

**JNTUH COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
B.TECH. FOUR YEAR DEGREE COURSE  
(CIVIL ENGINEERING)  
COURSE STRUCTURE**

**I YEAR****I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Mathematics-I (Linear Algebra and Calculus)	3	1	0	4
2	BSC	Engineering Physics	3	1	0	4
3	ESC	Programming for Problem Solving	3	0	0	3
4	ESC	Engineering Graphics	1	0	4	3
5	BSC	Engineering Physics Lab	0	0	3	1.5
6	ESC	Programming for Problem Solving Lab	0	0	3	1.5
		<b>Total Credits</b>				<b>17</b>

**I YEAR****II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Mathematics-II (Advanced Calculus)	3	1	0	4
2	BSC	Engineering Chemistry	3	1	0	4
3	ESC	Engineering Mechanics	3	1	0	4
4	HSMC	English	2	0	0	2
5	BSC	Engineering Chemistry Lab	0	0	3	1.5
6	ESC	Engineering Work Shop	1	0	3	2.5
7	HSMC	English Language and Communication Skills Lab	0	0	2	1
		<b>Total Credits</b>				<b>19</b>

**JNTUH COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
B.TECH. FOUR YEAR DEGREE COURSE  
(CIVIL ENGINEERING)  
COURSE STRUCTURE**

**II YEAR****I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-1	Building Materials, Construction and Planning	3	0	0	3
2	PCC-2	Engineering Geology	2	0	0	2
3	PCC-3	Strength of Materials-I	3	1	0	4
4	BSC	Mathematics –III (Probability and Statistics)	3	1	0	4
5	PCC-4	Fluid Mechanics	3	1	0	4
6	ESCLCE-CE	Computer aided Civil Engineering Drawing	0	0	3	1.5
7	LC-CE-1	Strength of Materials Lab	0	0	3	1.5
8	LC-CE-2	Engineering Geology lab	0	0	2	1
9	MC	Environmental Science	2	0	0	0
		<b>Total Credits</b>				<b>21</b>

**II YEAR****II SEMESTER**

S.No	Course Code	Course Title	L	T	P	Credits
1	ESC	Basics of Electrical & Electronics Engineering	3	0	0	3
2	ESC	Basics of Mechanical Engineering	2	0	0	2
3	PCC-5	Surveying & Geomatics	3	0	0	3
4	PCC-6	Strength of Materials-II	3	0	0	3
5	PCC-7	Hydraulics and Hydraulic Machinery	3	0	0	3
6	PCC-8	Structural Analysis -I	3	0	0	3
7	LC-CE-3	Surveying Lab	1	0	2	2
8	ESCLCE-CE	Basic Electrical & Electronics Lab	0	0	2	1
9	LC-CE-4	Fluid Mechanics & Hydraulic Machinery Lab	0	0	2	1
		<b>Total Credits</b>				<b>21</b>

**JNTUH COLLEGE OF ENGINEERING HYDERABAD**  
**(AUTONOMOUS)**  
**B.TECH. FOUR YEAR DEGREE COURSE**  
**(CIVIL ENGINEERING)**  
**COURSE STRUCTURE**

**III YEAR****I SEMESTER**

S. No.	Course Code	Course Title	L	T	P/D	Credits
1	PCC-9	Structural Analysis-II	3	0	0	3
2	PCC-10	Geotechnical Engineering	3	0	0	3
3	PCC-11	Structural Engineering –I(RCC)	3	0	2	4
4	PCC-12	Transportation Engineering-I	3	0	0	3
5	PEC-1	Professional Elective- I	3	0	0	3
6	HSMC	Business Economics & Financial Analysis	3	0	0	3
7	LC-CE-5	Highway Engineering and Concrete Technology Lab	0	0	3	1
8	LC-CE-6	Geotechnical Engineering Lab	0	0	3	1
9	HSMC LC-CE	Advanced Communications Lab	0	0	2	1
		<b>Total Credits</b>				<b>22</b>

**III YEAR****II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	PCC-13	Environmental Engineering-I	3	0	0	3
2	PCC-14	Foundation Engineering	3	0	0	3
3	PCC-15	Structural Engineering –II(Steel)	3	0	2	4
4	PCC-16	Hydrology & Water Resources Engineering	3	1	0	4
5	PEC-2	Professional Elective- II	3	0	0	3
6	OEC	Open Elective –I	3	0	0	3
7	LC-CE-7	Environmental Engineering Lab	0	0	2	1
8	LC-CE-8	Computer Aided Design Lab	0	0	2	1
9	MC	Constitution of India	2	0	0	0
		<b>Total Credits</b>				<b>22</b>

**JNTUH COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
B.TECH. FOUR YEAR DEGREE COURSE  
(CIVIL ENGINEERING)  
COURSE STRUCTURE**

**IV YEAR****I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PCC-17	Estimation, Costing and Project Management	3	1	0	3
2	PEC-3	Professional Elective – III	3	0	0	3
3	PEC-4	Professional Elective - IV	3	0	0	3
4	OEC	Open Elective –II	3	0	0	3
5	HMSC	Management Fundamentals for Engineers	3	0	0	3
6	MINI	Mini Project/Internship	0	0	4	2
7	PROJ	Project Stage-I	0	0	6	3
8	Seminar	Seminar	0	0	2	1
		<b>Total Credits</b>				<b>21</b>

**IV YEAR****II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	PEC-5	Professional Elective – V	3	0	0	3
2	PEC-6	Professional Elective - VI	3	0	0	3
3	OEC	Open Elective –III	3	0	0	3
4	PROJ	Project Stage-II	0	0	16	8
		<b>Total Credits</b>				<b>17</b>

**Professional Elective -I**

1. Concrete Technology
2. Earthquake Engineering
3. Introduction To Offshore Structures

**Professional Elective -II**

1. Pre-stressed Concrete
2. Bridge Engineering
3. Optimization techniques in structural engineering
4. Introduction to Composite Materials

**Professional Elective -III**

1. Irrigation & Hydraulics Structures
2. Design & Drawing of Irrigation Structures
3. Ground Water Development & Management
4. Pipe Line Engineering

**Professional Elective -IV**

1. Remote Sensing & GIS
2. Geo-environmental Engineering
3. Environmental Engineering –II
4. Solid Waste Management

**Professional Elective -V**

1. Pavement Design
2. Transportation Engineering-II
3. Urban transportation engineering

**Professional Elective -VI**

1. Ground Improvement Techniques
2. Soil Dynamics & Machine Foundations
3. Advanced Foundation Engineering
4. Geo Techniques For Infrastructure

**MATHEMATICS-I**  
**(Linear Algebra and Calculus)**

**I Year B.Tech. I-Sem**

**L T P C**  
**3 1 0 4**

**Pre-requisites:** Mathematical Knowledge of 12<sup>th</sup> / Intermediate level

**Course Objectives:** To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of Eigenvalues and Eigenvectors and to reduce the quadratic form to canonical form
4. Concept of Sequence.
5. Concept of nature of the series.
6. Geometrical approach to the mean value theorems and their application to the mathematical problems
7. Evaluation of surface areas and volumes of revolutions of curves.
8. Evaluation of improper integrals using Beta and Gamma functions.
9. Partial differentiation, concept of total derivative
10. Finding maxima and minima of function of two and three variables.

**UNIT-I: Matrices**

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations, Gauss elimination method; Gauss Seidel Iteration Method.

**UNIT-II: Eigenvalues and Eigenvectors**

Linear Transformation and Orthogonal Transformation: Eigenvalues and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

**UNIT-III: Sequences & Series**

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.  
Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

**UNIT-IV: Calculus**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.  
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-V: Multivariable calculus (Partial Differentiation and applications)**

Definitions of Limit and continuity.  
Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and Minima of functions of two variables and three variables using method of Lagrange multipliers.

**Text Books**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

**References**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.

**Course outcomes:**

After learning the contents of this paper the student must be able to

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigenvalues and Eigenvectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Analyse the nature of sequence and series.
5. Solve the applications on the mean value theorems.
6. Evaluate the improper integrals using Beta and Gamma functions
7. Find the extreme values of functions of two variables with/ without constraints.

**ENGINEERING PHYSICS****I Year B.Tech. I-Sem**

L	T	P	C
3	1	0	4

**Prerequisites: Nil****Course Objectives:**

The course should enable the students to:

1. Understand the concepts of interference and diffraction.
2. Learn the basic principles of laser and optical fiber.
3. Know about the classification of materials into three groups.
4. Exposed to present generation engineered materials and their properties.
5. Have knowledge about principles of wave mechanics.

**UNIT-I: Wave Optics**

Huygen's principle, Superposition of waves and interference of light by wave front splitting and amplitude splitting, Young's double slit experiment, Newton's rings, Michelson's interferometer, Mach-Zehnder interferometer, Fraunhofer diffraction from a single slit and circular aperture, Diffraction grating: Grating spectrum and resolving power.

**UNIT-II: Lasers and Fibre Optics**

Lasers: Interaction of radiation with matter: Spontaneous and Stimulated emission and absorption, Einstein coefficients, Characteristics of lasers: Resonating cavity, Active medium, pumping, population inversion, Construction and working of laser: Ruby laser, He-Ne laser, applications of lasers.

Fibre Optics: Introduction, Principle and Construction of an optical fibre, Acceptance angle, Numerical aperture, Types of Fibres, losses associated with optical fibres, Basic components in optical fiber communication system, Applications of optical fibres.

**UNIT-III: Introduction to solids**

Free electron theory of metals, Classical and quantum free electron theory, Estimation of Fermi energy, Dependence of Fermi level on temperature, Density of states, Bloch's theorem, Kronig – Penny modal and origin of energy bands, Classification of materials on the basis of energy bands, E – K diagram, Direct and Indirect band gaps, Effective mass.

**UNIT-IV: Engineered semiconductor materials**

Nanomaterials: Introduction, quantum confinement, surface to volume ratio, density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires and dots: design, fabrication and characterization techniques, Heterojunctions and associated band-diagrams.

**UNIT-V: Introduction to Mechanics**

Introduction, Space and Time, Newton's laws of motion, Inertial frames, Gravitational mass, Mechanics of a particle: Conservation of linear momentum, Conservation of angular momentum, Conservation of energy.

Mechanics of a system of particles: External and Internal forces, Centre of mass, Conservation linear momentum, Conservation of angular momentum and conservation of energy.

**Text Books:**

1. A textbook of Engineering Physics, Dr. M.N. Avadhanulu, Dr. P.G Kshirsagar – S.Chand
2. Haliday and Resnick, Physics – wiley



**References:**

1. Classical Mechanics by J.C. Upadyaya, Himalaya Publishing House, 2005.
2. Introduction to Solid State Physics by Charles Kittel, Wiley Student Edition
3. O. Svelto, "Principles of Lasers".
4. Ajoy Ghatak, "Optics", McGraw-Hill Education, 2012

**Course Outcomes:**

The student will be able to:

1. Analyze and get knowledge about interferometers and gratings.
2. Justify applications and principles of laser and how the graded index optical fiber is more efficient than step index optical fiber in fiber optic communication system.
3. Gain clear knowledge about Fermi level and energy band diagram
4. Get clear knowledge about fabrication and characterization of nanomaterials and Also will have knowledge about quantum wells and quantum dots.
5. Learn about completeness of Newton's laws and their applications.

**PROGRAMMING FOR PROBLEM SOLVING****I Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites:** Nil**Course objectives:**

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

**UNIT – I**

**Introduction to Computers:** Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

**Introduction to C Language:** Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

**UNIT – II**

**Statements:** if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

**Designing Structured Programs:** Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

**UNIT – III**

**Arrays and Strings:** Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

**UNIT – IV**

**Pointers:** Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

**Input and Output:** Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

**UNIT – V**

**Derived types:** Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

**Sorting and Searching:** Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

**Text Books:**

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C by J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

**Reference Books:**

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A. M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

**Course Outcomes:**

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

**ENGINEERING GRAPHICS****I Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>

**Pre-requisites: Nil****Course objectives:**

1. To provide basic concepts in engineering drawing
2. To impart knowledge about standard principles of orthographic projection of objects
3. To draw sectional views and pictorial views of solids

**UNIT-I****INTRODUCTION TO ENGINEERING DRAWING:**

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Involute. Scales – Plain, Diagonal and Vernier Scales.

**UNIT-II****ORTHOGRAPHIC PROJECTIONS:**

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

**UNIT-III**

Projections of Regular Solids – Auxiliary Views.

**UNIT-IV**

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

**UNIT-V****ISOMETRIC PROJECTIONS:**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions Auto CAD: Basic principles only

**Text Books:**

1. Engineering Drawing by N.D. Bhatt, Charotar
2. Engineering Drawing and Graphics by Rane and Shah, Pearson Edu.

**Reference Books:**

1. A Text Book of Engineering Drawing by Dhawan R K, S. Chand
2. Engineering Graphics with Auto CAD by James D Bethune, Pearson Edu.
3. Engineering Graphics by K R Mohan, Dhanpat Rai.
4. Text book on Engineering Drawing by KL Narayana, P Kannaih, Scitech

**Course Outcomes:**

At the end of the course, the student will be able to:

1. Prepare working drawings to communicate the ideas and information.
2. Read, understand and interpret engineering drawings.

**ENGINEERING PHYSICS LAB****I Year B.Tech. I-Sem****L T P C**  
**0 0 3 1.5****Prerequisites: Nil****Course Objectives:**

1. To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.
2. To introduce the concepts and techniques which have a wide application in experimental science, but have not been introduced in the standard courses.
3. To teach how to write a technical report which communicates scientific information in a clear and concise manner.

**LIST OF EXPERIMENTS**

1. Melde's experiment: To determine the frequency of a vibrating bar or tuning fork using Melde's arrangement.
2. Torsional pendulum: To determine the rigidity modulus of the material of the given wire using torsional pendulum.
3. Newton's rings: To determine the radius of curvature of the lens by forming Newton's rings.
4. Diffraction grating: To determine the number of lines per inch of the grating.
5. Dispersive power: To determine the dispersive power of prism by using spectrometer.
6. Coupled Oscillator: To determine the spring constant by single coupled oscillator.
7. LCR Circuit: To determine quality factor and resonant frequency of LCR circuit.
8. LASER: To study the characteristics of LASER sources.
9. Optical fibre: To determine the bending losses of Optical fibres.
10. Optical fibre: To determine the Numerical aperture of a given fibre.
11. Sonometer: To determine the AC frequency.
12. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil

**Note: Any 8 experiments are to be performed by each student****Learning Outcomes:****By the end of the course students will be able:**

1. To make careful experimental observations and draw conclusions from such data.
2. To distinguish between inferences based on theory and the outcomes of experiments.
3. To write a technical report which communicates scientific information in a clear and concise manner.

**PROGRAMMING FOR PROBLEM SOLVING LAB****I Year B.Tech. I-Sem**

L	T	P	C
0	0	3	1.5

**Course Objectives:**

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

**Week 1:**

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

**Week 2:**

5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

**Week 3:**

9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

**Week 4:**

11. Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to a given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.

**Week 5:**

15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:  $1+x+x^2+x^3+\dots+x^n$

For example: if n is 3 and x is 5, then the program computes  $1+5+25+125$ .

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if  $n < 0$ , then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

**Week 6:**

18.2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

19. Write a C program to convert a Roman numeral to its decimal equivalent.

**Week 7:**

20. Write a C program that uses functions to perform the following operations:

- i) Reading a complex number
- ii) Writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

**Week 8:**

21. i) Write a C program which copies one file to another.

ii) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

22. i) Write a C program to display the contents of a file.

ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

**Week 9:**

23. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

- i) Bubble sort
- ii) Selection sort
- iii) Insertion sort

**Week 10:**

24. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:

- i) Linear search
- ii) Binary search

**Text Books:**

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C by J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI, Pearson Education

**Reference Books:**

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press



**Course Outcomes**

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

**MATHEMATICS-II**  
**(Advanced Calculus)**

**I Year B.Tech. II-Sem**

**L T P C**  
**3 1 0 4**

**Pre-requisites:** Mathematical Knowledge of 12<sup>th</sup> / Intermediate level

**Course Objectives:** To learn

1. Methods of solving the differential equations of first and higher order.
2. Evaluation of multiple integrals and their applications
3. The physical quantities involved in engineering field related to vector valued functions
4. The basic properties of vector valued functions and their applications to line, surface and volume integrals

**UNIT-I: First Order ODE**

**8 L**

Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

**UNIT-II: Ordinary Differential Equations of Higher Order**

**10 L**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$  and  $xV(x)$ ; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

**UNIT-III: Multivariable Calculus (Integration)**

**10 L**

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallel piped).

