MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

B. Tech – Civil Engineering
Course Structure (R20)
Applicable From 2020-21 Admitted Batch

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2010001	Engineering Mathematics - I	BS	Yes	5	
2	2010007	Engineering Physics	BS	Yes	10	
3	2010501	Programming for Problem Solving	ES	Yes	10	
4	2010072	Engineering Physics Lab	BS	Yes	5	
5	2010571	Programming for Problem Solving Lab	ES	Yes	5	
6	2010371	Engineering Drawing Practice	ES	Nil	0	
7	-	Induction Programme				
Average percent of change					**6**	

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2020002	Engineering Mathematics - II	BS	Yes	5	
2	2020008	Engineering Chemistry	BS	Yes	15	
3	2020301	Engineering Mechanics	PC	Nil	0	
4	2020009	Communicative English	HSMC	Yes	20	
5	2020372	Engineering Workshop	ES	Nil	0	
6	2020073	Engineering Chemistry Lab	BS	Yes	10	
7	2020074	Communicative English Lab	HSMC	Yes	10	
8	2026665	Oops through C++	MC	Yes	100	
9	2020021	Environmental Science	MC	Nil	0	
Average percent of change					**18**	

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2030112	Strength of Materials - I	PC	Yes	20	
2	2030113	Surveying and Geomatics	PC	Yes	10	
3	2030004	Probability and Statistics	BS	Nil	0	
4	2030202	Basic Electrical and Electronics Engineering	ES	Nil	0	
5	2030502	Data Structures	ES	Yes	100	
6	2030171	Surveying Laboratory	PC	Nil	0	
7	2030272	Basic Electrical and Electronics Engineering Laboratory	ES	Nil	0	
8	2030572	Data Structures Laboratory	ES	Yes	100	
9	2030022	Gender Sensitization	MC	Nil	0	
Average percent of change					**25**	

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2040114	Strength of Materials - II	PC	Nil	0	
2	2040115	Building Materials, Construction and Planning	PC	Nil	0	
3	2040116	Fluid Mechanics	PC	Nil	0	
4	2040117	Structural Analysis - I	PC	Nil	0	
5	2040118	Engineering Geology	PC	Nil	0	
6	2040505	Python	ES	Yes	100	
7	2040172	Strength of Materials Laboratory	PC	Nil	0	
8	2040173	Computer Aided Civil Engineering Drawing Laboratory	PC	Nil	0	
9	2040575	Python Laboratory	ES	Yes	100	
Average percent of change					**22**	

III YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2050119	Hydraulics and Hydraulic Machinery	PC	Nil	0	
2	2050120	Structural Analysis - II	PC	Nil	0	
3	2050121	Structural Engineering - I (RCC)	PC	Nil	0	
4	-	Professional Elective - I	PE	Nil	0	
5	2050010	Business Economics and Financial Analysis	HSMC	Nil	0	
6	2050174	Fluid Mechanics and Hydraulic Machinery Laboratory	PC	Yes	20	
7	2050175	Concrete Technology Laboratory	PC	Yes	50	
8	2050176	Engineering Geology Laboratory	PC	Nil	0	
9	2050177	Introduction to Artificial Intelligence	MC	Yes	100	
Average percent of change					**18**	

III YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2060122	Hydrology & Water Resources Engineering	PC	Nil	0	
2	2060123	Transportation Engineering	PC	Nil	0	
3	2060124	Structural Engineering - II (Steel)	PC	Yes	20	
4	2060125	Geotechnical Engineering	PC	Nil	0	
5	-	Professional Elective - II	PE	Nil	0	
6	-	Open Elective - I	OE	Nil	0	
7	2060178	Geotechnical Engineering Laboratory	PC	Nil	0	
8	2060179	Transportation Engineering Laboratory	PC	Yes	50	
9	2060075	Advanced English Language Communication Skills Laboratory	HSMC	Nil	0	
10	2060180	Introduction to Machine Learning	MC	Yes	100	
Average percent of change					**17**	

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	2070126	Environmental Engineering	PC	Nil	0	
2	2070127	Estimation, Quantity Surveying and Valuation	PC	Yes	20	
3	2070011	Fundamentals of Management	HSMC	Yes	100	
4	-	Professional Elective - III	PE	Nil	0	
5	-	Professional Elective - IV	PE	Nil	0	
6	-	Open Elective - II	OE	Nil	0	
7	2070181	Environmental Engineering Laboratory	PC	Nil	0	
8	2070182	Computer Aided Design Laboratory	PC	Nil	0	
9	2070191	Industry Oriented Mini Project / Summer Internship *	PS	Nil	0	
10	2070192	Project Stage – I	PS	Nil	0	
Average percent of change					**12**	

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Change in syllabus	%	Remarks
1	-	Professional Elective - V	PE	Nil	0	
2	-	Professional Elective - VI	PE	Nil	0	
3	-	Open Elective - III	OE	Nil	0	
4	2080193	Technical Seminar	PS	Nil	0	
5	2080194	Project Stage - II	PS	Nil	0	
Average percent of change				**Nil**	**0**	

PE I - Professional Elective I

S. No	Course Code	Course Title
1	2050141	Concrete Technology
2	2050142	Elements of Earthquake Engineering
3	2050143	Prefabricated structures
4	2050144	Introduction to Offshore Structures

PE II - Professional Elective II

S. No	Course Code	Course Title
1	2060145	Introduction to Finite Element Methods
2	2060146	Advanced Structural Design
3	2060147	Repair and Rehabilitation of Structures
4	2060148	Prestressed concrete

PE III – Professional Elective III

S. No	Course Code	Course Title
1	2070149	Bridge Engineering
2	2070150	Railway, Airport and Harbour Engineering
3	2070151	Traffic Engineering
4	2070152	Pavement Analysis and Design

PE IV - Professional Elective IV

S. No	Course Code	Course Title
1	2070153	Design of Hydraulic Structures
2	2070154	Watershed Management
3	2070155	Water Supply Network
4	2070156	Groundwater Hydrology

PE V - Professional Elective V

S. No	Course Code	Course Title
1	2080157	Construction Project Management
2	2080158	Industrial Waste water Treatment
3	2080159	Waste Management
4	2080160	Environmental Impact Assessment

PE VI - Professional Elective VI

S. No	Course Code	Course Title
1	2080161	Foundation Engineering
2	2080162	Ground Improvement Techniques
3	2080163	Introduction to Composite Materials
4	2080164	Remote Sensing and GIS

Open Electives

S. No	Course Code	Course Title
1	2060101	Air and Noise Pollution Control
2	2070102	Remote Sensing and GIS
3	2080103	Disaster Management

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2010001 - ENGINEERING MATHEMATICS- I

B.Tech. I Year I Semester

L	T	P	C
3	1	0	4

Course Objectives: To learn

1. Types of matrices and their properties, Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form. Geometrical approach to the mean value theorems and their application to the mathematical problems.
3. Partial differentiation, concept of total derivative, finding maxima and minima of function of two and three variables.
4. The evaluation of Multiple integration and its applications

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
1. Find the Eigen values, Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.
2. Solve the applications on the mean value theorems.
3. Find the extreme values of functions of two variables with/ without constraints.
4. Evaluate the multiple integrals and apply the concept to find areas, volumes for cubes, sphere and rectangular parallelepiped

UNIT- I: Matrices

Matrices: Types of Matrices, Symmetric; Skew-symmetric; orthogonal matrices; rank of a matrix by Echelon form, 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.

Learning outcomes:

- Understand the matrix representation of a set of linear equations
- Explain the Normal form and Echelon form.
- Apply elementary operations to find the rank
- Analyse the solution of the system of Linear equations
- Evaluate the rank of the matrix.

UNIT- II: Eigen values and Eigen vectors

Eigen values 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 up to three variables. Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

Learning outcomes:

- Understand how to find the eigen values and eigen vectors of a matrix.
- Explain the quadratic form to canonical form using orthogonal transformations.
- Apply Cayley Hamilton theorem to find inverse and powers of the matrix
- Analyse the nature of the quadratic form.

- Evaluate the powers ofmatrix.

UNIT- III: Calculus of single variable.

Mean value theorems: Rolle"s Theorem, Lagrange"s Mean value theorem with their Geometrical Interpretation and applications, Cauchy"s Mean value Theorem. Taylor"s and Maclaurin theorems with remainders (without proof). Beta and Gamma functions and their applications.

Learning outcomes:

- Understand the concept of mean value theorem.
- Explain the nature of functions by using mean value theorems.
- Apply Taylor"s or Maclaurin"s series to find the series expansion for the functions.
- Analyse the geometrical interpretation of mean value theorem.
- Evaluation of the slopes at any point on the curve

UNIT- IV: Multivariable Calculus.

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.

Learning outcomes:

- Understand the concept of partial differentiation.
- Explain the functional dependence using Jacobian.
- Apply Lagrange"s method to find Maxima and minima.
- Analyse concept of Lagrange multipliers.
- Evaluate the maximum and minimum value of functions of two variables.

