



JECRCTM
UNIVERSITY
BUILD YOUR WORLD

School of Engineering

Course Structure and Syllabi

B. Tech. (Civil Engineering)

Academic Programs

July, 2013

Civil Engineering Syllabus at JECRC University

Semester III

Course No.	Course Name	L	T	P	C
CE301	Higher Engineering Mathematics	3	1	0	4
CE302	Fluid Mechanics	3	0	0	3
CE303	Fluid Mechanics Lab	0	0	2	1
CE-304	Strength of Materials-I	3	0	0	3
CE305	Strength of Materials-I Lab	0	0	2	1
CE306	Building Materials and Construction-I	3	0	0	3
CE307	Building Materials and Construction-I Lab	0	0	2	1
G3002	Programming with C++ and Java	3	0	0	3
G3003	Computer Lab-III	0	0	2	1
CE308	Engineering Geology	2	0	2	3
	Total	17	1	10	23

Semester IV

Course No.	Course Name	L	T	P	C
CE-401	Environmental Engineering-I	3	0	0	3
CE-402	Environmental Engineering-I Lab	0	0	2	1
CE-403	Hydraulics	3	0	0	3
CE-404	Hydraulics Lab	0	0	2	1
CE-405	Strength of Materials-II	3	1	0	4
CE-406	Strength of Materials-II Lab	0	0	2	1
CE-407	Building Materials and Construction-II	3	0	0	3
CE-409	Surveying-I	3	0	0	3
CE-410	Surveying- Lab	0	0	2	1
CE-411	Building Technology	2	0	0	2
CE-412	Building Planning and Design Lab	0	0	2	1
G4002	Web Designing Techniques	3	0	0	3
G4003	Computer Lab-IV	0	0	2	1
	Total	20	1	12	27

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Semester V

Course No.	Course Name	L	T	P	C
CE-501	Theory of Structures-I	3	0	0	3
CE502	Structures Engineering Lab - 1	0	0	2	1
CE-503	Concrete Structures-I	3	0	0	3
CE504	Concrete Lab	0	0	2	1
CE-505	Steel Structures-I	3	1	0	3
CE506	Steel Structures-I Lab	0	0	2	1
CE-507	Solid Waste Management	3	1	0	4
CE-508	Surveying-II	3	0	0	3
CE509	Surveying-II Lab	0	0	2	1
CE-510	Quantitative Surveying and Evaluation	2	0	0	2
CE-511	Industrial Economics and Management	2	0	0	2
	Total	19	2	8	25

Semester VI

Course No.	Course Name	L	T	P	C
CE-601	Theory of Structures-II	3	0	0	3
CE602	Theory of Structures-II Lab	0	0	2	1
CE-603	Concrete Structures-II	3	0	0	3
CE604	Design of Concrete Structures Lab	0	0	2	1
CE-605	Steel Structures-II	3	0	0	3
CE606	Design of Steel Structures-II Lab	0	0	2	1
CE-607	Transportation Engineering-I	3	0	0	3
CE608	Road Materials Testing Lab	0	0	2	1
CE-609	DE-I	2	0	0	2
CE610	DE-I	0	0	2	1
CE-611	Water Resources Engineering-I	3	1	0	4
CE-612	Geotechnical Engineering-I	3	0	0	3
CE613	Geotechnical Engineering-I Lab	0	0	2	1
	Total	20	1	12	27

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Semester VII

Course No.	Course Name	L	T	P	C
CE-701	Geotechnical Engineering-II	3	0	0	3
CE702	Geotechnical Engineering-II Lab	0	0	2	1
CE-703	Transportation Engineering-II	3	1	0	4
CE-704	Water Resources Engineering-II	3	1	0	4
CE-705	Remote Sensing and GIS	2	1	0	3
CE-706	Summer Training Seminar	-	-	-	5
CE-707	Environmental Engineering-II	2	0	0	2
CE708	Environmental Engineering-II Lab	0	0	2	1
CE-709	DE-II	2	0	0	2
CE710	DE-II Lab	0	0	2	1
CE-711	DE-III	2	0	0	2
CE712	DE-III Lab	0	0	2	1
	Total	17	3	8	29

Semester VIII

Course No.	Course Name	L	T	P	C
CE-801	Project work				20
	Total				20

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B. Tech. in Civil Engineering Semester III

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

CE301- Engineering Mathematics – III: Course Outlines

Fourier Series & Z Transform – Expansion of simple functions in Fourier series. Half range series, Change of intervals, Harmonic analysis. Introduction, Properties, Z Transforms.

