B.Tech. in Civil Engineering  Semester III

Contact Hours (L-T-P) : 3-1-0

Engineering Mathematics – III : Course Outlines


Laplace Transforms - Laplace transform with its simple properties. Unit step function, Dirac delta function their Laplace transforms, Inverse Laplace, transform – convolution theorem, applications to the solution of ordinary and partial differential equations having constant coefficients with special reference to wave and diffusion equations.

Fourier Transforms - Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.

Numerical Analysis - Difference operation Forward backward and central, shift and average operators and relation between them. Newton’s forward and backward differences interpolation formulae; Sterling’s formulae; Lagrange’s interpolation formula. Numerical differentiation and integration. Trapezoidal rule, Simpson's one third and one eighth rule.


Suggested Books

1.  B.S. Grewal – Higher Engineering Mathematics
Fluid Mechanics: Course Outlines

Properties of fluids; Newtonian and non-Newtonian fluids; Principles of fluid statics; Kinematics of flow; Equations of motion; Energy and momentum-applications; Flow measurement in pipes and open channels; Dimensional analysis and similitude; Introduction to boundary layer theory, Laminar and turbulent flow through pipes.

Suggested books:

1. Streeter, Wylie & Bedford - Fluid Mechanics
3. Garde R.J. - Fluid Mechanics Thorough Problems
4. Gupta Vijay & Gupta Santosh K. – Fluid Mechanics & Its Applications; New Age International Publisher
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering Semester III

Contact Hours (L-T-P) : 3-1-0

**Strength of Materials – I - Course Outlines**

Moment of inertia of an area; Polar moment of inertia; Perpendicular and parallel axes theorems; Principal axes and principal moment of inertia; Direct stress and strain; Shear stress and strain; Unsymmetrical bending and shear centre; Hooke’s law; Young’s modulus; Modulus of rigidity; Pure shear; Complex stress system; Poisson’s ratio; Strain energies and theories of failures; Relationships between elastic constants; Theory of simple bending; Support reaction, shear force and bending moment diagrams in determinate beams and plane frames; Bending and shear stress distribution in beams; Combined bending and direct stresses; Buckling of columns; Introduction to torsion.

**Suggested books :**

3. Wilbur & Norris - *Elementary Structural Analysis*
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering  Semester III

Contact Hours (L-T-P) : 3-0-0

Building Materials & Construction - Course Outlines

Building Materials - Stones, Bricks, Cement & Lime, Concrete, Steel


Suggested books:
   1. Duggal, S.K. – Building Materials
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering  Semester III

Contact Hours (L-T-P) : 3-0-0

**Engineering Geology - Course Outlines**

Physical geology and mineralogy; Classification of rocks and their uses as building and road materials; Historical geology; Structural geology: Folds, faults, unconformity etc.; Engineering geology: Geological investigations at dam, tunnel and bridge sites and influence of various structures. Precautions against faulting, folding, bedding planes, joints, cracks, fissures, permeability and ground water condition; Introduction to Remote sensing.

*Suggested Books:*

1. Billings - Structural Geology
2. Singh Prabin - Engineering Geology
3. Tyril - Petrology
4. Choudhury, Chakrabarti & Choudhury – An Introduction to Geographic Information Technology
B.Tech. in Civil Engineering Semester III

Contact Hours (L-T-P) : 3-0-0

Computer Applications in Civil Engineering - Course Outlines

Approximation & Error analysis, Roots of Non-linear equations, Linear Algebraic Equation, Curve fitting & Numerical Differentiation, Numerical Integration and Area under a Curve, Ordinary Differential Equation, Matrix manipulations

Suggested Books:

2. Joshi Sunil – Numerical Methods & Applied Statistics; Ashirwad Publication
JECRC University

Faculty of Engineering & Technology
B.Tech. Civil Engineering Semester III
Contact Hours per week: 2 hrs

**Engineering Mechanics Lab**

**List of Experiments**

<table>
<thead>
<tr>
<th>Experiment Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To study Behaviour of Struts</td>
</tr>
<tr>
<td>2</td>
<td>To verify Law of Parallelogram of Forces</td>
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<tr>
<td>3</td>
<td>To verify Polygon Law of Forces</td>
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<tr>
<td>4</td>
<td>To determine Support Reactions of a Simply Supported Beam</td>
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<tr>
<td>5</td>
<td>To measure coefficient of Static Friction</td>
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<tr>
<td>6</td>
<td>To determine Efficiency of a Compound Lever</td>
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<tr>
<td>7</td>
<td>To determine Efficiency Bell Crank Lever</td>
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<tr>
<td>8</td>
<td>To determine Efficiency of Worm and Worm Wheel</td>
</tr>
<tr>
<td>9</td>
<td>To verify superposition theorem</td>
</tr>
<tr>
<td>10</td>
<td>To determine efficiency of a Screw Jack</td>
</tr>
<tr>
<td>11</td>
<td>To determine efficiency of Double Purchase Crab Winch</td>
</tr>
<tr>
<td>12</td>
<td>To determine efficiency of Differential Wheel &amp; Axle</td>
</tr>
<tr>
<td>13</td>
<td>To study Pulley Systems</td>
</tr>
</tbody>
</table>
Materials Lab - I