**UNIT-IV: Vector Differentiation**

**10 L**

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration**

**10 L**

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

**Text Books**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006

**References**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002
2. Paras Ram, Engineering Mathematics, 2<sup>nd</sup> Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.

**Course outcomes:**

After learning the contents of this paper the student must be able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems
3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and gravity for cubes, sphere and rectangular parallel piped
4. Evaluate the line, surface and volume integrals and converting them from one to another

**ENGINEERING CHEMISTRY****I Year B.Tech. II-Sem**

L	T	P	C
3	1	0	4

**Pre Requisites: NIL****Course Objectives:**

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
3. To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
4. To acquire the skills pertaining to spectroscopy and to apply them for medical field etc.
5. To impart then knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

**Unit-1: Molecular structure and Theories of Bonding: (9)**

Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N<sub>2</sub>, O<sub>2</sub> and F<sub>2</sub> molecules.  $\pi$  Molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

**Unit-2: Water and its treatment: (9)**

Introduction – hardness of water – Causes of hardness . Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment. Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water. Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

**Unit-3: Electrochemistry and corrosion: (9)**

Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion. Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings –Methods of coating- Hot dipping, cementation – methods of application. Electroless plating and Electroless plating of Copper.

**Unit-4: Stereochemistry, Reaction Mechanism and synthesis of drug molecules: (9)**

Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n-butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of  $S_N1$ ,  $S_N2$  reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using  $KMnO_4$  and chromic acid.

Reduction reactions: reduction of carbonyl compounds using  $LiAlH_4$  &  $NaBH_4$ . Hydroboration of olefins. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

**Unit-5: Spectroscopic techniques and applications: (9)**

Principles of electronic spectroscopy: Beer's Lambert's law, numerical problems. Types of electronic excitations. Applications of uv-visible spectroscopy. IR Spectroscopy: Principle, modes of vibrations, selection rules, Force constant, some common organic Functional groups wave no. regions (C-H, NH, OH, -COOH, C=O, C≡N, C=C and C≡C) Applications of IR Spectroscopy, H NMR (NMR Spectroscopy) Principle of NMR spectroscopy Chemical shift, chemical shifts of some common organic protons. Introduction to MRI.

**Text Books:**

1. Text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing company(P)Ltd.,New Delhi..
2. Text Book of Engineering Chemistry Shashi Chawla, Dhanpat Rai Publishing company(P)Ltd.,New Delhi..

**Reference Books:**

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
3. University Chemistry, by B.H. Mahan
4. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
5. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5<sup>th</sup> Edition.

**Course Outcomes:**

The basic concepts included in this course will help the student to gain:

1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
2. The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
3. The required skills to get clear concepts on basic spectroscopy and application to medical field etc.
4. The knowledge and configurational and conformational analysis of molecules and reaction mechanisms.

**ENGINEERING MECHANICS****I Year B.Tech. II-Sem**

L	T	P	C
3	1	0	4

**Pre Requisites: NIL****Course Objectives:**

During this course, students should develop the ability to:

1. Work comfortably with basic engineering mechanics concepts required for analyzing static structures
2. Identify an appropriate structural system to study a given problem and isolate it from its environment.
3. Model the problem using good free-body diagrams and accurate equilibrium equations
4. Identify and model various types of loading and support conditions that act on structural systems.
5. Apply pertinent mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem.
6. Understand the meaning of centers of gravity (mass)/centroids and moments of Inertia using integration methods.
7. Communicate the solution to all problems in an organized and coherent manner and elucidate the meaning of the solution in the context of the problem.

**UNIT – I: INTRODUCTION OF ENGINEERING MECHANICS**

Basic concepts System of Forces-Coplanar Forces-Components in Space-Resultant- Moment of Forces and its Application – Couples and Resultant of Force System-Equilibrium of System of Forces-Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading.

**UNIT – II: FRICTION**

Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction – Cone of limiting friction– Friction of wedge, block and Ladder – Screw jack – Differential screw jack - Motion of Bodies.

**UNIT – III: CENTROID AND CENTER OF GRAVITY**

Centroids – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies - Area moment of Inertia: – polar Moment of Inertia–Transfer–Theorems - Moments of Inertia of Composite Figures.

**MOMENT OF INERTIA:** Moment of Inertia of Areas and Masses - Transfer Formula for Moments of Inertia-Moment of inertia of composite areas and masses.

**UNIT – IV: KINEMATICS**

Introduction – Rectilinear motion – Motion with uniform and variable acceleration– Curvilinear motion–Components of motion– Circular motion – Projectiles- Instantaneous centre.

**UNIT – V: KINETICS**

Kinetics of a particle – D’Alembert’s principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

**TEXT BOOKS:**

1. Engineering Mechanics by Shames & Rao - Pearson Education.
2. Engineering Mechanics by M.V. Seshagiri Rao and Durgai; University Press.
3. Engineering Mechanics – B. Bhattacharya - Oxford University Publications.

**REFERENCES:**

1. Engineering Mechanics (Statics and Dynamics) by Hibbler; Pearson Education.
2. Engineering Mechanics by Ferdinand L. Singer – Harper Collins Publishers.
3. Engineering Mechanics by A.K. Tayal, Umesh Publication.
4. Engineering Mechanics – G.S. Sawhney, Prentice Hall of India.
5. A text book of engineering mechanics by R. K. Bansal; Laxmi publications.
6. Engineering Mechanics by R.S. Khurmi; S. Chand & Co.

**Course Outcomes:**

At the end of the course, the student will be able to:

1. Solve problems dealing with forces in a plane or in space and equivalent force systems.
2. Solve beam and cable problems and understand distributed force systems.
3. Solve friction problems and determine moments of Inertia and centroid using integration methods.
4. Understand and know how to solve three-dimension force and moment problems.
5. Understand and know how to use vector terminology.

**ENGLISH****I Year B.Tech. II-Sem**

L	T	P	C
2	0	0	2

**INTRODUCTION**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt and for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development in the areas of Vocabulary, Grammar, Reading and Writing Skills, fostering ideas and practice of language skills in various contexts.*

**LEARNING OBJECTIVES**

The course will help students to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

**COURSE OUTCOMES**

Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

**SYLLABUS**

- ☞ (Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the class.)

**Unit –I**

**Vocabulary Building:** The Concept of Word Formation --The Use of Prefixes and Suffixes.

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Basic Writing Skills:** Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence.



**Unit –II**

**Vocabulary:** Synonyms and Antonyms.

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension.

**Writing:** Format of a Formal Letter-**Writing Formal Letters** E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

**Unit –III**

**Vocabulary:** Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-skills of Reading- Skimming and Scanning

**Writing:** Writing Introduction and Conclusion - **Essay Writing.**

**Unit –IV**

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Comprehension- Intensive Reading and Extensive Reading.

**Writing:** Writing Practices---**Précis Writing.**

**Unit –V**

**Vocabulary:** Technical Vocabulary and their usage

**Grammar:** Common Errors in English

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** **Technical Reports-** Introduction – Characteristics of a Report – Categories of Reports

Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**Note:** *Listening and Speaking skills which are given under Unit-6 are covered in the syllabus of ELCS Lab Course.*

**References:**

- i. *Practical English Usage.* Michael Swan. OUP. Fourth Edition 2016.
- ii. *Communication Skills.* Sanjay Kumar and Pushp Lata. Oxford University Press. 2018.
- iii. *English: Context and Culture* by Board of Editors published by Orient BlackSwan Pvt. Ltd.
- iv. *Remedial English Grammar.* F.T. Wood. Macmillan.2007.
- v. *On Writing Well.* William Zinsser. Harper Resource Book. 2001
- vi. *Study Writing.* Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- vii. *Exercises in Spoken English. Parts I –III.* CIEFL, Hyderabad. Oxford University Press

\*\*\*\*\*

**ENGINEERING CHEMISTRY LAB****I Year B.Tech. II-Sem****L T P C****0 0 3 1.5****Prerequisites: Nil****Course Objectives:**

The chemistry laboratory course consists of experiments related to the principles of chemistry required to the engineering student. The course will make the student to learn:

1. Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
2. To determine the rate constant of reactions from concentrations as a function of time.
3. The measurement of physical properties like adsorption and viscosity.
4. To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

**LIST OF EXPERIMENTS:**

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of  $\text{Fe}^{2+}$  by Potentiometry using  $\text{KMnO}_4$
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of  $R_f$  values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

**References**

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5<sup>th</sup> edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

**Course Outcomes:**

The experiments included in the chemistry laboratory will make the student to gain the skills on

1. Determination of parameters like hardness and chloride content in water.
2. Estimation of rate constant of a reaction from concentration – time relationships.
3. Determination of physical properties like adsorption and viscosity.
4. Calculation of  $R_f$  values of some organic molecules by TLC technique.

**ENGINEERING WORKSHOP****I Year B.Tech. II-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>3</b>	<b>2.5</b>

Pre-requisites: **Practical skill****Course Objectives:**

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, equipment and machines.
6. To study commonly used carpentry joints.
7. To have practical exposure to various welding and joining processes.
8. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
9. To understand the computer hardware and practice the Assembly of computer parts.
10. To practice the process of Installation of operating system windows.

**I. TRADES FOR EXERCISES:**(Any **six** trades from the following with minimum of **two** exercises in each trade)

1. Carpentry – 2 Lectures
2. Fitting- 1Lecture
3. Tin-Smithy- 1Lecture
4. Black Smithy-1Lecture
5. House-wiring-1Lecture
6. Foundry- 2 Lectures
7. Plumbing-1Lecture

**II. Trades for Demonstration & Exposure**

1. Demonstration of power tools -1 Lecture
2. Welding – 2 Lecture
3. Machine Shop -2 Lectures

**III. IT Workshop I:** Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises.**IT Workshop II:** Installation of operating system windows and linux simple diagnostic exercises.**Text Books:**

1. Workshop Practice by B.L.Juneja Cengage Learning
2. Elements of Workshop Technology–S. K.Hajra Choudhury and A. K. Hajra Choudhury.

**Course Outcomes:**

At the end of the course, the student will be able to:

1. Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding.
2. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
3. Apply basic electrical engineering knowledge for house wiring practice.

**ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB****I Year B.Tech. II-Sem**

L	T	P	C
0	0	2	1

**Prerequisites: Nil**

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

**Objectives**

- ✗ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✗ To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✗ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✗ To improve the fluency of students in spoken English and neutralize their mother tongue influence
- ✗ To train students to use language appropriately for public speaking and interviews

**Syllabus**

**English Language and Communication Skills Lab (ELCS) shall have two parts:**

- a. **Computer Assisted Language Learning (CALL) Lab**
- b. **Interactive Communication Skills (ICS) Lab**

**Listening Skills**

Objectives

1. To enable students, develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills**

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
  - Oral practice: Just A Minute (JAM) Sessions
  - Describing objects/situations/people
  - Role play – Individual/Group activities

- **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the**

syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)

### **Exercise – I**

#### **CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

#### **ICS Lab:**

*Understand:* Communication at Work Place- Spoken vs. Written language.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

### **Exercise – II**

#### **CALL Lab:**

*Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

#### **ICS Lab:**

*Understand:* Features of Good Conversation – Non-verbal Communication.

*Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations – Making Requests and Seeking Permissions - Telephone Etiquette.

### **Exercise - III**

#### **CALL Lab:**

*Understand:* Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

#### **ICS Lab:**

*Understand:* How to make Formal Presentations.

*Practice:* Formal Presentations.

### **Exercise – IV**

#### **CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests.

#### **ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks.

*Practice:* Making a Short Speech – Extempore.

### **Exercise – V**

#### **CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests.

#### **ICS Lab:**

1. Introduction to Interview Skills.
2. Common errors in speaking.

### **Minimum Requirement of infrastructural facilities for ELCS Lab:**

#### **1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

**System Requirement (Hardware component):**

*Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab:**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

**Learning Outcomes**

Students will be able to attain

- ↳ Better understanding of nuances of English language through audio- visual experience and group activities
- ↳ Neutralization of accent for intelligibility
- ↳ Speaking skills with clarity and confidence which in turn enhances their employability skills

**BUILDING MATERIALS, CONSTRUCTION AND PLANNING**

I I Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

Pre Requisites: NIL

**Course Objectives: The objectives of the course is to**

- **List** the construction material.
- **Explain** different construction techniques
- **Understand** the building bye-laws
- **Highlight** the smart building materials

**UNIT - I****Stones and Bricks, Tiles:** Building stones – classifications and quarrying – properties – structural requirements – dressing.

Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics.

**Timber, Aluminum, Glass, Paints and Plastics:** Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics.**UNIT – II****Cement & Admixtures:** Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests.

Admixtures – mineral &amp; chemical admixtures – uses.

**UNIT - III****Building Components :** Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ; foundations – types ; Damp Proof Course ; Joinery – doors – windows – materials – types.**Building Services:** Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Harzards – Classification of fire resistant materials and constructions**UNIT - IV****Mortars, Masonry and Finishing's****Mortars:** Lime and Cement Mortars

Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.

**Finishers:** Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.**Form work: Types:** Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.**UNIT – V****Building Planning:** Principles of Building Planning, Classification of buildings and Building by laws.**Course Outcomes****After the completion of the course student should be able to**

- **Define** the Basic terminology that is used in the industry
- **Categorize** different building materials , properties and their uses
- **Understand** the Prevention of damage measures and good workmanship
- **Explain** different building services

**TEXT BOOKS:**

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi.

**REFERENCES:**

1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
2. Building Materials by Duggal, New Age International.
3. Building Materials by P. C. Varghese, PHI.
4. Building Construction by PC Varghese PHI.
5. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
6. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.



**ENGINEERING GEOLOGY****I I Year B.Tech. I-Sem****L T P C**  
**2 0 0 2****Pre Requisites:** NIL**Course Objectives:** The objective of this Course is

- To give the basics knowledge of Geology that is required for constructing various Civil Engineering Structures, basic Geology, Geological Hazardous and Environmental Geology
- To focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Planning and construction of major Civil Engineering projects

**UNIT - I**

**Introduction:** Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks. Importance of Physical geology, Petrology and Structural geology.

**Weathering of Rocks :**Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like “Granite”

**UNIT - II**

**Mineralogy:** Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economic minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

**Petrology:** Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Lacrite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

**UNIT - III**

**Structural Geology:** Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies. Their importance In situ and drift soils, common types of soils, their origin and occurrence in India, Stabilisation of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

**UNIT - IV**

**Earth Quakes:** Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

**Importance of Geophysical Studies:** Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

**UNIT - V**

**Geology of Dams, Reservoirs, and Tunnels:** Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

**Course Outcomes:** At the end of the course, the student will be able to:

- Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
- The fundamentals of the engineering properties of Earth materials and fluids.
- Rock mass characterization and the mechanics of planar rock slides and topples

**TEXT BOOKS:**

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014

**REFERENCES:**

1. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
2. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications
3. F.G. Bell, Fundamental of Engineering B.S. Publications, 2005.
4. Krynine& Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
5. Engineering Geology by SubinoyGangopadhyay, Oxford university press.
6. Engineering Geology for Civil Engineers – P.C. Varghese PHI

**STRENGTH OF MATERIALS - I****II Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Pre Requisites:** Engineering Mechanics**Course Objectives:** The objective of this Course is

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers and beams for various types of simple loads
- To calculate the elastic deformation occurring in simple members for different types of loading.
- To show the plane stress transformation with a particular coordinate system for different orientation of the plane.
- To know different failure theories adopted in designing of structural members

**UNIT – I****SIMPLE STRESSES AND STRAINS:**

Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic moduli, Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

**STRAIN ENERGY** – Resilience – Gradual, sudden, and impact loadings – simple applications.

**UNIT – II****SHEAR FORCE AND BENDING MOMENT:**

Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT – III****FLEXURAL STRESSES:**

Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

**SHEAR STRESSES:**

Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

**UNIT – IV****DEFLECTION OF BEAMS:**

Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple - Mohr's theorems – Moment area method – Application to simple cases.

**CONJUGATE BEAM METHOD:** Introduction – Concept of conjugate beam method - Difference between a real beam and a conjugate beam - Deflections of determinate beams with constant and different moments of inertia.