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.

Numerical integration - Numerical integration of ordinary differential equations of first order, Picards method, Euler's method & Modified Euler's Method, Mille's method and Runga Kutta fourth order method.

Suggested Books

1. B.S. Grewal – Higher Engineering Mathematics

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

CE302 - 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
2. Natarajan M.K. – Principles of Fluid Mechanics
3. Garde R.J. - Fluid Mechanics Thorough Problems
4. Gupta Vijay & Gupta Santosh K. – Fluid Mechanics & Its Applications; New Age International Publisher

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Contact Hours per week: 2 hrs

CE303 - Fluid Mechanics Lab

List of Experiments

- 1 To verify Bernoulli's theorem.
- 2 To calibrate a Venturimeter.
- 3 To calibrate an Orificemeter
- 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.

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

CE304 - 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 :

1. *Adavi H.V. & Junnarkar S.B. - Mechanics of Structures, Vol. I*
2. *Punmia B.C. - Strength of Materials, Vol. I*
3. *Wilbur & Norris - Elementary Structural Analysis*

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Contact Hours per week: 2 hrs

CE305 - Strength of Materials-1 Lab

List of Experiments

- 1 To study Behaviour of Struts
- 2 To verify Law of Parallelogram of Forces
- 3 To verify Polygon Law of Forces
- 4 To determine Support Reactions of a Simply Supported Beam
- 5 To measure coefficient of Static Friction
- 6 To determine Efficiency of a Compound Lever
- 7 To determine Efficiency Bell Crank Lever
- 8 To determine Efficiency of Worm and Worm Wheel
- 9 To verify superposition theorem
- 10 To determine efficiency of a Screw Jack
- 11 To determine efficiency of Double Purchase Crab Winch
- 12 To determine efficiency of Differential Wheel & Axle
- 13 To study Pulley Systems

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

306-Building Materials & Construction - Course Outlines

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

Building Construction - Foundations: Different types of shallow & deep foundations, Causes of failure of foundation, Safe Bearing Capacity of soil Masonry: Stone & Brick masonry construction, Expansion, Construction joints, Damp proof courses, Doors & Windows, Lintels & Arches, Stairs, Floors, Roofs and Formwork

Suggested books:

1. Duggal, S.K. – *Building Materials*

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CE307- Building Materials and Construction-I

List of Experiments

- 1 To Identify materials by Visual Inspection
- 2 To Study the Procedure for Testing of Portland Cement (IS: 269-1967)
- 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

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

G3002- Programming with C++ and JAVA - Course Outlines

Programming in C++

C++ Overview, C++ Characteristics, Object-Oriented Terminology, Polymorphism, Object-Oriented Paradigm, Abstract Data Types, I/O Services, Standard Template Library, Standards Compliance, Functions and Variables, Functions: Declaration and Definition, Variables: Definition, Declaration, and Scope, Variables: Dynamic Creation and Derived Data, Arrays and Strings in C++, Qualifiers, Classes in C++, Defining Classes in C++, Classes and Encapsulation, Member Functions, Instantiating and Using Classes, Using Constructors, Multiple Constructors and Initialization Lists, Using Destructors to Destroy Instances, Using Destructors to Destroy Instances, Operator Overloading, Operator Overloading, Working with Overloaded Operator Methods, Initialization and Assignment, Initialization vs. Assignment, The Copy Constructor, Assigning Values, Specialized Constructors and Methods, Constant and Static Class Members, Inheritance, Overview of Inheritance, Defining Base and Derived Classes, Constructor and Destructor Calls, Input and Output in C++ Programs, Input and Output in C++ Programs, Standard Streams, Manipulators, Unformatted Input and Output.