List of Experiments

1. To Identify materials by Visual Inspection
3. To Study the Utilization of Fly Ash
4. To Study the Procedure for Testing of Stone
5. To Study the Fiber Reinforced Concrete
6. To Study the Properties and Use of Different Glasses
7. To Study the different Aluminum and Steel Sections
8. To Study the Manufacture and Use of Concrete Hollow Blocks
9. To Determine Compressive and Tensile Strength of Timber (Parallel and Perpendicular To Grain)
10. To Study the Properties of Kota Stone and Marble
11. To Find out the Water Absorption and Tolerance Limit of Bricks
12. To study Physical Properties of Minerals
13. To study Physical Properties of Rocks
14. To Identify Minerals and Rocks in Hand Specimen
15. To Identify Geological features through
   Structural Geological Diagrams
   Petrological Diagrams
   Engineering Geological Diagrams
16. To study Geological Maps for Interpretation
17. To study Dip & Strike Problems
JECRC University

Faculty of Engineering & Technology
B.Tech. Civil Engineering Semester III
Contact Hours per week: 2 hrs

Computer Programming Lab

List of Experiments

1. To develop computer programmes in C/C++ (revision of basic tools of programming).
2. To develop computer programmes in C/C++ for solving linear and non-linear equations by methods as covered in theory.
3. To develop computer programmes in C/C++ for solutions of differential equations by methods as covered in theory.
4. To develop computer programmes in C/C++ for Integration and area calculation by methods as covered in theory.
5. To develop computer programmes in C/C++ for best fitting curves by methods as covered in theory.
JECRC University

Faculty of Engineering & Technology
B.Tech. Civil Engineering Semester III
Contact Hours per week: 2 hrs

Fluid Mechanics Lab

List of Experiments

1. To verify Bernoulli’s theorem.
2. To calibrate a Venturimeter.
3. To calibrate an Orificimeter.
4. To determine Metacentric Height.
5. To determine $C_c$, $C_v$, $C_d$ of an orifice.
6. To determine $C_d$ of a mouthpiece.
7. To determine $C_d$ of a V-notch.
8. To determine viscosity of a given fluid.
Building Planning & Design – I

List of Experiments

1. Drawing of walls
   Brick and Stone masonry
   Partition wall, cavity wall and cross section of external wall
2. Pointing, Arches, Lintels and Floors
3. Doors and Windows
4. Stairs, cross section of Dog legged stairs
5. Roofs: Flat and Inclined (Steel)
7. Development of Front Elevation and Sectional Elevation from a given plan
8. Development of Plan, Front Elevation and Sectional Elevation from line diagram
Engineering Mathematics – IV - Course Outlines

Historical development, Engineering application of optimization, Formulation of design problems as a mathematical programming problems, Classification of optimization problems. Linear Programming: Graphical methods, Simplex methods, Revised simplex method, Duality in linear programming, post optimality analysis; Applications to Transportation and assignment problems.

Non Linear Programming: Unconstrained optimization techniques, Direct search methods, Descent methods, Constrained optimization, Direct and Indirect methods. Introduction, multi-decision processes, computational procedure.


Tensor Analysis: Definition of a tensor, Transformation of co-ordinates, contra variant and co-variant vectors, addition and multiplication of tensors, contraction of tensors, inner product, fundamental tensors, Christoffel symbols, covariant differentiation.

Suggested Books:

1. Rawat Mohan Lal – Operations Research
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering  IV Semester

Contact Hours (L-T-P): 3-0-0
(Associated Lab 2 hrs per week)

**Hydraulic Machines - Course Outlines**

**Dimensional Analysis & Models:** Dynamical Similarity and Dimensional Homegeneity Model experiment, geometric, Kinematic and Dynamic similarity. Reynold’s, froudes, Weber’s, Euler and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios. Scale effect. Principle of dimensional analysis Rayleigh method, Buckingham theorem, applications of dimensional analysis to pipe Friction problems, resistance to motion of partially and fully submerged bodies and other simple problems. Ship model experiments.


**Rapidly varied flow:** Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths Losses in jump, location of jump. Broad crested weirs for channel flow: Measurement, velocity distribution in open channels, parshall flume. **Impact of free Jets:** Impact of a jet on a flat or a curved vane, moving and stationary vane, flow over radial vanes.

**Centrifugal pumps and turbines:** Volute and whirlpool chambers, Loses of head due to variation of discharge Manometric and Hydraulic efficiencies, Description of single and multistage pumps. Specific speed, characteristic curves. Model Test. Reaction and Impulse turbines, specific speed, Mixed flow turbines. Pelton wheel turbine, Francis turbine, propeller turbine and Kaplan turbine Efficiency, Characteristics of turbines. Basic principles of governing of turbines, Draft-tube, Selection of turbines, model tests.

**Suggested books:**
2. Modo, P.N. – Hydraulic and Fluid Mechanics
Strength of Materials – II - Course Outlines


Fixed Beams & Continuous Beams: Analysis of fixed beams & continuous beams by three moment theorem and area moment method.

Torsion: Elementary concepts of torsion, shear stress in solid and hollow circular shafts, angle of twist, power transmitted by a shaft, combined bending and torsion; Springs: stiffness of springs, close coiled helical springs, springs in series and parallel, laminated plate springs.

Membrane Analysis: Stress and strain in thin cylindrical & spherical shells under internal pressures.

Introduction to Energy Methods: Strain energy due to bending, shear and torsion; Castigleno’s theorems, unit load method & their applications in analysis of redundant frames upto two degree of redundancy and deflection of determinate beams, frames and trussed beams; Stresses due to temperature & lack of fit in redundant frames. Theories of Failures


Suggested books-

JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering  IV Semester

Contact Hours (L-T-P): 3-0-0
(Associated Lab 2 hrs per week)

Building Materials & Constructions – II - Course Outlines

Concrete : Grade of concrete, proportioning of ingredients, water content and its quality for concrete, water/cement ratio and its role, gel/pace ratio, concrete mix deign (ACI, IS method), quality control for concrete. Properties of fresh concrete including workability, air content, flow ability, methods to determine and factors affecting. Properties of hardened concrete such as strengths, permeability, creep, shrinkage, factors influencing, standard tests on fresh and hardened concrete as per IS code. Aggregate, cement interface, maturity concept.