**UNIT – V****PRINCIPAL STRESSES:**

Introduction – Stresses on an oblique plane of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Principal stresses – Mohr's circle of stresses – ellipse of stress - Analytical and graphical solutions.

**THEORIES OF FAILURE:** Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory- Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

**Course Outcome:**

On completion of the course, the student will be able to:

- Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structured and mechanical components.
- Recognize various types loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
- to evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading
- Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress;
- Frame an idea to design a system, component, or process

**TEXT BOOKS:**

- 1) Strength of Materials by R.K Rajput, S.Chand & Company Ltd.
- 2) Mechanics of Materials by Dr.B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain

**REFERENCES:**

- 1) Strength of Materials by R. Subramanian, Oxford University Press
- 2) Mechanics of material by R.C.Hibbeler, Printice Hall publications
- 3) Engineering Mechanics of Solids by Egor P. Popov, Printice Hall publications
- 4) Strength of Materials by T.D. Gunneswara Rao and M. Andal, Cambridge Publishers
- 5) Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
- 6) Strength of Materials by B.S. Basavarajaiah and P. Mahadevappa, 3<sup>rd</sup> Edition, Universities Press

**MATHEMATICS -III**  
**PROBABILITY AND STATISTICS**

**II Year B.Tech. I-Sem**

**L T P C**  
**3 1 0 4**

**Pre Requisites:** Mathematics - I

**Course Objectives:** To make the student to understand the statistics and probability theories such as random variables, sampling distribution, tests of significance etc. so that he can apply them to engineering problems.

**UNIT-I: Probability**

Sample space and events – Probability – The axioms of probability – Some Elementary theorems – Conditional probability – Baye,s theorem, Random variables – Discrete and continuous.

**UNIT-II: Single Random variables and probability distributions**

Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution . Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution. Binomial , Poisson & normal distributions and their properties . Moment generating functions of the above three distributions. and hence finding the mean and variance.

**UNIT-III: Multiple Random variables, Correlation&Regression**

Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation -Coefficient of correlation, The rank correlation.

Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

**UNIT-IV: Sampling Distributions and Testing of Hypothesis**

**Sampling:**Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance.

**Parameter estimations** – likelihood estimate, interval estimations .

**Testing of hypothesis:** Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test,

**Large sample tests:**

(i)Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance& unknown variance, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii)Tests of significance difference between sample proportion and population proportion&difference between two sample proportions.

**Small sample tests:**

Student t-distribution,its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and it's properties. Test of equality of two population variances

Chi-square distribution , it's properties, Chi-square test of goodness of fit

**UNIT- V:Queuing Theory & Stochastic Processes**

Arrival Theorem – Pure Birth process and Death process M/M/1 Model. Introduction to Stochastic Processes – Markov process classification of states – Examples of Markov Chains, Stochastic Matrix, limiting probabilities.

**Course Outcomes:** Students will able to perform probability theories & statistics on engineering problems

**Text Books:**

- 1) Fundamentals of mathematical statistics by s c gupta and v.k.kapoor
- 2) Probability and statistics for engineering and the science by jay l.devore.

**References:**

- 1) Mathematics for engineers series –probability statistics and stochastic process by k.b.datta and m.a s.srinivas,cengage publications
- 2) Probability, statistics and stochastic process by prof.a r k prasad., wiely india
- 3) Probability and statistics by t.k.v.iyengar&b.krishna gandhi etel
- 4) A
- 5) text book of probability and statistics, shahnaz bathul , cengage learning

**FLUID MECHANICS****II Year B.Tech. I-Sem**

L	T	P	C
3	1	0	4

**Pre Requisites:** Engineering Mechanics**Course Objectives: The objectives of the course are to**

- Introduce the concepts of fluid mechanics useful in Civil Engineering applications
- Provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- learn about the application of mass, energy and momentum conservation laws for fluid flows
- train and analyse engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
- To obtain the velocity and pressure variations in various types of simple flows
- to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology

**UNIT – I****Properties of Fluid**

Distinction between a fluid and a solid;

Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

**Fluid Statics**

Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude.

Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure

gauges. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

**UNIT - II****Fluid Kinematics**

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform

flow; laminar and turbulent flow; rotational and irrotational flow;

compressible and incompressible flow; ideal and real fluid flow; one, two and three

dimensional flows; Streamline, pathline, streak line and stream tube; stream function, velocity potential function. One, two and three dimensional continuity equations in Cartesian coordinates.

**Fluid Dynamics**

Surface and Body forces - Euler's and Bernoulli's equation; Energy correction factor; Momentum equation. Vortex flow – Free and Forced. Bernoulli's equation to real fluid flows.

**UNIT - III****Flow Measurement in Pipes**

Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend.

**Flow Over Notches & Weirs**

Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

**UNIT – IV****Flow through Pipes**

Reynolds experiment, Reynolds number, Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures,

**UNIT - V****Laminar & Turbulent Flow**

Laminar flow through: circular pipes, annulus and parallel plates.

**Boundary Layer Concepts**

Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Definition of Drag and Lift and types drag, Magnus effect.

**Course Outcomes (COs):** Upon completion of this course, students should be able to:

- Understand the broad principles of fluid statics, kinematics and dynamics
- Understand definitions of the basic terms used in fluid mechanics and characteristics of fluids and its flow
- Understand classifications of fluid flow
- Be able to apply the continuity, momentum and energy principles

**Text Books**

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI Learning Private Limited, 2015.

**References.**

1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
3. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chadramouli, Oxford University Press, 2010
4. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai & Co
5. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publication Pvt Ltd.
6. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd. Reference Books



**COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB****II Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Pre Requisites:** Engineering Mechanics

**Course Objectives:** The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

**List of Experiments:**

1. Introduction to computer aided drafting and different coordinate system
2. Drawing of Regular shapes using Editor mode
3. Introduction GUI and drawing of regular shapes using GUI
4. Exercise on Draw tools
5. Exercise on Modify tools
6. Exercise on other tools (Layers, dimensions, textng etc.)
7. Drawing of building components like walls, lintels, Doors, and Windows. using CAD software
8. Drawing a plan of Building and dimensioning
9. Drawing a plan of a residential building using layers
10. Developing a 3-D plan from a given 2-D plan
11. Developing sections and elevations for given
  - a) Single storied buildings
  - b) multi storied buildings
12. Auto CAD applications in surveying, mechanics etc.

**Course Outcomes:** At the end of the course, the student will be able to:

- Use the Autocad commands for drawing 2D & 3D building drawings required for different civil engg applications.
- Plan and draw Civil Engineering Buildings as per aspect and orientation.
- Presenting drawings as per user requirements and preparation of technical report

**TEXT BOOKS:**

1. Computer Aided Design Laboratory by M. N. SeshPraksh& Dr. G. S. Servesh –Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

**STRENGTH OF MATERIALS LAB****II Year B.Tech. I-Sem****L T P C**  
**0 0 3 1.5****Pre Requisites:** Strength of Materials – Theory**Course Objectives:**

- Make measurements of different strains, stress and elastic properties of materials used in Civil Engineering.
- Provide physical observations to complement concepts learnt
- Introduce experimental procedures and common measurement instruments, equipment, devices.
- Exposure to a variety of established material testing procedures and techniques
- Different methods of evaluation and inferences drawn from observations

**List of Experiments:**

1. Tension test
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges
12. Continuous beam – deflection test.

**Course Outcomes:**

At the end of the course the student will be able to:

- Configure & Operate a data acquisition system using various testing machines of solid materials
- Compute and Analyze engineering values (e.g. stress or strain) from laboratory measurements.
- Write a technical laboratory report

**ENGINEERING GEOLOGY LAB****II Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Pre Requisites:** Engineering Geology- Theory

**Course Objectives:** The objective of this lab is that to provide practical knowledge about physical properties of minerals, rocks, drawing of geological maps, showing faults, uniformities etc.

**List of Experiments**

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.
9. Simple structural Geology Problems(Folds, Faults & Unconformities)

**Course Outcomes:** At the end of the course, the student will be able to:

- Understands the method and ways of investigations required for Civil Engg projects
- Identify the various rocks, minerals depending on geological classifications
- Will able to learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects and the quantification of processes such as rock slides and settlement.
- Write a technical laboratory report

**LAB EXAMINATION PATTERN:**

1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.
5. Microscopic identification of rocks.

**ENVIRONMENTAL SCIENCE****II Year B.Tech. I-Sem**

L	T	P	C
2	0	0	0

**Pre-Requisites: NIL****Course Objectives:**

1. Creating the awareness about environmental problems among students.
2. Imparting basic knowledge about the environment and its allied problems.
3. Developing an attitude of concern for the environment.
4. Motivating students to participate in environment protection and environment improvement.

**UNIT-I:****MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES:** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

**UNIT-II:**

**ECOSYSTEMS:** Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT-III:****ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of:

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**UNIT-IV:**

**SOLID WASTE MANAGEMENT:** Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

**UNIT-V:**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development - Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies -Wasteland reclamation. -Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

**Text Books:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission., Universities Press
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**Reference Books:**

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

**Course Outcomes:**

At the end of the course, it is expected that students will be able to:

1. Identify and analyze environmental problems as well as the risks associated with these problems
2. Understand what it is to be a steward in the environment  
Studying how to live their lives in a more sustainable manner

**BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING****II Year B.Tech. II-Sem**

L	T	P	C
3	0	0	3

**Course Objectives:** Objectives of this course are

- To introduce the concept of electrical circuits and its components
- To introduce the concepts of diodes and transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

**UNIT- I**

**Electrical Circuits:** R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis, **Single Phase AC Circuits:** R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

**UNIT-II**

**Resonance:** Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

**Network Theorems:** Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

**UNIT- III**

**P-N Junction Diode:** Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

**Rectifiers and Filters:** P-N junction as a rectifier – Half Wave Rectifier, Ripple Factor – Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters,  $\pi$ - section Filters.

**UNIT- IV**

**Bipolar Junction Transistor (BJT):** Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. Transistor Biasing And Stabilization – Operating point, DC and AC load lines, Biasing – Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors.

**Transistor Configurations:** BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

**UNIT- V**

**Junction Field Effect Transistor:** Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

**Special Purpose Devices:** Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

**Course Outcomes:** After this course, the student will be able

- To analyze and solve problems of electrical circuits using network laws and theorems.
- To identify and characterize diodes and various types of transistors.

**Text books:**

- Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
- Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath Mc Graw Hill Education

**References:**

- Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
- Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabratajit, TMH, 2/e, 1998.
- Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
- Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
- Network Theory by N. C. Jagan and C. Lakshminarayana, B.S. Publications.
- Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

**BASICS OF MECHANICAL ENGINEERING**

II Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Instructional Objectives**

To familiarize civil engineering students with the

- Basic machine elements,
- Sources of Energy and Power Generation,
- Various manufacturing processes,
- Power transmission elements, material handling equipment

**UNIT I:**

**Machine Elements:** Cams: Types of cams and followers

**Introduction to engineering materials-**Metals, ceramics, composites-Heat treatment of metals

**Riveted joints-** methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

**UNIT-II:**

**Power Transmission Elements:**Gears terminology of spur, helical and bevel gears, gear trains. Belt drives(types). Chain drives.

**Material handling equipment:** Introduction to Belt conveyors, cranes, industrial trucks, bull dozers,

**UNIT-III:**

**Energy:**

**Power Generation:** External and internal combustion engines (layouts, element/component description, advantages, disadvantages, applications).

**REFRIGERATION:** Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, details and principle of operation – calculation of COP

**Modes and mechanisms of heat transfer** – Basic laws of heat transfer – General discussion about applications of heat transfer.

**UNIT IV:**

**Manufacturing Processes:** Sheet Metal Work: Introduction – Equipments – Tools and accessories – Various processes(applications, advantages / disadvantages).

**Welding:** Types – Equipments – Techniques employed – welding positions-defects-applications, advantages / disadvantages – Gas cutting – Brazing and soldering.

**Casting:** Types, equipments, applications

**UNIT V:**

**Machine Tools:** Introduction to lathe, drilling machine, milling machine, grinding machine- Operations performed

**Text Books:**

1. Kumar, T., Leenus Jesu Martin and Murali, G., *Basic Mechanical Engineering*, Suma Publications, Chennai, 2007



**References:**

1. Prabhu, T. J., Jai Ganesh, V. and Jebaraj, S., *Basic Mechanical Engineering*, Scitech Publications, Chennai, 2000.
2. Hajra Choudhary, S.K. and HajraChoudhary, A. K., *Elements of Workshop Technology Vols.I & II*, Indian Book Distributing Company Calcutta, 2007.
3. Nag, P.K., *Power Plant Engineering*, Tata McGraw-Hill, New Delhi, 2008.
4. Rattan, S.S., *Theory of Machines*, Tata McGraw-Hill, New Delhi, 2010.

**SURVEYING & GEOMATICS****II Year B.Tech. II-Sem**

L	T	P	C
3	0	0	3

**Course Objectives:**

The object of the course student should have the capability to:

- Know the principle and methods of surveying.
- Measure horizontal and vertical- distances and angles
- Recording of observation accurately
- Perform calculations based on the observation
- Identification of source of errors and rectification methods
- Apply surveying principles to determine areas and volumes and setting out curves
- Use modern surveying equipment's for accurate results

**UNIT - I**

**Introduction and Basic Concepts:** Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

**Measurement of Distances and Directions**

**Linear distances-** Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

**Prismatic Compass-** Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

**UNIT - II**

**Leveling-** Types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.

**Contouring-** Characteristics and uses of Contours, methods of contour surveying.

**Areas -** Determination of areas consisting of irregular boundary and regular boundary.

**Volumes -**Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.

**UNIT - III**

**Theodolite Surveying:** Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

**Traversing:** Methods of traversing, traverse computations and adjustments, Omitted measurements.

**UNIT - IV**

**Curves:** Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.

**Tacheometric Surveying:** Principles of Tacheometry, stadia and tangential methods of Tacheometry,

**Modern Surveying Methods:** Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System- Principle and Applications.

**UNIT - V****Photogrammetry Surveying:**

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

**Course Outcomes:** Course will enable the student to:

- Apply the knowledge to calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments, measurement errors and corrective measures
- Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies

**TEXT BOOKS:**

1. Chandra A M, “Plane Surveying and Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi.
2. Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

**REFERENCES:**

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

**STRENGTH OF MATERIALS – II****II Year B.Tech. II-Sem**

L	T	P	C
3	0	0	3

**Pre Requisites:** Strength of Materials -I**Course Objectives:**The objective of this Course is

- To understand the nature of stresses developed in simple geometries shafts, springs, columns & cylindrical and spherical shells for various types of simple loads
- To calculate the stability and elastic deformation occurring in various simple geometries for different types of loading.
- To understand the unsymmetrical bending and shear center importance for equilibrium conditions in a structural members of having different axis of symmetry.

**UNIT – I****TORSION OF CIRCULAR SHAFTS :**

Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure.

**SPRINGS :**Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

**UNIT – II****COLUMNS AND STRUTS:**

Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler’s theorem for long columns- assumptions- derivation of Euler’s critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler’s critical stress – Limitations of Euler’s theory– Long columns subjected to eccentric loading – Secant formula – Empirical formulae — Rankine – Gordon formula- Straight line formula – Prof. Perry’s formula.

**BEAM COLUMNS:** Laterally loaded struts – subjected to uniformly distributed and concentrated loads.

**UNIT - III****DIRECT AND BENDING STRESSES:**

Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability- Overturning and sliding – stresses due to direct loading and bending moment about both axis.

**UNIT – IV****THIN CYLINDERS :**

Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

**THICK CYLINDERS :**

Introduction - Lamé’s theory for thick cylinders – Derivation of Lamé’s formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

**UNIT – V****UNSYMMETRICAL BENDING :**

Introduction – Centroidal principal axes of section – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.

