



INDUS INTERNATIONAL UNIVERSITY

COURSE SCHEME & SYLLABUS

BACHELOR OF TECHNOLOGY

CIVIL ENGINEERING

(SEMESTER FIRST TO EIGHTH)

**BOARD OF STUDIES OF CIVIL DEPARTMENT
SCHOOL OF ENGINEERING
(Batch 2014 Onwards)**

Course Scheme for B.Tech (Civil) 2014 - 2015

First Semester

S. No.	Course Code	Course Name	L	P	Cr
1.	UMA108	Mathematics-I	4	0	4.0
2.	UME107	Engineering Graphics	2	4	4.0
3.	UCS105	Computer Programming	3	3	4.5
4.	UEC108	Electrical and Electronics Science	3	3	4.5
5.	UME108	Manufacturing Process	3	3	4.5
6.	UPH108	Physics	3	2	4.0
		Total	18	15	25.5

Second Semester

S. No.	Course No.	Course Name	L	P	Cr
1.	UMA209	Mathematics-II	4	0	4.0
2.	UME008	CADD	2	3	3.5
3.	UCA203	Data structure using C	3	3	4.5
4.	UEC201	Semiconductor Devices	3	3	4.5
5.	UME202	Engineering Mechanics	4	0	4.0
6.	UEN003	Communicative English	2	0	2.0
7.	UCH001	Engineering Chemistry	3	2	4.0
		Total	21	11	26.5

Third Semester

S.No.	Course Code	Course Name	L	P	Cr
1.	UMA307	Linear Programming & Optimization Techniques	3	2	4.0
2.	UME301	Fluid Mechanics	3	3	4.5
3.	UCE301	Civil Engineering Materials	3	3	4.5
4.	UCE302	Architecture and Building Drawings	3	3	4.5
5.	UME304	Solid Mechanics	3	3	4.5
6.	UCE303	Surveying	3	3	4.5
7.	UEN004	Practical Communicative English - I	0	2	1
		Total	18	19	27.5

Fourth Semester

S. No.	Course Code	Course Name	L	P	Cr
1.	UMA407	Numerical Analysis and Statistical Methods	3	2	4.0
2.	UCE401	Material Science and Engineering	3	3	4.5
3.	UCE402	Hydrology and Ground Water	4	0	4.0
4.	UCE403	Structural Analysis	3	3	4.5
5	UCE404	Advanced Surveying	3	3	4.5
6	UCE405	Concrete Technology & Construction Machinery	3	3	4.5
7	UEN005	Practical Communicative English - II	0	2	1
		Total	19	16	27

Fifth Semester

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE501	Soil Mechanics	3	3	4.5
2.	UCE502	Water Supply Engineering	3	3	4.5
3.	UCE503	Advanced Structural Analysis	4	0	4
4.	UCE504	Steel Structure Design - I	4	0	4
5	UCE505	Transportation Engineering - I	3	3	4.5
6	UCE506	Construction Management	4	0	4
7	UCE507	Survey Camp 4 weeks- after second year during summer vacations	0	0	4
8	UEN006	Practical Communicative English - III	0	2	1
		Total	21	11	30.5

Sixth Semester

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE601	Sewerage and Sewage Treatment	3	3	4.5
2.	UCE602	Foundation Engineering	3	3	4.5
3.	UCE603	Hydraulic Engineering	3	3	4.5
4.	UCE604	Concrete Structures Design	4	0	4
5	UCE605	Transportation Engineering-II	4	0	4
6		Elective - I	4	0	4
7	UEN007	Practical Communicative English - IV	0	2	1
		Total	21	11	26.5

Seventh Semester

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE701	Project Semester 'OR'			16
2.	UCE702	Ground Improvement	4	0	4
3.		Elective-II	4	0	4
4.	UCE703	Project	0	0	4
5	UCE704	Practical Training (Six Weeks)	0	0	3
6	UEN008	Practical Communicative English - V	0	2	1
		Total	8	2	16

Eighth Semester

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE801	Steel Structures Design - II	4	0	4
2.	UCE802	Earthquake Resistant Design	3	3	4.5
3.	UCE803	Irrigation Engineering	4	0	4
4.	UBA015	Engineering Economics	4	0	4
5		Elective-III	4	0	4
6		Elective-IV	4	0	4
7	UCE804	Design Project	0	0	2
8	UEN009	Practical Communicative English - VI	0	2	1
		Total	23	5	27.5

Total Course Credits: 207

Elective -I

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE607	Planning of Buildings and Valuation Techniques	4	0	4
2.	UCE608	Advanced Core Software Application in the Field of Civil Engg.	0	0	4
3	UCE609	Industrial, Hospital, Nuclear Waste Management	4	0	4
4	UCE610	Green Energy Building	4	0	4

Elective - II

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE706	Site Organization and Management	4	0	4
2.	UCE707	Construction Materials and Techniques	4	0	4
3.	UCE708	Ground Water Engineering	4	0	4
4.	UCE709	MAT Lab Software Application In Civil Engg.			

Elective - III

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE806	Bridge Engineering	4	0	4
2.	UCE807	Geo-techniques	4	0	4
3.	UCE808	Water Resources Planning and Management	4	0	4
4.	UCE809	Advanced Transportation Engineering	4	0	4

Elective-IV

S. No.	Course Code	Course Name	L	P	Cr
1.	UCE810	Design of Masonry	4	0	4
2.	UCE811	Soil Dynamics.	4	0	4
3.	UCE812	Rock Mechanics	4	0	4
4.	UCE813	Remote Sensing and GIS	4	0	4

Detailed Syllabus of B Tech (1st Semester)

MATHEMATICS-I

(L-P-Cr: 4-0-4)

Successive Differentiation: Higher order derivatives, n^{th} derivatives of standard functions, n^{th} derivative of rational functions, Leibnitz theorem.

Applications of Derivatives: Mean value theorems and their geometrical interpretation, Cartesian graphing using first and second order derivatives, Asymptotes and dominant terms, Graphing of polar curves, Polar equations for conic sections.

Sequences and Series: Introduction to sequences and Infinite series, Tests for convergence/divergence: Limit comparison test, Ratio test, Root test, Cauchy integral test, Cauchy condensation test. Alternating series, Absolute convergence and conditional convergence.

Series Expansions: Power series, Taylor series, Convergence of Taylor series, Error estimates, Term by term differentiation and integration, Multiplication and division process in power series.

Partial Differentiation: Functions of several variables, Limits and continuity, Chain rule, Change of variables, Partial differentiation of implicit functions, Taylor series of two variables, Directional derivatives and its properties, Maxima and minima by using second order derivatives.

Multiple Integrals: Change of order of integration, Change of variables, Applications of multiple integrals to areas and volumes.

Vector Calculus: Differentiation and integration of vector valued functions, velocity, acceleration, tangent, principle normal and binormal vectors, Curvature, Torsion and TNB frame. Scalar and vector fields, Gradient, Divergence and Curl. Line integrals, Work, Circulation and Flux. Green's theorem in Plane, Gauss-divergence and Stoke's theorem (without proof).

Text Books

1. Thomas, G.B. and Finney, R.L., *Calculus and Analytic Geometry*, Pearson Education (2007) 9th ed.
2. Stewart James, *Essential Calculus*; Thomson Publishers (2007) 6th ed.

Reference Books

1. Wider David V, *Advanced Calculus: Early Trancedentals*, Cengage Learning (2007).
2. Apostol Tom M, *Calculus, Vol I and II* John Wiley (2003).

Introduction: Use of drafting tools, Lettering, Dimensions and Standards, Line Conventions.

Projection Systems: Projection Planes, Projection systems, Orthographic projections of points in first angle projection system and third angle projection system, Orthographic projections of lines on reference planes, True length of line using rotation of view method, Traces of lines, Auxiliary planes and their applications, Projections of Lamina parallel/inclined to reference planes, Projection of solids- Polyhedra, Solids of revolution, Sections of solids- Section plane parallel / inclined to reference planes, Intersection of solids.

Development of Surfaces: Development of surfaces like Prism, Pyramid, Cylinder, Cone, Sphere etc. using Parallel Line Method, Radial Line Method, Triangulation method.

Orthographic Projections: Extracting Orthographic projections from given pictorial views.

Isometric Views: Extracting Isometric projections from given Orthographic views using box method, Offset method.

Missing Lines and Missing Views: Evaluating missing lines and missing views from given orthographic views.

Text Books

1. Gill, P.S., *Engineering Drawing - Geometrical Drawings*, S.K. Kataria (2008).
2. Mohan, K.R., *Engineering Graphics*, Dhanpat Rai Publishing Company (P) Ltd (2002).

Reference Books

1. French, Thomas E., Vierck, C. J. and Foster, R. J., *Fundamental of Engineering Drawing & Graphics Technology*, McGraw Hill Book Company (2005).
2. Bhatt, N.D. and Panchal, V.M., *Engineering Drawing: Plane and Solid Geometry*, Charotar Publishing House (2006) 49th ed.

Laboratory Work

Relevant Engineering drawing exercises – manual and using AutoCAD

Introduction: Elements of computer processing, Hardware and software, Introduction and feature wise comparison of various Operating Systems, Including DOS, Windows and Linux, Problem solving- algorithms and flowcharts.

C Programming Basics: Basic program construction, Structure of a C program, Compilation process. Various compilers available on different OS/ environments including Turbo C, Borland C, gc, gcc, MSVC. Console I/O (printf, scanf), preprocessor directives, Comments, Data types, Type conversions, Operators - arithmetic, Relational, Logical, Conditional, Increment/decrement, Library functions, Header files.

Loops and Decision Statements: *for* loop, *while* loop, *do* loop, Various forms of *if* statement, *switch* statement, *break* statement, *continue* statement, *goto* statement, arrays and strings, Declaring an array, Initializing arrays, Accessing the array elements, Working with multidimensional arrays, Declaring and initializing string variables, Arithmetic operations on characters, String handling functions (string.h), Pointers, Pointers to pointers, Declaring and initializing pointers, Pointer expressions, Pointer increment and scale factor, Pointers and arrays, Pointers and strings.

Functions: Defining functions, Passing arguments to functions, Returning values from functions, Reference arguments, Variables and storage classes, Static functions, Pointers and functions.

Structures and Union: Declaring and initializing a structure, Accessing the members of a structure, Nested structures, Array of structures, Using structures in functions, Pointers and structures, Declaring and initializing a union.

Files: Reading and writing to text and binary files, Character I/O, String I/O, File pointers, Error handling, Redirection, Command line arguments.

Structured Programming vs. Object Oriented Programming.

Laboratory work

Simple programs to demonstrate the use of constants, Variables, printf, scanf and operators. Programs using Loops: Solution of quadratic equation, Summation of finite series, Fibonacci series, Prime numbers, Factorial. Menu driven programs using switch statement. Use of continue and break statements, Conditional operators. Passing variables to functions by values and by reference, Number conversion using array, Sorting, Merging, Arithmetic operations on matrices. String manipulation: Comparing, Copying, Reversing, Finding length, Extracting characters. Simple programs demonstrating the concept of Pointers, Passing values to functions using pointers for arrays, Structures. Creating various types of records using structures. Storing and retrieving records from a file, Copying a data file. Randomly accessing a record, Use of command line arguments.

Text Books

1. Kernighan Brian W. and Ritchie, Dennis M, *The C Programming language*, Dorling Kingsley(2008) 2nd ed.
2. Balagurusamy, E., *Programming in Ansi C*, TMH Publications (2007) 3rd ed.

Reference Books

1. Stroustrup, Bjarne, *The C++ Programming Language*, Addison Wesley (2000) 3rd ed.
 2. Kanetkar, Yashavant, *Let Us C*, BPB 7th Ed. (2006) 8th ed.
- Total contact hours: 33, , Total credits: 25.5

Introduction: Basic electrical quantities, Electric circuit sources and circuit elements and their behavior (Active and passive).

Supply Systems: AC Supply system (Single phase, Three phase–three wire, Three phase–four wire), DC supply system, Their specifications and Comparison. D.C. Networks: Mesh and Nodal Analysis, Star–Delta Transformation, Superposition theorem, Thevenin’s theorem, Norton’s theorem, Maximum power transfer theorem, Step voltage response of RL and RC series circuits.

Sinusoidal Steady-State Response of Circuits: Concept of Phasors, Phasor representation of circuit elements, Complex notation representation, Series and parallel circuits, Power and power factors, Resonance in series and parallel circuits, Balanced 3–phase voltage, Current and power relations, 3–phase power measurement.

Magnetic Circuits: Concept of Magnetic circuits, B–H curve, Calculation of Magnetic Circuits, Iron Losses.

Single–Phase Transformers: Constructional feature, EMF equation, Ideal transformer, Open and short circuit tests, Voltage regulation and efficiency.

Rotating Electrical Machines: Construction, Operating principles and Applications of DC generator, DC motor, Three phase Induction motor and Single phase induction motors.

Electrical safety and Wiring: Electrical safety and standards, House hold wiring and electric appliances.

Energy Management: Conservation efforts, Auditing.

Electronic Devices: P–N diode, BJT, SCR, FET, MOSFET, Their V–I characteristics and applications (Diode as rectifier, Zener diode as voltage regulator).

Laboratory Work

Kirchhoff’s laws, Network theorems, A.C. series and parallel circuits, Resonant circuit, Measurement of power 3–phase circuits, Reactance calculation of variable reactance choke coil, Tests on transformers, Starting methods of DC motor, Three phase induction motor and single phase induction motor, Identification and testing of devices (R,L,C, Diode and Transistor), V–I Characteristics of P–N diode, Zener diode , BJT as amplifier, Use of diode as half wave and full wave rectifier.

Textbooks

1. *Smith, I.M., Hiley, J. and Brown, K., Electrical and Electronic Technology, Dorling Kingsley (2007) 9th ed.*
2. *Nagrath, I.J. and Kothari, D.P., Basic Electrical Engineering, Tata McGraw–Hill (2002) 2nd ed.*
3. *Naidu, M.S. and Kamashaiah, S., Introduction to Electrical Engineering, Tata McGraw–Hill (2004).*

Reference Books

1. *Chakrabarti, A., Basic Electrical Engineering, Tata McGraw–Hill (2008).*
2. *Del Toro, V., Electrical Engineering Fundamentals, Prentice–Hall of India Private Limited(2008) 2nd ed.*

MANUFACTURING PROCESSES

(L-P-Cr: 3-3-4.5)

Introduction: Common engineering materials and their important mechanical and manufacturing properties, General classification of manufacturing processes.

Metal Casting: Principles of metal casting, Patterns, Their functions, Types, Materials and pattern allowances, Characteristics of molding sand, Types of cores, Chaplets and chills, their materials and functions, Moulds and their types, Requisites of a sound casting, Introduction to Die Casting.