Concrete Handling in Field : Interaction to mixing & batching methods, placing, transportation and Compaction methods, curing methods and compounds. Admixture in concrete : Chemical and mineral admixtures, their types, use of water reduces, accelerator, retarders, waterproofing plasticizers and super plasticizers, use of fly ash and silica fume in concrete, their properties, effect and production of high strength concrete, properties of high strength concrete & application.

Form work: Requirements, Indian standard on form work, loads on form work, type & method to provide centering and shuttering for Columns, beams, slabs, walls and staircase, slip and moving formwork. Site Preparation and temporary Structures: Sequence of construction activity and co-ordination, site clearance, marking, foundation plan, earthwork in dry and loose soil, different methods and their suitability, dewatering, construction of temporary shed, types of shoring, methods of underpinning and types of scaffolding. Damp Proofing: Causes of dampness, effects of dampness methods and material for damp proofing DPC treatment in buildings, methods and materials for anti termite treatment.

Joints : Requirements, types and material used, construction details. Arches and Lintels : Terms used, types of arches and their construction detail, types of lintels and constructions. Stairs : Terms used, requirements of good staircase, classification, construction details and suitability of different types of stairs, lifts and lamps. Construction System : Prefabricated/precast construction; advantages & disadvantage of prefabrication. Precast R.C. plank flooring/roofing, Thin R.C. ribbed slab for floors & roofs, thin precast RCC lintels in brickwalls, Modular co-ordination. Multi storied building frames, Concrete skeleton system, lift slab system, cast one house system, L-shaped panel system.

Ground & Upper floors : Floor components and their junctions, selection of flooring and floor types, construction details of ground and upper floors, merits and demerits. Roof and Roof Covering : Purposes, classification of roofs, terms used, types of pitched roofs, trussed roofs specially king port, queen port, steel roof trusses, details of steel roof trusses, method of construction, roof covering materials for pitched roofs.
Suggested books:
2. Varghese, P.C. – Building Materials
Surveying - I - Course Outlines

Basic principles, Maps, their scales and uses, plotting accuracy; Level, Theodolite, Tacheometer, Compass and other instruments; Introduction to Total Station; Temporary and permanent adjustments; Measurement of distances and directions; Levelling; Contouring; Traversing; Adjustment of survey data; Computation of coordinates; Plane Table survey; Curves.

Suggested books:

3. Surveying Instruments by Cledenning & Oliver
Building Technology - Course Outlines

Types of buildings, criteria for location and site selection, site plan and its detail. **Sun Consideration** : Different methods of drawing sun chart, sun shading devices, design of louvers, energy conservation in buildings, passive solar cooling and heating of buildings. **Climatic and comfort Consideration** : Elements of climate, global climate, climatic zones of India, comfort conditions, biclimatic chart, climate modulating devices. **Orientation** : Meaning, factors affecting orientation, orientation criteria for tropical climate. **Building Bye Laws and NBC Regulations** : Objective of by-laws, Regulation regarding; means of access, lines of building frontages, covered area, floor area ratio, open spaces around buildings, height & sizes of rooms, plinth regulation and sanitation provisions.

**Principles of Planning** : Different factors affecting planning viz-aspect, prospect, furniture requirement, roominess, grouping, circulation, elegance, privacy etc. **Vastu Shastra In Modern Building planning** : Factors considered in Vastu, site selection, orientation, planning and design of residential buildings.

**Functional design and Accommodation requirements**
(A) **Residential Buildings** : Anthrometry, activities and their spatial requirements; Area planning, living area, sleeping area, service area; Bubble diagram showing sequence of arrangement of area, plan, elevation, sectional elevation.
(B) **Non Residential Buildings** : viz-school buildings, rest house, primary health centres, post office, bank, college library, cinema theatres etc.

**Services in Buildings**
(A) Lighting and ventilation, doors and windows.
(B) Acoustics, sound insulation and noise control.

**Suggested books** –
1. Building Technology ; Sipani, R.K.
Hydraulics Lab

List of Experiments

1. To determine the minor losses.
2. To determine the friction factor.
3. To determine Cd of Broad crested weir.
4. To verify the momentum equation.
5. To determine the discharge of venturimeter.
6. To determine Manning’s & Chezy’s coefficient of roughness for the bed of a given flume.
7. To plot characteristics curve of hydraulic jump.
8. To plot characteristics curve of Pelton Wheel.
9. To plot characteristics curve of Centrifugal Pump.

Suggested books:

1. Laboratory work in Hydraulic Engineering; Asawa, G.L.; New Age International Publisher
Materials Lab – II

List of Experiments

1. Tensile Strength Test – Mild Steel and HYSD bar
2. Compressive Strength Test – Mild Steel and Cast Iron
3. Compressive Strength Test – Cement Cubes and Concrete Cubes
4. Compressive Strength Test – Bricks
5. Compressive Strength Test – Wooden Blocks
6. Hardness Test – Rockwell Hardness and Brinell Hardness
7. Impact Test – Izod and Charpy
8. Modulus of Rupture of Wooden Beam
9. Fatigue Test
10. Spring Test
11. Torsion Test
Concrete Lab