**SHEAR CENTRE:** Introduction - Shear centre for symmetrical and unsymmetrical (channel, I, T and L) sections

**Course Outcome:**

On completion of the course, the student will be able to:

- Describe the concepts and principles, understand the theory of elasticity, and perform calculations, relative to the strength of structures and mechanical components in particular to torsion and direct compression;
- to evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading
- Analyze strength and stability of structural members subjected to Direct, and Direct and Bending stresses;
- Understand and evaluate the shear center and unsymmetrical bending.
- Frame an idea to design a system, component, or process

**Text Books:**

- 1) Strength of Materials by R.K Rajput, S.Chand & Company Ltd.
- 2) Mechanics of Materials by Dr.B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain

**References:**

- 1) Strength of Materials by R.Subramanian, Oxford University Press.
- 2) Mechanics of Materials by R.C.Hibbeler, Pearson Education
- 3) Engineering Mechanics of Solids by Popov E.P. Printice-Hall Ltd
- 4) Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
- 5) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
- 6) Fundamentals of Solid Mechanics by M.L.Gambhir, PHI Learning Pvt. Ltd

**HYDRAULICS & HYDRAULIC MACHINERY****II Year B.Tech. II-Sem**

L	T	P	C
3	0	0	3

**Pre Requisites:****Course Objectives:**

- **To Define** the fundamental principles of water conveyance in open channels.
- **To Discuss** and analyze the open channels in uniform and Non-uniform flow conditions.
- To Study the characteristics of hydroelectric power plant and its components.
- To analyze and design of hydraulic machinery and its modeling

**UNIT-I****Open Channel Flow – I**

Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution. Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient "n". Most economical sections. Computation of Uniform flow, Normal depth.

**Critical Flow:** Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

**UNIT-II****Open Channel Flow – II**

Non uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

**Rapidly varied flow:** Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

**UNIT-III****Dimensional Analysis and Hydraulic Similitude**

Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems. Distorted models.

**Basics of Turbo Machinery**

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular

**UNIT-IV****Hydraulic Turbines – I**

Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.

**Hydraulic Turbines – II**

Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

**UNIT-V****Centrifugal Pumps**

Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

**Hydropower Engineering:** Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

**Course Outcomes:**

At the end of the course the student will be able to

- Apply their knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
- Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
- apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
- Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages

**Text Books**

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015

**REFERENCES**

1. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai & C
2. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd
3. Fluid Mechanics & Fluid Power Engineering by D.S. Kumar (Kataria & Sons Publications Pvt. Ltd.).
4. Open channel flow by V.T. Chow (McGraw Hill Book Company).
5. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborty, McGraw Hill Education (India) Private Limited
6. Hydraulic Machines by Banga & Sharma (Khanna Publishers).

**STRUCTURAL ANALYSIS – I****II Year B.Tech. II-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Strength of Materials –I**Course Objectives:**The objective of the course is to

- **Differentiate** the statically determinate and indeterminate structures.
- To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
- **Analyse** the statically indeterminate members such as fixed bars, continuous beams and for various types of loading.
- Understand the energy methods used to derive the equations to solve engineering problems
- **Evaluate** the Influence on a beam for different static & moving loading positions

**UNIT – I**

**ANALYSIS OF PERFECT FRAMES:** Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

**UNIT – II**

**ENERGY THEOREMS:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's theorem-Unit Load Method - Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.

**THREE HINGED ARCHES** – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels - Absolute maximum bending moment diagram for a three hinged arch.

**UNIT-III**

**PROPPED CANTILEVER and FIXED BEAMS:** Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

**UNIT – IV**

**CONTINUOUS BEAMS:** Introduction-Continuous beams - Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - effect of sinking of supports.

**SLOPE DEFLECTION METHOD:** Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminacies for frames - Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway - Shear force and bending moment diagrams and Elastic curve.



**UNIT – V**

**MOVING LOADS and INFLUENCE LINES:** Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load, uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span-Influence lines for forces in members of Pratt and Warren trusses - Equivalent uniformly distributed load -Focal length.

**Course Outcomes:**

At the end of the course the student will able to

- An ability to apply knowledge of mathematics, science, and engineering
- Analyse the statically indeterminate bars and continuous beams
- Draw strengthbehaviour of members for static and dynamic loading.
- Calculate the stiffness parameters in beams and pin jointed trusses.
- Understand the indeterminacy aspects to consider for a total structural system.
- Identify, formulate, and solve engineering problems with real time loading

**Text Books:**

- 1) Structural Analysis Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers.
- 2) Structural Analysis Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.

**References:**

- 1) Structural analysis T.S Thandavamoorthy, Oxford university Press
- 2) Structural Analysis by R.C.Hibbeler, Pearson Education
- 3) Basic Structural Analysis by K.U.Muthuet al., I.K.International Publishing House Pvt.Ltd
- 4) Mechanics of Structures Vol – I and II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
- 5) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Education Pvt. Ltd.
- 6) Fundamentals of Structural Analysis by M.L.Gamhir, PHI Learning Pvt. Ltd

**SURVEYING LAB****II Year B.Tech. II-Sem**

L	T	P	C
1	0	2	2

**Pre Requisites:** Surveying Theory**Course Objectives:**

- To impart the practical knowledge in the field- measuring distances, directions, angles,
- To determining R.L.'s areas and volumes
- To set out Curves
- To stake out points
- To traverse the area
- To draw Plans and Maps

**List of Experiments**

1. Surveying of an area by chain, and compass survey (closed traverse) & plotting.
2. Determine of distance between two inaccessible points with compass
3. Radiation method, intersection methods by plane table survey.
4. Levelling – Longitudinal and cross-section and plotting
5. Measurement of Horizontal and vertical angle by theodolite
6. Trigonometric leveling using theodolite
7. Height and distances using principles of tachometric surveying
8. Determination of height, remote elevation, distance between inaccessible points using total station
9. Determination of Area using total station and drawing map
10. Traversing using total station for drawing contour map
11. Stake out using total station
12. Setting out Curve using total station

**Course Outcomes:** At the end of the course, the student will be able to:

- Apply the principle of surveying for civil Engineering Applications
- Calculation of areas, Drawing plans and contour maps using different measuring equipment at field level
- Write a technical laboratory report

**BASIC ELECTRICAL & ELECTRONICS LAB****II Year B.Tech. II-Sem**

L	T	P	C
0	0	2	1

**Basic Electrical Engineering Laboratory-I****List of Experiments:**

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.  
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem
6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit

**Basic Electronics Engineering Laboratory-I**

- There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given. Lectures on measurement techniques and error calculation will also have to be organized.
- 3 hours per week must be kept, initially for practical lectures, and later for tutorials.

**List of Experiments:**

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
  2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
  3. Study of I-V characteristics of Junction diodes.
  4. Study of I-V characteristics of Zener diodes.
  5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
  6. Study of I-V characteristics of BJTs.
- mywbut.com

**FLUID MECHANICS & HYDRAULIC MACHINERY LAB**

II Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Pre Requisites:** FM & HHM Theory**Course Objectives**

- To **identify** the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
- To **explain** the standard measurement techniques of fluid mechanics and their applications.
- To **illustrate** the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- To **analyze** the laboratory measurements and to document the results in an appropriate format.

**List of Experiments**

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipe line
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Kaplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

**Course Outcomes**

Students who successfully complete this course will have demonstrated ability to:

- **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
- **Interpret** the results obtained in the laboratory for various experiments.
- **Discover** the practical working of Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
- **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
- Write a technical laboratory report

**STRUCTURAL ANALYSIS – II****III Year B.Tech. I-Sem**

L	T	P	C
3	0	0	3

**Pre Requisites:** SA- I**Course Objectives:**

The objectives of the course are to

- Identify the various actions in arches.
- Understand classical methods of analysis for statically indeterminate structures.
- Differentiate the approximate and numerical methods of analysis for indeterminate structures.
- Find the degree of static and kinematic indeterminacies of the structures.
- Plot the variation of S.F and B.M when a moving load passes on indeterminate structure

**UNIT – I**

**TWO HINGED ARCHES:** Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

**MOMENT DISTRIBUTION METHOD** - Analysis of continuous beams with and without settlement of supports using -Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames -Shear force and Bending moment diagrams, Elastic curve.

**UNIT – II**

**KANI'S METHOD:** Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two Storey Frames including Side Sway using Kani's Method - Shear force and bending moment diagrams - Elastic curve.

**CABLES and SUSPENSION BRIDGES:**

Equilibrium of a Suspension Cable subjected to concentrated loads and uniformly distributed loads - Length of a cable - Cable with different support levels - Suspension cable supports - Suspension Bridges - Analysis of Three Hinged Stiffening Girder Suspension Bridges.

**UNIT – III**

**APPROXIMATE METHODS OF ANALYSIS:** Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method - Analysis of multi-storey frames for gravity loads - Substitute Frame method - Analysis of Mill bents.

**UNIT – IV**

**MATRIX METHODS OF ANALYSIS:** Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' upto three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods -Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using stiffness method - Shear force and bending moment diagrams - Elastic curve.

**UNIT- V**

**INFLUENCE LINES FOR INDETERMINATE BEAMS:** Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

**INDETERMINATE TRUSSES:** Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies –Castigliano’s second theorem.

**Course Outcomes**

**After the completion of the course student should be able to**

- **Analyze** the two hinged arches.
- **Solve** statically indeterminate beams and portal frames using classical methods
- **Sketch** the shear force and bending moment diagrams for indeterminate structures.
- **Formulate** the stiffness matrix and analyze the beams by matrix methods

**Text Books:**

- 1) Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
- 2) Structural Analysis Vol I & II by G.S. Pandit S.P.Gupta Tata McGraw Hill Education Pvt. Ltd.

**References:**

1. 1)Indeterminate Structural Analysis by K.U.Muthu et al., I.K.International Publishing House
2. Pvt.Ltd
3. Structural analysis T.S Thandavamoorthy, Oxford university Press
4. Mechanics of Structures Vol –II by H.J.Shah and S.B.Junnarkar, Charotar
5. Publishing House Pvt. Ltd.
6. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
7. Examples in Structural Analysis by William M.C.McKenzie, Taylor & Francis.
8. Structural Analysis by R. C. Hibbeler, Pearson Education
9. Structural Analysis by Devdas Menon, Narosa Publishing House.
10. Advanced Structural Analysis by A.K.Jain, Nem Chand & Bros.

**GEOTECHNICAL ENGINEERING****III Year B.Tech. I-Sem**

L	T	P	C
3	0	0	3

**Pre-Requisites:** Engineering Geology, Applied Mechanics, Fluid Mechanics**Course Objectives:** The objectives of the course are to

- understand the formation of soil and classification of the soils
- determine the Index & Engineering Properties of Soils
- determine the flow characteristics & stresses due to externally applied loads
- estimate the consolidation properties of soils
- estimate the shear strength and seepage loss

**UNIT – I****INTRODUCTION:** Soil formation and structure – moisture content – Mass, volume relationships – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density.**INDEX PROPERTIES OF SOILS:** Grain size analysis – consistency limits and indices – I.S. Classification of soils.**UNIT –II****PERMEABILITY:** Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils .**EFFECTIVE STRESS & SEEPAGE THROUGH SOILS:** Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.**UNIT –III****STRESS DISTRIBUTION IN SOILS:** Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.**COMPACTION:** Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.**UNIT – IV****CONSOLIDATION:** Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil - preconsolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.**UNIT - V****SHEAR STRENGTH OF SOILS:** Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelopes – Shear strength of sands - dilatancy – critical void ratio, Introduction to stress path method.**Course Outcomes :****At the end of the course the student will able to**

- Characterize and classify the soils
- Able to estimate seepage, stresses under various loading conditions and compaction characteristics
- Able to analyse the compressibility of the soils
- Able to understand the strength of soils under various drainage conditions

**Text books:**

- 1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International PvtLtd,
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.

**References:**

1. Foundation Engineering by P.C.Varghese, PHI
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Principals of Geotechnical Engineering by BrajaM.Das, Cengage Learning Publishers.
4. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
5. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.
7. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi



**STRUCTURAL ENGINEERING – I (RCC)****III Year B.Tech. II-Sem**

L	T	P	C
3	0	2	4

**Pre-Requisites:** Structural Analysis I & II**Course Objectives****The objectives of the course are to**

- **Identify** the basic components of any structural system and the standard loading for the RC structure
- **Identify** and **tell** the various codal provisions given in IS. 456
- **Describe** the salient feature of limit state method, compare with other methods and the concepts of limit state of collapse and limit state of serviceability
- **Evaluate** the behaviour of RC member under flexure, shear and compression, torsion and bond.

**UNIT -I**

Introduction- Structure - Components of structure - Different types of structures - Equilibrium and compatibility- Safety and Stability - Loads – Different types of Loads – Dead Load, Live Load, Earthquake Load and Wind Load- Forces – What is meant by Design? – Different types of materials – RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000.

Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – Detailing of reinforcement

**UNIT – II**

Design for Shear, Bond and Torsion - Mechanism of shear and bond failure - Design of shear using limit state concept – Design for Bond –Anchorage and Development length of bars - Design of sections for torsion - Detailing of reinforcement

**UNIT - III**

Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using I S Coefficients - Design of dog-legged staircase –

Limit state design for serviceability for deflection, cracking and codal provisions.

**UNIT – IV**

Design of compression members - Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - I S Code provisions.

**UNIT – V**

Design of foundation - Different types of footings – Design of wall footing – Design of flat isolated square, rectangular, circular footings and combined footings for two columns.

**Course Outcomes****After the completion of the course student should be able to**

- **Compare** and **Design** the singly reinforced, doubly reinforced and flanged sections.
- **Design** the axially loaded, uniaxial and biaxial bending columns.
- **Classify** the footings and **Design** the isolated square, rectangular and circular footings
- **Distinguish** and **Design** the one-way and two-way slabs.

**TEXT BOOKS:**

1. Limit state designed of reinforced concrete – P.C.Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.

**REFERENCES :**

1. Reinforced concrete design by S.Unnikrishna Pillai & Devdas Menon, Tata Mc.Graw Hill.
2. Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd.
3. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Pvt.Ltd.,
4. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press
5. Design of concrete structures by J.N.Bandhyopadhyay PHI Learning Private Limited.
6. Design of Reinforced Concrete Structures by I.C.Syal and A.K.Goel, S.Chand& company.
7. Design of Reinforced Concrete Foundations – P.C. Varghese Prentice Hall of India.

**NOTE :**

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

**TRANSPORTATION ENGINEERING - I****III Year B.Tech. I-Sem**

L	T	P	C
3	0	0	3

**Pre-Requisites:** Surveying**Course Objectives:**

- Introduction to highway development in India an understanding factors to be considered while aligning of highways
- To understand the necessity of highway geometric design.
- To introduce traffic characteristic, road safety and parking issues.
- To understand the concepts of pavement design.

**UNIT -I**

Introduction, History and Importance of Highways, Characteristics of road transport, Current road development plans in India, Highway development in India, Highway planning, Highway alignment, Engineering surveys for Highway alignment, Highway projects, Highway drawings and reports, Detailed Project Report preparation, PPP schemes of Highway Development in India, Government of India initiatives in developing the highways and expressways in improving the mobility and village road development in improving the accessibility.

**UNIT – II**

Introduction to Highway Geometric Design; Width of Pavement, Formation and Land, Cross Slopes etc; Concept of Friction: Skid and Slip; Elements of geometric design of highways; Sight Distances: Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Horizontal alignment: Design of horizontal curves, super elevation, extra widening of pavement at curves; Vertical Alignment: Gradients, Compensation in Gradient, Design of summit curves and valley curves using different criteria; Integration of Horizontal and Vertical Curves

**UNIT - III**

Basic traffic characteristics: Speed, volume and concentration, relationship between flow, speed and concentration; Highway capacity and Level of service (LOS) concepts: Factors affecting capacity and LOS, relationship between V/C ratio and LOS; Traffic volume and spot speed studies: Methods; Road Safety; Traffic Signals: Types, warrants for signalization, design of isolated traffic signal by IRC method; Parking and road accidents: Types of parking facilities – on-street and off street, introduction to parking studies; Accident studies, road safety auditing; Introduction to street lighting; Road Intersections: Design considerations of at-grade intersections, introduction to interchanges

**UNIT - IV**

Tests on soils: CBR, Field CBR, modulus of sub-grade reaction, Tests on Aggregates: specific gravity, shape (flakiness and elongation indices), angularity number, water absorption, impact, abrasion, attrition, crushing resistance, durability (weathering resistance), stone polishing value of aggregates; Tests on bitumen: spot, penetration, softening point, viscosity, ductility, elastic recovery, flash and fire points, Introduction to modified bituminous binders like crumb rubber modified, natural rubber modified and polymer modified bitumen binders; Bituminous Concrete: Critical parameters controlling bituminous concrete mixture design, aggregate blending concepts viz. Rothfuch's method, trial and error procedure. Introduction to advanced concretes for road applications.