UNIT- V: Multiple integrals& applications:

Evaluation of Double integrals (Cartesian and polar coordinates); Change of order of integration (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: finding the area of a region using double integration and volume of a region using double and triple integration.

Learning outcomes:

- Understand the concept of double integrals.
- Explain the polar form of double integral and triple integral.
- Apply double integration techniques in evaluating areas bounded by region.
- Analyse the centre of mass of a Lamina
- Evaluation of double integrals interns of volumes

TEXT BOOKS:

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

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

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2010007: ENGINEERING PHYSICS

B.Tech. I Year I Semester

L	T	P	C
3	1	0	4

Course Objectives:

1. The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
2. Students will be able to demonstrate competency and understanding of the concepts found in Mechanics, Harmonic Oscillations, Waves in one dimension, wave Optics, Lasers, Fiber Optics and a broad base of knowledge in physics.
3. The main purpose of this course is to equip engineering undergraduates with an understanding of the scientific method, so that they may use the training beneficially in their higher pursuits.
4. Today the need is to stress principles rather than specific procedures, to select areas of contemporary interest rather than of past interest, and to condition the student to the atmosphere of change he will encounter during his carrier.

Course outcomes: Upon graduation, the graduates will have:

1. The knowledge of Physics relevant to engineering is critical for converting ideas into technology.
2. An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to new innovations and improvements.
3. In the present course, the students can gain knowledge on the mechanism of physical bodies upon the action of forces on them, the generation and transmission of the waves.
4. Optical Phenomena like Interference, diffraction, the principles of lasers and Fibre Optics.
5. Various chapters establish a strong foundation on the different kinds of characters of several materials and pave a way for them to use in at various technical and engineering applications.

UNIT- I: Introduction to Mechanics

Transformation of scalars and vectors under Rotation transformation, Forces in Nature, Newton‟s laws and its completeness in describing particle motion, Form invariance of Newton‟s second law, Solving Newton‟s equations of motion in polar coordinates.

Learning Outcomes:

- **Understand** the rotation transformation of vectors and scalars.
- **Explain** the form invariance of Newton‟s second law.
- **Apply** Polar coordinates on Newton‟s laws ofmotion.
- **Analyze** the various forces in nature.
- **Evaluate** the Newton's equations of motion in polar coordinates.

UNIT- II: Harmonic Oscillations

Mechanical and electrical simple harmonic oscillators, Complex number notation and phasor representation of simple harmonic motion, Damped harmonic oscillator: heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor, Steady state motion of forced damped harmonic oscillator, Power observed by oscillator.

Learning Outcomes:

- **Understand** the fundamental notation of Simple Harmonic Oscillations.
- **Explain** about the Damped and Forced oscillators.
- **Apply** knowledge of various damping conditions.
- **Analyze** the difference between damped and forced oscillators.

UNIT- III: Acoustics

Introduction, basic requirements for the acoustically good halls, reverberation and time of reverberation, transmission of sound and transmission loss, factors affecting the architectural acoustics and their remedy, sound absorbing materials, sabine formulae, absorption coefficients, stadium seating, movie theater, acoustic quieting.

Learning Outcomes:

- **Identify** the requirements for acoustically good hall.
- **Analyze** the various remedial methods to overcome factors affecting acoustically good hall.
- **Gain** knowledge about sound absorbing materials.

UNIT- IV: Interference and Diffraction

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, Frunhofer diffraction at a single slit, Diffraction grating- resolving power.

Learning Outcomes:

- **Classify** the types of Interference.
- **Outline** the working of Interferometer.
- **Identify** the diffraction and conditions for maxima and minima.
- **Gain** knowledge Grating and its Resolving power.

UNIT- V: Lasers and Fibre Optics

Lasers: Introduction to Lasers, Coherence, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Semiconductor laser; Applications of laser.

Fibre Optics: Introduction, Block diagram of fiber optic communication system, Total internal reflection, Acceptance angle and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

Learning Outcomes:

- **Study** about Laser and fiber optics for understanding an advanced communication systems.
- **Explain** the working principle of laser and optical fibers.
- **Classify** optical fibers based on refractive index profile and mode of propagation .
  Identify the applications of optical fibers in medical, communication and other fields.
  Apply the laser and fiber optic concepts in various fields.

TEXT BOOKS:

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning
2. I. G. Main, “Vibrations and waves in physics", 3rd Edn, Cambridge University Press, 2018.
3. Ajoy Ghatak, “ Optics”, McGraw Hill Education, 2012

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REFERENCES:

1. H. J. Pain, “The physics of vibrations and waves”, Wiley, 2006
2. O. Svelto, “Principles of Lasers”
3. “Introduction to Mechanics”, M.K.Verma, Universities Press

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2010501 - PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year I Sem **L T P C**

3 1 0 4

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.

Course Outcomes: The student will learn

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

Unit - I: Introduction to Programming

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments

Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

Unit - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

Unit - III: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

Unit - IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

Unit - V: Introduction to Algorithms:

Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, etc.

Basic searching in an array of elements (linear and binary search techniques),

Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXT BOOKS:

1. Byron Gottfried, Schaum"s Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2010072 - ENGINEERING PHYSICS LAB

B.Tech. I Year I Sem

L	T	P	C
0	0	3	1.5

List of Experiments:

1. Melde"s experiment:
   To determine the frequency of a vibrating bar or turning fork using Melde"s arrangement.

2. Torsional pendulum:
   To determine the rigidity modulus of the material of the given wire using torsional pendulum.

3. Coupled Oscillator:
   To determine the spring constant by coupled oscillator.

4. Newton"s rings:
   To determine the radius of curvature of the lens by forming Newton"s rings.

5. Diffraction grating:
   To determine the number of lines per inch of the grating.

6. Dispersive power:
   To determine the dispersive power of a prism by using spectrometer.

7. LCR Circuit:
   To determine quality factor and resonant frequency of LCR circuit.

8. LASER:
   To study the V-I characteristics of LASER sources.

9. Optical fibre:
   To determine the bending losses of Optical fibres.

10. Optical fibre:
    To determine the Acceptance angle and Numerical aperture of a given fibre

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2010571 - PROGRAMMING FOR PROBLEM SOLVING LAB

B.Tech. I Year I Sem

L	T	P	C
0	0	3	1.5

[Note: The programs may be executed using any available Open Source/ Freely available IDE Some of the Tools available are:
Code Lite: https://codelite.org/ Code::Blocks: http://www.codeblocks.org/ DevCpp :http://www.bloodshed.net/devcpp.html Eclipse: http://www.eclipse.org This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

1. Formulate the algorithms for simple problems
2. Able to develop programs based on condition checking
3. Implement pyramid programs
4. Able to perform matrix applications
5. Modularize the code with functions so that they can be reused
6. Create, read and write to and from simple text and binary files

Simple numeric problems:

a. Write a program for the simple, compound interest.
b. Write a program for calculating area, perimeter of a rectangle, triangle and square.
c. Write a program for calculating area and perimeter of a circle.
d. Write a program to implement bit-wise operators.
e. Write a program for converting Fahrenheit to Celsius.
f. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.
g. Write a simple program to find largest of two and three numbers using conditional operator.
h. Write a program for swapping two numbers with and without using third variable and using bitwise operators.

Condition branching and statements:

a. Write a program for finding largest of three numbers.
b. Write a program that declares Class awarded for a given percentage of marks, where marks<40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
c. Write a C program to find the roots of a Quadratic equation.
d. 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)

Condition branching and loops:

a. Write a program to find whether the given number is a prime or not.
b. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
c. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, number=5 and no. of rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 =10
   5 x 3 =15
d. Write a program that shows the binary equivalent of a given positive number between 0 to255.
e. A 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.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to calculate the following, where x is a fractional value. $1-x/2+x^2/4-x^3/6$
h. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:$1+x+x^2+x^3+….+x^n$. For example: if n=3 and x=5, then the program compute 1+5+25+125.
i. Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
1 2	* *	2 3	2 2	* *
1 2 3	* * *	4 5 6	3 3 3	* * *
			4 4 4 4	* *
				*

j. Write a C program to find given number is Armstrong number or not.
k. Write a C program to find given number is Perfect number or not.

Arrays, Strings, Pointers and Structures:

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a program to compute Mean, Variance, Standard Deviation, Sorting of n elements in single dimension array.
c. Write a C program that perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
d. Write a C program that sorts a given array of names.
e. Write a C program that 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.
f. Write a program for reading elements using pointer into array and display the values using array.
g. Write a program for display values reverse order from array using pointer.
h. Write a program through pointer variable to sum of n elements from array.
i. Write a program to implement student information by using structure to function.
j. Write a program to sort student id or name using structures.

Functions:

a. Write a C program to find factorial of a given number using functions.
b. Write a C program to perform swapping using functions.
c. Write a C program to find LCM, GCD of two numbers using functions.
d. Write a C program to implement sorting using functions.
e. Write a C program to create and print two dimensional array using functions.
f. Write a C program to find factorial of a given number using recursion.
g. Write a C program to find Fibonacci series using recursion
h. Write a C program to implement Towers of Hanoi problem using recursion.