List of Experiments

1. To determine standard (Normal) consistency of cement.
2. To determine Initial & Final setting time of cement.
3. To determine specific gravity of cement.
4. To determine the fineness of Cement by sieving through a 90 micron I.S. Sieve.
5. To determine the Compressive Strength of Cement.
6. To determine Soundness of cement by Le-chatelier apparatus.
7. To determine the specific gravity of fine aggregate (sand) by Pycnometer.
8. To determine the bulking of fine aggregate and to draw curve between water content and bulking.
9. To determine the fineness modulus of coarse aggregates and fine aggregates by sieve analysis.
10. To determine the workability of given concrete mix by slump test.
11. To determine the workability of given fresh concrete mix by compaction factor test.
12. To determine the workability of given concrete mix by Flow table test.
13. To design concrete mix in accordance with I S recommendations.
Surveying Practice – I

List of Experiments

1. Ranging and Fixing of Survey Station.
2. Plotting Building Block by offset with the help of cross staff.
3. To determine the magnetic bearing of a line
   a. Using surveyor’s compass
   b. Using prismatic compass
5. To determine the reduced levels using Tilting Level.
6. To determine the reduce levels in closed circuit using Dumpy Level.
7. To carry out profile leveling and plot longitudinal and cross sections for road.
8. To carryout temporary adjustment of Theodolite.
   a. By method of repetition.
   b. By method of Reiteration.
10. To determine the tachometric constant.
11. To determine the horizontal and vertical distance by tachometric survey.
12. To study the various minor instruments.
13. To determine the area of a figure using a planimeter.
JECRC University

Faculty of Engineering & Technology
B.Tech. Civil Engineering Semester IV
Contact Hours per week: 3 hrs
(Associated theory course 3L)

Building Planning & Design- II

List of Experiments

1- To design and draw working drawing of a Residential building with following detail.
   (a) Site plan
   (b) Foundation plan
   (c) Plan
   (d) Two sectional elevations
   (e) Front elevation
   (f) Furniture plan
   (g) Water supply and sanitary plan
   (h) Electric fitting plan
2- To design and draw a Primary Health Center
3- To design and draw a Primary School
4- To design and draw a Rest House
5- To design and draw a Post Office
6- To design and draw a Bank
7- To design and draw a College Library
8- To design and draw a Cinema Theatre
Theory of Structures – I - Course Outlines

Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), releases in structures Maxwell’s reciprocal theorem and Betties theorem. Analysis of Indeterminate Structures using Moment Area method.

Analysis of Statically Indeterminate Structures using Slope-deflection method and Moment-distribution methods.

Column Analogy method for indeterminate structures, determination of carry over factor for non-prismatic section. Conjugate beam method for analysis of indeterminate structures.

Energy methods and related theorems, solution of determinate & indeterminate structures using energy methods (i.e. determination of deflection and forces in structures).

Approximate methods for lateral loads: Analysis of multistory frames by portal method, cantilever method & factor method. Analysis of determinate space trusses by tension coefficient method.
Concrete Structures – I - Course Outlines


Design of one way slabs. Shear and Bond: Behavior of beams in shear and bond, design for shear, anchorage, curtailment and splicing of reinforcement, detailing of reinforcement. Serviceability Conditions: Limit states of deflection and cracking, calculation of deflections & crack width as per codal provisions.

Design of two way slabs and flat slabs by direct design method.

Design of Columns: Short and long rectangular and circular columns, eccentrically loaded columns.

Design of Column Footings: Isolated and combined column footings and circular raft foundations.

Suggested books:-

1. Concrete Technology; Subhash, Chander
2. Textbook of Concrete Technology; Kulkarni, P.D., New Age International Publisher
Steel Structures – I: Course Outlines

Types of steels and their permissible stresses; Connections: Design of riveted, bolted and welded connections under axial and eccentric loadings

Compression Member: Design of compression member; Axially and eccentrically loaded compression members, built up columns, design of lacings and battens.

Beams: Design of beams; simple and compound sections, main and subsidiary beams and their connections, grillage foundation.

Tension Members: Design of axially and eccentrically loaded tension members. Column Bases: Design of column bases, Slab base, gusseted base.

Plastic analysis of steel structures, fundamentals, static and mechanism method of analysis, bending of beams of rectangular and I sections beams, shape factor, design of simply supported beams, fixed beams, continuous beams and single span rectangular frames.

Suggested books:-
1. Design of Steel Structures; Duggal, S.K.
Solid Waste Management - Course Outlines


Onsite Handling, Storage and Processing: Public Health and Aesthetics, Onsite Handling, Onsite, Storage, Dust bins, Community Containers, Container Locations, On-site Processing Methods.


Processing and Disposal Methods: Processing Techniques and Methods of Disposal, Sanitary land filling, Composting and Incineration, Bioremediation.


Suggested books:-

1. Prospects and Perspectives of Solid Waste Management; Hosetti, B.B.; New Age International Publishers
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering V Semester

Contact Hours (L-T-P): 2-0-0
(Associated Lab 4 hrs per week)

Surveying – II: Course Outlines

Trigonometric Leveling: Methods of trigonometric leveling direct method and reciprocal method, axis Signal corrections. Determination of difference in elevations of points.

Curve Surveying: Elements of circular (Simple, compound and reverse) curves, transition curves, degrees of curves. Methods of setting out circular and transition curves.


Suggested books:

3. Surveying Instruments by Cledenning & Oliver
Quantitative Surveying & Valuation - Course Outlines

Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labor requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.).

Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts Services for building such as water supply, drainage and electrification.

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building.

Valuation: Purposes, depreciation, sinking fund, scrap value, year’s purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

Suggested books:

3. Surveying Instruments by Cledenning & Oliver
4. Higher Surveying; Chandra, A.M.; New Age International Publishers
Structures Engineering Lab

List of Experiments

1. Deflection of a truss
2. Clark-Maxwell reciprocal theorem with truss
3. Funicular polygon for flexible cable
4. Analysis of redundant frame
5. Deflection of curved members
6. Buckling of columns
7. Clark-Maxwell reciprocal theorem with simply supported beam
8. ILD for deflection in a steel beam using unit load method
9. ILD for support reaction using Muller-Breslau Principle
10. Unsymmetrical bending
Design of Concrete Structures – I

List of Exercises

Design as per syllabus of Concrete Structures – I.