Introduction to JAVA Tools

Introduction to Object Orientated Programming, Abstraction, Object Oriented Programming Principles, Features of JAVA, Introduction to Java byte code, Java Virtual machine. Differences between C++ and JAVA

Suggested Books

1. Let Us C: Bala Guruswami, TATA McGraw Hill.
2. Programming with C, C++: Yashwant Kanitkar

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Contact Hours (L-T-P) : 0-0-2

G3003 - Computer Lab-III (Object Oriented Programming) - Course Outlines

List of Experiments

1. To write a simple program for understanding of C++ program structure without any CLASS declaration. Program may be based on simple input output, understanding of keyword using.
2. Write a C++ program to demonstrate concept of declaration of class with public & private member, constructors, object creation using constructors, access restrictions, defining member functions within and outside a class. Scope resolution operators, accessing an object's data members and functions through different type of object handle name of object, reference to object, pointer to object, assigning class objects to each other.
3. Program involving multiple classes (without inheritance) to accomplish a task. Demonstrate composition of class.
4. Demonstration Friend function friend classes and this pointer.
5. Demonstration dynamic memory management using new & delete & static class members.
6. Demonstration of restrictions an operator overloading, operator functions as member function and/ or friend function, overloading stream insertion and stream extraction, operators, overloading operators etc.
7. Demonstrator use of protected members, public & private protected classes, multilevel inheritance etc.
8. Demonstrating multiple inheritance, virtual functions, virtual base classes, abstract classes

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

CE308 - 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. Tyrll - Petrology
4. Choudhury, Chakrabarti & Choudhury – An Introduction to Geographic Information Technology

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B.Tech. in Civil Engineering VI Semester

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

(Associated Lab 2 hrs per week)

CE401 - 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.

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B.Tech. Civil Engineering Semester VI

Contact Hours per week: 2 hrs

(Associated theory course 3L)

CE402 - 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.

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

(Associated Lab 2 hrs per week)

CE403 - Hydraulics - Course Outlines

Dimensional Analysis & Models: Dynamical Similarity and Dimensional Homogeneity 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.

Laminar Flow: Relation between shear & pressure gradient. Flow between plates & pipes. Equations for velocity distribution, pressure difference. **Turbulent Flow in pipes :** Theories of Turbulence, Nikuradse's Experiments. Hydrodynamically smooth & rough boundaries. Laminar, Sublayer, Equations of velocity distribution and friction coefficient. Stanton Diagram, Moody's diagram.

Flow through channels : Uniform, Non-Uniform and variable flow. Resistance equations of Chezy, Manning and Bazin. Section factor for uniform flow. Most Efficient rectangular, triangular and trapezoidal sections. Equations of gradually varied flow in Prismatic channels. Limitation of its applicability and assumption made in its derivation. Specific energy of flow. Critical depth in prismatic channels. Alternate depths. Rapid, critical and sub critical Flow Mild, steep and Critical Slopes. Classification of surface curves in prismatic channels and elementary computation

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.

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Suggested books:

1. *Bansal, R.K. – A Text book of Fluid Mechanics & Hydraulic Mechanics*
2. *Modi, P.N. – Hydraulic and Fluid Mechanics*

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Contact Hours per week: 2 hrs

(Associated theory course 3L)

CE404 - Hydraulics Lab

List of Experiments

1. To determine the minor losses.
2. To determine the friction factor.
3. To determine Cd of Broad crested wier.
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:

Laboratory work in Hydraulic Engineering; Asawa, G.L.; New Age International Publisher

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

(Associated Lab 3 hrs per week)

CE405 - Strength of Materials – II - Course Outlines

Deflection of Beams: Differential relation between load, shear force, bending moment, slope deflection. Slope & deflection in determinate beams using double integration method, Macaulay's method, area moment method and conjugate beam method.

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; Castiglino'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

Vibrations: Stress tensor and failure criterion. Elementary concepts of structural vibration, degree of freedom, free vibration of undamped single degree of freedom systems. Newton's law of motion, D'Alembert's principle, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Damped single degree of freedom system: types of damping, analysis of viscously damped, under-damped, over-damped & critically-damped systems, logarithmic decrement.