Files:

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their upper case equivalents.
c. Write a C program to count the occurrence of a character in a text file. The file name and the character are supplied as command line arguments.
d. 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).

REFERENCES

1. Byron Gottfried, Schaum"s Outline of Programming with C,McGraw-Hill
2. Let us C by Yashavant Kanetkar BPB publications (16th Edition)
3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
5. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, and Pearson Education.
7. Herbert Schildt, C: The Complete Reference, McGrawHill, 4thEdition.

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2010371 - ENGINEERING DRAWING PRACTICE

B.Tech. I Year I Sem **L T P C**

1 0 4 3

Pre Requisites: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

Course Objective:

1. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation.
2. To prepare the student to use the techniques, skills, and modern engineering tools necessary for engineering practice.
3. To get exposure to a CAD package.

Course Outcomes:

1. Familiarize with BIS standards and conventions used in engineering graphics.
2. Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g., plain and diagonal scale.
3. Develop the lateral surfaces of simple solids
4. Ability to draw orthographic projections and isometric projections of given engineering components.
5. Visualize different views like elevation and plan for a given line, plane figures or solid objects.
6. Apply drafting techniques and use 2D software e.g., AutoCAD to sketch 2D plane figures.

UNIT - 1 INTRODUCTION TO ENGINEERING DRAWING

Principles of Engineering Graphics and their Significance-Drawing Instruments and their Uses- Conventions in Drawing-BIS -Lettering and Dimensioning.

Geometrical Constructions: Bisecting a Line, Arc. Dividing A Line into „N" Equal Parts, Construction of Polygons, Division of Circle into Equal Parts (8 And 12)

Construction of Scales: Plain, Diagonal and Vernier Scale.

Conic Sections: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola- General Methods only.

Engineering Curves: Cycloid, Epicycloid, Hypocycloid **Involutes:**

For Circle, Triangle, Square, Pentagon and Hexagon.

Learning Outcome:

- To understand the basic standards, conventions of engineering drawing and how to use the instruments in drawing.
- Learn and draw the various types of curves used in engineering application.

UNIT - 2 ORTHOGRAPHIC PROJECTIONS

Principles- Assumptions- Different Angles of Projection.

Projections of Points- orientation in all the quadrants

Projections of Lines- Parallel, Perpendicular, Inclined to one plane and Inclined to both planes.

Projections of Planes: Surface Parallel, Perpendicular, Inclined to one plane and Inclined to both planes.

Learning Outcome:

- Knowledge in various planes of projections
- To draw the front view, top view and side views of the given geometrical elements

UNIT - 3 PROJECTIONS OF SOLIDS

Classification of solids- Axis- Parallel, Perpendicular, Inclined to one plane and Inclined to both planes- Prisms, Pyramids, Cylinder and Cone

Learning Outcome:

- To understand the various solid types
- To draw all the views of the given solid in all possible orientations.

UNIT - 4 SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Types of Section Planes, Sectioning Prisms, Pyramids, Cylinders and Cones using various planes. Development of surfaces of right Regular Solids- Parallel Line Method, Radial Line Method.

Learning Outcome:

- To identify the cut surfaces and represent the sectional views graphically when the solid is sectioned.
- To develop the surfaces of solid using various methods.

UNIT - 5 ISOMETRIC PROJECTIONS AND PERSPECTIVE PROJECTIONS

Principles, Isometric Views of Planes, Solids- Box Method, Offset Method, Compound solids, Sectioned Solids. Conversion of Isometric to Multi view projection and vice versa.

Learning Outcome:

- Knowledge in principles of isometric projection
- Conversion of isometric to orthographic and vice-versa.

TEXT BOOKS:

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishers, 2012.
2. Basanth Agrawal and C M Agrawal –Engineering Drawing 2e –,McGraw-Hill Education(India) Pvt.Ltd.

REFERENCES:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers
2. Engineering Drawing- Johle/Tata Macgraw Hill.
3. K.Veenugopal, –Engineering Drawing and Graphics + Autocad New Age International Pvt.Ltd, 2011.

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2020002 – ENGINEERING MATHEMATICS – II

B.Tech. I Year I I Semester. **L T P C**

3 1 0 4

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

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 parallelepiped
4. Evaluate the line, surface and volume integrals and converting them from one to another

UNIT - I: First Order ODE

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

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)

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 parallelepiped).

UNIT - IV: Vector Differentiation

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

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

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TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

REFERENCES:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

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2020008 - ENGINEERING CHEMISTRY

B.Tech. I Year II Sem

L	T	P	C
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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 electro chemistry, 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 and other fields.
5. To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

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 electro chemistry, 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 medicaland other fields.
4. The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

Unit - I:

Molecular structure and Theories of Bonding: Atomic and Molecular orbitals/ Introduction of VBT. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and CO molecules. π molecular orbitals of 1,3-butadiene.

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

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the Schrodinger wave equation to hydrogen and particle in a box.
- Explain the molecular orbital energy level diagram of different molecular species.
- Apply the band theory of solids for conductors, semiconductors and insulators.
- Analyze discuss the magnetic behavior and colour of complexes.
- Evaluate the Crystal Field theory and Splitting of d- orbital"s

Unit - II:

Water and its treatment: 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, Numerical Problems on hardness of water. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization.Boiler troubels-scale andsludge,

Caustic embrittlement, priming and foaming. Boiler feed water and its treatment–Calgonconditioning, Phosphate conditioning and colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis.

Learning Outcomes: The student will be able to

- Understand the differences between temporary and permanent hardness of water.
- Explain the principles of reverse osmosis and Ion-Exchange processes.
- Apply the drinking water with BIS and WHO standards.
- Analyze problems associated with hard water - scale and sludge.
- Evaluate the Internal and external treatment of water.

Unit - III:

Electrochemistry and corrosion: 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 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-Proper Design, Cathodic protection– Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroplating and electroless plating of Nickel.

Learning outcomes: The student will be able to

- Understand the Nernst equation for calculating electrode and cell potentials.
- Explain the corrosion prevention methods and factors affecting corrosion.
- Apply the Pilling Bedworth rule for corrosion and corrosion prevention.
- Analyze the Dry and Wet corrosion and its Mechanism.
- Evaluate the Corrosion control methods

Unit - IV:

Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, symmetry and chirality. Enantiomers, diastereomers, optical activity and configurational nomenclatures (D,L and R,S configurations) Conformational 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 $KMnO_4$.Reduction reactions: reduction ofcarbonyl compoundsusing $LiAlH_4$.Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the 3 dimension structures of organic chemistry
- Explain the symmetry , chirality of the organic molecule
- Apply the Markownikoff and anti Markownikoff"s additions; Grignard additionsconformations of butane
- Analyze the reaction mechanism of different compounds.
- Evaluate the synthesis of aspirin, paracetamol

Unit - V:

Spectroscopic techniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy and IR Spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift, spin-spin splitting Introduction to Magnetic resonance imaging.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the. Principles of .spectroscopy and its selection rules
- Explain the concepts of nuclear magnetic resonance spectroscopy
- Apply the chemical shift values for the different compounds
- Analyze the different structures of organic ompound
- Evaluate the vibrational and rotational spectroscopy

TEXT BOOKS:

1. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P)Ltd., New Delhi.
2. Text Book of Engineering chemistry by Jaya Shree Anireddy: Wiley Publications.
3. Text Book of Engineering Chemistry by Prasanth Rath,B.Rama Devi and Ch.VenkataRamana Reddy : Cengage Publication 2019.

REFERENCE BOOKS:

1. Organic reaction Mechanism by Morrison and Boyd.
2. Fundamentals of Molecular Spectroscopy by C.N.Banwell
3. Inorganic Chemistry by J.D.Lee

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2020301 - ENGINEERING MECHANICS

B.Tech. I Year II Sem **L T P C**

Prerequisites: Intermediate Mathematics and Physics **3 1 0 4**

Course Objectives:

1. To solve the resultant of any force system.
2. To analyze the types of frication for moving bodies and problems related to friction.
3. To determine the centroid of an area and center of gravity of body.
4. To understand the concept of area moment and mass moment about any axes.
5. Understand the work-energy principle

Course Outcomes: After completion of the course the student is able to

1. Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.(L_1)
2. Analyze the bodies on rough horizontal and inclined planes and connected Bodies (L_4)
3. Determine the centroid of composite areas, centre of gravity of composite bodies (L_3)
4. Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.(L_3).
5. Apply work-energy principle to solve the rigid body problems.(L_3).
6. Appraise the influences of a human factor considerations on engineering design (L_6)

UNIT - I

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

Learning Outcomes:

- Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.(L_1)

UNIT - II

Friction: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Simple Screw Jack

Learning Outcomes:

- Analyze the bodies on rough horizontal and inclined planes and connected Bodies (L_4)

UNIT - III

Centroid and Center of Gravity: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity - Center of gravity of composite bodies.