Suggested books:-

1. Concrete Technology; Subhash, Chander
2. Textbook of Concrete Technology; Kulkarni, P.D., New Age International Publisher
Design as per syllabus of Steel Structures – I.

Suggested books:-

1. Design of Steel Structures; Duggal, S.K.
Surveying Practice - II

List of Experiments

1. To measure the horizontal and vertical angles by Theodolite.
2. To determine the Height of an object by trigonometrical leveling (single plane method).
3. To determine the Height of an object by trigonometrical leveling (two plane method).
4. To shift the R.L. of known point by double leveling.
5. To measure and adjust the angles of a braced quadrilateral.
6. To prepare a contour map by indirect contouring.
7. To prepare the map of given area by plane tabling.
8. To determine the Azimuth of a given line by ex-meridian observations of Sun.
9. Survey Camp
Industrial Economics and Management

Course contents

1. Microeconomics: Law of demand and supply, utility approach and indifference curves, elasticity of demand & supply and applications, consumer surplus, Law of returns to factors and return to scale.


5. Management: Principles of management, functions-planning, organization, staffing, directing, controlling, coordination, decision making.
Influence line diagram & Rolling load: ILD for beams & frames, Muller-Breslau principle and its application for drawing ILD, Rolling load, maximum stress resultants in a member/section, absolute maximum stress resultant in a structure.

Arches: analysis of three hinged two hinged and fixed type parabolic arches with supports at the same level and at different levels.

Cable and Suspension bridges: Analysis of cables with concentrated and continuous loading, analysis of two & three hinged stiffening girder.

Kani’s Method: Analysis of beams and frames with & without sway by Kani’s method.

Unsymmetrical bending: Definition, location of NA, computation of stresses and deflection, shear center and its location. Composite Sections: Flexural analysis of composite sections.

Suggested books:

1. Theory of Structures; Ramamrutham, S.
Concrete Structures - II : Course Outlines

Elements of Pre-stressed Concrete: Principles and systems, material properties, losses of pre-stress, I.S. specifications, analysis and design of sections for flexure and shear, Introduction to continuous beams.


Water Tanks and Towers: Water Tanks and Water Towers-design of rectangular, circular and Intze type tanks, column brace type staging.


Suggested books:

1. Concrete Technology; Subhash, Chander
2. Reinforced Concrete Design: Principles and Practice; Krishna, Raju N.; New Age International Publishers
3. Design of R.C.C. Structural Elements; Bhavikatti, S.S.
4. Advance R.C.C. Design; Bhavikatti, S.S., New Age International Publishers
JECRC University  
Faculty of Engineering & Technology  
B.Tech. in Civil Engineering VI Semester  

Contact Hours (L-T-P): 3-0-0  
(Associated Lab 3 hrs per week)  

Steel Structures - II : Course Outlines  

Design of gantry girder, Design of roof trusses  

**Design of plate girder**: design of section, connections for flange plate to flange angles & flange angles to web, web and flange splicing. Vertical, Horizontal, Intermediate and Bearing stiffeners. Curtailment of plates.  

**Bridges**: Standard loading for railway bridges, design of Deck type plate-girder bridges, design of bracings and frames. Application of ILD to the design of bridges, design of through type truss bridges, design of members and joints, design of stringers, cross girder, lateral, sway and portal bracings.  

Water tanks, circular tanks with segmental bottoms, rectangular tanks, pressed steel tanks, design of staging.  

**Suggested books**:  

1. Design of Steel Structures; Duggal, S.K.
Environmental Engineering I: Course Outlines

Environment and its components, Importance of water, Role of an Environmental Engineer, Historical overview. **Water Demand:** Design flow, design periods, design population, factors affecting water consumption, variation in water demand, design capacities for various water supply components.

**Source of water and collection works:** Alternative sources i.e. rain, surface and ground water, Assessment of yield and development of the source. **Quality of water:** The hydrological cycle and water quality, physical, chemical and biological water quality parameters, water quality requirements, Indian Standards.

**Transmission of water:** Hydraulics of conduits, selection of pipe materials, pipe joints, pumps, pumps station. **Preliminary Treatment of Water:** Historical overview of water treatment, water treatment processes (theory and application): aeration, solids separation, settling operations, coagulation, softening,

**Advanced Treatment of Water:** filtration, disinfection, other treatment processes, dissolved solids removal, treatment plant design, preparation of hydraulic profiles.

**Distribution of water:** Method of distributing water, distribution reservoirs, distribution system, distribution system components, capacity and pressure requirements, design of distribution systems, hydraulic analysis of distribution systems, pumping required for water supply system. **Plumbing of Building for water supply:** Service connections, fixture units, simultaneous flow, design of plumbing system.
Transportation Engineering I : Course Outlines

**Introduction**: Importance and Role of Transportation Systems, Technological and Operating Characteristics of Transportation Systems, Components of transportation Systems, Transportation Coordination, Transportation Modes and their comparison. **Highway Planning**: Highway Planning Process, specifically in India, Transport or Highway relate Agencies in India, Classification of Roads and Road Development Plans, Road Patterns, Controlling Factors and Surveys for Highway Alignment.