**UNIT -V**

Introduction to Pavement Design: Types of pavements and their typical cross sections: flexible, rigid and composite; Flexible Pavement analysis and design: Introduction to multi layered analysis, IRC 37-2012 method of flexible pavement design; Rigid pavement analysis and design: Factors controlling rigid pavement design, types of stresses in rigid pavements, critical load positions, load stresses and temperature stresses in interior, corner and edge locations of jointed plain cement concrete pavement slabs, IRC 58-2015 method of rigid pavement design; Overlay Designs: Types of overlays on flexible and rigid pavements.

**Course Outcomes:**

At the end of this course, the students will develop:

- An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance
- An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates and a variety of bituminous mixtures. Also the students will develop the ability to interpret the results and assess the suitability of these materials for construction of highways.
- An ability to design flexible and rigid highway pavements for varying traffic compositions as well as soil subgrade and environmental conditions using the standards stipulated by Indian Roads Congress.
- An ability to evaluate the structural and functional conditions of in-service highway pavements and provide solution in the form of routine maintenance measures or designed overlays using Indian Roads congress guidelines.
- An ability to assess the issues related to road traffic and provide engineering solutions supported with an understanding of road user psychological and behavioural patterns.

**Textbooks:**

1. Khanna, S.K, Justo, A and Veeraragavan, A, 'Highway Engineering', Nem Chand & Bros. Revised Tenth Edition, 2014
2. Kadiyali L.R. and Lal N B, Principles and Practices of Highway Engineering; Seventh Edition, First Reprint; Khanna Publishers, New Delhi, 2018

**Code of Provisions:**

Design Codes: IRC 37-2012, IRC 58-2015, IRC 81-1997

**Reference books;**

- Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, Third Edition, Third Impression; Pearson Education, 2018.
- Khisty C J and Lall B Kent; Transportation Engineering: An Introduction, Third Edition, 1<sup>st</sup> Indian Adaptation; Pearson India Education Service Pvt. Ltd, New Delhi 2017.
- Subhash C Saxena, Text Book of Highway and Traffic Engineering; First Edition; CBS Publishers and Distributors. New Delhi, 2014
- C Venkatramaih, Transportation Engineering Volume 1 – Highway Engineering, 1<sup>st</sup> Edition, Universities Press, 2016
- Garber, N.J. and Hoel, L.A. Traffic and Highway Engineering, Fourth Edition; Cengage Learning, Stamford, CT, USA, 2010
- Parthachakroborty and Animesh Das, Principles of Transportation Engineering, PHI, 2013

Nicholas J Garber and Lester A Hoel, Traffic and Highway Engineering, 5<sup>th</sup> Edition, Cengage Learning India Private Limited, New Delhi, 5<sup>th</sup> Indian Reprint, 201

**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS****III Year B.Tech. I Sem**

L	T	P	C
3	0	0	3

**Course Objective**

1. To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

**Course Outcome**

1. To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

**UNIT I**

**Introduction to Engineering Economics-** Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

**UNIT II**

**Macro Economic Concepts:** National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

**UNIT III****Production, Cost, Market Structures & Pricing:**

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT IV**

**Capital Budgeting Techniques:** Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

**UNIT V**

**Introduction to Accounting:** Accounting Principles (GAPP), concepts, conventions- - Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. ( Simple Problems).

**Suggested Readings**

1. Henry Malcom Steinar-Engineering Economics, Principles, McGraw Hill Pub.
2. D.D.Chaturvedi, S.L.Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
3. Jain and Narang” Accounting, Kalyani Publishers.
4. Arora, M.N.” Cost Accounting, Vikas Publication.
5. S.N.Maheshwari, Financial Management, Vikas Publishing House.

**HIGHWAY ENGINEERING AND CONCRETE TECHNOLOGY LAB****III Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

**Pre-Requisites:** Building Materials, Concrete Technology, Highway Materials**Course Objectives: The objectives of the course**

- To learn laboratory tests and their procedures cement, fine aggregate, coarse aggregates and bitumen
- **To Evaluate** fresh concrete properties
- **To Understand** the test procedures for characterization of Concrete and bituminous mixes

**Student shall be able to****Categorize** the test on materials used Civil Engineering Building & Pavement constructions

To perform the tests on concrete for its characterization.

To Design Concrete Mix Proportioning by Using Indian Standard Method.

**Examine** the tests performed for Bitumen mixes.**To prepare a laboratory report****List of Experiments****I. Test on Cement**

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement
5. Compressive strength of cement
6. Workability test on concrete by compaction factor, slump and Vee-bee.

**II. Test on Aggregates (Coarse and Fine)**

1. Specific gravity (Pycnometer and wire basket), water absorption
2. Shape (Flakiness and elongation indices)
3. Impact and abrasion value tests
4. Crushing resistance and durability tests
5. Sieve Analysis and gradation charts (Job mix formula using Rothfuch's charts)
6. Bulking of sand, Bulk and compact densities of fine and coarse aggregates

**III. Test on Fresh Concrete**

1. Slump test
2. CF (compact factor test)
3. Vee-bee Test
4. Flow Table Test

**IV. Test on hardened concrete**

1. Compression test on cubes & Cylinders
2. Flexure test
3. Split Tension Test
4. Modulus of Elasticity

**V. Tests on Bitumen and Bituminous concrete**

1. Penetration, softening point and spot test
2. Ductility, Elastic recovery and viscosity
3. Flash and fire points and specific gravity
4. Marshall's Stability (sample preparation and testing for stability and flow values)

**Course Outcomes**

1. Testing the various materials as per IS code specification used in construction.
2. Judging the suitability of various materials for construction purposes.

**TEXT BOOKS:**

1. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons
2. Highway Material Testing manual, Khanna, Justo and Veeraraghavan, Nemchand Brothers

**IS CODES:**

1. IS 10262 :2009 “Concrete Mix Proportioning – Guidelines”
2. IS 516:2006 “Methods of Tests on Strength of Concrete”
3. IS 383 :1993 “Specification For Coarse And Fine Aggregates From Natural Sources For Concrete”
4. IS 1201 -1220 (1978) “Methods for testing tars and bituminous materials”
5. IRC SP 53 -2010 “Guidelines on use of modified bitumen”
6. MS-2 Manual for Marshalls Mix design 2002

**GEO TECHNICAL ENGINEERING LAB****III Year B.Tech. I-Sem**

L	T	P	C
0	0	3	1

**Pre-Requisites:** Soil Mechanics (Co-requisite)**Course Objectives:** To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.**LIST OF EXPERIMENTS**

1. Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)
2. a) Field density by core cutter method and  
b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

**Course Outcomes:** At the end of the course, the student will be able to classify and evaluate the behavior of the soils subjected to various loads.**REFERENCE:**

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International



**ADVANCED COMMUNICATION LAB****III Year B.Tech. I-Sem**

L	T	P	C
0	0	2	1

**Pre-Requisites:** English

**Course Objectives:** The purpose of this course is to develop the students competence in communication at an advanced level. Assuming that the students are fairly proficient in the basic communication skills of listening, speaking, reading and writing in English, this course aims to train them in communicating efficiently in the workplace and professional contexts.

**1. Introduction**

The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use ‘good’ English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

**2. Objectives:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students’ fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**Learning Outcomes**

- ☞ Accomplishment of sound vocabulary and its proper use contextually.
- ☞ Flair in Writing and felicity in written expression.
- ☞ Enhanced job prospects.
- ☞ Effective Speaking Abilities

**3. Syllabus:**

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

- 1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary -** Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one’s writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

#### 4. Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. **Prescribed Lab Manual:** A book titled *A Course Book of Advanced Communication Skills(ACS) Lab* published by Universities Press, Hyderabad.

#### 6. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner’s Compass**, 8<sup>th</sup> Edition
- **DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)**
- **The following software from ‘train2success.com’**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

**Course Outcomes:** Communicate efficiently in the work place up professional context

#### 7. Books Recommended:

1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. **Advanced Communication Skills Laboratory Manual** by Sudha Rani, D, Pearson Education 2011.
4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. **Business and Professional Communication: Keys for Workplace Excellence.** Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.

6. **The Basics of Communication:A Relational Perspective.** Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. **Handbook for Technical Communication** by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
10. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
12. **Job Hunting** by Colm Downes,Cambridge University Press 2008.
13. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
14. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.**
15. Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.
16. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

#### **DISTRIBUTION AND WEIGHTAGE OF MARKS:**

##### ***Advanced Communication Skills Lab Practicals:***

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

##### **Mini Project: As a part of Internal Evaluation**

1. **Seminar/ Professional Presentation**
  2. **A Report on the same has to be prepared and presented.**
- \* ***Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***
  - \* ***Not more than two students to work on each mini project.***
  - \* ***Students may be assessed by their performance both in oral presentation and written report.***

**ENVIRONMENTAL ENGINEERING - I****III Year B.Tech. II-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Fluid Mechanics

**Course Objectives:** This subject provides the knowledge of water sources, water treatment, design of distribution system waste water treatment, and safe disposal methods. The topics of characteristics of waste water, sludge digestion are also included.

**UNIT – I**

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

**UNIT – II**

Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation-flocculation clarifier design – coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

**UNIT - III**

Characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self purification of rivers.

**UNIT – IV**

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters –ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks working principles and design – soak pits.

**UNIT – V**

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of particulates – Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

**Course Outcomes:**At the end of the course, the student will be able to:

- Assess characteristics of water and wastewater and their impacts
- Estimate quantities of water and waste water and plan conveyance components
- Design components of water and waste water treatment plants
- Be conversant with issues of air pollution and control

**TEXT BOOKS:**

1. Environmental Engineering by H.S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.

**REFERENCES:**

1. Environmental Engineering I and II by BC Punmia, Std. Publications.
2. Environmental Engineering I and II by SK Garg, Khanna Publications.
3. Environmental Pollution and Control Engineering CS Rao, Wiley Publications
4. Water and Waste Water Technology by Steel, Wiley
5. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
6. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
7. Water and Waste Water Technology by Mark J Hammar and Mark J. HammarJr. Wiley, 2007.
8. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
10. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
11. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication

**FOUNDATION ENGINEERING****III Year B.Tech. II-Sem**

L	T	P	C
3	0	0	3

**Pre-Requisites:** Soil Mechanics**Course Objectives:**

- To Plan Soil exploration programme for civil Engineering Projects
- To check the stability of slopes
- To determine the lateral earth pressures and design retaining walls
- To determine the Bearing capacity of Soil
- To design pile group foundation

**UNIT – I**

**SOIL EXPLORATION:** Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.

**UNIT – II**

**SLOPE STABILITY:** Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices, Bishop’s Simplified method of slices – Taylor’s Stability Number- stability of slopes of earth dams under different conditions.

**UNIT – III**

**EARTH PRESSURE THEORIES:** Active , Passive and at rest soil pressures Rankine’s theory of earth pressure – earth pressures in layered soils – Coulomb’s earth pressure theory.

**RETAINING WALLS:** Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

**UNIT –IV**

**SHALLOW FOUNDATIONS-** Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi’s, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

**UNIT -V**

**PILE FOUNDATION:** Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

**Course Outcomes:****At the end of the course the student will able to**

- Understand the principles and methods of Geotechnical Exploration
- Decide the suitability of soils and check the stability of slopes
- Calculate lateral earth pressures and check the stability of retaining walls
- Analyse and design the shallow and deep foundations

**Text books:**

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New Delhi
2. Principals of Geotechnical Engineering by BrajaM.Das, Cengage Learning Publishers.

**References:**

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998 ).
4. Geotechnical Engineering by S. K.Gulhati&Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, New york.

**STRUCTURAL ENGINEERING – II (Steel)****III Year B.Tech. II-Sem**

L	T	P	C
3	0	2	4

**Pre-Requisites:** Structural Analysis I & II**Course Objectives****The objectives of the course is to**

- Explain the mechanical properties of structural steel, plasticity, yield.
- **Describe** the salient features of Limit State Method of design of Steel structures.
- **Identify** and **explain** the codal provisions given in IS. 800.
- **Analyze** the behaviour of steel structures under tension, compression and flexure.
- **Design** the tension, compression, flexural members and plate girder
- Design the connection in steel structure, built-up member and (bolted and welded).

**UNIT – I**

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths- deflection limits – serviceability – stability check.

Design of Connections– Different types of connections – Bolted connections –Design strength – efficiency of joint–prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam-column connections- Eccentric connections - Type I and Type II connection – Framed connection– stiffened / seated connection.

**UNIT – II**

Design of tension members –Simple and built up members - Design strength – Design procedure for splicing - lug angle.

Design of compression members – Buckling class – slenderness ratio –Design of simple compression members - laced – battened columns – splice – column base – slab base.

**UNIT – III**

*Plastic Analysis*; Plastic moment – Plastic section modulus - Plastic analysis of continuous beams

Design of Flexural Members –Laterally supported and unsupported Beams – Design of laterally supported beams- Bending and shear strength/buckling – Built-up sections - Beam splice

**UNIT – IV**

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.

**UNIT – V**

Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design –Design of welded Gantry girder

***Note: Design of structural members include detailed sketches.***



**Course Outcomes:****After the completion of the course student should be able to**

- Analyze the tension members, compression members.
- Design the tension members, compression members and column bases and joints and connections
- Analyze and Design the beams including built-up sections and beam and connections.
- Identify and Design the various components of welded plate girder including stiffeners

**Text Books:**

- 1.Design of steel structures by S.K.Duggal,Tata Macgrawhill publishers,2000,2<sup>nd</sup> Edition
- 2.Design of steel structures by N.Subramanian,Oxford University press,2008

**Reference Books:**

1. Design of steel structures by K.S.Sairam,Pearson Educational India, 2nd Edition,2013
2. Design of steel structures by Edwin H.Gayrold and Charles Gayrold,Tata Mac-grawhill publishers,1972
3. Design of steel structures by L.S.JayaGopal,D.Tensing,Vikas Publishing House

**NOTE :**

Alternate weeks two periods of theory can be converted into drawing classes. The end examination paper should consist of Part – A and Part – B. Part – A should consist of two questions in design and drawing out of which one question to be answered. Part –B should consist of five questions in design out of which three to be answered. Weightage for Part – A is 40 % and Part – B is 60 %.

**HYDROLOGY & WATER RESOURCES ENGINEERING**

III Year B.Tech. II-Sem

L	T	P	C
3	1	0	4

**Pre-Requisites:** Fluid Mechanics & HHM**Course Objectives:**

**This course provides the description of** hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle. And its components. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.

**Unit - I**

**Introduction:** Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data.

**Precipitation**

Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Thiessen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

**Unit - II****Abstractions from precipitation**

Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney & Criddle Methods, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

**Runoff**

Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

**Unit - III****Hydrographs**

Hydrograph – Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation - Direct Runoff Hydrograph Unit pulse and Unit step function - Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.

**Unit - IV****Groundwater Hydrology**

Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law. **Well Hydraulics** - Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

**Crop Water Requirements** – Water requirement of crops - Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

**Unit - V**

**Canal Systems:** Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels-rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals- Types of lining-Advantages and disadvantages. Drainage of irrigated lands- necessity, methods.

**Course Outcomes:**

**At the end of the course the student will be able to**

- Understand the different concepts and terms used in engineering hydrology
- **To identify and** explain various formulae used in estimation of surface and Ground water hydrology components
- Demonstrate their knowledge to **connect** hydrology to the field requirement

**Text Books**

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers

**Reference Books**

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International)
5. G L Asawa, Irrigation Engineering, Wiley Eastern

**ENVIRONMENTAL ENGINEERING LAB****III Year B.Tech. II-Sem**

L	T	P	C
0	0	2	1

**Pre-Requisites:****Course Objectives: the objectives of the course are to**

- **Perform** the experiments to determine water and waste water quality
- **Understand** the water & waste water sampling, their quality standards
- **Estimate** quality of water, waste water, Industrial water

**Practical Work: List of Experiments**

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/DO
12. Determination of Residual Chlorine
13. Total count No.
14. Noise level measurement

**Course outcomes****After the completion of the course student should be able to**

- **Understand** about the equipment used to conduct the test procedures
- **Perform** the experiments in the lab
- **Examine** and **Estimate** water, waste water, air and soil Quality
- **Compare** the water, air quality standards with prescribed standards set by the local governments
- **Develop** a report on the quality aspect of the environment

**Text/Reference Books:**

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.