Learning Outcomes:

- Determine the centroid of composite areas, centre of gravity of composite bodies (L_3)

UNIT - IV

Area moments of Inertia: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer

Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies – Product of Inertia.

Learning Outcomes:

- Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.(L_3)

UNIT - V

Kinetics of Rigid Bodies: Types of motion, D"Alemberts principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; kinetic of rigid body rotation.

Learning Outcomes:

- Understanding basic laws and principles of kinetics of particle and rigid body. (L_2)
- Apply work-energy principle to solve the rigid body problems.(L_3)

TEXT BOOKS:

1. Singer"s Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy and J.Suresh Kumar/ BSP
2. Engineering Mechanics/ Irving Shames, G.Krishna Mohan Rao / Prentice Hall.

REFERENCES:

1. Engineering Mechanics/ Bhattaharyya/ Oxford.
2. Tayal A.K.(2010), Engineering Mechanics. Umesh Publications.
3. Engg. Mechanics by S.S. Bhavikati & K.G. Rajasekharappa

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2020009 – COMMUNICATIVE ENGLISH

B.Tech. I Year 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 also 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, fostering ideas and practice of language skills in various contexts and cultures.*

Learning Objectives: The course will help to

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

Course Outcomes: Students should be able to

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

UNIT - I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

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-Organizing Principles of Paragraphs in Documents.

UNIT - II

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

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

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

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: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence

UNIT - IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

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

Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

UNIT - V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

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.

TEXT BOOKS:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

REFERENCES:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar.Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

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2020372 - ENGINEERING WORKSHOP

B.Tech. I Year II Sem **L T P C**

Prerequisites: **1 0 3 2.5**

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, equipments 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

Course Outcomes:

1. Explain the design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. (L4)
2. Demonstrate the design and model various basic prototypes in the trade of fitting such as Straight fit, V-fit. (L4)
3. Understand to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder. (L4)
4. Demonstrate the design and model various basic prototypes in the trade of Welding. (L4)
5. Explain to make various basic prototypes in the trade of Black smithy such as J shape, and S shape. (L4)
6. Understand to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring. (L4)

UNIT - I CARPENTRY & FITTING

Carpentry – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)

Fitting – Introduction, fitting tools, sequence of operations and applications (V-Fit, Dovetail Fit & Semi-circular fit)

Learning Outcomes:

Students should be able to,

- Understand the trade of carpentry and fitting. (L2)
- Explain the tools involved in manufacturing operations. (L3)
- Evaluate the applications of carpentry and fitting. (L4)

UNIT - II TIN SMITHY AND BLACKSMITHY

Tin-Smithy – Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).

Blacksmithy- Introduction, Blacksmithy tools, sequence of operations and applications (Round to Square, Fan Hook and S-Hook)

Learning Outcomes:

Students should be able to,

- Understand the oldest manufacturing methods. (L2)
- Describe the sequence of operations involved. (L3)

- Explain the safety precautions and tools usage. (L4)

UNIT - III HOUSE WIRING AND WELDING

House-wiring – Introduction, Electrical wiring tools, sequence of operations and applications (Parallel & Series, Two-way Switch and Tube Light)

Welding Practice – Introduction, electrode, welding tools, and sequence of operations. Advantages and applications (Arc Welding & Gas Welding)

Learning Outcomes:

Students should be able to,

- Discuss the topic of Heat engines.(L3)
- Identify types of Heat engines cycles.(L5)
- Evaluate the Factors affecting routing procedure, Route Sheet.(L4)

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCES:

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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2020073 - ENGINEERING CHEMISTRY LAB

B.Tech. I Year II Semester

L	T	P	C
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Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will earn:

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 an 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.

Course Outcomes: The experiments will make the student gain 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.

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 Conductometrictitrations
4. Estimation of Acetic acid by Conductometrictitrations
5. Estimation of HCl by Potentiometrictitrations
6. Estimation of Fe^{2+} by Potentiometry using$KMnO_4$
7. Determination of rate constant of acid catalysed hydrolysis of methylacetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of R_f values. eg ortho and para nitrophenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid oncharcoal
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 5thedition
4. Text book on Experiments and calculations in Engineering chemistry – S.S.Dara

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2020074 – COMMUNICATIVE ENGLISH LAB

B.Tech. I Year II Semester **L T P C**
0 0 2 1

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.

Course Objectives:

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

Learning Outcomes: Students will be able to attain

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

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 insentences.

1. Listening for general content
2. Listening to fill upin formation
3. Intensive listening
4. 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**:
Understand: Interview Skills. *Practice:* Mock Interviews.
****

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2026665 – OOPS THROUGH C++

B.Tech. I Year II Semester **L T P C**

0 2 0 0

Objectives:

1. To strengthen problem solving ability by using the characteristics of an object-oriented approach.
2. To design applications using object oriented features
3. To handle Exceptions in programs.

Week 1: Write C++ programs for demonstrating arithmetic, logical, relational and bitwise operators.

Week 2: a) Write a C++ program to find the sum of individual digits of a positive integer.
b) Write a C++ program to print even and odd numbers up to given number.

Week 3: a) Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
b) Write a C++ program to find both the largest and smallest number in a list of integers.

Week 4: a) Write a C++ program to sort a list of numbers in ascending order.
b) Write a Program to illustrate New and Delete Keywords for dynamic memory allocation

Week 5: Write a C++ a program Illustrating Class Declarations, Definition, and Accessing Class Members.

Week 6: Write a C++ program to demonstrate scope resolution operator

Week 7: Write a C++ Program to illustrate default constructor, parameterized constructor and copy constructors

Week 8: Write a C++ Program to Demonstrate the i) Operator Overloading .ii) Function Overloading.

Week 9: Write a C++ Program to Demonstrate Friend Function and Friend Class.

Week 10: Write a C++ program to demonstrate single and Multilevel Inheritance

Week 11: Write a C++ program to demonstrate Multiple and Hybrid Inheritance

Week 12: Write a C++ program to demonstrate Exception handling

TEXT BOOKS:

1. C++, the Complete Reference, 4th Edition, Herbert Schildt, TMH.
2. Object Oriented Programming with C++ by Balagurusamy

REFERENCES:

1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education

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2020021 - ENVIRONMENTAL SCIENCE

B.Tech. I Year II Sem

L	T	P	C
3	0	0	0

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

Course Outcomes:

1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT- I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT- II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT- III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT- IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical

waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon lifestyle.

TEXT BOOKS:

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

REFERENCES:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt.Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

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2030112 - STRENGTH OF MATERIALS – I

B. Tech. II Year I Sem **L T P C**

Pre-requisites: Engineering Mechanics **3 0 0 3**

Course Objective: The objective of the course is

1. To understand the concepts of stress, strain and strain energy
2. To calculate the shear force and bending moments for various loading conditions
3. To analyze the beams under flexural stresses
4. To analyze the beams under shear stresses
5. To calculate the deflections of beams under different loading conditions
6. To understand principal stresses and strains in structural members and various theories of failures.

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

1. Evaluate the strength and deformation of members subjected to axial load.
2. Draw the shear force and bending moment diagrams for determinate beams.
3. Analyze the bending stresses in various beam sections
4. Evaluate the shear stress distribution across various beam sections
5. Assess the slope and deflection of beams by various methods
6. Understand and evaluate the stresses on oblique plane and various theories of failures.

UNIT - I

Simple stresses and strains: Concept of stress and strain- Strain diagram - Elasticity and plasticity – Hooke's law – Elastic constants – Poisson's ratio – Bars of varying section – composite bars – Temperature stresses.

Strain energy: Resilience – Gradual, sudden, and impact loadings – simple applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the behaviour of axially loded members of different cross section.
- Analyse bars subjected to thermal stresses.
- Evaluate strain energy stored in a body subjected to external load.

UNIT - II

Shear force and bending moment: Beam - Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for determinate beams – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the various types of beams and external loads.
- Evaluate the variation of Shear Force and Bending Moment along the length of the beam.

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UNIT - III

Flexural stresses: Theory of simple bending – Section Modulus - bending stresses

Shear stresses: Formula for shear stress distribution – Shear stress distribution for different sections.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept bending stress and shear stress.
- Evaluate the variation of shear stress and bending stress distribution across the section.

UNIT - IV

Deflection of beams: Slope and deflection – Double integration method - Macaulay's method – Moment area method - Conjugate beam method

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept slope, deflection and elastic curve of beams.
- Evaluate the slope and deflection of beams by different methods.

UNIT - V

Principal stresses: Stresses on an oblique section –Analytical and graphical solutions.

Theories of failure: Introduction – Various theories of failure

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of principal stresses
- Evaluate stresses and factor of safety according to various theories of failure.