**Highway Materials and Construction**: Desirable Properties, Testing Procedures, Standards and standard values relating to Soil, Stone Aggregates, Bitumen and Tar, fly-ash/pond-ash. Methods of constructing different types of roads viz. Earth roads, Stabilized roads, WBM roads, fly ash embankments, Bituminous roads and Concrete roads. Specific features of rural roads.


**Elementary Traffic Engineering**: Significance of different Traffic Engineering Studies viz. Speed, Volume, O & D, Parking and Accident’s Study. Importance and types of Traffic Signs, Signals, Road Markings and Road Intersections.

**Structural design of Highway Pavements**: Design of Flexible Pavements by G. I. and CBR methods. Design of Rigid Pavements by Westergard and modified methods. (As per guidelines of IRC) **Hill Roads**: Special factors in Alignment and Geometric design, Drainage and maintenance of Hill roads. Road side Arboriculture and Landscaping. Recent Developments in Urban Roads and their role in economic developments.

**Suggested books:**
**Remote Sensing and GIS - Course Outlines**

**Photogrammetry:** Definition of Photogrammetric Terms, Geometry of aerial and terrestrial photographs, Aerial camera and photo-theodolite, Scale of a Photograph, Tilt and Height displacements, Stereoscopic vision and stereoscopes, Height determination from parallax measurements, Flight planning, Maps and Map substitutes and their uses.


Different types of platforms, sensors and their characteristics, Orbital parameters of a satellite, Multi concept in Remote Sensing.

**Image Interpretation:** Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth – collection and verification, advantages of multidate and multiband images. Digital Image Processing concept.

**Geographic Information System (GIS):** Introduction & applications of GIS in map revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, water resources, Soil Erosion, Land suitability analysis, change detection.
Structural Analysis Lab

List of Experiments

Introduction to matrix methods; Stiffness (Deflection) and Flexibility (Force) matrices for bar, plate, and beam elements w.r.t. local axes and global axes, for entire structure w.r.t. global axes (Direct method and by assembly method).

Introduction of Finite Element Methods.
JECRC University

Faculty of Engineering & Technology
B.Tech. Civil Engineering Semester VI
Contact Hours per week: 3 hrs
(Associated theory course 3L)

**Design of Concrete Structures – II**

**List of Experiments**

Design as per syllabus of theory.
Design of Steel Structures – II

List of Experiments

Design as per syllabus of theory.
Environmental Engineering Lab - I

List of Experiments

1. To determine the pH of the given sample of water.
2. To determine the turbidity of the given sample of water.
3. To determine Total Solids of the given water sample.
4. To determine the Total Dissolved Solids of the given water sample.
5. To find out conductivity of the given water sample.
6. To determine hardness of the given water sample.
7. To find out chloride of the given water sample.
8. To determine alkalinity of the given water sample.
9. To find out acidity of the given water sample.
10. To determine hardness of the given water sample.
11. To determine the optimum dose of alum by Jar test.
12. To study various water supply Fittings.
1. Aggregate impact test
2. Angularity number test
3. To determine fineness modulus of a given sample of coarse aggregate.
4. Los angles abrasion test
5. Aggregate crushing value test
6. Standard tar viscometer test
7. Specific gravity and water absorption test
8. To determine the elongation index for given sample of aggregate.
9. To determine the flakiness index of given sample of aggregate.
10. Ductility test
11. To determine the softening point for given sample of bitumen.
12. Marshall stability test
13. Float test
Geotechnical Engineering – I : Course Outlines

Soil and soil-mass constituents, water content, specific gravity, void ratio, porosity, degree of saturation, air void and air content, unit weights, density index etc. Inter-relationships of the above. Determination of index properties of soil: water content, specific gravity, particle size distribution, sieve and sedimentation analysis, consistency limits, void ratio and density index. Classification of soil for general engineering purposes: particle size, textural, H.R.B. Unified and I.S. Classification systems.

Clay mineralogy: Soil structure; single grained, honeycombed, flocculent, and dispersed, structure of composite soils, clay structure; basic structure, mineral structures, structures of Illite Montmorillinite and kaolinite and their characteristics. Soil water absorbed, capillary and free water, Darcy’s law of permeability of soil and its determination in laboratory. Field pumping out tests, factors affecting permeability, permeability of stratified soil masses.


Mohr’s circle of stress, shearing strength of soil, parameters of shear strength, Coulomb’s failure envelope, determination of shear parameters by Direct Shear Box. Triaxial and unconfined compression test apparatuses. Typical stress-stain curves for soils. Typical failure envelopes for cohesion less soils and normally consolidated clay soils.

JECRC University
Faculty of Engineering & Technology
B.Tech. in Civil Engineering VII Semester

Contact Hours (L-T-P): 3-0-0

**Water Resource Engineering – I : Course Outlines**

Definitions, functions and advantages of irrigation, present status of irrigation in India, classification for agriculture, soil moisture and crop water relations, Irrigation water quality. Consumptive use of water, principal Indian crop seasons and water requirements, multiple cropping, hybrid crops, water harvesting and conservation.

**Canal Irrigation:** Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, design of channels, regime and semi theoretical approaches (Kennedy’s Theory, Lacey’s Theory), cross section of channels, silt control in canals. **Water Distribution System:** Rotational delivery (Warabandi, Jama Bandi, Khasra Bandi, Sajra Sheets), continuous delivery and delivery on demand, Role of command area development authority, Functions and organizational structures.

**Distribution of Canal Water:** System of regulation and control, outlets, assessment of canal revenue.

**Hydraulics of Alluvial Rivers :** Critical tractive force, regimes of flow, resistance relationship for natural streams, bed load, suspended load and total equations, different stages of rivers, meandering, aggradations, and degradation, river training & bank protection works.