Metal Forming and Shearing: Forging, Rolling, Drawing, Extrusion, Bending, Spinning, Stretching, Embossing and Coining, Die and Punch operation in press work, Shearing, Piercing and blanking, Notching, Lancing.

Machining Processes: Principles of metal cutting, Cutting tools, their materials and applications, Geometry of single point cutting tool, Cutting fluids and their functions, Basic machine tools and their applications, Introduction to non-traditional machining processes (EDM, USM, CHM, ECM, LBM, AJM, and WJM).

Joining Processes: Electric arc, Gas, Resistance and Thermit welding, Soldering, Brazing and Braze welding, Adhesive bonding, Mechanical fastening (Riveting, Screwing, Metal stitching, Crimping etc.).

Plastic Processing: Plastics, their types and manufacturing properties, Compression molding, Injection molding and Blow molding, Additives in Plastics.

Modern Trends In Manufacturing: Introduction to numerical control (NC) and computerized numerical control (CNC) machines, Programmable automation (FMS, CIM, etc.).

Laboratory Work

Relevant shop floor exercises involving practice in pattern making, Sand casting, Machining, Welding, Sheet metal fabrication techniques, Fitting work and surface treatment of metals, Demonstration of Forge welding, TIG/MIG/GAS/Spot/Flash butt welding, Demonstration on Shaper, Planer and Milling machine.

Text Books

1. Degarmo, E. P., Kohser, Ronald A. and Black, J. T., *Materials and Processes in Manufacturing, Prentice Hall of India (2008) 8th ed.*
2. Kalpakjian, S. and Schmid, S. R., *Manufacturing Processes for Engineering Materials, Dorling Kingsley (2006) 4th ed.*

Reference Books

1. Martin, S.I., Chapman, W.A.J., *Workshop Technology, Vol.1 & II, Viva Books (2006) 4th ed.*
2. Zimmer, E.W. and Groover, M.P., *CAD/CAM - Computer Aided Designing and Manufacturing, Dorling Kingsley (2008).*
3. Pandey, P.C. and Shan, H. S., *Modern Machining Processes, Tata McGraw Hill (2008).*
4. Mishra, P. K., *Non Conventional Machining, Narosa Publications (2006).*
5. Campbell, J.S., *Principles of Manufacturing, Materials and Processes, Tata McGraw Hill Company (1999).*
6. Lindberg, Roy A., *Processes and Materials of Manufacture, Prentice Hall of India (2008) 4th ed.*

Sound Waves: Introduction, Reverberation, Eyring's Formula, Absorption coefficient, Conditions for good acoustical design, Production and detection of ultrasonic waves and their applications.

Electromagnetic Waves: Introduction, Coulomb's Law & Gauss's Law. Poisson's & Laplace's equations. Basic laws of electricity & magnetism. Maxwell's equations in differential and integral forms, derivation of Maxwell's equation. Concept of displacement current, Electromagnetic wave equations for free space, Conducting and dielectric medium, Poynting theorem, Concept of wave guides.

Light: Interference: thin films, wedge-shaped films, non-reflecting films, Newton rings, experimental arrangement and diameter of the rings, measurement of wavelength of sodium light and refractive index of transparent liquid, Michelson interferometer. Diffraction: Fresnel & Fraunhofer. Single, double and multiple slits (plane diffraction grating). Dispersive and resolving powers. Polarization: polarized and unpolarized light, production and detection.

Quantum Mechanics: Origin of quantum hypothesis, de-Broglie hypothesis of matter waves, Uncertainty principle, Wave function and wave mechanics, Schrodinger equation: time dependent & steady state form, Quantum mechanical operators, Expectation value and one dimensional solutions for step potential, potential barrier and potential well.

Laser: Basic concepts, Laser properties, stimulated absorption, spontaneous & stimulated emission, Einstein's coefficients, Pumping and population inversion, Laser systems: ruby, Nd:YAG, He-Ne and semiconductor lasers.

Laboratory Work

To determine the: wave length of sodium light using diffraction grating, refractive index of a prism material using spectrometer. Numerical aperture of an optical fiber. Frequency of ac mains by using an electromagnet. Value of Planck's constant by using a photo electric cell. Dielectric constant and polarizability of a dielectric material. Value of e/m of electron by J. J. Thomson method. Velocity of ultrasound waves using ultrasonic spectrometer in a given liquid (Kerosene oil). Angular divergence of a laser beam. Wave length of sodium light by Newton's ring method. Wave length of He-Ne laser using diffraction grating. To generate sine & square waves using CRO and measure their frequency and amplitude.

Text Books:

1. David, J. G., *Introduction to Electrodynamics*, Pearson Education (2003).
2. Ghatak, A., *Optics*, Tata McGraw Hill Publishing Co. Ltd, New Delhi (2006).
3. Beiser, A., *Concept of Modern Physics*, Tata McGraw Hill Publishing Co. Ltd, New Delhi (2003).

Reference Books:

1. Rajendran Baldev Raj and Palanichary P.V., *Science & Technology of Ultrasonics* 1st Edition, Narosa Publications (2007).
2. Schiff L. I., *Quantum Mechanics*, 3rd Edition MC- Graw Hill, (2007) Chattopadhyay D. and Rakshit P.C., *Practical Physics*, 7th Edition, New Central Book Agency (2002).

Detailed Syllabus of B Tech (2nd Semester)

MATHEMATICS-II

(L-P-Cr: 4-0-4)

Ordinary Differential Equations:-

Classification and construction of differential equations, Exact Differential Equations, Equations Reducible to exact form by Integrating factor, Equations of first order and higher degree, Clairauts Equation, Leibnitz Linear and Bernoulli Equations, Second and higher order differential Equations, Method of finding Complimentary functions and Particular Integrals, Solution techniques: Using one known solution, Cauchy - Euler equation Method of undetermined coefficients, Variation of parameters method, Operator method, Simultaneous Differential Equations with Constant Coefficients

2 Linear Algebra

Rank of Matrix, Elementary Transformations, Linear independence and dependence of vectors, Gauss Jordan Method for finding inverse of matrix, Consistency of Linear System of Equations, Eigen-values, Eigen-vectors, Diagonalisation, Special type of matrices and their properties, Caley Hamilton Theorem.

3 Complex Numbers

De- Moivre's theorem and its Applications, Real and imaginary parts of Exponential, Logarithmic, Circular, Inverse, Hyperbolic, Inverse Hyperbolic Functions of Complex Series, C+iS Method

4 Complex Variables

Basics of complex plane, Analytic functions, Cauchy-Riemann equations, Harmonic functions,

Text Books

1. *Krishnamurthy, V.K., Mainra, V.P. and Arora, J.L., An introduction to Linear Algebra, Affiliated East West Press (1976).*
2. *Simmons, G.F., Differential Equations (With Applications and Historical Notes), Tata McGraw Hill (2009) 2nd ed.*
3. *Kasana, H.S., Complex Variables: Theory and Applications, Prentice Hall of India (2004) 2nd ed.*
4. *B.S.Grewal Higher Engineering Maths Khanna Publishers*

Reference Books

1. *Kreyszig Erwin, Advanced Engineering Mathematics, John Wiley (2006) 8th ed.*
2. *Ram Babu, Engineering Mathematics, Pearson Education (2009).*

COMPUTER AIDED DESIGN AND DRAFTING (L-P-Cr: 2-3-3.5)

UNIT 1: Introduction

Getting Started with AutoCAD, Starting AutoCAD, Working with Commands, Opening an Existing Drawing File, Saving Your Work, Basic Drawing & Editing Commands, line ,circle ,arc, rectangle ,erase ,delete, trim, mirror, copy.

UNIT 2: Drawing Organization and Information & creating complex components

Organizing Your Drawing with Layers, editing layers, templates, Poly line and their types, arc and their types, draw polygons and their types, Advanced Editing Commands, Trimming and Extending, Stretching Objects, Creating Fillets and Chamfers, Offsetting Objects, Creating Arrays of Object, Inserting Blocks, Inserting Blocks from Tool Palettes, Preparing to Print, Setting Up a Layout, Printing Concepts.

UNIT 3: Annotating the Drawing and Advanced Layouts and Printing

Advanced Layouts Creating and Using Named Views, Creating Additional Viewports, Layer Overrides in Viewports, Additional Annotative Scale Features, zoom in zoom out command, dimensioning the components and their types, dimensioning tools, Creating Boundaries, Working with Regions, Temporary Overrides.

UNIT 4: 3D Drawing and Modeling and Creating Solids & Surfaces from 2D Objects

Introduction to 3D drawing, 3D commands, revolve ,extrude, swept solid and surface ,swept blend, mirror, loft, sweep, Simple Solids, Working with Solid Primitives, Solid Primitive Types, Working with Composite Solids , Working with Mesh Models Advanced Solid Editing, Editing Components of Solids, Editing Faces of Solids, Fillets and Chamfers on Solids, Working Drawings from 3D Models, Creating Multiple Viewports.

UNIT 5: Lab Exercises

UNIT I

Introduction

Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-O, omega, little o, theta, Time-Space trade-off. Abstract Data Types (ADT)

Arrays

Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists

Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List, Garbage Collection and Compaction.

UNIT II

Stacks

Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion.

Queues, Operations on Queue

Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues, De-queue and Priority Queue.

UNIT III

Trees

Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Heaps, Binary Search trees, AVL trees.

Tree Traversal algorithms: In order, Pre order and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

UNIT IV

Graphs

Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost

Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm, Introduction to Activity Networks.

Sorting, Searching and Hashing: Basic Searching techniques (Linear & binary), Introduction to Sorting. Sorting using selection, insertion, bubble, merge, quick, radix, heap sort, shell sort, topological sort, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Text Book:

1. G.A.V.PAI, *Data Structures and Algorithms*, TMH

Suggestive Readings:

1. *Data Structures (Schaum's Outlines)*, G A V Pai, TMH
2. *Data Structure using C*, AM Tanenbaum, Y Langsam and MJ. Augenstein, Prentice- Hall.
3. *Data Structures and Algorithms*. India: Pearson Education, Hopcroft and Ullma,.

Practical List:

1. Write a program to search an element in a two-dimensional array using linear search.
- 2.
3. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
4. Write a program to sort a given list using quick sort algorithm.
5. Write a program to implement Queue.
6. Write a program to implement Stack.
7. Write a program to implement the various operations on string such as length of string concatenation, reverse of a string & extracting a sub-string from an existing string.
8. Write a program to implement binary search tree. (Insertion and Deletion in Binary search Tree)
9. Write a program to create a linked list & perform operations such as insert, delete, update, reverse in the link list
10. Write the program for implementation of a file and performing operations such as insert, delete, update a record in the file.
11. Create a linked list and perform the following operations on it
 - a) add a node
 - b) Delete a node
12. Write a program to simulate the various searching & sorting algorithms and compare their timings for a list of 1000 elements.
13. Write a program to simulate the various graph traversing algorithms.

ENGINEERING MECHANICS

(L-P-Cr: 4-0-4)

Equivalent Force Systems: Vector Algebra, Planar force systems, Coplanar collinear forces, Concurrent forces, Coplanar parallel forces, Basic concepts of force-couple systems, Varignon's theorem, Simplest equivalent for general force system, Distributed force systems.

Equations of Statics and its Applications: Simple frictionless rigid body assemblies; Equations of equilibrium, Free body diagrams, Support reactions, Two-force members; Plane trusses; Rigid body assemblies including friction; Types and laws of friction.

Centre of Gravity, Mass and Area moment of Inertia: Centroids of simple and built up section, Second moment of area.

Virtual Work and Potential Energy Principles: Application of these principles as replacement of equations of statics for real life problems.

Kinematics of Rigid Bodies: Types of motion, Linear and circular motion.

Dynamics of Rigid Bodies: Newton's Laws, D'Alembert's Principle, and Energy Principles.

Text Books

1. *Shames, Irving H., Engineering Mechanics- Statics and Dynamics, Pearson Education (2006) 4th ed.*
2. *SS Bhakatti, Engineering Mechanics, New Age publishers*
3. *DS kumar, Engineering Mechanics, kataria and sons.*
4. *F. P. Beer and E. R. Johnston, E. R. Eisenberg, W. E. Clausen, Vector Mechanics for Engineers – Statics, Tata McGraw Hill Book Company, 2007*
5. *R. C. Hibbeler, Engineering Mechanics- Statics, Prentice Hall, 2009*

Module-1

(OBJ: To develop basic concept of quantum mechanics and its applications in bonding and spectroscopy)

1. Structure Bonding: Failure of classical mechanics, uncertainty principle, wave nature of particles, Schrödinger equation (need not be derived), interpretation of wave functions, Molecular Orbital theory of diatomic molecules and metallic bonding. (No of lectures-7)

2. Spectroscopy and photochemistry: Interaction and radiation with matter, microwave, IR and UV-VIS spectroscopy: Basic Concepts of selection rules and application to molecular structure determination. (No of lectures-5)

Module - 2

(To develop the basic concepts of thermodynamics and its application to chemical systems)

1. Thermodynamics and chemical equilibrium: variables of states: 1st law of thermodynamics and applications to ideal gas, enthalpy and heat capacity,

Measurement of enthalpy and heat capacity, thermo-chemical calculation 2nd law of thermodynamics concepts of entropy, entropy in physical and chemical changes, molecular interpretation of entropy.

The free energy concepts: application to gases: Gibbs Helmholtz equation: free energy change and criterion of spontaneity of chemical equation; free energy change and criterion of spontaneity of chemical reactions and chemical equilibrium. Physical, ionic and chemical equilibrium. (No of lecturers- 9)

2. Phase rule: one and two component systems H₂O , S, Cd-Bi and Fe-C systems (No of lecturers- 3)

Module - 3

(To develop basic concepts about the rates of reactions Basic idea on homogeneous and heterogeneous catalysis process) 1. Reaction Kinetics and catalysis: collision theory; order and molecularity of reaction kinetics of zero, 1st and 2nd order reactions; activation energy, theory of absolute reaction rates, homogeneous and heterogeneous catalysis. (No of lectures-6)

Module-4

(To develop concepts of electrochemistry and solid state)

1. Electro chemistry: Electro chemical cells, EMF and free energy change of electrochemical reactions, electrode potentials and measurements with reference to standard hydrogen electrode and their application to redox processes, Measurement of EMF, determination of pH, Dry cells , fuel cells and storage cells (No of lectures – 6)

2. Solid state: crystal systems, Bravais lattices, closed packed structures, ionic solids, crystal defects including Schottky and Frankel defects. (No of lectures-4)

Books:

1. *Physical chemistry by G.M.Barrow, 5th edition, Tata McGraw Hill, New Delhi, 1992*
2. *Physical Chemistry by P.W. Atkins, 5th/6th edition, oxford*
3. *Textbook of Chemistry -I, Kalyani Publisher.*

Chemistry Laboratory (Any ten Experiments)

1. Determination of amount of sodium hydroxide and sodium carbonate in a mixture.
2. Determination of Total hardness of water by EDTA method.
3. Estimation of calcium present in the limestone.
4. Preparation of aspirin.
5. Standardization of KMnO_4 using sodium oxalate.
6. Determination of ferrous iron in Mohr's salt by potassium permanganate.
7. Determination of Rate constant of acid catalyzed hydrolysis of ester.
8. Determination of dissolved oxygen in a sample of water.
9. Determination of Viscosity of lubricating oil by red wood Viscometer.
10. Determination of Flash point of given oil by Pensky Marten's Flash point apparatus.
11. Determination of available chlorine in bleaching powder.