**COMPUTER AIDED DESIGN LAB****III Year B.Tech. II-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Pre-Requisites:** Computer Aided Civil Engineering Drawing or AUTO CAD Principles –Excel-Structural Engineering -1 & 2

**Course Objectives : The objectives of the course are to**

- **Learn** the usage of any fundamental software for design
- **Create** geometries using pre-processor
- **Analyse** and Interpret the results using post processor
- **Design** the structural elements

**LIST OF EXPERIMENTS**

1. Analysis & Design determinate structures using a software
2. Analysis & Design of fixed & continuous beams using a software
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL,LL,WL,EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built up steel beam
8. Developing a design programme for foundation using EXCEL Spread Sheet
9. Detailing of RCC beam and RCC slab
10. Detailing of Steel built up compression member

**Course Outcomes**

**After the completion of the course student should be able to**

- **Model** the geometry of real world structure Represent the physical model of structural element/structure
- Perform **analysis**
- **Interpret** from the Post processing results
- **Design** the structural elements and a system as per IS Codes

**Note:** Drafting of all the exercises is to be carried out using commercially available designing software's.

**ESTIMATION, COSTING AND PROJECT MANAGEMENT****IV Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**Pre-Requisites:NIL**

**Course Objectives:** The subject provide process of estimations required for various work in construction. To have knowledge of using SOR & SSR for analysis of rates on various works and basics of planning tools for a construction projects.

**UNIT – I**

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings

**UNIT – II**

Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

**UNIT – III**

Rate Analysis – Working out data for various items of work over head and contingent charges.

**UNIT-IV**

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation -Standard specifications for different items of building construction.

**UNIT-V**

**Construction project planning-** Stages of project planning: pre-tender planning,pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.

Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion

**NOTE : NUMBER OF EXERCISES PROPOSED :**

1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

**Course Outcomes:**

- Understand the technical specifications for various works to be performed for a projectand how they impact the cost of a structure.
- Quantify the worth of a structure by evaluating quantities of constituents, derive theircost rates and build up the overall cost of the structure.
- Understand how competitive bidding works and how to submit a competitive bidproposal.
- An idea of how to optimize construction projects based on costs
- An idea how construction projects are administered with respect to contract structures and issues.
- An ability to put forward ideas and understandings to others with effective communication processes

**Text Books**

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, LaxmiPublications, 2016

**Reference books:**

1. Estimating and Costing by G.S. Birdie
2. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014\
3. Standard Schedule of rates and standard data book by public works department.
4. I. S. 1200 ( Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
5. Estimation, Costing and Specifications by M. Chakraborti; Laxmi publications.
6. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015

**PROFESSIONAL ELECTIVE -III**

**IV Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>



**PROFESSIONAL ELECTIVE -IV**

**IV Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OPEN ELECTIVE -II**

**IV Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**MANAGEMENT FUNDAMENTALS FOR ENGINEERS****IV Year B.Tech. I Sem**

L	T	P	C
3	0	0	3

**Course Objective**

To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

**Course Outcome**

The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

**UNIT I****Introduction to Management**

Evolution of Management, Nature & Scope-Functions of Management-Role of Manager-levels of Management-Managerial Skills - Challenges-Planning-Planning Process-Types of Plans-MBO.

**UNIT II****Organization Structure & HRM**

Organization Design-Organizational Structure-Departmentation-Delegation-Centralization - Decentralization-Recentralization-Organizational Culture- Organizational climate- Organizational change.

Human Resource Management-HR Planning - Recruitment & Selection - Training & Development- Performance appraisal - Job satisfaction-Stress Management Practices.

**UNIT III****Operation Management**

Introduction to Operations Management-Principles and Types of Plant layout-Methods of production (Job Batch and Mass production) - Method study and Work measurement-Quality Management - TQM-Six sigma - Deming's Contribution to Quality - Inventory Management – EOQ - ABC Analysis - JIT System-Business Process Re-engineering(BPR).

**UNIT IV****Marketing Management**

Introduction to Marketing-Functions of Marketing-Marketing vs. Selling-Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation -Types of Marketing - Direct Marketing-Network Marketing - Digital Marketing-Channels of Distribution - Supply Chain Management (SCM).

**UNIT V****Project Management**

Introduction to Project Management-steps in Project Management - Project Planning - Project Life Cycle-Network Analysis-Program Evaluation & Review Technique(PERT)-Critical Path Method(CPM) - Project Cost Analysis - Project Crashing - Project Information Systems.

**Suggested Readings**

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
4. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
5. Industrial Engineering and Management: Including Production Management, T.R.Banga, S.C Sharma , Khanna Publishers.

**MINI PROJECT / INTERNSHIP****IV Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

A) There shall be an Industrial oriented Mini Project in Collaboration with an Industry of the relevant specialization to be registered immediately after III Year II Semester Examinations and taken up during the summer vacation for about eight weeks duration.

B) The industry oriented Mini-Project shall be submitted in a report form, and a presentation of the same shall be made before a Committee, which evaluates it for 100 marks. The committee shall consist of Head of the Department, the supervisor of Mini-Project, and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented Mini-Project. The Mini-Project shall be evaluated in the IV year I Semester.

**PROJECT STAGE – I****IV Year B.Tech. I-Sem****L T P C**  
**0 0 6 3**

Each Student shall start the project work during the IVth Year –I Semester as per the instructions of the of the Project Guide/Project Supervisor assigned by the HEAD Of The DEPARTMEN. Out of a total 200 marks allotted for the Project Work, 60 marks shall be for CIE( Continuous Project Evaluation ) and 140 marks for SEE(End Semester Viva –Voce Examination).

**SEMINAR****IV Year B.Tech. I-Sem****L T P C**  
**0 0 2 1**

There shall be a Seminar Presentation in IV Year II Semester.

For the seminar, the student shall collect the information on a specialized topic, prepare a Technical Report and Submit to the Department at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report) shall be evaluated by two faculty members assigned by the Head of the Department, for 100 marks. There shall be SEE or external Examination for Seminar

**PROFESSIONAL ELECTIVE -V**

**IV Year B.Tech. II-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>



**PROFESSIONAL ELECTIVE -VI**

**IV Year B.Tech. II-Sem**

**L T P C**  
**3 0 0 3**

**OPEN ELECTIVE -III**

**IV Year B.Tech. II-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PROJECT STAGE - II****IV Year B.Tech. II-Sem****L T P C**  
**0 0 16 8**

The Project Viva –Voce shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. Out of 60 marks allocated for CIE, 30 marks shall be awarded by the Project Supervisor (based on the Continuous Evaluation of Student's Performance through the Project work period) and the other 30 marks shall be awarded by a Departmental Committee Consisting of Head of the Department and Project Supervisor, based on the work carried out the presentation made by the Student at the time of Viva –Voce Examination

**PROFESSIONAL ELECTIVE - I  
(STRUCTURAL ENGG STREAM)  
CONCRETE TECHNOLOGY**

**III Year B.Tech. I-Sem**

**L T P C  
3 0 0 3**

**Pre Requisites:** Building Materials

**Course Objectives:** The objectives of the course are to

- **Know** different types of cement as per their properties for different field applications.
- **Understand Design** economic concrete mix proportion for different exposure conditions and intended purposes.
- **Know** field and laboratory **tests** on concrete in plastic and hardened stage.

**UNIT I**

**CEMENT:** Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

**UNIT - II**

**AGGREGATES:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.

**UNIT – III**

**FRESH CONCRETE:** Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

**UNIT - IV**

**HARDENED CONCRETE :** Water / Cement ratio – Abram’s Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing.

**TESTING OF HARDENED CONCRETE:** Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

**ELASTICITY, CREEP & SHRINKAGE** – Modulus of elasticity – Dynamic modulus of elasticity – Poisson’s ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

**UNIT – V**

**MIX DESIGN :** Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

**SPECIAL CONCRETES:** Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

**Course Outcomes:**

**After the completion of the course student should be able to**

- **Determine** the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
- **Apply** the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
- **Use** advanced laboratory techniques to characterize cement-based materials.
- **Perform** mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fibre reinforced concrete.

**Text books:**

1. Concrete Technology by M.S.Shetty. – S.Chand& Co. ; 2004
2. Concrete Technology by A.R. Santhakumar, 2<sup>nd</sup> Edition, Oxford university Press, New Delhi

**References:**

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

**IS Codes:**

IS 383  
IS 516  
IS 10262 - 2009

**PROFESSIONAL ELECTIVE - I  
(STRUCTURAL ENGG STREAM)  
EARTHQUAKE ENGINEERING**

**III Year B.Tech. I-Sem**

**L T P C  
3 0 0 3**

**Pre-Requisites:** Structural Engineering –II & RC Design

**Course Objectives**

**The objectives of the course are to**

- **Understand** Engineering Seismology
- **Explain** and discuss single degree of freedom systems subjected to free and forced vibrations
- **Acquire** the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
- **understand** importance of ductile detailing of RC structures

**UNIT - I**

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales- Energy released-Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph- Characteristics of strong ground motions- Seismic zones of India.

Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

**UNIT II**

**Conceptual design:** Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel.

**Introduction to earthquake resistant design:** Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

**UNIT III**

**Reinforced Concrete Buildings:** Principles of earthquake resistant design of RC members- Structural models for frame buildings- Seismic methods of analysis- Seismic design methods- IS code based methods for seismic design- Seismic evaluation and retrofitting- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces- Equivalent lateral force procedure- Lateral distribution of base shear.

**UNIT IV**

**Masonry Buildings:** Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

**UNIT V**

**Structural Walls and Non-Structural Elements:** Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage- Isolation of non-structures. Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behaviour of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes.

**Course Outcomes**

**After the completion of the course student should be able to**

- **Explain** and **derive** fundamental equations in structural dynamics
- **Discuss** and **explain** causes and Theories on earthquake, seismic waves, measurement of earthquakes
- **Evaluate** base shear using IS methods
- **Design** and **Detail** the reinforcement for earthquake forces

**TEXT BOOKS:**

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

**REFERENCES:**

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons.
2. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
3. Elements of Mechanical Vibration by R.N.Iyengar, I.K.International Publishing House Pvt. Ltd.
4. Masonry and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand & Bros
5. Earthquake Tips – Learning Earthquake Design and Construction
  - a. C.V.R. Murthy

**PROFESSIONAL ELECTIVE - I  
(STRUCTURAL ENGG STREAM)  
INTRODUCTION TO OFFSHORE STRUCTURES**

**III Year B.Tech. I-Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** FM & Hydraulics, Structural Analysis, RC Design

**Course Objectives:** The subject provide a knowledge on offshore structures, analysis and design of offshore structures.

**UNIT I**

Types of offshore structures .selection .function - Physical, environmental and geotechnical aspects of marine and offshore construction. Loads and responses of offshore structures. Foundations for offshore structures. Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines

**UNIT II**

**WAVE THEORIES**

Wave generation process, small and finite amplitude wave theories.

**UNIT III**

**FORCES OF OFFSHORE STRUCTURES**

Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

**UNIT IV**

**OFFSHORE SOIL AND STRUCTURE MODELING**

Different types of offshore structures, foundation modeling and structural modeling.

**UNIT V**

**ANALYSIS AND DESIGN OF OFFSHORE STRUCTURES**

Static method of analysis, foundation analysis and dynamics of offshore structures. Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

**Course Outcomes:** Able to understand & design offshore structures

**Text Books**

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures McGraw Hill Book co.
3. Chakrabarti., S.K., Hand Book of Offshore Engineering (Vols. 1 & 2) Elsevier Publications

**References**

1. Brebbia C.A. and Walker, 'Dynamic Analysis of Offshore Structures', Newnes Butterworth, London, 1978.
2. Sarpakaya T and Isaacson M., 'Mechanics of Wave Forces on Offshore Structures', Van Nostrand Reinhold, New York, 1981.
3. Hallam M.G., Heaf N.J. and Wootton, L.R., 'Dynamics of Marine Structures', CIRIA Publications, Underwater Engg., Group, London, 1978.
4. Graff W.J., 'Introduction to Offshore Structures', Gulf Publishing Co., Houston, Texas, 1981.
5. Clough R.W. and Penzien J., 'Dynamics of Structures', II Edition, McGraw-Hill, 1992.
6. Simiu E. and Scanlan R.H., 'Wind Effects on Structures', Wiley, New York, 1978.
7. Codes of Practices (latest versions) such as API RP-2A, Bureau Veritas etc.
8. Proceedings of Offshore Technology Conference (O.T.C.), Behaviour of Offshore Structures (BOSS) and other Conferences on Offshore Engineering.



**PROFESSIONAL ELECTIVE - II  
(STRUCTURAL ENGG STREAM)  
PRESTRESSED CONCRETE**

III Year B.Tech. II-Sem

L	T	P	C
3	0	0	3

**Pre-Requisites:** Reinforced Concrete Design**Course Objectives****The objectives of the course are to**

- Understand the principles & necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.
- Understand Analysis and design of prestressed concrete members.

**UNIT I:**

**Introduction:** Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.

**UNIT II:**

**Methods and Systems of prestressing:** Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, MagnelBlaton system, Freyssinet system and Gifford- Udall System- Lee McCall system. **Losses of Prestress:** Loss of prestress in pretensioned and posttensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.

**UNIT III:**

**Flexure:** Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.

**Shear:** General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.

**UNIT IV:**

**Transfer of Prestress in Pretensioned Members :** Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

**UNIT V**

**Composite Beams:** Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

**Deflections:** Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

**Course Outcomes****After the completion of the course student should be able to**

- Acquire the knowledge of evolution of process of prestressing.
- Acquire the knowledge of various prestressing techniques.
- Develop skills in analysis design of prestressed structural elements as per the IS codal provisions

**References :**

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. RamamruthamDhanpat Rai & Sons, Delhi.
4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

**PROFESSIONAL ELECTIVE - II  
(STRUCTURAL ENGG STREAM)  
BRIDGE ENGINEERING**

**III Year B.Tech. II-Sem**

**L T P C  
3 0 0 3**

**Pre Requisites:** Structural Engineering, Soil Mechanics & Foundation Engineering and Water Resources Engineering

**Course Objectives:** To study different types of bridges, forces that act on bridges, Design of bridge

**UNIT-I**

**Introduction:**

Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.

**Standard Specifications for Roads and Railways Bridges:**

General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

**UNIT-II**

**Design Consideration for R. C. C. Bridges:**

Various types of R.C.C. bridges (brief description of each type), design of R.C.C. culvert and T-beam bridges.

**UNIT-III**

**Design Consideration for Steel Bridges:**

Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

**UNIT-IV**

**Hydraulic & Structural Design:**

Piers, abutments, wing-wall and approaches.

**Brief Description:** Bearings, joints, articulation and other details.

**UNIT -V**

**Bridge Foundation:**

Various types, necessary investigations and design criteria of well foundation.

**Note for Paper-setter:** EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

**Course Outcomes:** To study different types of bridges, forces that act on bridges, Design of bridge.

**Books:**

- 1 Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub.N.Delhi.
- 2 Design of Bridges, N.Krishna Raju, Oxford & IBH, N.Delhi.
- 3 Bridge Deck Analysis, R.P.Pama & A.R.Cusens, John Wiley & Sons.
- 4 Design of Bridge Structures, T.R.Jagadish & M.A.Jairam, Prentice Hall of India, N.Delhi.

**PROFESSIONAL ELECTIVE - II  
(STRUCTURAL ENGG STREAM)  
OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING**

III Year B.Tech. II-Sem

L	T	P	C
3	0	0	3

**Pre- requisites:-Mathematics I&II**

**Course Objectives:** To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.

**UNIT 1**

**Introduction to Optimization:** Introduction - Historical developments - Engineering applications of Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables - treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

**UNIT II**

**Linear Programming:** Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methods - grid search method - Univariate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

**UNIT III**

**Dynamic Programming:** Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

**UNIT IV**

**Network Analysis:** Introduction - Elementary graph theory - Network variables and problem types - Minimum-cost route - Network capacity problems - Modification of the directional sense of the network.

**UNIT V**

Application of Optimization techniques to trusses, Beams and Frames.

**Course Outcomes:** The student will be able to understand the basic principles of optimization, and in a position to formulate optimization models for a wide range of civil engineering problems and able to solve them.