Suggested books-

1. *Raghunath, H.M. – Strength of Materials – New Age International Publishers*

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Contact Hours per week: 3 hrs

(Associated theory course 3L)

CE406 – Strength of 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

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B.Tech. in Civil Engineering IV Semester

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

(Associated Lab 2 hrs per week)

CE407 - 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/pore ratio, concrete mix design (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 reducers, accelerator, retarders, water-proofing 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 ramps. **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**

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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:

1. *Gupta, R.K. – Civil Engineering Materials & Construction Practices*
2. *Varghese, P.C. – Building Materials*

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B.Tech. in Civil Engineering IV Semester

Contact Hours (L-T-P): 2-0-0

(Associated Lab 4 hrs per week)

CE408 - 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:

1. Surveying Vol. I & II by K.R. Arora.
2. Surveying Vol. I & II by B.C. Punmia.
3. Surveying Instruments by Cledenning & Oliver

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Contact Hours per week: 2 hrs

(Associated theory course 3L)

CE409 - 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
4. Measurement and adjustment of included angles of traverse 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.
9. Measurement of horizontal angle.
 - 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.

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B.Tech. in Civil Engineering IV Semester

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

(Associated Lab 3 hrs per week)

CE410 - 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 –

Building Technology ; Sipani, R.K.

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Contact Hours per week: 3 hrs

CE411 - Building Planning & Design

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)
- 6 Foundations for Masonry Structures and Framed Structures, Provision of Damp Proof Course
- 7 Development of Front Elevation and Sectional Elevation from a given plan
- 8 Development of Plan, Front Elevation and Sectional Elevation from line diagram

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B.Tech. in Civil Engineering V Semester

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

CS4002: Web Designing Techniques – I - Course Outlines

Introduction to Networking Technology

Computer network, uses of computer networks, network hardware, network protocol, Reference models: The OSI reference model, the TCP/IP Reference model, a comparison of the OSI and TCP/IP reference models. Introduction of Ethernet, Hub, Client Server Architecture, Switch, modem.

The World Wide Web (WWW)

HTML History, Hypertext and Hypertext Markup Language.**HTML Documents:** Tags, Elements of an HTML Document: Text Elements, Tag Elements, Structural elements of HTML documents, Header tags, Body tags, Paragraphs, Title.

List: Numbered list, Non-Numbered lists, Definition lists

Formatting HTML Documents: Logical styles (source code, text enhancements, variables), Physical Styles (Bold, Italic, underlined, crossed),

Managing images in html: Image format (quality, size, type), Importing images (scanners), Tags used to insert images.

Frames

Tables in HTML documents: Tags used in table definition, Tags used for border thickness, Tags used for cell spacing, Tags used for table size, Dividing table with lines, Dividing lines with cells, Cell types: Titles cells, Data cells

Hypertext and Link in HTML Documents

URL/FTP/HTTP

Types of links: Internal Links, External Link, Link Tags, Links with images and buttons, Links that send email messages Special effects in HTML documents.

Web Designing with PHP (Introduction)

Orientation and First Steps: PHP's Place in the Web World, Basic Rules of PHP Programs, Application of PHP on the internet. Advantages of PHP.

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Contact Hours (L-T-P): 0-0-2

CS4007: Computer Lab – IV - Course Outlines

List of Exercises

Develop a static html page using style sheet to show your own profile.

- Add a page to show 5 photos and
 - Add a page to show your academics in a table
 - Add a page containing 5 links to your favorite website
 - Add navigational links to all above pages (add menu).
2. Update your homepage, by creating few html file.
 3. Use Cascading Style Sheets to format your all pages in a common format.
 4. Basic programs:
 - Write a simple "hello word" program.
 - Write a program to accept two strings (name and age) from user. Print welcome statement.
 - Write a program to create a calculator, which can support add, subtraction and multiply and division operation.
 - Write a program to take input parameters for a table (no. of rows and no. of columns), and create the desired table.
 - Create a "Contact Me" page -
 - Ask user to enter his name, email ID,
 - Use Java-Script to verify entered email address.
 - Store submitted value in a MySql database.
 - Display latest 5 submitted records in contact me page.
 - Display above record with navigation support. (e.g. next, previous, first, last).

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

(Associated Lab 2 hrs per week)

CE501 - 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.

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Contact Hours per week: 2 hrs

(Associated theory course 3L-1T)

CE502 - 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

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

(Associated Lab 3 hrs per week)

CE503 - Concrete Structures – I - Course Outlines

Design Philosophies: Working stress, ultimate strength and limit states of design. Introduction to working stress method. Analysis and Design of prismatic Sections in flexure using limit state methods: singly and doubly reinforced prismatic sections and lintels.