Book : B.Tech practical Chemistry-Kalyani publisher

SEMICONDUCTOR DEVICES (L-P-C: 3-3-4.5)

Introduction: Semiconductor Material, crystalline and amorphous, crystal lattice, periodic structure, cubic lattice, plane and directions, crystal growth. Crystal defects: Point defects, line defects, surface defects and volume defects.

Basic semiconductor Physics: charge carriers in semiconductors, intrinsic and extrinsic materials, carrier concentration, Fermi level, conductivity and mobility, carrier drift and diffusion, Hall effect, Invariance of Fermi level at equilibrium. Degenerate and non-degenerate semiconductors. Direct and indirect bandgap semiconductors.

Semiconductor junction diodes: p-n junction diode, thermal equilibrium, built in potential, ideal behavior, no applied bias, current voltage characteristics under forward and reverse bias. Band diagram, Depletion layer, space charge region and junction capacitance.

Zener diode, avalanche breakdown, zener breakdown. Schottky diodes and their applications.

Optoelectronic & Microwave devices: Photodetectors, Photodiodes: an illuminated junction. Light emitting diode (LED): working principle and materials. Photovoltaic devices, Solar cells: solar spectrum, materials, current voltage characteristics, efficiency and fill factor. Semiconductor Lasers: materials and working principle. Tunnel diode, Impatt diode, Gunn diode and semiconductor controlled rectifier.

Bipolar Junction Transistors and Field effect Transistors: fundamentals of BJT operation, schematic symbols, working principle, unbiased and biased transistor, transistor currents, and transistor currents. Base curve, collector curves, common base characteristics and amplification. Common emitter characteristics. Amplification and switching.

JFET & MOSFET: Basic idea, working principle, drain and transconductance curves. JFET Amplifier, JFET applications. Depletion mode and Enhancement mode MOSFET.

Laboratory Work

Study of I-V characteristics of p-n junction diodes (Silicon & Germanium), LED and Zener diode. Study of I-V characteristics of Bipolar Junction Transistor (BJT) in various configurations as common base, common emitter. Study of I-V characteristics of Field Effect Transistor (FET). Study of areal, spectral, current voltage (IV) & power load characteristics of solar cell. To determine the Hall mobility, coefficient and type of semiconducting material using Hall measurement setup.

Textbooks

1. B. G. Streetman and S. K. Banerjee, *Solid State Electronic Devices*, PHI Publishing (2006) 6th ed.
2. Donald A Neaman, *Semiconductor Physics & Devices*, Tata McGraw-Hill (2007) 4th ed.

Reference Books

1. S O Kasap, *Principles of Electronic Materials & Devices*, Tata McGraw-Hill (2007) 3rd ed.
2. <http://nptel.ac.in/courses/Webcourse-contents/IIT-Delhi/Semiconductor%20Devices/>.
3. B. V. Zeghbroeck, *Principles of Semiconductor Devices* (2011) Web book <http://ecee.colorado.edu/~bart/book/book/contents.htm> (University of colorado).
4. M. S. Tyagi, *Introduction to semiconductor materials and devices*, John Wiley & Sons, (2008).

List of Experiments

1. To study the I-V characteristics of p-n junction diodes (Silicon & Germanium).
2. To study the I-V characteristics of Zener diode and measure its Zener voltage.
3. To study the input and output characteristics of a PNP/ NPN transistor in common base configuration.
4. To study the input and output characteristics of a PNP/ NPN transistor in common emitter configuration.
5. To study the I-V characteristics (drain & transconductance) of Field Effect Transistor (FET).
6. To study the variation of the open circuit voltage of a solar cell as a function of incident light intensity.
7. To study the power load characteristics of a solar cell under the illumination.
8. To study the characteristics of SCR (silicon controlled rectifier).
9. To determine the Hall mobility, coefficient and type of semiconducting material using Hall measurement setup.

CIVIL 3RD
SEMESTER
SYLLABUS

LINEAR PROGRAMING AND OPTIMIZATION TECHNIQUES

L P Cr

3 3 4.5

Scope of Operations Research: Introduction to linear and non-linear programming formulation of different models.

Linear Programming: Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex and revised simplex methods, Exceptional cases in LP, Duality theory, Dual Simple method, Sensitivity analysis.

Network Analysis: Transportation problem (with transshipment), Assignment problem, Traveling salesman problem, Shortest route problem, Minimal spanning tree, Maximum flow problem.

Integer Programming: Branch and bound algorithm, Traveling salesman problem.

Dynamic programming: Forward recursions, General problem, Reliability problem, Capital budgeting problem, Cargo-loading problem.

CPM and PERT: Drawing of networks, Removal of redundancy, Network computations, Free slack, Total slack, Crashing, Resource allocation.

Non-Linear Programming: Characteristics, Concepts of convexity, maxima and minima of functions of n-variables using Lagrange multipliers and Kuhn-Tucker conditions, One dimensional search methods, Fibonacci, golden section method and gradient methods for unconstrained problems.

Software: Introduction to software for optimization techniques (TORA).

Text Books

1. Taha, H.A., *Operations Research: An Introduction, Prentice Hall of India (2007) 8th ed.*
2. Kasana, H.S., *Introductory Operation Research: Theory and Applications, Springer Verlag (2005).*

Reference Books

1. Rardin, Ronald L., *Optimization in Operations research, Pearson Education (2005).*
- Ravindran A, Phillips D.T. and Solberg J.J. *Operation Research: Principles and Practice, John Wiley (2007).*

FLUID MECHANICS

L	P	Cr
3	3	4.5

Introduction: Physical properties of fluids, Types of fluids. biofluidmechanics

Fluid statics: Basic equation for pressure field, Measurement of pressure, Hydrostatic forces on Immersed plane and curved surfaces, Buoyancy and flotation.

Fluid kinematics: Methods of describing fluid motion, Velocity and acceleration of a fluid particle, Type of fluid flows, Displacement of a fluid particle, Circulation and vorticity, Continuity equation, Velocity potential and stream function.

Fluid dynamics: Euler's equation, Bernoulli's equation, Momentum equation, Kinetic energy and momentum correction factors.

Flow through pipes: Energy losses, HGL and TEL, Concept of equivalent pipe, Flow through a siphon.

Flow measuring devices: Venturimeter, Orificemeter, Pitot tube, Circular orifice, Current meter, Notches.

Dimensional analysis: Methods of dimensional analysis, Model studies.

Open channel flow: Types of channels, Classification of flows, Uniform flow formulae, Gradually varied Flow.

Pumps: Brief description of types and working of pumps.

Laboratory work

1. Verification of Bernoulli's Theorem,
2. Calibration of Venturimeter,
3. Calibration of orifice meter,
4. To check the stability of a ship model,
5. Determination of friction factor for pipes of different materials,
6. Determination of hydraulic coefficients of an orifice,
7. Determination of loss coefficients for various types of pipe fittings,
8. Calibration of a triangular notch,
9. Visualization of laminar and turbulent flow.

Text Books

1. Streeter, V.L., Wylie E. B. and Bedford, K.W., *Fluid Mechanics*, McGraw Hill Book Company (1998).
2. Jain, A.K., *Fluid Mechanics including hydraulic machines*, Khanna Publishers (2004).
3. Kumar D.S., *Fluid Mechanics and Fluid Power Engineering*, S. K. Kataria(2009).

Reference Books

1. Subramanya, K., *Theory and Application of Fluid Mechanics*, Tata McGraw Hill (2001).
2. Modi P.N. and Seth S.M., *Hydraulics and Fluid Mechanics*, Standard Book House (2002).
3. Shames I.H., *Mechanics of Fluid*, McGraw Hill (2005).
4. Fox, R.W. and McDonald, A.T., *Introduction to Fluid Mechanics*, John Wiley and Sons (2008) 5th ed.

CIVIL ENGINEERING MATERIALS

L	P	Cr
3	3	4.5

Bricks: Composition of good brick earth, harmful ingredient, manufacture of bricks, characteristics of good bricks, shapes classification of bricks as per IS 1077-1985.

Stones: Classification of rocks, test for stones, characteristics of a good building stone, deterioration of stones, common building stones of India, comparison of the brick comparison of the brick work and stone work.

Cement: Manufacture, basic properties of cement compounds, grades, packing storage, quality control and curing, supplementary cementitious materials such as fly ash, rice husk ash, silica fume.

Aggregates: Classification, characteristics, soundness of aggregates, fineness modulus, maximum size of aggregate and grading of aggregates.

Admixtures and Superplasticizers: Functions, classification, accelerating admixture, retarding admixture, air-containing admixtures, waterproofing and permeability reducing admixture, corrosion inhibiting admixtures and coloring admixture.

Lime & Mortar: Classifications & Properties.

Timber: Classification and identification of timber, defects in timber, characteristics of good timber, seasoning of timber and its methods, preservation of timber, varieties of industrial timber, famous Indian timber tress, Plywood.

Metals: Manufacture of steel, market forms of steel e.g. mild steel and HYSD steel bars, rolled steel sections. Thermo Mechanically Treated (TMT) Bars, Brief discussion of properties and uses of aluminum.

Miscellaneous Materials: Epoxies, Asbestos, Asphalt, Bitumen, insulating materials, materials for doors and windows, paints, varnishes, white washing, distempering, materials for structural repairs, cracks and joint fillers.

Laboratory Work

1. To Determine the Specific Gravity of cement.
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement
3. To Determine Soundness of Cement.
4. To Determine the Compressive Strength of Cement.
5. To Determine the Compressive Strength of Bricks/Tiles.
6. To Determine the Fineness Modulus of Fine and Coarse Aggregates.

7. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete
8. To check the properties of Coarse aggregate
9. To carry out the Tensile test on Steel

Text Books

1. *Gambhir, M.L., Concrete Technology, Tata McGraw Hill (2004) 3rd ed.*
2. *Rangwala, S.C., Engineering Materials, Charotar Publishing House (2007) 35th ed.*

Reference Books

1. *Kumar, Sushil, Engineering Materials, Metropolitan Press (1994).*
2. *Kumar, Sushil, Building Construction, Standard Publishers (1990) 15th ed.*
3. *Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Building Construction, Laxmi Publishing House (2008) 10th ed.*

ARCHITECTURE AND BUILDING DRAWINGS

L	P	Cr
3	3	4.5

Aspects of Architecture Design: Proportion, orientation, etc.

Building Drawings: Building layout, Architectural, Structural working drawings.

Masonry: Stone & Brick: Brick masonry, Bonds and junctions, Walling, Mud wall, Sun-dried bricks, Burnt bricks, stones walling, Load bearing & non load bearing brick masonry for multistoried constructions, Brick panel walling, reinforced masonry, Bonds & junctions.

Prefabricated Construction: Prefabricated components, Assembly at site, Low cost housing & hollow blocks.

Lintels & Arches: Location and construction details in wood, Brick, stone and R.C.C.

Stairs & Stair cases: Suitability of location, Stairs in multistoried buildings, Residential and public buildings, Fire escape, Stairs in timber, stone, brick, RCC and Metal Drawings in Plan elevation and sections. Hand rail & railings, Description and sketches of lifts escalators.

Doors & Windows: Details, location in buildings, Sizes & construction for wooden & metal, Battened braced, framed, flush and paneled, sliding, folding telescopic, with louvers, collapsible. Windows in timber and Metal casement, double hung, Dormer, Corner, Fanlight, skylight, clear storey etc. Low cost ideas, Revolving doors, Aluminum doors and windows.

Roofing and Flooring: Types of Flooring, Flat roofs: Waffle floor, channels, cored units, etc., Inclined roofs, Form Work and Scaffolding.

Laboratory Work Using Auto CAD

1. Drawings of Brick masonry bonds and junctions, DPC, Lintels and Arches, Stairs, Doors & Windows
2. A plan of building consisting two stories with three/four rooms:
 1. Plan, Elevations & Section (Modular).
 2. Site Plan (Bye laws application).
 3. Proposed doors – Construction with details.
 4. Roof & floor – details in construction.
 5. Stair case details.

Text Books:

1. Singh, Gurcharan, *Building Construction Engineering*, Standard Book House (1994).

2. *Sharma, S.K., Building Construction, S. Chand (1994).*

Reference Books

1. *Kumar, Sushil, Building Construction, Standard Publisher and Distributors (1990) 5th ed.*
2. *Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Building Construction, Laxmi Publications (2008) 10th ed.*
3. *Sharma, S.K. and Kaul, B.K., A Text Book of Building Construction, S. Chand (1985)*

SOLID MECHANICS

L	P	Cr
3	3	4.5

Equivalent Force Systems: Vector Algebra, Planar force systems, Coplanar collinear forces, Concurrent forces, Distributed force systems.

Equations of Statics and its Applications: Simple frictionless rigid body assemblies; Equations of equilibrium, free body diagrams, Support reactions.

Centre of Gravity, Mass and Area Moment of Inertia: Centroid of simple and built up section, Second moment of area.

Axial stress and strain: Concept of stress and strain, Generalized Hooke's law, Stress-strain diagram of ductile and brittle materials, properties of engineering materials, statically determinate and indeterminate problems, Compound and composite bars, Thermal stresses.

Torsion of Circular shafts: Basic assumptions, Torsion formula, Power transmitted by shafts, Design of solid and hollow shafts based on strength and stiffness.

Shear force and Bending Moment Diagrams: Types of load on beam, Classification of beams, Shear force and bending moment diagrams: Simply supported, Overhung and Cantilever beams subjected to any combination of point loads, uniformly distributed and varying load and moment, Relationship between load, shear force and bending moment.

Theory of Pure Bending: Derivation of flexural formula for straight beams, Bending stress calculation for beams of simple and built up sections.

Shear Stresses in Beams: Shear stress formula for beams, Shear stress distribution in beams.