**Text Books:**

1. Introduction to Optimum Design by J.S.Arora. McGraw Hill New York
2. Optimization: Theory and Applications by S.S.Rao.Wiley & Sons

**References**

1. Numerical Optimization Techniques for Engineering Design with applications by G.N.Vanderplaats. McGraw-Hill, New York
2. Elements of Structural Optimization by R.T.Haftka and Z.Gurdal. Kluwer Academic Publishers, Dordrecht, 1992
3. Optimum Structural Design by U.Kirsch. McGraw-Hill, New York
4. Optimum Design of Structures by K.I.Majid. Wiley, New York

**PROFESSIONAL ELECTIVE - II  
(STRUCTURAL ENGG STREAM)  
INTRODUCTION TO COMPOSITE MATERIALS**

**III Year B.Tech. II-Sem**

L	T	P	C
3	0	0	3

**Pre- Requisites: -Structural Engineering –I (RCC)**

**Course Objectives:-**

- To Study the properties of Composite Laminae and its macro mechanical analysis
- To study the behavior of glass fibre reinforced laminates.
- To design GRP box beams and stressed skinned roof structures.

**UNIT - I**

Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials- Homogeneous materials, composite materials.

**UNIT - II**

Macro mechanical Properties of composite Laminae: Introduction, Assumptions and Idealizations, Stress Strain relationships for composite Laminae- Isotropic, Orthotropic laminae, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminae. Macro mechanical Analysis of composite Laminae: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminae- Stress- Strain relationships in continuous, discontinuous fibre laminae, Strength characteristics of glass reinforced laminae- Strengths in continuous, discontinuous fibre laminae.

**UNIT - III**

Behaviour of Glass Fibre-Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites-Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites- Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates- uni-directionally and multi directionally continuously reinforced laminates, discontinuously reinforced laminates – Stiffness and Strength properties.

**UNIT - IV**

GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive, mechanical, Combinational, Transformed sections.

**UNIT - V**

Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance- Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.

Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

**Course Outcomes:-**

**After the completion of the course the student will be able to**

- Acquire the knowledge about the composite laminae, glass fibre reinforced laminae and their strength characteristics
- Develop skills in design of GRP box beams&Stressed skinned roof structure.

**Text book**

1. GRP in Structural Engineering M.Holmes and D.J.Just.
2. Mechanics of Composite materials and Structures by Madhujith Mukhopadhyay; Universities Press

**CONSTITUTION OF INDIA****III Year B.Tech. II-Sem**

L	T	P	C
2	0	0	0

**Pre-Requisites:** Nil**Course Objectives:** Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

**UNIT – I:****History of Making of the Indian Constitution:**

- History
- Drafting Committee, ( Composition& Working)

**Philosophy of the Indian Constitution:**

- Preamble
- Salient Features

**UNIT – II:****Contours of Constitutional Rights & Duties:**

- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

**UNIT – III:****Organs of Governance:**

- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions

**Executive:**

- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

**UNIT – IV:****Local Administration:**

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
- Pachayati raj: Introduction, PRI: Zila Pachayat.
- Elected officials and their roles, CEO ZilaPachayat: Position androle.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

**UNIT – V:****Election Commission:**

- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

**Text Books:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis,2015.
3. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition,2015.
4. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.

**Course Outcomes:**

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of1956



**PROFESSIONAL ELECTIVE – III  
(HYDRAULICS AND WATER RESOURCES STREAM)  
IRRIGATION AND HYDRAULIC STRUCTURES**

**IV Year B.Tech. I-Sem**

**L T P C  
3 0 0 3**

**Pre-Requisites:** Hydraulics & Hydraulic machinery, Hydrology & Water Resources Engineering

**Course Objectives:** To study various types of storage works and diversion headwork, their components and design principles for their construction.

**UNIT - I**

Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation – Life of Reservoir.. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.

**UNIT - II**

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

**UNIT- III**

Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.

**UNIT- IV**

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations,-Silt Ejectors and Silt Excluders

Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

**UNIT- V**

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canal escapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: types, selection of suitable type, various types, design considerations for cross drainage works

**Course Outcomes:** At the end of the course, the student will be able to:

- Know types of water retaining structures for multiple purposes and its key parameters considered for planning and designing
- Understand details in any Irrigation System and its requirements
- Know, Analyze and Design of a irrigation system components

**TEXT BOOKS:**

1. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg, Khanna Publishers.
2. Irrigation engineering by K. R. Arora Standard Publishers.
3. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., New Delhi

**REFERENCES:**

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

**PROFESSIONAL ELECTIVE - III  
(HYDRAULICS AND WATER RESOURCES STREAM)  
DESIGN AND DRAWING OF IRRIGATION STRUCTURES**

IV Year B.Tech. I-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** WRE – I & II

**Course Objectives:** Learn designing and drawing of hydraulic structure like surplus weir , siphon well drop, trapezoidal notch fall, tank sluice with tower head.

**Design and drawing of the following hydraulic structures**

Group A

1. Surplus weir.
2. Syphon Well Drop
3. Trapezoidal notch fall.
4. Tank sluice with tower head

Group B

1. Sloping glacis weir.
2. Canal regulator
3. Under Tunnel.
4. Type III Syphon aqueduct

**Final Examination pattern:**

The Question paper is divided into two parts with two questions in each part. The student has to answer ONE question from each part. Part I should cover the designs and drawings from Group A for 45 marks and Part II should cover only designs from group B carrying 30 marks.

The duration of examination will be FOUR hours.

However, the students are supposed to practice the drawings for Group B structures also for internal evaluation.

**Course Outcomes:** Able to provide design & drawing of irrigation structures

**TEXT BOOKS:** 1. Water Resources Engineering – Principles and Practice by Challa Satyanarayana Murthy, New Age International Publishers. 2. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard Book House.

**PROFESSIONAL ELECTIVE - III  
(HYDRAULICS AND WATER RESOURCES STREAM)  
GROUND WATER DEVELOPMENT AND MANAGEMENT**

IV Year B.Tech. I-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Water Resources Engineering**Course Objectives:** The objective of the course is to study the moment, occurrence of ground water and its development and management**UNIT – I**

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

**UNIT – II**

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

**UNIT – III**

Steady groundwater flow towards a well in confined and unconfined aquifers – Dupuit's and Theim's equations, Assumptions, Formation constants, yield of an open well Well interface and well tests – Recuperation Test.

**UNIT – IV**

Unsteady flow towards a well – Non equilibrium equations – Theis' solution – Jacob and Chow's simplifications, Leaky aquifers – Well Interference.

**UNIT – V**

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

**Course Outcomes:** To gain knowledge about ground water moment, Surface and Subsurface investigation. Applying GIS & Remote sensing for ground water investigation.**TEXT BOOKS:**

1. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.

**REFERENCES :**

1. Groundwater Hydrology by BOWER, John Wiley & sons.
2. Groundwater System Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.

**PROFESSIONAL ELECTIVE - III  
(HYDRAULICS AND WATER RESOURCES STREAM)  
PIPE LINE ENGINEERING**

IV Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

**Pre Requisites: Fluid Mechanics, Hydraulics and Hydraulic Machinery****Course Objectives:**

- To familiarize the students with the various elements and stages involved in transportation of water.
- To understand standards and practices in piping design.
- To know various equipment and their operation in pipeline transportation.
- To understand technology in transportation of fluids.

**UNIT - I**

**Elements of pipeline design:** Types of piping systems; transmission lines, In-plant piping systems, Distribution mains, Service lines. Types of Water distribution networks; serial networks, branched networks and looped networks. Network components and Network model. Basic hydraulic principles; continuity and Energy principle.

**Pipeline route selection, survey and geotechnical guidelines:** Introduction - Preliminary route selection - Key factors for route selection - Engineering survey - Legal survey - Construction/As-built survey - Geotechnical design.

**UNIT – II**

**Frictional Head loss in Pipes:** Major and Minor losses, Artificially roughened pipes, Moody Diagram. Friction coefficient relationships, Empirical formulae, Simple pipe flow problems Equivalent pipes; pipes in series, parallel, series-parallel; problems. Water Hammer and energy transmission through pipes: gradual and Instantaneous closure

**UNIT– III**

**Reservoirs, Pumps and Valves:** Types of Reservoirs, Pumps; introduction, system head-discharge-pump head and head-discharge relationships, characteristic curves, pump combination. Valves: check valves, flow control valves, Pressure Reducing valves, both Flow control and Pressure Reducing Valves.

**Network Parameters and Types of analysis:** Network parameters, Parameter interrelationships, Necessity of Analysis, common Assumptions, types of analysis, rules for Solvability of Pipe networks.

**UNIT – IV**

**Network Formulation of Equations:** States of parameters, Single-Source Networks with known pipe Resistances. Multisource Networks with known pipes resistances. Networks with unknown pipe resistances. Inclusion of Pumps, Check Valves, Flow Control Valves and Pressure Reducing Valves – Problems.

Hardy Cross Method: Methods of balancing heads (Loop Method). Method of Balancing Flows (Node Method). Modified Hardy Cross Method. Convergence Problem. Different software for WDN analysis and design.

**UNIT - V**

**Material selection and quality management:** Elements of design – Materials designation standards – Quality management.

**Pipeline construction:** Construction – Commissioning.

**Pipeline protection, instrumentation, pigging & Operations:** Pipeline coating – Cathodic protection – Cathodic protection calculations for land pipelines – Internal corrosion – Flow meters and their calibration – Sensors – Pigs – Pipeline Operations and maintenance.

**Course Outcome:** At the end of the course the student will be able to get an understanding of the key steps in a pipeline's lifecycle: design, construction, installation, asset management and maintenance.

**Text Books:**

1. Analysis of Water Distribution Networks, P.R. Bhave and R. Gupta, Narosa Publishing House Pvt. Ltd.
2. Pipeline Engineering, Henry Liu, Lewis Publishers (CRC Press), 2003.
3. Piping and Pipeline Engineering: Design, Construction, Maintenance Integrity and Repair, George A. Antaki, CRC Press, 2003.

**Reference Books:**

1. Piping Calculation Manual, E. Shashi Menon, McGraw-Hill, 2004.
2. Pipeline Rules of Thumb Handbook, E. W. McAllister, 7<sup>th</sup> Edition, 2009.
3. Liquid Pipeline Hydraulics, E. Shashi Menon, Mareel Dekker Inc., 2004.

**PROFESSIONAL ELECTIVE - IV  
REMOTE SENSING & GIS**

IV Year B.Tech. I-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:****The objectives of the course are to**

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

**UNIT – I**

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

**UNIT- II:**

**Introduction to GIS:** Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing,

**Spatial Database Management System:** Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization

**Data models and data structures:** Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

**UNIT- III:**

**Spatial Data input and Editing:** Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

**Spatial Analysis:** Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

**UNIT- IV:****Implementing a GIS and Applications**

**Implementing a GIS:** Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS

**Applications of GIS**

GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

**Course Outcomes****After the completion of the course student should be able to**

- **Describe** different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- **Evaluate** the accuracy of Data and implementing a GIS
- Understand the applicability of RS and GIS for various applications.

**TEXT BOOKS**

1. Remote Sensing and GIS by Basudeb Bhatta , Oxford University Press, 2<sup>nd</sup> Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGrawHill Education (Indian Edition), 7<sup>th</sup> Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4<sup>th</sup> Edition, Wiley Publishers, 2012.

**REFERENCES**

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.Kiefer, Wiley Publishers, 7<sup>th</sup> Edition, 2015.\
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3<sup>rd</sup> Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N.Madhu, Pearson Education, 1<sup>st</sup> Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M.Anji Reddy,



**PROFESSIONAL ELECTIVE - IV  
(ENVIRONMENTAL ENGG STREAM)  
GEO ENVIRONMENTAL ENGINEERING**

IV Year B.Tech. I-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Soil Mechanics & Environmental Engineering-I**Course Objectives:**

1. To study the sources of contamination and characterization of contaminated ground.
2. To study and model the contaminable Transport.
3. To identify appropriate remediation technique for the contaminated.

**Unit. I**

**Sources and Site Characterization:** Scope of Geoenvironmental Engineering, Various Sources of Contaminations, Need for contaminated site characterization; and Characterisation methods.

**Unit. II**

**Solid and Hazardous Waste Management:** Classification of waste, Characterisation solid wastes, Environmental Concerns with waste, waste management strategies.

**Unit. III**

**Contaminant Transport:** Transport process, Mass-transfer process, Modeling, Bioremediation, Phytoremediation.

**Unit. IV**

**Remediation Techniques:** Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

**Unit. V**

**Landfills:** Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

**Course Outcomes:** Able to identify appropriate remediation techniques for contamination & provide models

**Text Books**

1. Bedient, Refai & Newell - Ground Water Contamination
2. Sharma, H. D. and Reddy, K. R. - Geoenvironmental Engineering

**References:**

1. Rowe, R. K. - Geotechnical & Geoenvironmental Engineering Handbook
2. Reddi, L. N. and Inyang, H. I. - Geoenvironmental Engineering
3. LaGrega, M. D., Buckingham, P. L. and Evans, J. C. - Hazardous Waste Management

**PROFESSIONAL ELECTIVE - IV  
(ENVIRONMENTAL ENGG STREAM)  
ENVIRONMENTAL ENGINEERING -II**

IV Year B.Tech. I-Sem

L	T	P	C
3	0	0	3

**Pre –Requisites : Environmental Engineering-I****Course Objectives:** The objectives of the course are to

- **Understand the** Air pollution Concepts
- **Define** the terms **and Understands** the necessity of solid waste management
- Understanding the concepts of industrial waste treatment and hazardous waste

**UNIT – I**

Air Pollution – sources of pollution – Classification – effects on human beings – Global effects of Air pollution.

**UNIT – II**

Air pollution Control Methods – Particulate control devices – General Methods of Controlling Gaseous Emission, Special Treatment Methods – Adsorption – Reverse Osmosis – Defluoridation – Ion exchange – Ultra Filtration.

**UNIT –III**

Theories industrial waste treatment – Volume reduction – strength reduction – Neutralization – Equalization – Proportioning – Nitrification and Denitrification – Removal of Phosphates.

**UNIT – IV**

Solid waste Management – sources, composition and properties of solid waste – collection and handling – separation and processing, Solid waste disposal methods – Land filling – Incineration composting.

**UNIT – V**

Hazardous Waste – Nuclear waste – Biomedical wastes – chemical wastes – Effluent – disposal and Control methods, Noise Pollution – effects of noise and control methods – Effluent standards – Air emission standards – Water Act – Air Act – Environment Protection Act.

**Course Outcomes:-**

- Identify Air pollution control Methods
- Gain Knowledge about environmental protection Act's

**TEXT BOOKS:**

1. Environmental Science and Engineering by J.G.Henry and G.W.Heinke – Person Education.
2. Environmental Engineering and Management – Dr.Suresh K.Dhameja – S.K.Kartarai & Sons 2<sup>nd</sup> Edition 2005.

**REFERENCES:**

1. Physico – Chemical process for waster quality control by Weber
2. Air Pollution and Control by MN Rao & H.N.Rao

**PROFESSIONAL ELECTIVE - IV  
(ENVIRONMENTAL ENGG STREAM)  
SOLID WASTE MANAGEMENT**

IV Year B.Tech. I-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:** The objectives of the course are to

- **Define** the terms **and Understands** the necessity of solid waste management
- **Explain** the strategies for the collection of solid waste
- **Describe** the solid waste disposal methods
- **Categorize** Hazardous Waste

**UNIT-I**

**Solid Waste:** Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

**UNIT-II**

**Engineering Systems for Solid Waste Management:** Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques;

**UNIT-III**

**Engineering Systems for Resource and Energy Recovery:** Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composting - recovery of thermal conversion products; Pyrolysis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

**UNIT-IV**

**Landfills:** Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

**UNIT-V**

**Hazardous waste Management:** – Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

**Course Outcomes:** At the end of the course the student will able to:

- Identify the physical and chemical composition of solid wastes
- Analyze the functional elements for solid waste management.
- Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
- Identify and design waste disposal systems

**Text Books:**

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.

**References:**

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw Hill Inc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design and Construction' Prentice Hall, 2002.

**PROFESSIONAL ELECTIVE - V  
(TRANSPORTATION ENGG STREAM)  
PAVEMENT DESIGN**

IV Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Transportation Engineering**Course Objectives:** The study factors affecting pavement design, material characteristics , design of flexible, rigid pavements and low volume roads.**UNIT – I**

**Factors Affecting Pavement Design:** Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

**UNIT – II**

**Stresses In Pavements:** Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses In Flexible Pavements:** Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts. **Stresses In Rigid Pavements:** Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars

**UNIT – III**

**Material Characteristics:** CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics.

**UNIT - IV**

**Design Of Flexible Pavements:** Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods

**Design Of Rigid Pavements:** Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

**UNIT – V**

**Design of Pavement for Low Volume Roads:** Pavement design for low volume roads, Rural road designs – code of practice. **Design of Overlays:** Types of Overlays, Suitability, Design of overlays.