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, Laxmi Publications Pvt Limited.
3. Strength of Materials by R. Subramanian, Oxford University Press.
4. Strength of Materials by S. Ramamrutham, Dhanpat Rai Publishing Company (p) Ltd.
5. Strength of Materials by R.S.Khurmi, S.Chand and Co

REFERENCES:

1. Mechanics of Materials by R.C. Hibbeler, Prentice Hall publications.
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications.
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge University Press.
4. Strength of Materials by R.K. Bansal, Lakshmi Publications Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, Universities Press.

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2030113 - SURVEYING AND GEOMATICS

B.Tech. II Year I Sem **L T P C**

Pre-requisites: **-** **3 0 0 3**

Course Objectives: The objective of the course is

1. To know the principles and methods of surveying
2. To measure horizontal and vertical- distances and angles
3. To recording of observation accurately and Perform calculations based on the observation
4. To Identify source of errors and rectification methods
5. To apply surveying principles to determine areas and volumes and setting out curves
6. To use modern surveying equipment's for accurate results

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

1. Apply the knowledge to calculate angles, distances and levels
2. Identify data collection methods and prepare field notes for levels, Interpret survey data and compute areas and volumes
3. Understand working principles of survey instruments and apply the knowledge of trigonometric leveling
4. Understand and apply the corrective measures on measurement errors
5. Apply the knowledge on curve alignment by different methods
6. Understand & apply the principles and concepts of modern equipment and its methodologies

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.

Different methods of distance measurement, direct methods of distance measurement using chain/tape, ranging, Tape corrections.

Compass and its types, Bearings, Included angles, Local Attraction, Magnetic Declination and dip

Learning Outcomes:

At the end of the unit, students should able to

- Understand the concepts and classification of surveying, conventional symbols used for mentioning the different objects in the field, list of accessories used for surveying.
- Do the corrections if any during the measurement of distances.
- Measure the bearings in prismatic compass, converting WCB to RB and vice versa, Also to correct the bearings if any local attraction and calculate the included angle of a traverse.

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 and volumes - Determination of areas for regular and irregular boundary, Determination of volume

of earth work for level section, volume of borrow pits, capacity of reservoirs.

Learning Outcomes:

At the end of the unit, students should able to

- Understand reduced level, elevation, fore sight, inter sight, back sight, bench mark, different levels & staves and also to write field book by different methods.
- Draw the contour map using different methods; understand the characteristics and uses of contour lines.
- Calculate the quantity of earth work from contour map using different formula

UNIT - III

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

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

Learning Outcomes:

At the end of the unit, students should able to

- Understand the components of theodolite, terminologies used in theodolite, temporary adjustments, how to measure the horizontal and vertical angles using theodolite.
- Perform trigonometric leveling under the category of base is accessible and inaccessible to measure the height of the object using angular and linear measurements.
- Perform tachometric leveling to measure the height and distance of the object using angular and stadia hair measurements.

UNIT - IV

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

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

Learning Outcomes:

At the end of the unit, students should able to

- Perform traverse surveying using chain and compass or by optical means.
- Do corrections if any in the traverse measurements.
- Perform the calculation for road alignment using different methods in the field too.

UNIT - V

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages, Applications and Field Procedure, Errors in Total Station Survey, GPS- Principle and Applications.

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 stereo plotting instruments, mosaics, map substitutes.

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Learning Outcomes:

At the end of the unit, students should able to

- Know the advanced instruments used for surveying and its principle, application, errors due to various circumstances
- Handle total station, GPS for calculating distance, area
- Application and principles of photogrammetry for doing reconnaissance survey, different types, methods and mapping of photogrammetry.

TEXT BOOKS:

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi.
2. Duggal S K, “Surveying (Vol – 1 & 2)”, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3. N N Basak, “Surveying and Levelling”, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Chandra A M, “Plane Surveying and Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi.

REFERENCES:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Arora K R “Surveying (Vol 1, 2 & 3), Standard Book House, Delhi.
3. R. Subramanian, “Surveying and Levelling”, Oxford University Press, New Delhi.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030004 - PROBABILITY AND STATISTICS

(Common to CIVIL, CSE and IT branches)

B.Tech. II Year I Sem **L T P C**

Pre-requisites:- **3 1 0 4**

Course Objectives: To learn

1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
2. The basic ideas of statistics including measures of central tendency, correlation and regression.
3. The statistical methods of studying data samples.
4. The sampling theory and testing of hypothesis and making inferences.

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

1. Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
2. Apply discrete and continuous probability distributions.
3. Classify the concepts of data science and its importance.
4. Infer the statistical inferential methods based on small and large sampling tests.
5. Interpret the association of characteristics through correlation and regression tools.

UNIT - I

Probability and Random Variables

Probability: Sample Space, Events, Probability of an Event, Additive Rules, conditional probability, independent events, Product Rule and Bayes' theorem.

Random variables: Discrete and continuous random variables. Expectation, Mean and Variance of random variables. Chebyshev's inequality.

Learning Outcomes:

- Understand the concept of probability
- Explain the notion of random variable, distribution functions and expected value.
- Apply Baye's theorem to real time problems
- Analyse the mean and variance of random variables
- Evaluate the probability of event for more complex outcomes.

UNIT - II

Probability Distributions & Estimation

Probability distribution-Binomial, Poisson approximation to the binomial distribution, uniform,exponential and Normal distribution. Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.

Learning Outcomes:

- Understand the concept of Probability distribution.
- Explain the statistical parameters
- Apply Binomial and Poisson distributions for real data

- Analyse the properties of Normal distribution and its applications.
- Evaluate probabilities, theoretical frequencies.

UNIT - III

Sampling theory and Small samples

Population and sample, parameters and statistics; sampling distribution of means (⌐ known)-central limit theorem, t-distribution, sampling distribution of means (⌐ unknown)-sampling distribution of variances-chi-square and F-distributions, point estimation, maximum error of estimation, interval estimation.

Learning Outcomes:

- Understand the concept of sampling and estimation.
- Explain the concept of estimation, interval estimation and confidence intervals
- Apply distribution problems in real world.
- Analyse the types of distributions
- Evaluate the maximum error of estimation, interval estimation

UNIT - IV

Testing of Hypothesis & Stochastic Processes and Markov Chains:

Large sample test for single proportion, difference of proportions, single mean, difference of means; Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n- step transition probabilities, Markov chain, Steady state condition, Markov analysis.

Learning Outcomes:

- Understand the concept of testing of hypothesis
- Explain the single proportions and difference of proportions.
- Apply the concept of hypothesis testing for large samples.
- Analyse testing hypothesis for small samples to draw the inference.
- Evaluate single mean and difference of means for small samples.

UNIT - V

Curve Fitting For Statistical Data

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves; Correlation and regression – Rank correlation.

Learning Outcomes:

- Understand the concept of curve fitting.
- Explain the Method of least squares.
- Apply the Correlation and regression to real data
- Analyse polynomial curve – fitting, general curve fitting and interpolation
- Evaluate Rank correlation.

TEXT BOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.
2. Fundamentals of Mathematical Statistics, Khanna Publications, S C Guptas and V.K. Kapoor.

REFERENCES:

1. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
2. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

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(AUTONOMOUS)

2030202 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common for Civil & Mechanical)

B.Tech. II Year I Sem **L T P C**

Pre-requisites:- **3 0 0 3**

Course Objectives: The objective of the course is

1. To introduce the concepts of electrical circuits and its components.
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits.
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

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

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

UNIT – I

D.C. CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. CIRCUITS

Representation of sinusoidal wave forms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT – II

ELECTRICAL INSTALLATIONS

Components of LT Switch gear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT – III

ELECTRICAL MACHINES

Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

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UNIT – IV

PN JUNCTIONANDZENERDIODE:

Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

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, π- section Filters.

UNIT – V

BIPOLAR JUNCTION TRANSISTOR (BJT):

Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

FIELD EFFECT TRANSISTOR (FET):

Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCES:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9thEd, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e,1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2ndedition by Raymond A. De Carlo and Pen-Min-Lin, Oxford UniversityPress-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S.Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli,TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India,1989.

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(AUTONOMOUS)

2030502 - DATA STRUCTURES

B.Tech. II Year I Sem **L T P C**

Pre-requisites: Programming for Problem Solving **3 0 0 3**

Course Objectives: The objective of the course is

1. Exploring basic data structures such as linked list, stacks and queues.
2. Describes searching and sorting techniques.
3. Introduces trees and graphs.

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

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for searching and sorting.
4. Design programs using a variety of data structures- lists, stacks, queues, trees and graphs.

UNIT - I

Introduction to Data Structures, Linear list – singly linked list, Doubly linked list, Circular linked list - operations and its applications

UNIT-II

Stacks- Introduction, Operations, array and linked representations of stacks, stack applications (Infix to postfix conversion and postfix evaluation), Queues-Introduction, operations, array and linked representations of queues and its applications.

UNIT - III

Searching: Linear Search and Binary Search and its applications.
Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort and its applications.

UNIT-IV

Trees - Introduction, Types of trees, Binary tree, recursive and non- recursive Traversals of Binary Tree, Binary search tree- Operations and its applications.