Analysis of Plane Stress and Strains: Mohr's stress circle, Relation between elastic constants, Strain measurements.

Laboratory Work

□ *Tests for Hardness, Bending, Impact, Tensile strength, Torsion and Compression tests.*

List of Experiments

1. Rockwell/Brinell hardness number of given specimens.
2. Vicker's hardness number test.
3. Torsion test (Destructive): To determine the torsional rigidity of the material.
4. Tensile test on strip/universal testing machine – to obtain the young's modulus of elasticity, tensile strength and percentage elongation of the material.
5. Impact strength of the given material – Izod's and Charpy tests.
6. Experimentally determine the value of E of the beam material using deflections formula for cantilever and simply supported beams.

7. Non-destructive torsion test to determine modulus of rigidity of the shaft material.
8. To study the behavior of the material on UTM.

Textbooks

1. *Bhattacharyya, B., Engineering Mechanics, Oxford University Press (2009).*
2. *Singh, D.K., Mechanics of Solids, Pearson Education Ltd. (2002).*

Reference books

1. *Nanda, S., Basu, N. and Nayak, P.C., Introduction to Mechanics, Narosa Publishing House (1999).*
2. *Shames, Irving H. and Pitarresi, J. M., Solid Mechanics, Prentice Hall of India (1993).*
3. *Crandall, S.H., Dahl, N.C. and Lardner, T.J., An Introduction to the Mechanics of Solids: An Introduction, Tata McGraw Hill (2007) 2nd ed.*

SURVEYING

L	P	Cr
3	3	4.5

Surveying: Definition, classification of surveys, Principle, distorted or shrunk scales, precision in surveying.

Chain Surveying: Instruments for measuring distances, chains, tapes, ranging – direct indirect, methods of chaining, folding and opening of chain, chaining on sloping ground, mistakes in chaining, corrections for linear measurements. Reconnaissance, station selection, limiting length of offsets, field notes.

Compass Surveying: Instruments used in traversing, bearings, meridians, declination, dip of magnetic needle, bearing of lines from included angles, local attraction, closing error and its removal.

Plane Table Surveying: Introduction to plane table surveying, principle, instruments, working operations, setting up the plane table, centering, leveling, Orientation, methods of plane table survey, two and three point problems, danger circle, Lehmann's Rules, errors.

Leveling: Definitions of terms used in leveling, different types of levels, parallax, staves, adjustments, bench marks, classification of leveling, booking and reducing the levels, rise and fall method, line of collimation method, errors in leveling, permanent adjustments, corrections to curvature and refraction, setting out grades, longitudinal leveling.

Contours: Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contour maps.

Laboratory Work

List of Experiments

1. Unfolding / Opening and folding of chain / Measurement of distances / offsets.
2. Chain Survey of an area using base line method.
3. Ranging a line by direct and indirect method.
4. Plane table survey of an area.
5. Two point and Three point problem.
6. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
7. Different methods of leveling, height of instrument, rise & fall methods.

Text Books

1. *Singh, Narinder, Surveying, Tata McGraw Hill (1992).*
2. *Kanetkar, T.P., and Kulkarni, S.L., Surveying and Leveling Part I and II, Pune Vidhyarthi Griha Prakashan (2006).*

Reference Books

1. *Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, Laxmi Publications (2005) 16th ed.*
2. *Agor, R., Surveying, Khanna Publishers (1982).*
3. *Venkatramaiah, C., A Text Book of Surveying, Universities Press (1996).*

CIVIL 4th
SEMESTER
SYLLABUS

NUMERICAL AND STATISTICAL METHODS

L	P	Cr
3	2	4

Floating-Point Numbers: Floating-point representation, Rounding, Chopping, Error analysis, Condition and instability.

Non-Linear Equations: Bisection, Secant, Fixed-point iteration and Newton-Raphson methods, Order of convergence.

Linear Systems and Eigen-Values: Gauss-elimination method (using Pivoting strategies) and Gauss-Seidel Iteration method. Rayleigh's power method for eigen-values and eigen-vectors.

Interpolation: Finite differences, Newton's Forward and Stirling interpolating polynomials, Lagrange and Newton's divided difference interpolation formula with error analysis.

Numerical Integration: Newton-Cotes quadrature formulae (with error) and Gauss - Legendre quadrature formulae.

Differential Equations: Solution of initial value problems using Taylor Series, Euler's and Runge-Kutta (up to fourth order) methods.

Statistical Methods (40% Weightage)

Random Variables: Definition, Distribution Function, Discrete and Continuous Random Variables, Probability functions, Cumulative distributions functions, Mathematical expectation.

Probability Distributions: Binomial, Poisson, Geometric, Uniform, Normal, Exponential and Log- Normal distribution.

Sampling Distributions: Sampling distribution of Means and variance, Chi-Square distribution, t - distribution and F - distribution.

Hypothesis Testing: General concepts, Testing a Statistical Hypothesis, one and two tailed tests, Critical region, Confidence interval estimation. Single and two sample tests on proportion, mean and variance.

Linear Regression and Correlation: Linear Regression, Least Square principal and the Fitted models, Karl Pearson's Correlation Coefficient, Rank Correlation, Lines of Regression (two variables only), Multiple linear Regression

Laboratory Work

Programming exercises on numerical and Statistical methods using C or C++ languages.

1. To detect the interval(s) which contain(s) root of equation $f(x)=0$ and implement bisection Method to find root of $f(x)=0$ in the detected interval. Application with one Example of Field of Civil Engg
2. To find the root of $f(x)=0$ using Newton-Raphson and fixed point iteration methods.
3. To evaluate the Newton's Forward Lagrange and divided difference interpolating polynomials of degree $\leq n$, Based on $(n+1)$ points.
4. To solve linear system of equations using Gauss elimination (without pivoting) method.
5. To solve linear system of equations using Gauss- seidel method.
6. To find the dominant eigen-value and associated eigen-vector by Rayleigh power method. Application with one Example of Field of Civil Engg
7. To integrate a function numerically using trapezoidal and Simpson's rule.
8. To solve the initial value problem using modified Euler's and Runge-kutta methods.
9. Generation of random numbers for Binomial and Poisson distributions using Linear Congruential Generator Algorithm. Application with one Example of Field of Civil Engg
10. Regression analysis using least square principle. Application with one Example of Field of Civil Engg
11. Correlation analysis for bivariate distribution. Application with one Example of Field of Civil Engg
12. Multiple linear Regression Application with one Example of Field of Civil Engg.

Text Books

1. *Conte, S.D and Carl D. Boor, Elementry Numerical Analysis: An Algorithmic approach, Tata McGraw Hill, New York (2005).*
2. *Johnson, R., Miller, I. and Friends, J., Miller and Freund's Probability and Statistics for Engineers, Pearson Education(2005) 7th ed.*
3. *Gerald C.F and Wheatley P.O., Applied Numerical Analysis, Pearson Education (2008) 7th ed.*

Reference Books

1. *Mathew, J.H., Numerical Methods for Mathematics, Science and Engineering, Prentice Hall Inc.J (2002).*
2. *Meyer, P.L.. Introductory Probability and Statistical Applications, Oxford (1970) 2nd ed.*
3. *Jain M.K., Iyengar, S.R.K., and Jain, R.K. Numerical Methods for Scientific and Engineering Computation, New Age International (2008) 5th ed.*
4. *Walpole, Ronald E., Myers, Raymond H., Myers, Sharon L. and, Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson Education (2007) 8th ed.*

MATERIALS SCIENCE AND ENGINEERING

L	P	Cr
3	3	4.5

Crystal Structure and Chemical Bonding: Materials and their classification, Mechanical, Chemical, Electrical properties, Structure-property relationship in engineering materials, Miller Indices, Crystal planes and directions, Determination of crystal structure using X-rays, Chemical bonding in solids, Primary and Secondary bonds.

Structure of Solids: Crystalline and non-crystalline materials, Inorganic solids, Silicate structures and its applications.

Crystal Imperfections: Point defects, Line defects, Surface defects, Movement of Dislocation, Dislocation energy.

Diffusion: Laws of diffusion, Temperature dependence of diffusion coefficient, Determination of activation energy.

Mechanical Properties of Materials: Elastic, Anelastic and Viscoelastic behaviour, Plastic behaviour of solids, Critical shear stress, Twinning and slipping phenomenon, Creep.

Equilibrium Diagram: Solids solutions and alloys, Gibbs phase rule, Isomorphous and eutectic phase diagrams and their construction, Lever arm rule, Application of phase diagrams, Zone refining.

Corrosion Process: Corrosion, Cause of corrosion, Types of corrosion, Protection against corrosion.

Conducting and Resistor Materials: Conducting and resistor materials, Coefficient of thermal expansion, Matthiessen and Nordheim rules for alloys and their engineering application.

Semiconductors: Semiconducting materials, Element and compound semiconductors their properties and applications.

Magnetic Materials: Magnetic materials, Soft and hard magnetic materials their properties and applications.

Dielectric Materials: Dielectric materials, Polarization, Dielectric loss and dielectric breakdown, Ferro, Piezo- and Pyroelectric materials, their properties and applications.

Biomaterials and Applications: Biomaterials with reference to biopolymer and bioceramics.

Modern Materials: Introduction and application to nanomaterials, Smart materials and structures, Optical materials, Superconducting materials, Materials for nuclear and space applications.

Laboratory Work

1. To determine Curie temperature of a ferrite sample and to study temperature dependence of permeability in the vicinity of curie temperature.
2. To study cooling curve of a binary alloy.
3. Determination of the Young's modulus and Ultimate strength of a given fiber strand.
4. To determine the dielectric constant of PCB laminate.
5. Detection of flaws using ultrasonic Flaw Detector (UFD).
6. To study the intensity response of L.D.R and voltage response of a V.D.R.

7. To prepare two metallic specimens for metallographic examination and measure their grain size.
8. Estimation of band-gap energy of Germanium.
9. To determine the light intensity response of a Silicon Solar Cell.
10. To determine the resistivity of a given sample using four probe method.
11. To determine Fiber and void fraction of a glass fiber reinforced composite specimen.
12. To investigate creep of a given wire at room temperature.
13. To estimate the Hall coefficient, carrier concentration and their mobility in Ge Crystal
Approved by the Senate in its 70th meeting held on May 25,2009 Using Hall effect.
14. To estimate the Band-gap of energy of Ge Crystal using Four Probe Technique.
15. To Study the Corrosion behavior of metallic materials.

Text Books

1. *Smith, W.F., Materials Science and Engineering, Tata McGraw Hill (2008) 4th ed.*
2. *Raghavan, V., Materials Science and Engineering: A first Course prentice Hall of India (2005) 5th ed.*
3. *Callister, William D., Materials Science and Engineering: An Introduction, John Wiley (2006) 6th ed.*

Reference Books

1. *Kasap, S.O., Electronic Materials and Devices, Tata McGraw Hill (2007) 3rd ed.*
2. *Van Vlack, L.H., Elements of Material Science and Engineering, Pearson Education (2006) 6th ed.*

HYDROLOGY AND GROUND WATER

L	P	Cr
4	0	4

Introduction: Hydrologic cycle, Scope and Applications.

Precipitation: Types Forms, Measurement by rain gauge and other methods, Design of rain gauges station, mean precipitation, Presentation of rainfall data, Estimation of missing rainfall data. Test for consistency of record, Analysis of rainfall data, Frequency analysis of rainfall data.

Abstractions from Precipitation: Evaporation, Factors affecting evaporation, Evaporation measurement, Infiltration indices.

Run Off: Factors affecting run off, Estimation of run-off (various methods), Rainfall-runoff correlations.

Hydrographs: Components, Base flow separation, Derivation of unit hydrograph and its applications & limitations, Synthetic and Instantaneous unit hydrograph.

Reservoir Planning: Types of reservoir, Storage zones, Selection of reservoir site, Mass curve analysis for reservoir capacity, Reservoir yield and its determination for a given reservoir capacity, Reservoir sedimentation and its control,

Floods: Estimation of peak flood, Methods of flood control, and Flood routing,

Ground Water: Role of Ground Water in hydrological cycle, Distribution of Ground Water, Types of aquifers, Aquifers parameters.

Well Hydraulics: Darcy's law, Types of aquifers, Steady flow towards fully penetrating well, Equation of motion and its applications to ground water flow problems, Types of tube wells, Methods of construction.

Text Books

1. *Subramanya, K., Engineering Hydrology, Tata McGraw Hill (2008) 3rd ed.*
2. *Raghunath, H.M., Hydrology: principles, analysis and design, New Age International Publishers (2006) 2nd ed.*
3. *Garg, S.K., Irrigation Engineering and Hydraulic Structures, Standard Book House (2008) 21st ed.*

Reference Books

1. *Chow, V.T., Mays, L.W. and Maidment, D.R., Applied Hydrology, McGraw Hill (2003).*
2. *Ojha, Bhunya and Berndtsson, Engineering Hydrology, Oxford Publication (2008).*

STRUCTURAL ANALYSIS

L	P	Cr
3	3	4.5

Analysis of Determinate Structures: Revision of analysis of plane trusses, Analysis of pin jointed space trusses using tension coefficients and equilibrium equations.

Displacements: Energy Methods: Strain energy in members, Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, Unit load method.

Analysis of Indeterminate Beams and Frames: Theorem of three moments; Conventional methods of Analysis of rigid frames: Slope deflection method, Moment distribution method.

Moving Loads and Influence Line Diagrams: Bending moment and shear force diagrams due to single and multiple concentrated rolling loads and uniformly distributed moving loads, Equivalent UDL, Muller Breslau principle: Influence lines for beams, Girders with floor beams and frames calculations of the maximum and absolute maximum, shear force and bending moment.

Influence lines for Indeterminate Structures: Influence lines for bending moment, shear force and reactions for continuous, balanced cantilever beams.

Analysis of Typical Structures: Three hinged and two hinged arches, influence lines for thrust, radial shear and bending moment.

Laboratory Work

List of Experiments:

1. Deflection of a simply supported beam and verification of Clark-Maxwell's theorem
2. To determine the flexural rigidity (EI) of a given beam
3. To verify Moment-Area Theorems for slope and deflection of a beam
4. To determine the elastic displacement of curved members
5. To study the behavior of a portal frame under different load condition
6. To study deflection of a statically determinate pin jointed truss.
7. To obtain experimental values for horizontal thrust in a two hinged arch.
8. To obtain experimental values for horizontal thrust in a three hinged arch
9. To study the behavior of asymmetric beam.
10. To calculate the forces in the various members for a redundant joint 3 bars suspension system.