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

Textbook of Concrete Technology; Kulkarni, P.D., New Age International Publisher

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B.Tech. Civil Engineering Semester IV

Contact Hours per week: 2 hrs

(Associated theory course 3L)

CE504 - 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.

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

(Associated Lab 3 hrs per week)

CE505 - 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.

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Contact Hours per week: 3 hrs

(Associated theory course 3L)

CE506 - Design of Steel Structures – I

List of Exercises

Design as per syllabus of Steel Structures – I.

Suggested books:-

1. *Design of Steel Structures; Duggal, S.K.*

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

CE507 - Solid Waste Management - Course Outlines

General: Problems associated with Solid Waste Disposal.

Generation of Solid Waste: Goals and objectives of solid waste management, Classification of Solid Waste. Solid Waste Generation, Factors Influencing Generation of Solid Waste, Characteristics of Solid Waste, Analysis of Solid Waste.

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

Solid Waste Collections, Transfer and Transport: Collection Systems, Equipment and Labor requirement, Collection Routes, Options for Transfer and Transport Systems.

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

Recovery of Resources, Conversion, Products and Energy: Material Recovery, Energy Generation and Recovery Operation, Reuse in other industry.

Industrial Solid Waste: Nature, Treatment and Disposal Methods.

Suggested books:-

1. Prospects and Perspectives of Solid Waste Management; Hosetti, B.B.; New Age International Publishers

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Contact Hours (L-T-P): 2-0-0

(Associated Lab 4 hrs per week)

CE508 - 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.

Triangulation: Merits and demerits of traversing, triangulation and trilateration. Grades of triangulation, Strength of figure, field procedure of triangulation. Reconnaissance and selection of triangulation stations. Intervisibility of stations and calculation of the heights of towers. Equipment needed for base line measurement, corrections to base line. Satellite station and base line extension.

Errors in Surveying: Classification of errors in surveying. The probability curve, its equation and properties, theory of least squares, weight, most probable value, probable errors, standard errors. Normal equation correlates. **Adjustment of Triangulation Figures:** Adjustment of levels. Adjustment of triangulations figures, Braced quadrilateral Triangle with central, station. Approximate and method of least squares for figure adjustment, Trilateration.

Field Astronomy: Definitions of terminology used in Astronomy, Co-ordinate Systems. Relationships between different Co-ordinate systems. Astronomical Triangle, Napier's Rule. Different methods of determination of Azimuth. **Electronic distance measurement and use of Total station. Survey camp:** (including exercise on triangulation, topographic, or project survey) with duration of maximum 10 days.

Suggested books:

Civil Engineering Syllabus at JECRC University

1. Surveying Vol. I & II by K.R. Arora.
2. Surveying Vol. I & II by B.C. Punmia.
3. Surveying Instruments by Cledenning & Oliver

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B.Tech. Civil Engineering Semester V
Contact Hours per week: 4 hrs
(Associated theory course 2L)

CE509 - 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

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

CE510 - 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:

1. Surveying Vol. I & II by K.R. Arora.
2. Surveying Vol. I & II by B.C. Punmia.
3. Surveying Instruments by Cledenning & Oliver
4. Higher Surveying; Chandra, A.M.; New Age International Publishers

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Contact Hours per week: 2 hrs

CE511 - 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.
2. **Macroeconomics**:- concepts relating to National product- National income and its measurement, Simple Keynesian theory, simple multiplier, money and banking. Meaning and concept of international trade, determination of exchange rate, balance of payment.
3. **Project Evaluation**:- Meaning, Capital and OMR cost, Project life, Stages, Methods of Evaluations with their limitations.
4. **India**:- Brief history of Indian Constitution, framing-features, fundamental rights, duties, directive principles of state. History of Indian National Movement.
Socioeconomic growth after independence.
5. **Management**:- Principles of management, functions-planning, organization, staffing, directing, controlling, coordination , decision making.

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

(Associated Lab 3 hrs per week)

CE601 - Theory of Structures – II : Course Outlines

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:

Theory of Structures; Ramamrutham, S.

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Contact Hours per week: 3 hrs

(Associated theory course 3L-1T)

CE602 - 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).