**Course Outcomes:**The student will be able to design pavements**Text Books:**

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc

**References:**

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
3. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design

**PROFESSIONAL ELECTIVE - V  
(TRANSPORTATION ENGG STREAM)**

IV Year B.Tech. I-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**TRANSPORTATION ENGINEERING - II****Pre Requisites:** Transportation Engineering-I

**Course Objectives:** To study importance Railways, Airport engineering , and about ports and harbours .

**UNIT – I****INTRODUCTION TO RAILWAY**

Permanent way components – Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast, Gauge –Creep of Rails- Theories related to Creep – Sleeper density.

**UNIT – II**

**GEOMETRIC DESIGN OF RAILWAY TRACK:** Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve, Points and Crossing, Rail Joints & Welding of Joints, Railway station& Yards, Signalizing & interlocking.

**UNIT – III****AIRPORT ENGINEERING:**

Airport Site selection – Runway Orientation – Basic Runway Length – Corrections for Elevation, Temperature – Airport Classification - Runway Geometric design – Factors Controlling Taxiway Layout - Terminal Area – Apron – Hangar – Blast Considerations, Typical Airport Layouts – Wind rose diagram - Runway Lightening system & Marking.

**UNIT – IV****PORT AND HARBOUR ENGINEERING:**

Requirements of Port and Harbour, Classification of Port & Harbour, Features of a Harbour, Planning of Harbour, Breakwaters, Dry docks, Jetties, Aprons, Transit shed and Warehouses, Navigational aids, Maintenance of Port and Harbours, Inland Water Transport

**UNIT –V****INTELLIGENT TRANSPORT SYSTEMS:**

ITS Definition, Benefits of ITS, user services, Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Introduction to ITS applications;Advanced Traffic Management systems (ATMS), Advanced Public Transportation systems (APTS),ITS architecture components and standards, Overview of ITS implementations in developed countries.

**Text books:**

1. Satish Chandra and Agarwal, M.M. (2007) “Railway Engineering” Oxford Higher Education, University Press New Delhi.
2. Airport Planning and Design- S.K. Khanna and M.G Arora, Nemchand Bros.
3. A Text book of Transportation Engineering – S.P.Chandola – S.Chand & Co. Ltd. – (2001).
4. Transportation Engineering and Planning – C.S. Papacostas, P.D.Prevedouros

**References:**

1. A Text Book of Railway Engineering-S.C.Saxena and S.Arora, Dhanpatrai and Sons, New Delhi.
2. Highway, railway, Airport and Harbour Engineering – K.P. Subramanian
3. Harbour, Dock and Tunnel Engineering – R. Srinivasan
4. Dock and Harbour Engineering – Hasmukh P Oza, Gutam H Oza



**PROFESSIONAL ELECTIVE -V  
(TRANSPORTATION ENGG STREAM)  
URBAN TRANSPORTATION ENGINEERING**

IV Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- The course introduces students to the fundamentals of Urban transportation engineering
- It familiarizes students with contemporary transportation planning issues and methods of analysis.

**Unit I:**

**Introduction:** Fundamentals of Transportation, Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems

**Unit II:**

**Data Collection And Inventories:** Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

**Unit III:**

**Travel Demand issues:** Travel Attributes, Assumptions in Demand Estimation, Detailed approach on 4 step travel demand estimation; Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

**Unit IV:**

**Demand and supply planning** Plan Preparation and Evaluation: Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis

**Unit V:**

**Metropolitan cities:** Issues in urban mobility, integrating land use and transport planning; Overview of urbanization process, city structure and urban activity and infrastructure systems, Economic and social significance of urban infrastructure systems; Transport's Role in tackling Social Inclusion

**Course Outcomes:**

At the end of the course, the student will be able to:

- Identify urban transportation problems.
- Estimate urban travel demand.
- Plan urban transport networks.
- Identify urban transport corridors.
- Prepare urban transportation plans

**Text books**

1. Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London Ltd.
2. Introduction to Urban System Planning - B.G.Hutchinson; Mc Graw Hill.

**References:**

1. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers
2. Lecture notes on UTP - Prof. S. Raghavachari , R.E.C.Warangal.
3. Metropolitan transportation planning – John W. Dickey, Tata Mc Graw Hill, New Delhi,1975.

**PROFESSIONAL ELECTIVE - VI  
(GEOTECHNICAL ENGG STREAM)  
GROUND IMPROVEMENT TECHNIQUES**

IV Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Prerequisites: Geo-Technical Engineering, Foundation Engineering****Course Objectives: The objectives of the course are**

- To know the need of ground improvement
- To acquire the knowledge on the various ground improvement techniques available and their applications for different types of soils
- To understand suitable ground improvement technique for given soil conditions.

**UNIT I:**

**Introduction to Engineering Ground Modification:** Need and objectives, Identification of soil types, In situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.

**UNIT II:**

**Mechanical Modification:** Shallow Compaction Techniques- Deep Compaction Techniques- Blasting- Vibrocompaction- Dynamic Tamping and Compaction piles.

**UNIT III:**

**Hydraulic Modification:** Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering-Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains.

**UNIT IV:**

**Physical and Chemical Modification** – Modification by admixtures, Modification Grouting, Introduction to Thermal Modification including freezing.

**UNIT V:**

**Modification by Inclusions and Confinement** - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

**Course Outcomes: At the end of the course the student able to**

- Know the necessity of ground improvement
- Understand the various ground improvement techniques available
- Select & design suitable ground improvement technique for existing soil conditions in the field

**Text Books**

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill publications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis

**References:**

1. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
4. K. Krisch & F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
5. Donald P Coduto – Foundation Design Principles and Practices, 2<sup>nd</sup> edition, Pearson, Indian edition, 2012.

**PROFESSIONAL ELECTIVE - VI  
(GEOTECHNICAL ENGG STREAM)  
SOIL DYNAMICS AND MACHINE FOUNDATIONS**

IV Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre Requisites:** Soil Dynamics**Course Objectives:** To study fundamentals of vibration, wave propagation and dynamic soil properties, vibration analysis , design of machine foundations and machine foundations on piles.**UNIT- I****Fundamentals of Vibration:** Definitions, Simple harmonic motion, Response of SDOF systems of Free and Forced vibrations with and without viscous damping, Frequency dependent excitation, Logarithmic decrement, Determination of viscous damping, Systems with Two and Multiple degrees of freedom, Vibration measuring instruments.**UNIT- II****Wave Propagation and Dynamic Soil Properties:** Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behavior of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Elastic constants of soils, Correlations for shear modulus and damping ratio in sands and clays.**UNIT- III****Foundation Vibration Analyses:** Types, General Requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Vertical vibration of circular foundations resting on Elastic Half Space- Lambs, Reissner, Quinlan & Sung's analogies.**UNIT- IV****Design of Machine Foundations:** Analysis and design of block foundations for reciprocating engines, IS code of practice design procedure for foundations of reciprocating and impact type machines. Vibration isolation and absorption techniques.**UNIT- V****Machine Foundations on Piles:** Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Design procedure for a pile supported machine foundation.**COURSE OUTCOMES:**

- Students understand theory of vibration and resonance phenomenon, Amplification.
- Students understand propagation of body waves and surface waves through soil.
- Student exposed to different methods for estimation of dynamic soil properties required for design purpose.
- Students can predict dynamic bearing capacity and assess liquefaction potential of any site.
- Students apply theory of vibrations to design machine foundation based on dynamic soil properties and bearing capacity.

**REFERENCE:**

1. Swami Saran - Soil Dynamics and Machine Foundation, Galgotia Publications Pvt. Ltd. (2010)
2. Prakash, S. - Soil Dynamics, McGraw Hill Book Company (1981)
3. I.Chowdhary and S P Dasgupta - Dynamics of Structures and Foundation, 2009.
4. Arya, S. D, O'Neil, M. and Pincus, G.- Design of Structures and Foundations for Vibrating Machines, Gulf Publishing Co., 1979.
5. Prakash, S. and Puri, V. K. - Foundation for Machines: Analysis and Design, John Wiley & Sons, 1998.
6. Kameswara Rao, N. S. V. - Vibration Analysis and Foundation Dynamics, Wheeler Publication Ltd., 1998.
7. Richart, F. E. Hall J. R and Woods R. D. - Vibrations of Soils and Foundations, Prentice Hall Inc., 1970.
8. Das, B. M. - Principles of Soil Dynamics, PWS KENT publishing Company, Boston.2002
9. Bharat Bhushan Prasad – Advanced Soil Dynamics and Earthquake Engineering, PHI Learning Pvt. Limited, New Delhi, 2011.

**PROFESSIONAL ELECTIVE – VI  
(GEOTECHNICAL ENGG STREAM)  
ADVANCED FOUNDATION ENGINEERING**

IV Year B.Tech. II-Sem

L	T	P	C
3	0	0	3

**Pre- Requisites:-**Soil Mechanics & Foundation Engineering**Course Objectives:**

- To study Soil exploration & Preparation of soil reports.
- To study the concepts of foundations on collapsible and expansive soils
- In depth study of Shallow & Deep foundations
- To study the settlements of Pile groups.

**UNIT- I**

**Soil Exploration:** Exploration Methods; Planning the Exploration Program; Boring and Sampling; In Situ Tests: Standard & Cone Penetration Tests, Field Vane & Borehole shear tests, Dilatometer, Pressuremeter; Rock Sampling, Core Recovery, RQD; Geophysical Exploration; Preparation of Soil Report.

**UNIT- II**

**Shallow Foundations: Bearing Capacity:-** General Formulae; Effect of Water Table; Footings with eccentric or Inclined Loads, Foundations on Layered Soils, on finite layer with a Rigid Base at Shallow Depth, effect of compressibility of soil.

**UNIT- III**

**Settlement:** Components – Immediate, Consolidation & Creep, Stresses and Displacements in Homogeneous, Layered and Anisotropic Soils; Consolidation Settlement; One, Two & Three Dimensional Consolidation; Secondary Compression Settlement; Bearing Pressure using SPT, CPT, Dilatometer and Pressuremeter; Settlement of foundations on Sands-Schmertmann and Burland & Busbridge methods; Structure Tolerance to Settlement and Differential Settlements, Rotation of Tall Structures.

**UNIT- IV**

**Deep Foundations: Single Pile:** Vertically loaded piles, Static capacity  $\alpha$ ,  $\beta$  and  $\lambda$  Methods, Dynamic formulae; Point Bearing Resistance with SPT and CPT Results; Bearing Resistance of Piles on Rock; Settlement; Pile Load Test; Uplift Resistance; Laterally Loaded Piles -Ultimate Lateral Resistance; Negative Skin Friction; Batter Piles; Under Reamed Piles; Ultimate Capacity of Pile Groups in Compression, Pullout & Lateral Load; Efficiency; Settlements of Pile Groups; Interaction of Axially & Laterally Loaded Pile Groups.

**UNIT- V****Special Topics of Foundation Engineering**

**Foundations on Collapsible Soils:** Origin and occurrence, Identification, Sampling and Testing, Preventive and Remedial measures.

**Foundations on Expansive Soils:** The nature, origin and occurrence, Identifying, testing and evaluating expansive soils, typical structural distress patterns and Preventive design & construction measures.

**Introduction to Reliability-Based Design:** Methods, LRFD for structural strength requirements, LRFD for geotechnical strength requirements, Serviceability requirements.

**Course Outcomes:**

- Able to plan and select the soil exploration methods
- Determine the Bearing capacity of Soil and elements for the design of shallow foundations
- To design the deep foundations under different loading conditions
- To design the foundations on problematic soils and reliability based design for shallow and deep foundations

**REFERENCE:**

1. Das, B. M. - Principles of Foundation Engineering 7<sup>th</sup> Cengage Learning (2013)
2. Donald P Coduto – Foundation Design Principles and Practices, 2<sup>nd</sup> edition, Pearson, Indian edition, 2012. Phi Learning (2008)
3. Bowles, J. E. - Foundation Analysis & Design 5<sup>th</sup> Edition McGraw-Hill Companies, Inc. (1996)
4. Poulos, H. G. & Davis, E. H. - Pile Foundation Analysis and Design john wiley & sons inc (1980-08)
5. Reese, L. C. & Van Impe, W. F. - Single Piles and Pile Groups under Lateral Loading -Taylor & Francis Group (Jan 2000)
6. Tomlinson, M. J. - Foundation Design and Construction - Prentice Hall (2003)
7. Lymon C. Reese, William M. Isenhowe, Shin-Tower Wang- Analysis and Design of Shallow and Deep Foundations (2006)
8. Salgado, R. - The Engineering of Foundations McGraw-Hill, Boston (2008)

**PROFESSIONAL ELECTIVE-VI  
(GEOTECHNICAL ENGG STREAM)  
GEOTECHNIQUES FOR INFRA STRUCTURE**

IV Year B.Tech. II-Sem

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**UNIT – I**

**Site Investigation for Infrastructure Projects:** methods of site investigation, types of soil samples and samplers- Geotechnical field testing – SPT, CPT, Plate Load Test, Pile Load Test.

**UNIT – II**

**Foundations for Railway & Highway Bridges:** types of foundations, design forces, safe and allowable bearing capacity of shallow foundations, settlement computation; Pile foundations – types, axial and lateral capacity of pile, pile group analysis and pile cap; Drilled Piers & Caissons – introduction, drilled piers, caissons, well foundations, bearing capacity and lateral stability aspects, well sinking.

**UNIT – III****Introduction to Marine and offshore Structures**

Introduction, types of marine and offshore structures, break waters, jetties, berthing structures, groins, gravity platforms, jackup platforms and jacket platform.

**UNIT – IV****Foundations for Transmission Line, Radar Antenna, Microwave and TV Tower and Chimneys:**

Introduction, foundations for towers and chimneys, design forces, behaviour of pad and chimney foundations, design of chimney and pad foundations, anchor foundations (rock anchors), design of foundations for towers and chimneys, design and construction of shallow foundations on rocks.

**UNIT – V**

Machine foundations – Introduction - types of machines, types of foundations for machines, allowable stresses and amplitudes and general design guidelines of foundation for machines.

**Excavation Schemes:** Sheet Piles - introduction, types of sheet pile walls, cantilever sheet pile wall, anchored sheet pile wall, stability analysis of anchored bulkhead by free earth support and fixed earth support method, position of anchorage; Braced Excavations- methods used for shallow and deep open cuts, design pressure and procedures for bracings of cuts; Cellular Cofferdams – types and uses.**Difficult Soils & Improvement Techniques:**

Difficult soils- loose granular soils, soft clays and shrinkable soils – identification, swell and swell pressure, principles of soil stabilisation techniques, vibro replacement and vibro compaction techniques. Introduction to forensic Geotechnical Engineering and some case studies.

**Text Books**

1. Foundation analysis and design – J. E Bowles, McGraw Hill Book Company
2. Foundation Engineering – P. C. Varghese, Prentice Hall of India.

**References:**

1. Design of Foundation Systems Principles and Practices – N. P. Kurian, Narosa Publishing House.
2. Principles of Foundation Engineering – B. M. Das, CENGAGE Learning, Thomson, Brooks/Cole.
3. Soil Mechanics and foundation engineering – P. Purushottama Raj, Pearson Education.
4. Construction of marine and offshore structures – Ben C Gerwick, jr., CRC Press, Taylor and Francis Group.
5. Analysis and design of foundations and retaining structures – Shamsher Prakash, Gopal Ranjan and Swami Saran, Sarita Prakasan.

6. Dynamic soil tests and applications – N S V Kameswara Rao, Wheeler Publishing.
7. Pile design and construction practice – M J Tomlinson, View point Publications, Palladian Publications Limited.
  - a. IS: 4091 (1979) -Design and construction of foundations for transmission line towers.
8. IS: 11233 (1985) - Design and construction of foundations for Radar Antenna, Microwave and TV Tower.
9. Geotechnical Engineering: Principles and practices of soil mechanics and foundation Engineering by VNS Murthy, Taylor & Francis Group