Text Books

1. Wang, C.K., *Indeterminate Structural Analysis*, McGraw Hill (1983).
2. Norris, C.H., Wilbur, J.B. and Utku, S., *Elementary Structural Analysis*, McGraw Hill (1991) 4th ed.

Reference Books

1. *Dayaratnam, P., Advanced Structural Analysis with matrix applications, Tata McGraw Hill (1983).*
2. *Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, S.M.T.S.2 Theory of Structures, Laxmi Publications (2004).*

ADVANCE SURVEYING

L	P	Cr
3	3	4.5

Theodolite: Types of theodolites, measurement of angles, temporary and permanent adjustments, closed & open traverse, omitted measurements, consecutive and independent coordinates, advantages and disadvantages of traversing closing error, Bowditch & Transit Rules, Total Station and its working.

Tacheometry: Definitions and terms used in tacheometry, difference between theodolite and tacheometer, uses, principle of tacheometry, determination of constants, angular tacheometry with staff vertical and staff inclined, Merits and Demerits; Anallatic lens theory, Tacheometric field work, tangential method of tachometry, subtense method of tacheometry, direct reading tacheometer, different types of staves.

Triangulation: Measurement of base line, correction of base line, selection of stations

Curves: Definition, elements of a simple curve, different methods of setting out a simple circular curve, elements of a compound curve, reverse curves, transition curves, their characteristics and setting out, vertical curves, setting out vertical curves, sight distances.

Remote sensing: Introduction, Interaction of EMR with earth surface, Working Principles and instrumentation, Active & passive sensors.

GIS: Introduction, Concepts and terminology, utility of GIS, essential components of GIS, Making Of DEM from toposheet.

Global Positioning Systems (GPS): Working principle, Types of GPS, Corrections, Application of GPS. Utility of GPS.

Laboratory Work

List of Experiments

1. Measurement of horizontal and vertical angle by theodolite.
2. Determination of tachometric constants and determination of reduced levels by tachometric observations.
3. Determination of height of an inaccessible object.
4. Setting out a simple curve.
5. Setting out of circular curves in the field using different Methods
6. Measurement of various parameters using Total Station.

CONCRETE TECHNOLOGY AND CONSTRUCTION MACHINERY

L	P	Cr
3	3	4.5

Introduction: Definition of concrete, brief introduction to properties of concrete, advantage of concrete, uses of concrete in comparison to other building materials

Ingredients of Concrete:Cement: The chemical ingredients, situations of use and special precautions in: Ordinary Portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, quick setting, white and coloured cements, portlandpozzolana cement

Aggregates: Classification of aggregates. Characteristics of aggregates: Particle size and shape, crushed and rounded aggregates, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials in the aggregate; Grading of aggregates; coarse aggregate, fine aggregate; All in aggregate; fineness modulus; interpretation grading charts and combination of two aggregates

Water: Limits on the impurities as per IS; effect of excessive impurities on concrete, ascertaining the suitability of water with help of concrete cube test

Properties of Concrete: Properties in plastic stage, workability, segregation, bleeding. Properties of hardened concrete: strength, durability, impermeability, dimensional changes

Water Cement Ratio: Hydration of Cement, effect of various water cement ratios on the physical structure of hydrated cement, water cement ratio law and the conditions under which the law is valid; internal moisture, temperature, age and size of specimen. Definition of cube strength of concrete, relations between water cement ratio and strength of concrete

Workability: Definition, phenomenon of workability, concept of internal friction, segregation and harshness; factors affecting workability; water content; shape, size and percentage of fineness passing 300 micron. Measurement of workability: slump test and compaction factor test; recommended slumps for placement in various conditions of placement

Proportioning for Ordinary Concrete: Object of mix design, strength required for various grades from IS 456, preliminary test, cube test, proportioning for ordinary mix as prescribed by BIS and its interpretation. Adjustment on site for: Bulking water contents, absorption, workability, design datas for moisture, bulkage, absorption and suitable fine aggregate and coarse aggregate ratio. Difference between ordinary and controlled concrete. Introduction to no fines concrete.

Construction Equipment:

Introduction to Construction Equipment: Their contribution and importance in construction Industry. Classification of Equipment, Financial aspects related to construction equipment's, Discounted present worth analysis, Depreciation, Cost of owning and operating construction equipment, Basics of equipment replacement policy.

Engineering fundamentals: Related to performance of IC engines, rimpull, drawbar pull, Coefficient of traction, Gradability, Soil fundamentals.

Equipments: Tractors and related equipment: Bulldozers, Rippers, Scrapers. Excavating Equipment: Power Shovels, Draglines, Hoes, Clam Shells and trenching machines, their basic Parts, Operation, Output estimation, Factors influencing output and methods to enhance it.

Belt conveyor system: Terminology, Classification, Components, Power requirement estimation and design.

Hauling equipment: Trucks and wagons, operation and guideline for selection and deployment. Overview of other construction equipment.

Text Books (TB):

1. TB1: Concrete Technology by Birindersingh
2. TB2: M.S. Shetty
3. TB2 Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology";
New Delhi Oxford and IBH Publishing Co.
4. TB4 : Conc. Tech by R.K. Aggarwal

Reference Books (RB):

RB1: NeGambhir, ML; "Concrete Technology"; New Delhi, Tata McGraw Hill Ltd.,

CIVIL 5th
SEMESTER
SYLLABUS

SOIL MECHANICS

L	P	Cr
3	3	4.5

Introduction: Soil formation, classification of various soil types, properties of marine clay

Phase relationships: Index properties, sieve & hydrometer analysis, Atterberg's limits, sensitivity, thixotropy, and plasticity charts. Determination of engineering properties of soil. Indian standard and Unified classification systems of soils.

Clay Mineralogy: Introduction to Clay minerals, their characteristics. Soil structure, granular soil fabric.

Seepage and Permeability: Darcy's law, seepage velocity, factors affecting permeability, Laboratory and field determination of permeability. Flow net and its properties, Laplace equation, methods of drawing flow net, seepage through earth dams, phreatic lines, exit gradient and seepage pressures, phenomenon of piping and heaving, filters. Anisotropy, Permeability of layered soils.

Effective Stress Principle Capillarity, types of head, seepage forces, quick sand condition, and critical hydraulic gradient.

Compaction: Compaction tests, OMC, factors affecting compaction, control of compaction, field compaction equipment and their suitability. Stresses in Soils: Stresses beneath various loaded areas, Boussinesq and Westergaard's formulae, pressure bulbs,

Compressibility and Consolidation: Terzaghi's theory, time rate of consolidation, consolidation test, Compressibility & Coefficient of Consolidation, NC, OC soils, determination of pre-consolidation pressure, settlement analysis, secondary consolidation.

Shear Strength: Definition, Mohr's stress circle, Mohr-Columb strength theory, direct, triaxial, unconfined and vane shear tests. Drainage conditions, Concept of pore pressure coefficients, shear characteristics of normally consolidated, over consolidated clays and dense and loose sands, residual strength.

Laboratory Work: The students will be introduced to Index and Engineering properties of soils to complement the theory component of the course by performing experiments. They will perform related experiments as per BIS specifications.

1. Determination of water content.
2. Determination of field density by Core cutter method
3. Determination of field density by Sand replacement method
4. Grain size Analysis by Mechanical Method.

5. Grain size Analysis by Hydrometer Method.
6. Determination of Specific Gravity by Pycnometer.
7. Determination of Liquid Limit, Plastic limit.
8. Determination of Shrinkage limit.
9. Determination of Permeability by constant head permeameter.
10. Determination of permeability by variable head permeameter.
11. Consolidation Test
12. Unconfined Compression Test.
13. Direct Shear Test.

Text Books

1. *Gopal Ranjan & Rao A.S.R.; Basic and Applied Soil Mechanics, New Age Publishers (2004)*
2. *Murthy V.N.S.; A Text Book on Soil Mechanics and Foundation Engineering, C.B.S. Publisher(2008)*
3. *Raj Parshotham; Geotechnical Engineering, Pearson Education(2009).*

Reference Books

1. *Coduto D.P.; Geotechnical Engineering , Pearson Education(2007).*
2. *Das B.M.; Principles of Geotechnical Engineering, Thomson Asia Pte(2002).*
3. *Venkatramaiah; Geotechnical Engineering, New Age Publisher(2006).*

WATER SUPPLY ENGINEERING

L	P	Cr
3	3	4.5

Introduction: Definition and scope of water supply engineering

Water Sources: Surface and ground water sources; Selection and development of sources; Assessment of potential; Flow measurement in closed pipes; Water harvesting-History, concepts and structures

Water Supply Systems: Municipal water demands and demand variations, Population forecasting and water demand estimations; Intakes and transmission systems, pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems

Water Quality: Physical, chemical and biological water quality parameters; Water quality index; Water quality standards; Quality for designated uses of water; Classification of water bodies.

Pumps and pumping stations: Types of pumps and their characteristics and efficiencies.

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

Small scale and household level water purification system and water fixtures

Laboratory Work:

- 1) Flow measurements in closed conduits – Venturimeter, Orificemeter.
- 2) Determination of Colour & Turbidity.
- 3) Determination of Solids: Total, Dissolved and Suspended; dissolved solids through conductivity.
- 4) Determination of Alkalinity and its species.
- 5) Determination of pH, and Acidity and its species.

- 6) Determination of Hardness (different types)
- 7) Determination of Chlorides.
- 8) Determination of Iron.
- 9) Determination of fluorides.
- 10) Jar test for optimum coagulant dose estimation.
- 11) Determination of residual chlorine and chlorine dose.

Text Books

1. *Garg S. K.; Environmental Engineering, Vol. I, Khanna Publishers(1990)*
2. *McGhee, Terence J.; Water Supply and Sewerage, McGraw Hill(1991), 5th Edition*
3. *Manual on Water Supply and Treatment by Ministry of Urban Development, New Delhi.*

References Books

1. *Modi P.N.; Water Supply Engineering, Standard Book House(1995)*
2. *H. S Peavy, D. R. Rowe & George Tchobanoglous, "Environmental Engineering", McGraw-Hill International Ed.(1985).*
3. *APHA, AWWA & WEF, "Standard Methods Examination of Water and Wastewater", Water Environment Federation, (1993).*
4. *Manual for Sewer and Sewerage – Central Public Health & Environmental Engineering Organisation – Ministry of Housing and Urban Development, Govt. of India, (1993).*

ADVANCED STRUCTURAL ANALYSIS

L	P	Cr
4	0	4

Analysis of Cables and Suspension Bridges: General cable theorem, shape, elastic stretch of cable, maximum tension in cable and back-stays, suspension bridges.

Revision of Matrix Algebra: Solution of simultaneous algebraic equations.

Introduction to systems approach: Force and Displacement methods

Matrix Force Method: Introduction to flexibility approach, Choice of redundant, static equilibrium matrix, deformation compatibility matrix, member flexibility matrix, static equilibrium and deformation compatibility checks. Application for continuous beams and rigid frames

Matrix Displacement or Stiffness Method: Conditions of stress-strain relationships, equilibrium and compatibility. (a) Structures with axial force members – trusses (b) Structures with flexural members - continuous beams and rigid frames.

Formulation of various matrices: Static equilibrium matrix - deformation compatibility matrix, member stiffness matrix, global stiffness matrix, external load matrix, static equilibrium and deformation, compatibility checks and effects of support settlement and lack of fit.

Direct Stiffness Method: Derivation of global matrix from energy considerations, transformation matrices, member stiffness matrix with respect to member coordinate system, member stiffness matrix for global coordinates and global stiffness matrix. Displacement boundary conditions, effect of temperature and lack of fit.

Introduction to Finite Element Method: 1-D bar element

Text Books

1. Gere J. M. and Weaver W.; *Matrix Analysis of Framed Structures*, CBS Publishers & Distributors (2004), 2nd Edition.
2. Pandit G. S. and Gupta S. P.; *Structural Analysis – A Matrix Approach*; Tata McGraw Hill Education Pvt. Ltd.(2008), 2nd Edition

Reference Books

1. Martin H. C.; *Matrix Structural Analysis*, McGraw Hill Book Company, New York.
2. Prakash Rao D. S.; *Structural Analysis – A Unified Approach*, Tata McGraw Hill Publishing (1996), 1st Edition.

3. *Reddy C. S.; Basic Structural Analysis, Tata McGraw Hill Publication (1996), 2nd Edition.*

STEEL STRUCTURES DESIGN - I

L	P	Cr
4	0	4

Introduction: Loads, structural steels and their specifications, structural elements, steel vs. concrete and timber, design specifications as per IS: 800, strength and stiffness considerations.

Riveted/Bolted Connection: Riveting and bolting, their types, failure of riveted joint, efficiency of a joint, design of riveted joint, concentric riveted joints, advantages and disadvantages of bolted connections.

Welded Connection: Types of welded joints, design of welded joint subjected to axial loads, welded joints subjected to eccentric loads, simple, semi-rigid and rigid connections.

Compression Members: Axially loaded columns, effective length, slenderness ratio, and allowable stresses, general specifications, design of axially loaded members, laced and battened columns and their design, built up compression members, eccentrically loaded columns and their design, column splice.

Tension Members: Types of tension members, net area, net effective area for angles, design of tension members, tension splice.

Plastic Design: Introduction, advantages and disadvantages, strength of tension and compression members, theory of plastic bending, distributed loading.

Flexural Members (Beams): Design criteria, permissible stresses, laterally supported beams and their design laterally unsupported beams and their design, web buckling, web crippling, built up beams, members subjected to bending and compression.

Column Bases: Introduction, slab base, gusseted base, column base subjected to moment, grillage foundation.

Text Books

1. *Subramanian N.; Design of Steel Structures, Oxford University Press (2008).*
2. *Ajmani, A. L. and Arya, A. S., Design of Steel Structures, Nem Chand and Brothers (2000).*

Reference Books

1. *Dunham, C.W., Planning of Industrial Structures, John Wiley and Sons (2001).*
2. *Gary, W., Steel Designer's Manual, Prentice Hall (2008).*
3. *Glower, F., Structural Pre-cast Concrete, Oxford Publishers (2008).*

TRANSPORTATION ENGINEERING - I

L	P	Cr
3	3	4.5

General: Introduction, Different modes of transport, Development of Transport System,

Classifications of Roads: Importance, earth roads, gravel roads, water bound macadam, Various types of bituminous constructions and their selection, Construction of earth, gravel , water bound macadam, Construction techniques of surface dressing, mastic asphalt, cement concrete pavements.

Planning of Highways: Planning & Management of Highways, Various road plans developed in India, Road patterns, Highway Surveys & Alignment, Design, Drawings, Estimates & Project Report.

