects, planing of an irrigation project, Economics & financing of irrigation works. Documentation of project report.

TUBE - WELL IRRIGATION
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:
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, Alficial cut-off objects and design Considerations River control - objectives and methods.

BOOKS:
3. Irrigation Engg. & Hydraulic Structure Varshney, Gupta & Gupta  
SOFTWARE LAB
CIV- 705

EXTERNAL: 50
SESSIONAL: 150

Use of Civil Engineering Softwares like STAAD PRO, Auto Civil 3D, MIDAS, NISA CIVIL, 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)
EIGHTH SEMESTER

COURSE NAME : MAINTENANCE OF BUILDINGS
COURSE NO. : CIV. 801
L  T  P   : 3 1 0
EXTERNAL: 100
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

PRINCIPLES OF MAINTENANCE  (03)
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  (05)
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  (05)
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  (05)
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  (04)
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  (03)
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  (06)
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  (04)
Specials features for maintenance of multi-storeyed buildings, including fire protection system, elevators, booster pumps, generator sets.

MAINTENANCE OF SERVICES  (06)
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

COURSE NAME : IRRIGATION ENGINEERING -II
COURSE NO. : CIV. 802
L T P    : 3 1 0
EXTERNAL: 100
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

THEORIES OF SEEPAGE  (02)
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  (03)
Weirs versus barrage, design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

ENERGY DISSIPATION DEVICES  (03)
Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

DIVERSION HEAD WORKS  (02)
Functions and investigations: component parts of a diversion head work and their design considerations, silt control devices.

SECTION- B

DISTRIBUTORY REGULATORS  (02)
Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape.

CANAL FALLS  (03)
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  (03)
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  (03)
Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

BOOKS:

4. I.S. Codes.

COURSE NAME : CONSTRUCTION PLANNING & MANAGEMENT
COURSE NO. : CIV. 803
L T P : 3 1 0
EXTERNAL: 100
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

WORKS MANAGEMENT

INTRODUCTION (04)
Need for project planning and management Engineer’s role in Construction economy, Value engineering, Time value of money.
Construction schedule activity and events Bar Chart, Milestone Chart, Uses and Drawbacks - evolution of networks

PERT PROGRAMME (EVOLUTION AND REVIEW TECHNIQUE) (04)
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) (04)
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.

THREE PHASE APPLICATION OF CPM (04)
Three phases - Planning, scheduling and controlling, updating an arrow diagram, time grid diagram.

PROJECT COST ANALYSIS (04)
Types of project costs direct and indirect cost-time relationships, cost slopes straight-line and segmented approximations, optimum cost and optimum duration, conducting a crash programme, determining the minimum total cost of a project, advantages and limitations of PCM.

SECTION- B

CONSTRUCTION ENGINEERING

PREPARATION OF CONSTRUCTION SCHEDULE FOR A CONSTRUCTION PROJECT (04)
Project description; activities; activity relationship and duration, scheduling, resources; delivering materials; scheduling labour and equipment Job-layout; Project control during construction; Project supervision; Construction cost control.

FACTORS AFFECTING SELECTION OF CONSTRUCTION EQUIPMENT (04)
Types of equipment; cost of owning and operating equipment depreciation cost; obsolescence cost; investment cost; operating cost; economic lift of equipment; maintenance and repair cost.

EARTH MOVING MACHINERY (04)
Tractor and related equipment; bulldozers; angledozes; rippers; scrappers; power shovels; dragline; slack line; clamshells hoes; trenching machines.
CONSTRUCTION EQUIPMENTS (04)
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 (04)
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
4. Project Planning and Control with PERT/CPM : Dr. B.C. Punmia, Luxmi Publications

COURSE NAME : SOLID WASTE MANAGEMENT
COURSE NO. : CIV. 804
L T P : 3 1 0
EXTERNAL: 100
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 (04)
Types and sources of solid wastes, Municipal, solid waste, Industrial solid wastes and Hazardous wastes, Present scenarios of municipal and industrial waste management in India.

PROPERTIES OF SOLID WASTES (04)
Physical and chemical composition of municipal solid wastes, waste generation rates, factors effecting waste generation rates.

MANAGEMENT OF SOLID WASTES IN INDIA (04)
Prevalent SWM practices and deficiencies : Storage of waste at source, segregation of wastes, Primary collection of waste, transportation of waste, disposal of wastes, institutional deficiencies.

ENGINEERED SYSTEMS OF SOLID WASTE MANAGEMENT (04)
Design specifications of primary waste collection tools, waste storage bins, transportation vehicles, route selection and provision of transfer stations.

SECTION- B

DISPOSAL OF WASTES (04)
Site selection, rapid EIA of proposed sites, disposal technologies such as :
Composting: Aerobic composting, Anaerobic composting, mechanical composting, vermin composting; advantages and limitations of composting technologies, Economics of composting.

ANAEROBIC DIGESTION (04)
Traditional digestors such as KVIC model, Deenbandhu model, emerging technologies for waste stabilisation. Incineration: Fuel Pellets, Refuse derived fuels, mechanical incinerators; advantages and limitations of incineration.

SANITARY LANDFILLING (04)
Method of preparing sanitary landfill site, land filling techniques, operation and maintenance of landfill sites including leachate collection and treatment, recovery of methane from landfill sites for power generation.
HAZARDOUS WASTE MANAGEMENT (04)

BOOKS:

IRRIGATION DRAWING- II

CIV- 806

EXTERNAL:  40
SESSIONAL:  60

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.

SEMINAR

CIV- 807

Each student shall be required to deliver presentations and submissions etc. in the class on the topics as suggested by the course teacher.