**Water Logging:** Causes, preventive and curative measures, drainage of irrigated lands, saline and alkaline lands, types of channels lining and design of lined channel. **Well Irrigation:** Open wells and tube wells, types of tube wells, duty of tube well water.

**Hydrology:** Definition, Hydrologic cycle, Application to Engineering problems, measurement of rainfall, rain gauge, peak flow, flood frequency method, catchment area formulae, Flood hydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination, Estimation of run off.
JECRC University  
Faculty of Engineering & Technology  
B.Tech. in Civil Engineering VII Semester

Contact Hours (L-T-P): 3-0-0

**Building Design - Course Outlines**

**Design Loads:** Design loads for different types of buildings. (IS-875 part 1 & 2). Load distribution & concept of load flow to different structural components. **Structural Systems:** Assumption of integrity aspect ratios & over turning resistance, strength & stiffness of buildings, symmetry and Asymmetry in building forms, Vertical and lateral load resting elements, shear walls, framed tubes and various multistory configurations.

**Lateral loads:** Wind loads & calculation of wind load on structures (IS: 875-Part 3).

**Lateral loads:** Earthquake loads & calculations of earthquake loads on buildings masonry & framed structures. (IS: 1893 – Part 1).

**Masonry and Framed Buildings:** Design of masonry buildings and framed buildings, Earthquake resistant construction of buildings, and various provisions as per IS codes; IS-4326, IS-13827, IS-13828, IS-13920, IS-13935.

**Mass Housing:** Prefabricated construction for mass housing. **Special Roofs:** Introduction to folded plates, cylindrical shells, north-light shell roofs, grid and ribbed floors.
Introduction: Systems of pre-stressing in detail, pre-stressing techniques, transfer of pre-stress, types of commercially available jacks, computation of losses of pre-stress. Anchorage Zone: end block stresses, design

Cable profiles: Concordant and non-concordant cable profile and associated factors in continuous members. Modern cable laying: materials & practices, precautions etc. Computation of deflection in pre-stressed concrete members.

Design of Pre-stressed Concrete Sections: Flexural, shear and torsion resistance of members, preliminary and final design of sections, design of pre and post tensioned flexural members; simply supported and continuous members.

Pre-stressed Slab: Design of slabs, tendon layout, precast slab, production and their applications. Partial Pre-stressing: Principles and advantages, methods, practices and design.

Design of circular pipes and circular water retaining structures etc. Case study of one bridge girder with design and constructional features.
JECRC University  
Faculty of Engineering & Technology  
B.Tech. in Civil Engineering VII Semester  

Contact Hours (L-T-P): 3-0-0

**Transportation Engineering – II : Course Outlines**

**Introduction and Permanent Way Components**: Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways and Cross-sections in different conditions, Drainage, Salient Features and types of Components viz. Rails, Sleepers, Ballast, Rail Fastenings. **Study of Specific Aspects**: Coning of Wheels, Creep, Wear, failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing, Stations, Yards and Sidings, Turn-Table, Signaling.

**Points and Crossings**: Types of Turnouts, Points or Switches, layout Plans of different types of Crossings, Design calculations of turnouts. **Railway Systems Specific to Urban Movements**: Surface railways (sub urban railway system of Mumbai, Chennai and Delhi), Underground system (Metro of Kolkata/ Delhi), Elevated Systems (as Proposed for Jaipur, Delhi, Mumbai), Light Rail System (MRTS, Thane). Recent Developments in Railway Networking.

**Geometric Design**: Gradient and Grade Compensation, Super elevation and cant, cant deficiency, Types of Curves, Transition curves, their designs, Widening of Gauges.

**Airport Engineering**: Introduction: Requirements to Airport Planning, Airport Classifications, Factors in Airport Site Selection, Airport Size, Obstructions, Zoning. **Planning and Design of Airport**: Requirements of Airport, Planning of Terminal Area, and different Layouts, Location of Gates, Types of Runway patterns, Runway Layout, Runway Length, Geometric Design of Runways, Layout of Taxiways, Geometric Standards, Exit or Turnaround Taxiways, Apron and Hangers.

JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering VII Semester

Contact Hours per week 4

Minor Project

Minor projects related to Civil Engineering
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering VII Semester

**Contact Hours per week 2**

**Practical Training Seminar**

Practical Training Seminar related to Civil Engineering
Geotechnical Engineering Lab- I

List of Experiments

1. Grain size distribution by sieving.
2. Determination of water content by Pycnometer.
3. Determination of specific Gravity by Pycnometer.
4. Determination of liquid limit by Casagrande’s apparatus.
5. Determination of liquid limit by cone penetrometer.
6. Determination of plastic limit
7. Determination of shrinkage limit
8. Determination of field density by core-cutter
9. Determination of field density by sand replacement method
10. Determination of compaction properties by standard Proctor Test Apparatus
11. Determination of C-Ø values by Direct Shear Test Apparatus
12. Determination of unconfined compressive strength by unconfined compression Test apparatus

Design as per syllabus of theory.
Environmental Engineering Lab-II

List of Experiments

1. To determine the pH of the given sample of sewage.
2. To determine Total Solids of the given sewage sample.
3. To determine the Total Dissolved Solids of the given sewage sample.
4. To find out Total Settle-able Solids of the given sewage sample.
5. To determine Total Suspended Solids of the given sewage sample.
6. To find out the Quantity of Dissolved Oxygen present in the given water sample by Winkler’s Method.
7. To determine Biochemical Oxygen Demand exerted by the given wastewater sample.
8. To find out Chemical Oxygen Demand of the waste water sample.
9. To study various Sanitary Fittings.