Geometric Design of Highways and Expressways: Introduction, Highways Classification, Right of way, Land width, width of formation, Thickness of pavement, Sight Distances, Stopping site distance, overtaking sight distance, overtaking zones, camber, Road Curves, Transition Curves, Super elevation. Widening at curves, IRC-recommendations for various geometric design parameters.

Types of bituminous binders and properties: Manufacturing of bitumen, comparison between bitumen and tar, cut back & emulsion, Modified binders.

Pavements: Types of pavements, Factors affecting design of pavements, wheel load, Climatic Factors Structure of Flexible pavement, Function of various components of Flexible pavement, design of flexible pavements by G.I. method and as per design procedure of IRC 37:2001, C.B.R. Method of Flexible pavement design, Cement Concrete Roads.

Failures of flexible and rigid pavements: Causes of Failures and Remedial Measures, Maintenance of pavement evaluation and its strengthening.

Traffic Studies: Definition of Traffic Engineering, Various faces of Traffic Engineering, Road user characteristics, Importance of traffic studies, spot speed, speed and delay and origin and destination studies. Traffic accident studies, Causes of accidents and Remedial Measures,

Drainage: Introduction, Importance & Principles of Highway Drainage, Surface Drainage, Sub Surface drainage

Highway Maintenance: Introduction, Maintenance of Earth, gravel, WBM Roads, Bituminous Roads, Cement Concrete pavements, Maintenance of berms, Side Slopes, Pavement edge and draining work, Capillary cut-off.

Highway Economics: Economics of Pavement types, Economic Evaluation of Highway Schemes.

Highway & Environment: Effect of Highways on environment, Noise pollution, Air pollution, visual Intrusion & Degrading the Aesthetics, Roadside Amenities, Landscaping.

Laboratory Work:

1. Aggregate crushing value test.
2. Abrasion test.
3. Aggregate impact test.
4. Shape test.
5. Water absorption and specific gravity tests.
6. Penetration test.
7. Ductility test.
8. Softening point test.
9. Flash & fire point test.
10. Viscosity test.
11. Soundness test.
12. CBR test.

Text Books

1. *Khanna S.K. and C.E.G. Justo, "Highway Engineering", Nemchand Bros, (2002)*
2. *Kadyali L. R.; Highway Engineering, Nem Chand & Brothers, Roorkee (2001)*

Reference Books

1. *Oglesby and Hews; Highway Engineering, Wiley Publisher, 1957*
2. *Sharma & Sharma; Principle and Practice of Highway Engineering, Asia Publishing House, New Delhi.*
3. *Road Development plan for India (1981-2001), IRC, New Delhi, (1984).*
4. *Rao G. V.; Transportation Engineering, Tata McGraw Hill Publisher, New Delhi (1999)*
5. *Yoder E. J.; Principles of Pavement Design, John Wiley & Sons, (October 1975)*

CONSTRUCTION MANAGEMENT

L	P	Cr
4	0	4

Quantity Survey and Cost Estimation: Definitions, objectives, role and functions of quantity surveyor, Pre-tender survey, Quantity measurements, analysis of rates for different items of work. Specifications, its types. General and detailed specifications for different items of work. Estimates and budgets types and their preparation. Estimate of Buildings, Roads, canals. Building bye Laws.

Contracts: Definition, need, importance, types of contracts and their characteristics, procedure for tendering and contracts, evaluation and examination of tenders, award of work, Joint Ventures. Valuation, its types. Determination of value of a property.

Network Techniques: Bar milestone charts Planning and scheduling of PERT / CPM, Time cost optimisation.

Material Management: Importance, scope, objectives and functions, identification of source and vendor analysis, purchase procedure, inventory control, layout and storage of stores, safety in handling and precautionary measures, wastage and analysis of wastages.

Equipment: Importance, need, functions and principles, types of equipment and their uses, selection planning and matching of construction plant and equipment.

Account Procedure of PWD Works: Classification of Works, Muster Roll, Deposit works. Cash Book, Imprest, temporary Advance, Stores, Indent, Tools and Plants.

Text Books

1. Kohli D. D.; *A Text book on Estimating and Costing and Accounts*, S. Chand & Company New Delhi(1994).
2. R.L. Peurifoy, W.B. Ledbetter and C.J. Schexnayder, “*Construction planning and methods*”, Fifth editions, McGraw Hill International edition, (1996).

Reference Books

1. Seetharaman S.; *Construction Engineering and Management*, Umesh Publication Delhi.(2001)
2. Punima B. C. and Khandelwal; *Project Planning and Control with PERT and CPM*, Laxmi Publication New Delhi.(2002)
3. K.K. Chitkara, “*Construction project management: planning, scheduling and controlling*”, Tata McGraw-Hill, (1998).
4. B. Sengupta and H Guha, “*Construction management and planning*”, Tata McGraw Hill, (1995)
5. L.S. Srinath, “*PERT and CPM principles and Applications*”, Third edition, Affiliated east-west press Pvt Ltd, (2001).

6. *J. Singh, "Heavy Constructon-Planning, equipment and methods", Oxford & IBH Publishing Co. Pvt (1993).*
7. *Datta B. N.; Estimating and Costing in Civil Engineering, U.B.S. Publisher(2010)*

SURVEY CAMP

L	P	Cr
0	0	4

Survey Camp of 4 weeks duration will be held immediately after IVth semester at a Hilly Terrain. The students are required to prepare the Topographical Map of the area by traditional method. Students should also be exposed to modern Survey Equipment and practices, like Total Station, Automatic Level, and GPS etc.

CIVIL 6th
SEMESTER
SYLLABUS

SEWERAGE AND SEWAGE TREATMENT

L	P	Cr
3	3	4.5

Introduction: Definition and Scope, types of sewer pipes and their laying and testing.

Sewerage system: Generation and Estimation of Community Sewage; Flow variations; Storm Water flow; Flow measurement in open channels; Alternate systems for sewage collection and conveyance; Drains and sewers types; Sewer appurtenances; Construction and Maintenance of sewers; Sewage pumping and pumping stations; Design, Operation and maintenance of sewerage systems.

Characterization of sewage: Parameters for characterization; Sampling, testing and analysis of sewage; Relative stability and population equivalent; BOD

Treatment of sewage: Basic principles of sewage treatment; Introduction to unit operations and processes - primary treatment units such as screening, grit chamber, Floatation units; Sedimentation tanks, secondary treatment units such as different types of aerobic suspended and attached growth systems, and tertiary treatment for polishing, nutrient removal and disinfection; Sludge Handling and disposal – thickening, stabilization, dewatering, drying and disposal.

Sewage treatment units design: Design of grit chamber, primary and secondary clarifiers, ASP, TF, stabilization ponds and oxidation ponds

Treated effluent disposal: Disposal into surface water bodies; Reuse for irrigation and aquaculturing; Land disposal; Disposal through injection into groundwater; effluent standards

Low cost sanitation systems – Imhoff tanks, septic tank - soakage pit/soil absorption systems; stabilization ponds; macrophyte ponds; oxidation ponds; and constructed wetland systems.

Plumbing: Sewer connections for houses and buildings; Traps, sanitary fittings & fixtures, typical lay out for a residence.

Laboratory Work:

1. Flow measurement in open channels using V and rectangular notches
2. Determination of DO.
3. Determination of BOD.
4. Determination of COD.
5. Determination of Sulphates.
6. Determination of Nitrite and Nitrate nitrogen.

7. Determination of Ammonical and Total Kjeldhal Nitrogen.
8. Determination of phosphorus (total and available).
9. Determination of SVI (including MLSS and MLVSS estimations).
10. Settling column test for primary settling tank design.
11. Settling column test for secondary setting tank design

Text Books

1. *Garg S. K.; Environmental Engineering Vol. II, Khanna Publishers New-Delhi (1990)*
2. *H. S Peavy, D. R. Rowe & George Tchobanoglous, "Environmental Engineering", McGraw-Hill International Ed., (1985).*
3. *Manual on sewerage and sewage treatment, Ministry of Urban Development, New Delhi.*

References Books

1. *P.N. Modi; Sewage Treatment and disposal & Waste Water Engineering, Standard Book House New-Delhi (1995)*
2. *Metcalf & Eddy, "Wastewater Engineering- Treatment and Reuse," Tata McGraw Hill, 4th Edn., (2003).*
3. *Clair N Sawyer & Perry L McCarty, G. F. Parkin, "Chemistry for Environmental Engineers", McGraw-Hill, (1994).*
4. *Standard Methods for the Examination of Water and Waste Water, American Public Health Association.*

FOUNDATION ENGINEERING

L	P	Cr
3	3	4.5

Soil Exploration: Introduction to soil exploration, scope, soil exploration for different structures, spacing, significant depth, boring and sampling techniques, types of samples, penetration test (SCP and SPT), sample disturbances

Earth Pressure: at rest condition, states of plastic equilibrium, Rankine and Coulomb's theories for active and passive conditions, Influence of surcharge, water table.

Stability of Slopes: Infinite slope, types of failure, total and effective stress analysis, Taylor's stability numbers, concept of factors of safety, method of slices, modified method of slices, Swedish's circle method.

Bearing Capacity: Definitions, depth of foundation, Terzaghi's general bearing capacity equation, IS code equation, factors affecting bearing capacity. Settlements for clays and sands, permissible settlements, bearing capacity by penetration tests, plate load test.

Pile Foundations: Types, function, selection of piles, pile driving formulae, equipment, point, bearing and friction piles. Load carrying capacity of single pile, group action, spacing of piles, Negative skin friction, settlement of pile groups, under-reamed piles.

Caissons and Wells: Introduction, components, shapes, stability of well foundation, sinking of well.

Machine Foundation: Definition, types, problem of machine foundation.

Laboratory Work:

1. Determination of Relative density of coarse grained soils in dry and saturated conditions.
2. Determination of shear strength at different densities by Direct shear test.
3. Determination of MDD and OMC at different compactive effort by compaction test.
4. Determination of Unconfined compressive strength at different compactive effort.
5. Determination of compressibility characteristics of fine grained soils by Consolidation test.
6. Determination of bearing capacity by Standard Penetration test.
7. Determination of shear strength of dry sands by Tri-axial shear test.
8. Determination of shear strength of saturated sands by Tri-axial test.
9. Determination of bearing capacity by Plate load test.

10. Determination of bearing capacity by static and dynamic cone Penetration test.

11. Determination of bearing capacity by lab and field vane shear test.

Text Books

1. *Gopal Ranjan & Rao A.S.R.; Basic and Applied Soil Mechanics, New Age Publishers (2004)*
2. *Murthy V.N.S.; A Text Book on Soil Mechanics and Foundation Engineering, C.B.S. Publisher (2008)*

References Books

1. *J. E. Bowles, Foundation Analysis and Design, McGraw Hill, (1996)*
2. *Cheng Liu & Jack B Evett; Soils and Foundations, Prentice-Hall Inc., USA (2000)*
3. *Singh Alam; Modern Geotechnical Engineering, C.B.S Publishers (2008)*

HYDRAULIC ENGINEERING

L	P	Cr
3	3	4.5

Laminar flow: Navier-Stokes, equation of motion (no derivation), Laminar flow through a pipe, Parallel Plates.

Turbulent Flow: Transition from laminar to turbulent flow, Shear stress in turbulent flow, Mixing length concept, Smooth & rough surfaces, Resistance of smooth and artificially roughened pipes.

Boundary Layer Analysis: Boundary layer thickness and its characteristics, Laminar and turbulent boundary layers, Von-Karman Integral Momentum equation and its application for different velocity profiles, Separation of boundary layer and methods for its preventions.

Flow around submerged bodies: Drag and lift, Types of drag force, Drag on sphere, Cylinder and aerofoil; Circulation and Lift on a cylinder and aerofoil; Magnus effect.

Flow in Open Channels: Difference between pipe flow and channel flow, Types of channels, Classification of flows, Velocity distribution, Uniform flow formulas, Most efficient channel sections, Specific energy and specific curve, Momentum Equation in open channels, Critical depth and its computation, Channel transitions, Non-uniform flow in open channels, Dynamic equation for GVF, Hydraulic jump, Types, Unsteady flow equation.

Laboratory Work:

1. To verify Stokes Law and to study the variation of drag coefficient with Reynolds no.
2. To determine the viscosity of a given liquid by capillary-tube-viscometer
3. To determine Manning's co-efficient of roughness for the bed of a given flume.
4. To measure the velocity distribution in a rectangular flume and to determine the energy and momentum correction factors.
5. To study the flow through a horizontal contraction in a rectangular open channel.
6. Study the surface profile of a free and forced vortex motion.
7. To study the formation of hydraulic jump in a horizontal rectangular open channel
8. To measure velocity distribution over a flat surface in a wind stream and to determine the displacement and momentum thickness.
9. To study the pressure distribution along the spillway surface.
10. To calibrate a broad-crested weir and to study the pressure distribution along its surface.

11. To measure the pressure distribution around a cylinder placed in a wind stream and to calculate the coefficient of drag.
12. To calibrate various flow measuring devices

Text Books

1. *P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, (1998).*
2. *Ojha C.S.P., Berndtsson R. and Chandramouli P.; Fluid Mechanics and Machinery, Oxford Publishers (2010).*

Reference Books

1. *Garde, R. J., and Mirajgaonkar A. G., Engineering Fluid Mechanics, Nemchand and Bros, Roorkee (1983).*
2. *Som and Biswas; Introduction to Fluid Mechanics and Machines, Tata McGraw Hill, ND,(2004).*
3. *Rangaraju K. G., Flow through Open Channels, Tata McGraw Hill, ND, (2003).*
4. *Schlichting H., Boundary Layer Theory, Tata McGraw Hill, ND, (2001.)*
5. *Subramanya, K.;; Flow in open Channels, Tata McGraw Hill, ND (2002).*
6. *Henderson, F. M, Open Channel Flow, McMillan, New York, (1996).*
7. *French, R. H., Open Channel Hydraulics, McGraw Hill Publishing Company, NewYork (1985).*

CONCRETE STRUCTURES DESIGN

L	P	Cr
4	0	4

Staircase Design: Design of different types of staircases using the Limits state design method

Building Frames: Design of continuous beams, slabs, columns, detailing of reinforcement in the same

Flats Slabs: Advantages and disadvantages of flat Slabs, Action of Flat Slab, Preliminary design of flat slabs, Basic action of two-way slab, Determination of minimum thickness of slab.

Beams curved in plan: Reinforced Concrete Design Circular beam loaded uniformly and supported on symmetrically placed columns.

Combined Footings: Different types, design of rectangular, trapezoidal, strap and raft footings, Pile Foundations.

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

Domes: Analysis and design of spherical and conical domes

Water Tanks: Introduction, general design requirements on no crack basis, circular and rectangular tanks resting on ground, Overhead tanks design including foundation.