1. *Introduction of Finite Element Methods.*

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

(Associated Lab 3 hrs per week)

CE603 - Concrete Structures - II : Course Outlines

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

Torsion: Design of beams for torsion. **Continuous and Curved Beams:** Design of continuous R.C. beams, moment redistribution, beams curved in plan.

Circular Domes: Circular domes with u.d.l. & concentrated load at crown. **Yield Line Theory:** Application of Y.L.T. to slabs with simple support conditions.

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

Culverts and Bridges: Design of slab culverts for I.R.C. loading. Cantilever Retaining Walls: Design of cantilever type retaining walls & introduction and stability analysis of counter-fort and buttress type retaining walls.

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*

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Contact Hours per week: 3 hrs

(Associated theory course 3L)

CE604 - Design of Concrete Structures – II

List of Experiments

Design as per syllabus of theory.

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

(Associated Lab 3 hrs per week)

CE605 - 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.*

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Contact Hours per week: 3 hrs
(Associated theory course 3L)

CE606 - Design of Steel Structures – II

List of Experiments

Design as per syllabus of theory.

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

CE607 - 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.

Highway Geometric Design: Cross Sectional Elements, camber, Sight Distances – definition and analysis of SSD and OSD, Design of Horizontal Alignment – Super elevation, extra widening, transition curves. Design of Vertical Alignment – Gradients, Vertical curves.

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:

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Contact Hours per week: 3hrs

CE608 - Road Material Testing Lab

List of Experiments

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 give sample of bitumen.
12. Marshall stability test
13. Float test

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

CE611 - 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.

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

(Associated Lab 2 hrs per week)

CE612 - 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 Montmorillonite 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.

Stresses in soil mass: total, effective and neutral pressure, calculation of stresses, influence of water table on effective stress, quicksand phenomenon. Seepage and Seepage Pressure, Laplace's equation for seepage. Flow net and its construction. Uplift pressure, piping, principle of drainage by electro Osmosis, phriatic line, Flow net through earth dam.

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-strain curves for soils. Typical failure envelopes for cohesion less soils and normally consolidated clay soils.

Principles of soil compaction, laboratory compaction tests; Proctor's test Modified Proctor tests, Measurement of field compaction, field methods of compaction and its control, dry and wet of optimum, factors affecting compaction. Soil stabilization, Mechanical Stabilization. Stabilization with cement, lime and bitumen.

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Contact Hours per week 2

(Associated theory course 3L)

CE613 - 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- ϕ values by Direct Shear Test Apparatus
12. Determination of unconfined compressive strength by unconfined compression Test apparatus

Design as per syllabus of theory.

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

(Associated Lab 2 hrs per week)

CE701 - Geotechnical Engineering – II : Course Outlines

Stresses in Soil under surface loading: Boussinesq's and Westergaard's analysis for vertical pressure and its distribution in a soil mass. Vertical stresses due to concentrated loads, Horizontal and shear stresses due to concentrated loads. Isobar diagram, Vertical stress distribution on a horizontal plane. Influence diagram. Vertical stresses at point under line load and strip load. Vertical stresses at a point under circular and rectangular loaded area. Approximate methods of obtaining vertical pressure due to surface loading. Newmark's chart, Fensky's Chart. Pressure bulb and its significance in Foundation exploration. Contact pressure below foundations.

Compressibility and Consolidation: Introduction to consolidation, comparison of compaction and consolidation, Spring Analogy Terzaghi's one dimensional consolidation theory, Degree of consolidation, consolidation test, Compressibility parameters, coefficient of consolidation. Preconsolidation pressure and its determination. Normally, over and under consolidated soils. Methods of predicting Settlement and its rate. Total and differential Settlement.

Stability of Slopes: Classifications of slopes, Stability analysis of infinite slopes. Stability of finite slopes by Swedish and Friction circle method. Taylor's stability number curves. Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction. Bishop's method of stability analysis. **Site Investigations:** Methods of explorations. Planning of Investigations, Depth of exploration, Number of boreholes, Undisturbed and Disturbed samples. Types of samplers. Brief description of procedures of sampling, Transportation and Storage of samples. Geophysical methods of investigations

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.

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Bearing Capacity of Soils: Terminology related to bearing capacity, Common types of foundations. Terzaghi and Meyehoff's theory for bearing capacity. Rankine's method for minimum depth of foundation. Skempton's method. Effect of eccentricity and water table on bearing capacity. IS code method, Plate load and penetration tests for determining bearing capacity. Introduction to pile, well and machine Foundations.