UNIT - V

Graphs: Introduction, Types of graphs, Representation of graphs, Graph Traversal Methods, comparison between trees and graphs and its applications.

TEXT BOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson Education.

REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning. 2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, Pearson.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030171 - SURVEYING LABORATORY

B.Tech. II Year I Sem **L T P C**

Pre-requisites: Surveying and Geomatics **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To know the principles and methods of surveying using different equipments & methods
2. To determination of distance, area using chain, compass and plane table surveying
3. To Recording the observation accurately and Perform calculations based on the observation
4. To Identify of source of errors and rectification methods
5. To apply surveying principles to determine areas and volumes and setting out curves
6. To understand the concept of advanced techniques and operation of modern equipment and perform various experiments by using that.

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

1. Measure the distance, area of the field using the instruments chain, compass, plane table and plot the same.
2. Know the concepts of leveling, and perform & plot the cross & longitudinal sectioning.
3. Measurement of angles using theodolite, and calculate the distance and elevation of the given point using trigonometric leveling and tacheometric leveling.
4. Understand the concepts of EDM, and calculate the distance, area of the field
5. Perform the traverse and plot the contour map for the obtained data.
6. Locate the position of points using stake out method, perform the curve using modern equipment.

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. Leveling – 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2030272 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

(Common for Civil and Mechanical)

B.Tech. II Year I Sem **L T P C**

Pre-requisites: Basic Electrical and Electronics Engineering **0 0 2 1**

Course Objectives: The objective of the course is

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

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

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

List of experiments/demonstrations:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
   ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta- star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of

(i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.

2. PN Junction diode characteristics.
3. Zener diode characteristics and Zener as voltage Regulator.
4. Input & Output characteristics of Transistor in CB / CE configuration.
5. Full Wave Rectifier with & without filters.
6. Input and Output characteristics of FET in CS configuration.

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(AUTONOMOUS)

2030572 - DATA STRUCTURES LABORATORY

B.Tech. II Year I Sem **L T P C**

Pre-requisites: Programming for Problem Solving **0 0 2 1**

Course Objectives: The objective of the course is

1. To covers various concepts of C programming language
2. To introduces searching and sorting algorithms
3. To provides an understanding of data structures such as stacks and queues.

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

1. Ability to develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
2. Ability to Implement searching and sorting algorithms

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.: i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.: i) Creation ii) Insertion iii) Deletion
3. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion
4. Write a program that implement stack operations using i) Arrays ii) Pointers
5. Write a c program to implement infix to postfix conversion using stack.
6. Write a c program to implement postfix evaluation.
7. Write a program that implement Queue operations using i) Arrays ii) Pointers
8. Write a 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
9. Write a program that implements the following sorting methods to sort a given list of integers in ascending order i) Merge sort ii) Quick sort
10. Write a program 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
11. Write a program to implement the tree traversal methods using both recursive and non-recursive.
12. Write a program to implement the graph traversal methods.

TEXT BOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

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REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, Pearson.

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2030022 - GENDER SENSITIZATION

B.Tech. II Year I Sem **L T P C**

Pre-requisites:- **2 0 0 0**

Course Objectives: The objective of the course is

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

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

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.

UNIT – I

UNDERST AND INGGENDER

Gender: Why Should We Study It? (*Towards a World of Equals:* Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals:* Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT - II

GENDERANDBIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals:* Unit -4) Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals:* Unit -10) Two or Many? Struggles with Discrimination.

UNIT - III

GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals:* Unit -3) "My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals:* Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

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UNIT - IV

ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals:* Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". **Domestic Violence:** Speaking Out (*Towards a World of Equals:* Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals:* Unit -11) Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V

GENDER: CO – EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals:* Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXT BOOKS:

1. "*Towards a World of Equals: A Bilingual Textbook on Gender*" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCES:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

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(AUTONOMOUS)

2040114 - STRENGTH OF MATERIALS - II

B.Tech. II Year II Sem **L T P C**

Pre-requisites: Strength of Materials - I **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the concepts of torsion and deflection of springs
2. To understand the behavior of columns and struts for various loading conditions
3. To calculate the direct and bending stresses of members subjected to various loads
4. To analyze the members for stability under sliding and overturning
5. To evaluate the hoop and radial stresses for thick and thin cylinders
6. To evaluate the stresses due to unsymmetrical bending and location of shear center

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

1. Apply the torsion theory for analysis of circular shafts and springs
2. Analyze columns and struts
3. Understand the concept of direct and bending stresses.
4. Analyze the structures under the conditions of sliding, overturning
5. Analyze the stress in Thin and thick cylinders.
6. Understand the concept of stresses & shear center for symmetrical and unsymmetrical Sections

UNIT - I

Torsion of circular shafts: Theory of pure torsion – Derivation of Torsion equation - – Polar section modulus – Power transmitted by shafts – Combined bending and torsion – Design of shafts according to theories of failure

Springs: Types of springs – deflection of close and open coil helical springs under axial pull and axial couple – springs in series and parallel

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the behaviour of shafts subjected to torsion
- Design shafts for pure torsion and Combined action of bending with torsion.
- Analyze and design open and closed coil helical springs.

UNIT – II

Columns and struts: Types of columns – Crushing load – Euler's theory – Equivalent length of a column – slenderness ratio – core of a section - 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

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the types of column
- Analyze short and long columns subjected to axial load by various theories
- Analyze columns subjected to both axial load and lateral load

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UNIT – III

Direct and bending stresses: Stresses under the combined action of direct loading and bending moment – 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.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the behaviour of structures subjected to direct and bending stresses
- Evaluate the failure load for retaining walls, dams and chimneys.

UNIT – IV

Thin cylinders: Thin seamless cylindrical shells – hoop, longitudinal and volumetric stress and strains – changes in diameter and volume of thin cylinders – Thin spherical shells.

Thick cylinders: Lame's theory for thick cylinders – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyse and design thin and thick cylinders.
- Sketch the stress distribution across the section of thick cylinder

UNIT – V

Unsymmetrical bending: Centroidal principal axes of section – Moments of inertia referred to any set of rectangular axes – Principal axes - Stresses in beams subjected to unsymmetrical bending

Shear centre: Shear centre for symmetrical and unsymmetrical (channel, I, T and L) sections

Learning Outcomes:

At the end of this unit, the student will be able to

- Evaluate bending stresses in members subjected to unsymmetrical bending
- Locate shear centre for a section.

TEXT BOOKS:

1. Strength of Materials by R. S. Khurmi, S. Chand Publications
2. Mechanics of Materials by Dr. B.C Punmia, Dr.Ashok Kumar Jain and Dr.Arun KumarJain
3. Strength of Materials by R. Subramanian, Oxford University Press
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.

REFERENCES:

1. Strength of materials by S.S. Rattan, Tata McGrawhill publications
2. Strength of materials by S.S. Bhavikatti
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Strength of Materials (Part 1) by S. Timoshenko
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rdEdition, Universities Press

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(AUTONOMOUS)

2040115 - BUILDING MATERIALS, CONSTRUCTION AND PLANNING

B.Tech II Year II Sem	**L**	**T**	**P**	**C**
Prerequisites:-	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

1. To learn various construction materials for constructing a building.
2. To know the process involved to manufacture of cement, tests on cement, grades of concrete, tests on concrete, NDT, admixtures used for concrete
3. To understand different building components
4. To understand Plumbing services using different materials
5. To know the types of form work, utilisation, preparation of mortars for finishing work.
6. To learn Bye laws to construct a building

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

1. General knowledge on stones, bricks and its production and masonry. And other type of modern material for construction
2. Understand the process involved in the manufacturing of cement, their test, grades of concrete, tests on concrete, NDT, different admixtures used for concrete
3. Identify the different building components, and their materials.
4. To do the plumbing services using materials
5. To know the types of form work and where to be utilised, preparation of mortars for finishing work.
6. Able to know the bye laws to construct a building

UNIT I

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing. Stone masonry – types; Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics. Brick masonry – types – bonds.

Timber and Other modern materials: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics. Geomembranes and Geotextiles for earth reinforcement

UNIT - II

Cement, Concrete & Admixtures: Cements – Grade of cements - Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests.

Admixtures – mineral & 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

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UNIT – IV

Structural Systems: Load Bearing Structure - Framed Structure - Load transfer mechanism.
Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.
Mortars: Lime and Cement Mortars - Preparation of mortar
Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.

UNIT – V

Building Planning: Principles of Building Planning, Classification of buildings and Building by laws.

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.