Codal Provision for RC Elements: General and provisions for ductile detailing as per IS:13920

Text Books:

1. Jain, A.K., *Reinforced Concrete-Limit State Design*, Nem Chand & Bros (1999).
2. Varghese, P. C., *Limit State Design of Reinforced Concrete*, PHI Publishers (2002).

Reference Books:

1. S.K. Mallik and A.P. Gupta, "Reinforced concrete design", Oxford and IBH (1999).
2. S.N. Sinha, "Reinforced concrete design", Tata McGraw Hill (2000)
3. S.U. Pillai and D. Menon, "Reinforced concrete Design", Tata McGraw Hill (1999).
4. R. Park and T. Paulay, "Reinforced Concrete Structures", John Wiley and Sons, (1975)
5. C. E. Reynolds, "Reinforced Concrete Designers Hand Book", E&FN Spon, (1999)
6. "Design Aids for Reinforced Concrete to IS:456: 2000", Bureau of Indian Standards, (2000)

TRANSPORTATION ENGINEERING - II

L	P	Cr
4	0	4

Railways: Role of railways in transportation, permanent way, gauges in railway tracks, typical railway track cross-section, coning of wheels, Function of rails, requirement of rails, types of rail sections – comparison of rail types, length of rail, rail wear, rail failures, creep of rails, rail fixtures and fastenings – Fish plates, spikes, bolts, chairs, keys, bearing plates.

Sleepers: Functions and requirements of sleepers, classification of sleepers, timber, metal and concrete sleeper, comparison of different types of sleepers, spacing of sleepers and sleeper density.

Ballast: Function and requirements of ballast, types, comparison of ballast materials.

Geometric design: alignment, horizontal curves, super elevation, equilibrium, cant and cant deficiency, length of transition curve, gradients and grade compensation. Stations and yards, and their classification

Points and crossings: introduction, necessity of points and crossings, turnouts, points and crossings, design of a simple turnout.

Track Recording: Equipment, Mechanized Maintenance, Track Recording & track Tolerances, High Speed Trans, Present & Future

Signaling and interlocking: objects of signaling, engineering principle of signaling, classification of signaling, control of train movements, interlocking definition, necessity and function of interlocking, methods of interlocking, mechanical devices for inter locking. Traction and tractive resistance, stresses in track, modernization of railway track.

Airport Engineering: Brief history of air transport: Aircraft characteristics. Airport site selection, various surveys for site selection. Classifications of obstructions, Imaginary surfaces, Approach zone and turning zone. Runway orientation, basic runway length, corrections for elevation, temperature & gradient, airport classification, layout, specifications and design of helipads.

Runway & Taxiway Design: Geometric design of runway, airport capacity, factors controlling taxiway layout, geometric design standards for taxiway holding aprons, Wind-rose diagram, Structural design of runway pavements, Air Cargo, Terminal area, building area, parking area, apron, hanger typical airport layouts.

Text Books

1. *Arora and Saxena; Railway Engineering by, Dhanpat Rai Publications (P) Ltd, New Delhi. (2006)*
2. *Khanna, Arora & Jain; Airport Planning and Design, Nem Chand & Brothres, Roorkee. (6th Edition)*

Reference Books

1. *Rangawala S. C.; Railway Engineering, Charotar Publishing House Pvt Ltd (1989)*
2. *Aggarwal M.M & Satish Chandra; Railway Engineering, [Oxford University Press](#) (2000).*
3. *Robert Horenjeff; Planning and Design of Airports (2nd edition), McGraw Hill Book Co*

CIVIL 7th
SEMESTER
SYLLABUS

GROUND IMPROVEMENT

L	P	Cr
4	0	4

Introduction: Introduction to different methods of ground improvement and its importance, mechanical method of ground improvement, ground Freezing, methods, Hydrogeology of frozen soils, strength and behaviour of frozen soils, ground heating, effect on soil properties, methods.

Drainage: Techniques, filter drains, sand drains, lime columns, Electro-osmosis and Electrochemical stabilization.

Compaction & Consolidation Techniques: Pre-compression, compaction piles, vibro-compaction (Vibro-floatation, Terra-probe, vibro-replacement, concrete columns & vibro-displacement) .

Soil Reinforcement: Load transfer mechanism, strength development, anchored earth. In-situ reinforcement techniques viz soil nailing.

Grouts: Properties, penetration, clay, cement clay, cement, clay-chemical, chemical and Bituminous grouts, grouting methods viz penetration.

Reinforced Earth: Introduction, Mechanism of reinforced types of reinforcement strength characteristics, Design of reinforced earth retaining walls, abutments, earth slopes

Exclusion Techniques: Sheet piles, contiguous bored piles, secant piles.

Text Books

1. Raj Parshotham; *Geotechnical Engineering, Pearson Education (2009)*.
2. F.G. Bell; *Engineering Treatment of Soils, E & FN Spon Publishers, UK (2001)*.

Reference Books

1. Moseley M.P.; *Ground Improvement, Blackie A&P (2000)*.
2. Saran Swami; *Reinforced Soil and its Engineering Applications, I.K. International (2006)*

CIVIL 8th
SEMESTER
SYLLABUS

STEEL STRUCTURE DESIGN – II

L	P	Cr
4	0	4

Stability Analysis: Computation of permissible axial stresses, bending stresses and combined stresses

Plate Girders: Introduction, weight and economic depth, design of flanges, design of web, curtailment of flange plates, intermediate and bearing stiffeners, design of a riveted and welded plate girders, web and flange splice.

Industrial Buildings (Steel Structures): Design of roof trusses and supporting system, Industrial building frames, bracing, crane girders and columns, design of crane girders, analysis of trussed bents.

Steel Bridges: Introduction to suspension bridges, cantilever bridges, cable-stayed bridges. Standard specifications for railway bridges, Railway bridge code. General arrangement of single-track broad-gauge railway bridge with open floor, design of stringers, cross girders.

Aluminium and Light Weight Structures: Permissible stresses, tension members, compression members, local buckling of compression members, design of beams and connections

Text Books

1. *N. Subramanian; Design of Steel Structures, Oxford University Press, (2008).*
2. *Ajmani, J. L. and Arya, A. S., Design of Steel Structures, Nem Chand and Brothers (2000).*

Reference Books:

1. *Dunham, C.W., Planning of Industrial Structures, John Wiley and Sons (2001).*
2. *Gary, W., Steel Designer's Manual, Prentice Hall (2008).*
3. *S. M. A. Kazimi and R. S. Jindal, "Design of Steel Structures", Prentice Hall of India Pvt Ltd, (1988).*
4. *M. Edwin, J. Gaylord and J. E. Stallmeyer, "Design of Steel Structures", Mc Graw Hill, (1991)*

EARTHQUAKE RESISTANT DESIGN

L	P	Cr
3	3	4.5

Introduction: Nature of dynamic loads, earthquake, wind and blast loads, characteristics of dynamic problems, method of discretization etc.

Theory of Vibrations: Formulation of Equation of Motions: Free and forced vibrations of single degree of freedom systems, damping and its effects, transient vibration, Review of formulation of flexibility and stiffness matrices of framed structures, application of vibration theory.

Multi-degree of freedom systems: Mode shapes and frequencies, numerical techniques for finding modes shapes and corresponding frequencies, orthogonality relationship of principal modes, Determination of fundamental frequency, Rayleigh's principle and its applications, normal mode theory for forced vibration, analysis of multi-degree freedom system, and dynamic response by mode superposition method. Vibration of continuum system, free and forced vibration response.

Introduction to Structural Failures due to Earthquake

Introduction to IS: 1893 – 2002: Seismic analysis and design of OHSR's, framed structures by equivalent lateral load procedure and Modal analysis

Introduction to Ductile Detailing of Structures, Concept of Soft Story, Design of Shear Walls, IS:13920-1993.

Use of Codes with reference to Masonry Buildings like IS: 4326, IS: 13828, IS: 13827

Laboratory Work

1. Time period of a compound pendulum.
2. Radius of gyration by Bifilar suspension.
3. Damping properties of materials by free vibrations.
4. Torsional vibrations of a two mass system.
5. Longitudinal vibrations of a Helical spring.
6. Damping properties of materials by forced vibrations.
7. To verify the Dunkerleys rule.
8. Torsional vibrations of a single mass system.

9. To study the various responses (frequency and time response) through a Real time FFT analyzer.
10. To make computer programs for theoretical verification of the above experiments.

Text Books

1. Paz Mario; *Structural Dynamics (Theory and Computation)*, CBS Publishers and Distributors, 2nd edition (2004).
2. Agarwal Pankaj and Shrikhande M.; “*Earthquake Resistant Design of Structures*” Prentice Hall of India(2004)

Reference Books

1. Roy R. Carig, Jr: *Structural Dynamics -An Introduction to computer methods*, John Wiley & Sons (1981).
2. R.W. Clough and J. Penzien, “*Dynamics of Structures*”, Second edition, McGraw Hill International edition, (1993).

Anil K. Chopra, :*Dynamics of Structures: Theory and applications to earthquake engineering*”, Prentice Hall of India Ltd., (1997)

IRRIGATION ENGINEERING

L	P	Cr
4	0	4

Introduction: Introduction, types and methods of irrigation.

Water Requirement of Crops: Soil-moisture-irrigation relationship, depth and frequency of irrigation, irrigation efficiencies, consumptive use and its determination, duty and delta relationship, factors affecting duty, crop seasons.

Canal Irrigation: Canal irrigation system, canal alignment, canal losses, estimation of design discharge of a canal, design of stable channels by Lacey's and Kennedy's theory, Water logging- Effects, causes and remedial measures, land drainage, design of tile drains.

Canal Headworks: Layout and component parts of a diversion headwork scheme and their design considerations, sediment control in canals.

Design of Hydraulic Structures: Types, considerations in design, causes of failure of hydraulic structures founded on previous foundations, Bligh's creep theory and Khosla seepage theory, hydraulic jump and its applications in the design of hydraulic structures, design of a weir or barrage, design of a canal head regulator.

Canal Regulation Works: Canal falls, necessity, location, and types of falls, design of a vertical drop fall and a glacis fall, roughening measures for energy dissipation.

Outlets: Canal outlets, requirement of a good outlet, types, criteria for judging the performance of outlets, design principle of open flume outlet and A. P. M. outlet.

Cross Drainage Works: Need, types, selection of suitable CD work, design of CD works, design of transitions for canal waterway.

Text Book

1. *S.K. Garg: Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 13th Edition, New Delhi (1998).*

Reference Books

1. *Fundamentals of Irrigation Engineering by Bharat Singh, 9th Edition, Nem Chand, Roorkee (1998).*

DESIGN PROJECT

L	P	Cr
0	0	4

The design project shall consist of any one of the following components viz. design of structures, geotechnical investigations, water supply distribution system, irrigation engineering and highway design ,water resources engineering . They shall be evaluated on the basis of project report and viva-voce examination.

ELECTIVE – I

ELECTIVE- II

SITE ORGANIZATION AND MANAGEMENT

L	P	Cr
4	0	4

Preparation: Site Clearance, Layout, infra-structural facilities, organizing utilities, site grading Security, safety, legal frame-work, acquisition of land, liaison with local authorities.

Organization: Various levels, job description, role of consultants, contractor and client and their responsibilities, training, Job layout, placement of material equipment on site. Documentation, inspection.

Mobilization: Machinery, stores equipment, contractor, work-shop, Quarries, vendors

Supervision: Procedure for quality assurance, Controlling and reporting system, Labour laws, legislation

Text Books

1. *B. Sengupta and H. Guha; Construction Management and Planning, Tata McGraw Hill (1995)*
2. *R.L. Peurifoy, W.B. Ledbetter and C.J. Schexnayder, "Construction planning and methods", Fifth editions, McGraw Hill International edition, (1996).*

Reference Books

1. *P.K. Joy; Total Project Management – The Indian Context, McMillan India Ltd.(1992)*
2. *P.K. Joy; Hand Book for Construction Management, MacMillan India Ltd.(2nd edition)(2000)*
3. *Hand Book on Labour Contract Legislation, ILO*

CONSTRUCTION MATERIALS AND TECHNIQUES

L	P	Cr
4	0	4

Materials, Concretes & Form-work: Cold worked sheets, plastics, wood-products, materials aluminium alloys for thermal insulation, acoustics, etc. Advanced construction material, polymer fiber reinforcement concrete, ferrocement, high strength concrete, concrete in high and low temperature. Special Concretes, Pavement Quality Concrete, RMC its characteristics, advantages, Costing Analysis, Shotcrete and concreting in tunnels, Slip Form Shuttering, Latest type of Formwork, e.g. DOKA, Tunnel etc. Retaining walls and reinforced earth walls.

Special Foundation: Construction techniques of foundations for chimney, transmission and cooling towers. Pile foundations, Machine foundations

High Rise Building: Construction techniques for high rise building, chimneys, dams, Fire hazards in high rise building and preventive measures, Special problems of high-rise construction & optimization of space

Low Cost Housing: Types, Design and advantages

Cost Analysis: Pre-Cast and Pre-Fabricated Construction and Modular Construction, production and utilization in various types of structures.

Techniques for boring including cut and cover method, trenchless technology

Text Books

1. S. C. Rangwala, *Engineering Materials, Chaortar Publishing House, Anand, (1985)*
2. M.J. Tomlinson; *Pile Design & Construction Practice by, View Point Publication, USA(1979)*

Reference Books/Journals

1. *Low Cost Houses, Publications by HUDCO, India Habitat Centre, Lodhi Road, New Delhi*
2. *Glower, F., Structural Pre-cast Concrete, Oxford Publishers (2008).*
3. *Shetty M. S.; Concrete Technology Theory and Practise, S. Chand Publishers (2009)*
4. *A. M. Neville and J. J. Brooks, Concrete Technology, updated, Addison Wesley Longman, International student edition (1999).*
5. *Neil Jackson and R. K. Dhir, Civil Engineering materials, Macmillan Fourth edition (1988).*
6. *Proceedings of International Conference on Advances in Structural Engineering, Edited S.K. Kaushik, Phoenix Publishing House Pvt. Ltd.*

GROUND WATER ENGINEERING

L	P	Cr
4	0	4

Principles of Ground water flow: Definition and occurrence of ground water flow, Role of ground water in a hydrologic cycle, Mechanical energy and fluid potential, Hydraulic head, Darcy's law, Heterogeneity and anisotropy, Types of aquifer and its properties, Compressibility, Specific storage, Ground water flow equation, Steady flow in a confined and unconfined aquifer, Flow lines and Equipotential lines, Flow net.

Well Hydraulics: Introduction, Drawdown due to abstraction from well, Steady and unsteady abstraction from well, Well interference.