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Contact Hours per week 2

(Associated theory course 3L)

CE702 - 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.

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B.Tech. in Civil Engineering VII Semester

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

CE703 - 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.

Airport Pavement Design: Factors Affecting Pavement Design, Design methods of Flexible Pavements, Design methods of Rigid Pavements.

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

CE704 - 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.

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

CE705 - Remote Sensing and GIS - Course Outlines

Remote Sensing: Introduction and definition of remote sensing terms, Remote Sensing System, Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows.

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

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

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.

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CE706 - Practical Summer Training Seminar

Practical Training Seminar related to Civil Engineering

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Contact Hours per week 2

CE708 - 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.

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Contact Hours per week 6

CE801 - Major Project

Project related to Civil Engineering

List of Departmental Elective (DE) Subjects

Any three subjects DE-I (CE609, 610), DE-II (CE709, 710) and DE-III (CE711, CE712) are to be chosen from the list of following subjects.

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

Project Planning - Course Outlines

FINANCIAL EVALUATION OF PROJECTS AND PROJECT PLANNING: Capital investment proposals, criteria 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.

CONTRACT MANAGEMENT: Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration.

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.

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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.

Reinforced concrete culverts & bridges: Reinforced concrete slab culvert, T-beam bridges-courbons & Hendry-Jaegar methods. Design of balanced cantilever bridge.

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.

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

(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.

Limits of settlements for various structures, Indian Standard Code Provisions (IS: 1904, 6403, 8009). Determination of allowable bearing capacity as per IS code. Schemartman's method, Dee beer's and Mortin method of finding out settlement from static cone penetration test. Methods of finding out bearing capacity from plate load test, standard penetration test data.

Pile foundations: types of pile and their use, modes of failure. Bearing capacity and settlement of pile foundation. Types of piles, Allowable load, Pile load test, Dynamic and static formulae. Bearing Capacity factors. Pile group bearing capacity and settlement. Negative skin friction. Behavior of piles under lateral loading. Winkler's assumption. Pile resistance and deflection under lateral loads, elastic method, Brooms method.

Foundation on difficult Soils: Collapsible soil; identification, Collapse settlement: foundation design. Sanitary land fills settlement of sanitary land fill. **Expensive soils:** Behaviour of expansive soil, foundation practices, under-reamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980 for design of under-reamed pile foundations.

Raft foundation: common types of raft, combined footing. Bearing capacity of raft, differential settlement of raft; semi empirical method of design of raft foundation. **Well foundations:** design and construction. Bearing capacity, settlement and lateral resistance. Tilts and shifts, IS and IRC codes methods.

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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.

Statistical Methods for Traffic Engineering: Elementary concepts and Probability, Mean, Standard Deviation and variance, Poisson and Binomial Distribution, Normal distribution, sampling Theory and Significance testing, Linear Regression and correlation.

Traffic Characteristics: Macroscopic and Microscopic Characteristics related to Volume, Speed and Density, their relationships, Road User Characteristics – Human and vehicular Characteristics. **Traffic Engineering Design:** Principles of Road Junction design, Design of Roundabouts, Bus Stops and Parking Lots, Design of Signals.

Traffic Management: Traffic Laws, Regulations and Ordinances for Drivers, Pedestrians and Mixed Traffic. Traffic control Measures – One Way streets, Kerb Parking Control, Intersection Control, Speed Control, Access Control. Expressways. Traffic Control Devices – Traffic Markings, Signs, Signals, Traffic Islands, their Classification, types and Sketches, Street Lighting.

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.

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Contact Hours per week 2

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.
2. Analysis of rates- for earthwork, concrete work, D.P.C., stone masonry, plastering, pointing and roadwork.
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.

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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.
4. Design of machine foundation.
5. Design of retaining structures etc.

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B.Tech. in Civil Engineering Semester IV

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

Operations Research - 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.

Elementary Statistics & Probability: Elementary theory of probability, Bayes' Theorem and practical applications, Theoretical probability distributions: Binomial, Poisson and Normal.

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:

Rawat Mohan Lal – Operations Research

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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

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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.

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

Design of Pre Stressed Concrete structures - Course Outlines

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.