Design as per syllabus of theory.
Geotechnical Engineering – II : Course Outlines


Earth Pressure: Active, passive and earth pressure at rest. Rankine’s and Coulomb’s theories. Rebhann’s and Culman’s graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill. Stability analysis of retaining walls. Earth pressure on cantilever sheet piles, rigid bulk heads.

Water Resource Engineering – II : Course Outlines

**Regulation of works:** Falls, Classification of falls, Design of falls, Distributory head regulator and cross-head regulator, Escape, bed bars. **Cross-Drainage Structure:** Necessity of Cross-drainage structures, their types and selection, comparative merits and demerits, design of various types of cross-drainage structure-aqueducts, syphon aqueduct, superpassage syphon, level crossing and other types.

**Diversion Head works:** Design for surface and subsurface flows, Bligh’s and Khosla’s methods. Selection of site and layout, different parts of diversion headworks, types of weirs and barrages, design of weirs on permeable foundation, silt excluders and different types of silt ejectors. Energy dissipation.

**Embankment Dams:** Suitable sites, causes of failures, stability and seepage analysis, flownet, slope stability analysis, precautions of piping, principles of design of earth dams. **Gravity Dams:** Force acting on a gravity dam, stability requirements, Instrumentation.

**Spillways:** Spillway capacity, flood routing through spillways, different types of spillways and gates, energy dissipation below spillways. **Hydro Power Plant:** General features of hydroelectric schemes, elements of power house structure, selection of turbines, draft tube and setting of turbine, cavitations.

**Reservoirs:** Evaluation of impact of water projects on river regimes and environment. Reservoir sedimentation and water shed management. **Optimization:** Introduction to optimization techniques and system approach. Introduction to G.I.S. and Computer aided irrigation design.
FINANCIAL EVALUATION OF PROJECTS AND PROJECT PLANNING: Capital investment proposals, criterions to judge the worthwhileness of capital projects viz. net present value, benefit cost ratio, internal rate of return, Risk cost management, main causes of project failure. Categories of construction projects, objectives, project development process, Functions of project management, Project management organization and staffing. Stages and steps involved in project planning, Plan development process, objectives of construction project management.

PROJECT SCHEDULING: Importance of project scheduling, project work breakdown process – determining activities involved, work breakdown structure, assessing activity duration, duration estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.

PROJECT COST AND TIME CONTROL: Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, cost slope, Process of crashing of activities, determination of the optimum duration of a project, updating of project networks, resources allocation.


SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT: Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, frame work, benefits of computerized information system. Environmental and social aspects of various types of construction projects.
JECRC University
Faculty of Engineering & Technology
B.Tech. in Civil Engineering VIII Semester

Contact Hours (L-T-P): 3-0-0

(a.) Bridge Engineering - Course Outlines

Type of bridges & classification of road & railways bridges. IRC & Railway loadings for bridges, wind load & Earthquake forces. Steel bridges Design of through type & deck type steel bridges for IRC loading. Design of deck type & through type truss bridges for railway loadings.


Pre-stressed Concrete bridges: Pre-stressed & Post stressed concrete bridges Design of deck slab & girder sections.

Bearings: Bearings for slab bridges and girder bridges. Elastomeric bearings, design concepts as per IRC 83 (Part II).

Joints: Expansion joints.
(b.) Advanced Foundation Engineering : Course Outlines

Shallow foundation: Methods of estimation of bearing capacity computation of bearing capacity factors, Effect of eccentric and inclined loads effect of water table on bearing capacity, Moyerhof’s analysis, Bearing capacity of stratified soils, Methods of estimation of settlement of footings.


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Contact Hours (L-T-P): 3-0-0

(c.) Advanced Transportation Engineering : Course Outlines

Traffic Studies: Road inventories, Traffic Volume Studies, Spot Speed Studies, Travel Time and delay Studies, Origin-Destination studies, Methodology and Analysis of O-D data, Traffic capacity, Parking studies and characteristics, Accident studies and characteristics, causes and preventive measures.


Traffic and Environment: Detrimental Effects of Traffic on the environment – air pollution, noise pollution, visual intrusion, aesthetics etc. Road Safety: The identification of problem, causation and Prevention, Road layout and Improvements, Safety equipment.
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering VIII Semester

Contact Hours per week 6

Major Project

Project related to Civil Engineering
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering VIII Semester

Contact Hours per week 2

Seminar

Seminar related to Civil Engineering
JECRC University
Faculty of Engineering & Technology
B.Tech. in Civil Engineering VIII Semester

Contact Hours per week 2
(Associated theory course 3L)

Geotechnical Engineering Lab – II

List of Experiments

1. To determine the differential free swell index of soil.
2. To determine the compressibility parameters of soil by consolidation test.
3. To determine the swelling pressure of soil.
4. To determine the shear strength parameters of soil by tri-axial test.
5. To determine the permeability of soil by constant and falling head methods.
6. To determine the CBR of soil.
7. To determine the grain size distribution of fine grained soil by Hydrometer.

Design as per syllabus of theory.
Professional Practice and Estimating

List of Experiments

1. Estimates – Methods of building estimates, types; site plan, index plan, layout plan, plinth area, floor area; Technical sanction, Administrative approval; estimate of buildings, roads, earthwork and R.C.C. works.
3. Specifications- For different classes of building and Civil Engineering works.
4. Types of contracts – Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order.
5. Arbitration
6. Valuation of real estate.
JECRC University
Faculty of Engineering & Technology

B.Tech. in Civil Engineering VIII Semester

Contact Hours per week 2

Foundation Design

List of Experiments

1. Design of isolated shallow footings, combined footings, raft foundations.
2. Design of pile foundations.
3. Design of wells and cassions.
5. Design of retaining structures etc.