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(AUTONOMOUS)

2040116 - FLUID MECHANICS

B.Tech. II Year II Sem. **L T P C**

Prerequisites:- **3 0 0 3**

Course Objectives: The objective of the course is

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

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

1. Understand the broad principles of fluid statics, kinematics and dynamics
2. Understand definitions of the basic terms used in fluid mechanics and characteristics of fluids and its flow
3. Understand classifications of fluid flow
4. Measure flow in pipes
5. Determine loss of head through pipes
6. apply the continuity, momentum and energy principles

UNIT - I

Properties of Fluid

Basic concepts: Density, Specific weight, Specific volume, Specific gravity, Kinematic and dynamic viscosity - variation of viscosity with temperature - Newton law of viscosity - vapour pressure - boiling point - surface tension and capillarity

Fluid Statics

Fluid Pressure at a point, variation of pressure in a fluid, Pascal's law, measurement of pressure - simple and differential manometers - Hydrostatic pressure and force: horizontal, vertical and inclined surfaces - Buoyancy

Learning Outcomes:

At the end of the unit, student should able to,

- Understand the properties of fluids
- Measure the pressure of fluid

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 - Stream line - path line - streak line and stream tube - stream function, velocity potential function - One, two- and three-dimensional continuity equations in Cartesian coordinates.

Fluid Dynamics

Euler's and Bernoulli's equation - Impulse-momentum equation and its applications – Bernoulli's equation to real fluid flows.

Learning Outcomes:

At the end of the unit, student should able to,

- Understand the concepts of fluid kinematics
- Understand the concepts of fluid dynamics

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 - Velocity of approach - Broad crested weir.

Learning Outcomes:

At the end of the unit, student should able to,

- Measure the flow in pipes through venture and orifice meter
- Measure the flow in pipes through notches and weir

UNIT - IV

Flow through Pipes

Reynolds experiment - Loss of head through pipes – Darcy-Weisbach equation - minor losses - total energy line - hydraulic grade line - pipes in series - equivalent pipes - pipes in parallel – syphon - power transmission through pipes - water hammer in pipes and control measures.

Learning Outcomes:

At the end of the unit, student should able to,

- Able to measure the minor and major losses in pipes
- Analyse the pipe networks using different methods

UNIT - V

Boundary Layer Concepts

Boundary layer: Definition, laminar and turbulent boundary layers - boundary layer thickness - displacement thickness - momentum thickness and energy thickness - Laminar sub-layer, smooth and rough boundaries - Boundary layer separation and Control - Definition of Drag and Lift and types drag - magnus effect.

Learning Outcomes:

At the end of the unit, student should able to,

- Understand the laminar and turbulent flow
- Understand the concepts of boundary layer

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.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.

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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 Chakraborthy, 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.

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2040117 - STRUCTURAL ANALYSIS - I

B.Tech. II Year II Sem **L T P C**

Pre-requisites: Strength of Materials I & II **3 0 0 3**

Course Objectives: The objective of the course is

1. To differentiate the statically determinate and indeterminate structures, analyse the propped cantilever and fixed beams
2. To understand the energy methods used to derive the equations to solve engineering problems
3. To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
4. To analyse the statically indeterminate members such as continuous beams and for various types of loading by slope deflection, moment distribution method and theorem of three moments method.
5. To analyse the pin jointed plane frames under different loading positions.
6. To evaluate the Influence on a beam for different static & moving loading positions

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

1. Understand determinate and indeterminate structure
2. Analyse the statically indeterminate beams and frames
3. Evaluate the normal thrust, radial shear, bending moment of three hinged arch.
4. Analyse the beams and frames using slope and deflection, moment distribution and theorem of three moments method
5. Analyse the pin jointed plane frames
6. Evaluate the structure under moving loads and draw the SFD

UNIT - I

PROPPED CANTILEVER AND FIXED BEAMS

Static and kinematic indeterminacies for beams - Analysis of Propped cantilever and fixed beams subjected to different types of loads - Deflection of Propped cantilever and fixed beams - effect of sinking of support.

Learning Outcomes:

At the end of the unit, students should able to

- Understand the difference between static and kinematic indeterminacy, slope and deflection for various support conditions corresponding to different types of loads.
- Analyse the propped cantilever beam for different loading condition and draw the SFD and BMD. Also to find the maximum deflection of beam.
- Analyse the fixed beam for different loading condition and draw the SFD and BMD. Also to find the maximum deflection of beam.

UNIT - II

ENERGY THEOREMS AND THREE HINGED ARCHES

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 and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

Learning Outcomes:

At the end of the unit, students should able to

- Know the different types of arches, determinate and indeterminate arches, cables and its behaviour for different loading condition and can able to draw the BMD.
- Perform the calculation to analyse the three hinged arches for various loading condition and find the maximum bending moment, radial shear and horizontal thrust.

UNIT - III

SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD

Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

Moment Distribution Method and its application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

Learning Outcomes:

At the end of the unit, students should able to

- Understand the concepts behind the analysis of beam using slope deflection and moment distribution method.
- Analyse the continuous beam for different loading condition and draw the SFD and BMD using slope deflection method.
- Analyse the continuous beam for different loading condition and draw the SFD and BMD using moment distribution method.

UNIT - IV

THEOREM OF THREE MOMENTS AND ANALYSIS OF TRUSSES

Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

Types of trusses - Perfect, Imperfect and Redundant pin jointed plane frames - Method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

Learning Outcomes:

At the end of the unit, students should able to

- Know the theorem of three moments to solve continuous beams and know the types of trusses and its behaviour for different loading position.
- Analyse the continuous beam and draw the SFD and BMD for the continuous beam for different loading, end conditions.
- Analyse the trusses using the method of joints, section and tension coefficient for different loading positions.

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.

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.

Learning Outcomes:

At the end of the unit, students should able to

- Know the concepts and application of influence lines and its different classification.
- Perform the calculation for moving loads using influence lines and draw the SFD and BMD
- Analyse the beam for different conditions of moving loads.

TEXT BOOKS:

1. Basic Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
2. Indeterminate Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
3. Analysis of Structures, Vol & II, Vazirani.V.N and Ratwani, M.M, Khanna Publishers, 2015.
4. Structural Analysis Vol I & II by G.S.Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt. Ltd. 2008
5. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.
6. R. Vaidyanathan & P. Perumal, Structural Analysis Vol I & II, (Fourth Edition), Laxmi Publications, New Delhi, 2016.

REFERENCES:

1. William Weaver, J and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Delhi,1995
2. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
3. Reddy.C.S, “Basic Structural Analysis”,Tata McGraw Hill Publishing Company,2005.
4. Rajasekaran. S, & G. Sankarasubramanian., “Computational Structural Mechanics”, PHI Learning Pvt. Ltd, 2015
5. Negi L.S.and Jangid R.S.,Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2004.
6. Structural analysis T. S Thandavamoorthy, Oxford university Press, 2011

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(AUTONOMOUS)

2040118 - ENGINEERING GEOLOGY

B.Tech. II Year II Sem **L T P C**

Prerequisites:- **2 0 0 2**

Course Objective: The objective of the course is

1. To understand the role of Geological concepts in Civil Engineering.
2. To understand weathering process and mass movement rocks
3. To evaluate different types of minerals and rock compositions.
4. To understand different geological structures and its suitability for groundwater and building construction
5. To evaluate subsurface information through geophysical investigations
6. To apply geological principles in selecting sites for tunnels, dams and reservoirs

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

1. Understand the role of Geological concepts in Civil Engineering.
2. Understand weathering process and mass movement rocks
3. Evaluate different types of minerals and rock compositions.
4. Understand different geological structures and its suitability for groundwater and building construction
5. Evaluate subsurface information through geophysical investigations
6. Apply geological principles in selecting sites for tunnels, dams and reservoirs

UNIT - I

Introduction: Importance of geology from Civil Engineering point of view, Case histories of failure of some Civil Engineering constructions, Importance of Physical geology, Petrology and Structural geology.

Weathering of Rocks: Its effect over the properties of rocks importance of weathering.

Learning Outcomes:

At the end of this unit, the students will able to

- Understand the importance of various geological aspects in the field of Civil Engineering
- Acquire the knowledge of weathering on various types of Rocks

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.

Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills.

Learning Outcomes:

At the end of this unit, the students will able to

- Analyze the various minerals by using the physical identification
- Acquire the knowledge of various types of Rocks and their utilization in constructions

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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.

Ground water: Ground water, Water table, common types of ground water, springs, cone of depression, zone of saturation, cone of depression, ground water exploration.

Learning Outcomes:

At the end of this unit, the students will able to

- Analyze the secondary structures present in the rocks
- Understand the formation and various stages of groundwater

UNIT – IV

Earth Quakes: Causes and effects, shield areas and seismic belts. Seismic waves. Landslides, their causes and effect;

Importance of Geophysical Studies: Principles of geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radio metric methods and geothermal method.

Learning Outcomes:

At the end of this unit, the students will able to

- Analyze the effects and causes of earthquakes and landslides in selecting the site for construction
- Study the various sub structures present below the surface without effecting the surface features by using geophysical investigations.

UNIT – V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and Geological Considerations in the selection of a dam site. Geological factors influencing water Tightness and life of reservoirs. Tunnels - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Lithological, structural and ground water).