Well Construction: Method of construction of shallow and deep well.

Groundwater Conservation: Estimation of recharge, artificial recharge.

Groundwater quality: Indian and international standards, Pollution of groundwater sources, remedial and preventive measures.

Exploration: Electric resistivity method, Saline water intrusion in aquifers, Groundwater levels fluctuation.

Text Books

1. *Raghunath H M, Groundwater, New Age International, (2007)*
2. *Franklin W. Schwartz and Hubao Zhang, Fundamentals of Groundwater, John Wiley, (2003)*

Reference Books

1. *David Keith Todd, Groundwater Hydrology, Wiley India Edition, (2007).*
2. *Bear, J. Hydraulics of Groundwater, McGraw-Hill, (1979)*
3. *Freeze, R.A. and Chery, J.A, Groundwater. Prentice Hall, Inc, Englewood Cliffs, New Jersey, (1979).*

Elective III

BRIDGE ENGINEERING

L	P	Cr
4	0	4

Introduction: Definition, components of a bridge, classifications, importance of bridges.

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

Standard Specifications: Road bridges, I.R.C. loadings, code provisions on width of carriageway, clearances, loads considered etc.

Slab type Bridges: Design of R.C.C. Skew Culverts

Reinforced Concrete Bridges: T-Beam Bridge.

Sub Structure: Types of piers and abutments, design forces, design of piers and abutments.

Bearing and Joints: Various types of expansion bearing and fixed bearings, design of bearings

Construction, inspection and maintenance of bridges

Text Books

1. *D. Johnson Victor; Elements of Bridge Engineering, Oxford and IBH Publishers, New Delhi.(1980)*
2. *Vazirani & Ratwani; Design of Concrete Bridges, Khanna Publishers, New Delhi.(1999)*

Reference Books

1. *Analysis, Design and Construction of Bridges by V.K. Raina, Tata McGraw Hill(2002)*
2. *N. Krishna Raju, "Design of Bridges", Oxford and IBH (1988).*

GEO-TECHNIQUES

L	P	Cr
4	0	4

Sheet Piles and Cofferdams: Types of sheet piles, principal advantages of sheet piles, analysis of cantilever wall in sands, simplified approach in clays ($\phi = 0$), Anchored bulk head stability, Free earth support method, fixed earth support method Types of cofferdams, relative merits and their advantages as compared to other types.

Open Cuts: Necessity of bracing and strutting in open cuts, pressure distribution diagram under various cases, deep open cut in loose and dense sands, deep open cut in normally loaded and stiff clays. Heaving of vertical cuts in clay.

Earth Dams: Criteria for selection of dams, material required in earth dam construction, homogenous and zoned dams, Control of seepage, through body of dam and through its foundations.

Arching Action in Soils: Arching in soil, theory of arching in soils, practical utility of arching in various field problems.

Foundation on expansive soils: Introduction mineralogy, identification testing techniques, swelling pressure, types, practice.

Dewatering: Approximate computation for flow quantity to dewater an excavation, slurry wall and safety factor. Simple sketches to illustrate the principles of dewatering by different methods and their relative suitability, electro-osmosis.

Text Books

1. VNS Murthy; *Advanced Foundation Engineering*, CBS, New Delhi (2007).
2. Gopal Ranjan & ASR Rao; *Basic and Applied Soil Mechanics*, New Age Publishers, New Delhi (2004).

Reference Books

1. F.G Bell; *Engineering Treatment of Soils*, Chapman and Hall, UK (2001).
2. Swami Saran; *Analysis and Design of Substructures*, Oxford and IBH, New Delhi (2005).
3. Bowles; *Foundation Analysis & Design*, McGraw Hill Publishing Co., New Delhi (1996).

WATER RESOURCES PLANNING AND MANAGEMENT

L P Cr

4 0 4

Introduction: Assessment of water resources of the country, Requirement for various uses, Future of water resources engineering.

Planning and Management: Issues in planning, Water resources planning process, Planning for single purpose and multipurpose projects, Principles of multipurpose development; Functional requirement of multipurpose uses, Compatibility of multipurpose uses. Conjunctive use of surface and ground water.

Project Economics: Basic principles, Tangible and intangible values, Selection of interest rate, benefit-cost ratio method, Risk and uncertainty, Application to water resources problems.

Dams: Types, classification, factors governing the selection of a dam.

Design of gravity dams: Analysis of forces, combination of forces for design, modes of failure and criteria for structural stability, principal and shear stresses, methods of analysis (detailed description of gravity method only).

Spillways: Location, types, design considerations of ogee spillway, energy dissipation below spillways, and design of stilling basins.

Reservoir Planning: Types of reservoirs, storage zones, selection of reservoir site, mass curve analysis for reservoir capacity, reservoir yield and its determination, reservoir sedimentation and its control.

Text Books

1. *Chaturvedi, M. C., Water resources Planning and Management, Tata MC Graw Hill, New Delhi (1997).*
2. *Garg, S. K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi, (1993).*

Reference Books

1. *Linsley R., Franzini*

, J., Freyberg, D., and George Tchobanoglous, *Water Resources Engineering*, 4th ed. McGraw Hill Publishing Company, New York, (1992).

2. James, L. D., and Lee, R. R., *Economics of Water Resources Planning*. McGraw Hill Publishing Company, New York, (1971).
3. Chow, V. T. et. al., *Applied Hydrology*, McGrawHill Publishing Company, New York (1988).

ADVANCED TRANSPORTATION ENGINEERING

L	P	Cr
4	0	4

Transportation Planning & Analysis: Basic elements of Transport Planning, Urban Transport System Planning, Level of Urban transport Planning

Public Transport System: Purpose & Methods of Public Transport Systems, introduction to ITS

Design of Flexible Pavements: Burmister's (layered systems) method, Triaxial method, North Dakota cone method, Wyoming method, IRC method of flexible pavement design.

Design of Rigid Pavements: Load and temperature stresses, Westergaard method of rigid pavement design, IRC recommendations, Design of joints and load transfer devices; joint fillers and sealers.

Soil Stabilized Roads: Methods of soil stabilization, mechanical stabilization, stabilization with additives/admixtures like lime, cement and bitumen. Stabilization of problematic soils like desert sand & black cotton soils.

Mix design: Requirement of bitumen mixes, design of bituminous mix, Marshall method of bituminous mix design, Hubbard method of mix design, Parametric evaluation of bituminous mixes, I.R.C.-recommendations.

Road Specifications: Specifications for bitumen roads, bitumen surface treatments, penetration macadam, bitumen bound macadam and bitumen concrete, mastic asphalt, specification for cement concrete roads, construction of bituminous and cement concrete roads, continuously reinforced concrete/pre-stressed/fibre reinforced pavements.

Traffic control: Traffic signs, Road markings, traffic signals, types i.e. simultaneous system, alternate system, simple progressive system and flexible progressive system, general principles of signal design.

Traffic control aids. Roadway delineations, object markers, guard rails, Barriers.

Traffic regulations: Traffic laws, Basic principles of regulation, regulation of speed, regulations of vehicles, regulation concerning driver, regulation concerning traffic rules for pedestrian traffic, general rules concerning traffic, enforcement of regulations.

Intersections: Design of intersection, grade separated intersection, Need for rotary intersection, principles of design, design of rotary intersection.

Text Books

1. *Khanna S.K. and C.E.G. Justo, "Highway Engineering", Nemchand Bros, (2002)*
2. *Kadyali L. R.; Highway Engineering, Nem Chand & Brothers, Roorkee*

Reference Books

1. *Oglesby and Hews; Highway Engineering, Wiley Publisher, (1957)*
2. *Sharma & Sharma; Principle and Practice of Highway Engineering, Asia Publishing House, New Delhi (1980).*
3. *Road Development plan for India (1981-2001), IRC, New Delhi, (1984).*
4. *Rao G. V.; Transportation Engineering, Tata McGraw Hill Publisher, New Delhi*
5. *Highway Materials, H.M.S.O.(London).*
6. *Yoder E. J.; Principles of Pavement Design, John Wiley & Sons, (October 1975)*

ELECTIVE – IV

DESIGN OF MASONRY

L	P	Cr
4	0	4

Introduction: Brick masonry units, Concrete masonry units, types, grades and properties of concrete masonry units, mortar, grout and plaster. Masonry construction, types of bonds, bond at connections, types of joints, contraction and expansion joints

Brick Masonry in Buildings: Brickwork, brick walls, brick columns and piers. Allowable stresses, cross sectional area, shape factor of units, slenderness ratio. Type of loading, net permissible stresses, composite brick concrete piers. Bed stone and bed plates.

Laterally loaded Masonry Structure: Structures and loads, stability of masonry, masonry dams, retaining walls.

Foundations, Piers, Walls and Abutments: Wall and column footings in buildings, bridge foundations, the substructure, loads on substructures. Determination of safe bearing capacity. Lateral load resistance of well foundations.

Structural Design: General, Load Dispersion, arching action, design thickness/cross section. Design of foundations, piers, walls, dams and retaining walls, design of lintels, Reinforced Brick columns.

Masonry Arches and Domes: Arches in buildings, stability of masonry arches. Design of masonry arches by elastic theory. Analysis of masonry domes – stability of masonry domes.

Seismic Design of brick masonry buildings

Introduction to SP20 (S&T):1991 “Handbook on Masonry Design and Construction”.

Text Book

1. A.S. Arya; *Structural Design in Steel, Masonry and Timber, Nem Chand & Bros.*(1987)

Reference Books

1. SP20 (S&T): 1991 “*Handbook on Masonry Design and Construction*”.
2. Sushil Kumar; *Building Construction, Standard Publishers and Distributors, 19th Edition (2003)*

SOIL DYNAMICS

L	P	Cr
4	0	4

Introduction: Nature of dynamic loads, stress conditions on soil elements under E.Q. loading.

Dynamic Earth Pressure: Earth pressure problem and retaining walls, Behavior of retaining walls during earthquakes. Modification of Coulomb's theory, Modified graphical constructions for lateral earth pressure, Analytic solution of $C - \phi$ soils, Indian standard code of practice. Determination of dynamic properties of soils.

Liquefaction of Soils: Theory, Criterion of liquefaction, factor affecting and its determination, laboratory studies in Tri-axial shear and oscillatory simple shear, Evaluation of liquefaction potential by various methods. Vibration table studies, Liquefaction behavior of loose and dense sands; silt and clayey silts.

Machine Foundations: Criteria for satisfactory functioning of machine foundation, methods of analysis. Degrees of freedom of a block foundation. Vibrations of a block, determination of dynamic coefficient by various methods. I.S. method for design of reciprocating machines, Vibration Isolation.

Introduction to the dynamics of dams and reservoirs

Text Books

1. Saran, Swami, "Soil Dynamics and Machine Foundations" Galgotia, New Delhi (1999).
2. Prasad B.B.; Soil Dynamics and Earthquake Engineering, PHI Learning Private Ltd (2009)

Reference Books

1. Prakash, S. "Soil Dynamics, McGraw Hill International Edition, New York. Publishing, New Delhi (1994).
2. Barken, D.D., "Dynamics of Bases and Foundations," McGraw Hill Book Company, New York (1995).

ROCK MECHANICS

L	P	Cr
4	0	4

Introduction: Introduction to rock mechanics, its relation with engineering Geology and soil mechanics, Importance and application of rock mechanics to civil engineering.

Classification: Review of litho-logical classification of rocks, engineering classification of intact and fissured rocks- Deere and Miller and Deere classification, RQD Classification, RQM, classification on fissures joints and faults.

Engineering Properties of Rock Masses: Void index test, compression and tensile test, permeability, strength characteristics, strength of intact and fissured rocks, effect of test conditions.

In-situ testing of Rocks: Field direct shear test, Tri-axial test, use of flat jacks, cable jacking, Chamber test, plate load test.

Stability of Rock slopes: Modes of failure in rock masses, simplified Bishop's method wedge method.

Stabilization of rocks: Rock bolting, principle of rock bolting, Rock grouting, grouting materials, grouting operations and method of grouting, Water jet cutting

Text Books

1. Parbin Singh; *Engineering Geology*, Kataria and Sons, Ludhiana/Delhi(2005).
2. Richard E. Goodman; *Introduction to Rock Mechanics*, John Wiley and Sons, New York (1996).

Reference Books

1. I.W. Farmer; *Engineering Behaviour of Rocks*; E & F Spon, London, U.K. (1998).
2. C. Jaeger; *Rock Mechanics and Engineering*, Cambridge Univ. Press, London, UK(1997)
3. Jaeger and Cook; *Fundamentals of Rock Mechanics*, Methuen, London, U.K(1994).

REMOTE SENSING AND GIS

L	P	Cr
4	0	4

Principles and Fundamentals of Remote Sensing: Sources of Energy – Active and Passive radiation – Electromagnetic Radiation – Nomenclature, Reflectance, Transmission and Absorption, Thermal Emission – Plank’s formula, Stefan – Boltzman Law, Wein’s Displacement Law; Characteristics of Solar Radiant Energy.

Sensors and Platforms: Types of sensors, Multispectral, orbital characteristics, working principles and instrumentation. Storage and Retrieval of data. IRS and ERS satellite systems – Introduction, Stages of development, Sensory Characteristics, Orbit and Coverage’s, various types of data product and its uses.

Data Processing: Initial data statistics. Pre-processing – Atmospheric, Radiometric and Geometric corrections.

Data analysis: Image Interpretation Elements, Keys and Aids. Basic Instrumentation. Visual analysis of data in application of remote sensing to various engineering fields.

Principles of Geographical Information Systems (GIS): Geographic information and spatial data types, Hardware and software; GIS; Steps of spatial data handling, database management systems, Spatial referencing

Data: Quality, measures of location errors on maps, Satellite-based positioning, Spatial data input, data preparation, Point data transformation

Analytical GIS capabilities; retrieval and classification; overlay functions, neighbourhood operations; network analysis; error propagation, Data visualization

Text Books

1. *T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, (1994)*
2. *J.B. Campbell, Introduction to Remote Sensing, Taylor & Francis, London, (1996)*

Reference Books

1. *R.N. Colwell (Editor-in-Chief), Manual of Remote Sensing, Vols I & II, American Society of Photogrammetry, Falls Church, Virginia, (1983)*
2. *George Joseph, Fundamentals of Remote Sensing, Universities Press, New Delhi, (2003).*
3. *John R. Jensen, Remote Sensing of the Environment an Earth Resource Perspective, Pearson Education. Delhi, (2003)*

4. *Jhanwar, M.L. and Chouhan; Remote Sensing and Photogrammetry – Principles and Applications, T.S. Vigyan Prakashan, Jodhpur*