Learning Outcomes:

At the end of this unit, the students will able to

- Apply the knowledge in selecting the location of site for the dams and reservoirs constructions.
- Analyze the role of groundwater, lithology and secondary structures in tunneling

TEXT BOOKS:

1. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd. 2005
2. Engineering Methods by D. Venkat Reddy; Vikas Publishers 2015.
3. Engineering Geology by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd 2014
4. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S publications
5. Engineering Geology by Vasudev Kanithi, University Press.

REFERENCES:

1. Fundamental of Engineering by F.G. Bell, B.S. Publications, 2005.
2. Principles of Engineering Geology & Geotechnics by Krynine & Judd, CBS Publishers
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers by P.C. Varghese , PHI

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2040505 – PYTHON

B.Tech. II Year II Sem. **L T P C**

Prerequisites:- **2 0 0 2**

Course Objectives: The objective of the course is

1. To handle Strings and Files in Python.
2. To understand Lists, Dictionaries and Regular expressions in Python.
3. To understand FILES, Multi thread programming in Python.

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

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.

UNIT - I

Python Introduction, History & Installing of Python, Python basics, Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions.

Control structures

UNIT - II

Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types.
Iterators, List comprehensions, Generator Expressions

UNIT - III

FILES: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

UNIT - IV

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module, Modules and Files, Namespaces, Importing Modules, Importing Module Attributes

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT - V

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

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TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCES:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

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(AUTONOMOUS)

2040172 - STRENGTH OF MATERIALS LABORATORY

B.Tech. II Year II Sem. **L T P C**

Pre-requisites: Strength of Materials - I **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To make measurements of different strains, stress and elastic properties of materials used in Civil Engineering.
2. To provide physical observations to complement concepts learnt
3. To introduce experimental procedures and common measurement instruments, equipment, devices.
4. To exposure to a variety of established material testing procedures and techniques
5. To different methods of evaluation and inferences drawn from observations

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

1. Evaluate properties of steel, Brick and concrete
2. Evaluate deflection, bending strength and young's modulus of cantilever and simply supported beam.
3. Determine modulus of rigidity of materials
4. Determine hardness value of material
5. Determine impact and shear strength of material
6. Determine stiffness and modulus of elasticity of material

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 or bricks
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.

REFERENCES:

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Strength of Materials by R.K. Bansal, Lakshmi Publications Pvt. Ltd.

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2040173 – COMPUTER AIDED CIVIL ENGINEERING DRAWING LABORATORY

B.Tech. II Year II Sem	**L**	**T**	**P**	**C**
Pre-requisites: Engineering Drawing Practice	**0**	**0**	**2**	**1**

Course Objectives: The objective of the course is

1. To teach the student usage of Auto cad, basic drawing fundamentals in various civil engineering applications, especially in building drawing.
2. To teach students the basic commands and tools necessary for professional 2D drawing, 3D drawing and drafting using AutoCAD
3. To sketch and take field dimensions.
4. To take data and transform it into graphic drawings.
5. To learn basic engineering drawing formats

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

1. Understand CAD software and basic functions
2. Evaluate plans of Single storied building & multi-storeyed buildings
3. Develop different sections at different elevations
4. Detailing of building components like doors, windows roof trusses
5. Develop section and elevation for single and multi-storeyed buildings using CAD software.
6. Understand development concepts in detailing

List of Experiments

1. Introduction to computer aided drafting & coordinate system.
2. Exercise on Draw & Modify tool bars.
3. Exercise on Layer, Dimension, Texting & Block etc.
4. Drawing a plan of Building and dimensioning using layers.
5. Single storied buildings b) Multi storied buildings.
6. Developing sections and elevations for given
7. a) Single storied buildings b) Multi storied buildings.
8. Drawing of building components like walls, lintels, Doors, and Windows.
9. Introduction to 3 – D view.
10. Exercise on 3 – D.
11. Developing a 3-D plan from a given 2-D plan.
12. Developing section and elevation of a residential building.

TEXT BOOKS:

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

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2040575 - PYTHON LABORATORY

B.Tech. II Year II Sem **L T P C**

Pre-requisites:- **0 0 2 1**

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 -Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
c) Write a program using a for loop that loops over a sequence. What is sequence?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow -Continued

a) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 6 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius
If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 7 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 8 - Functions - Problem Solving

a) Write a function cumulative_ product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 9 - Multi-D Lists

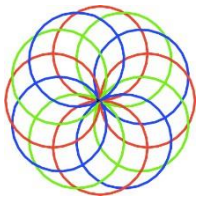
a) Write a program that defines a matrix and prints

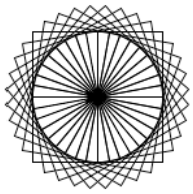
b) Write a program to perform addition of two square matrices

c) Write a program to perform multiplication of two square matrices

Exercise - 10 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk
2. Write a program to implement the following figures using turtle





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2050119 - HYDRAULICS AND HYDRAULIC MACHINERY

B. Tech. III Year I Sem **L T P C**

Prerequisites: Fluid Mechanics **3 0 0 3**

Course Objectives: The objective of the course is

1. To define the fundamental principles of water conveyance in open channels.
2. To discuss and analyze the open channels in uniform and Non-uniform flow conditions.
3. To study the characteristics of hydroelectric power plant and its components.
4. To analyze and design of hydraulic machinery and its modeling

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

1. Apply knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
2. Understand and solve problems in uniform, gradually and rapidly varied flows in open channel in steady state conditions.
3. Apply dimensional analysis and differentiate the model, prototype and similitude conditions for practical problems.
4. Assess different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages
5. Understand classification of turbine and determine the efficiency of different turbines
6. Understand classification of pumps and identify its efficiency

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.

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the uniform flow, turbulent flow in open channel and how to measure it
- Measure energy, critical depth

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).

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Learning Outcomes:

At the end of the unit, students should able to,

- Understand the turbulent flow in open channel and how to measure it
- How the flow changed in to rapidly varied flow, and its character

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

Learning Outcomes:

At the end of the unit, students should able to,

- Do dimensional analysis
- Measure the work done and efficiency of vanes

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.

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the heads, efficiency of turbines
- Classification and working principles 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.

Learning Outcomes:

At the end of the unit, students should able to,

- Understand the concepts and working principles of pumps.
- Classification of hydropower plants and its operations

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
3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai &Co

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REFERENCES:

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

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(AUTONOMOUS)

2050120 - STRUCTURAL ANALYSIS - II

B. Tech. III Year I Sem **L T P C**

Pre-requisites: Structural Analysis - I **3 1 0 4**

Course Objectives: The objective of the course is

1. To understand the concepts and principles of analysis, calculate and draw the variation of shear force and bending moment of the structure
2. To analyse the indeterminate arches.
3. To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses.
4. To apply the concepts of matrix analysis for different beams, frames and truss
5. To learn and apply the knowledge of Plastic analysis on beams and rigid frames.

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

1. Analyse the indeterminate frames with and without sway by slope deflection and moment distribution method.
2. Analyse the different types of indeterminate arches.
3. Understand the concepts of Muller Breslau principle and draw the influence lines for statically indeterminate beams.
4. Understand and apply the knowledge of flexibility method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
5. Understand and apply the knowledge of stiffness method on different types of beams and frames and draw the shear force diagram and bending moment diagram for various loading condition
6. Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames

UNIT - I

SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD

Slope Deflection Method: Analysis of Single Bay – single storey Portal Frames by Slope Deflection Method Including Side Sway. Shear force and bending moment diagrams. Elastic curve, Analysis of inclined frames

Moment Distribution Method - Analysis of Single Bay Single Storey Portal Frames including side Sway. Analysis of inclined frames.

Learning Outcomes:

At the end of the unit, students should able to

- Understand the concepts behind the analysis of rigid using slope deflection and moment distribution method.
- Analyse the indeterminate frame for different loading condition and draw the SFD and BMD using slope deflection method.
- Analyse the indeterminate frame for different loading condition and draw the SFD and BMD using moment distribution method.

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UNIT - II

ARCHES AND INFLUENCE LINES FOR INDETERMINATE BEAMS

Analysis of two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

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.

Learning Outcomes:

At the end of the unit, students should able to

- Perform the calculation to analyse the two hinged and fixed arches for various loading conditions and find the maximum bending moment, radial shear and horizontal thrust.
- Know the concepts on influence lines and its application
- Understand the Muller Breslau's principle
- Analyse the beams with the redundancy is one for different end conditions

UNIT - III

FLEXIBILITY MATRIX METHOD

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy - Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

Learning Outcomes:

At the end of the unit, students should able to

- Understand the redundancy of the beams, concepts and applications of flexibility matrix method.
- Perform the analysis on the continuous beam using flexibility matrix method
- Analyse the pin jointed and rigid jointed frames using flexibility matrix method

UNIT - IV

STIFFNESS MATRIX METHOD

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two)

Learning Outcomes:

At the end of the unit, students should able to

- Understand the redundancy of the beams, concepts, equilibrium conditions and applications of stiffness matrix method.
- Perform the analysis on the continuous beam using stiffness matrix method
- Analyse the pin jointed and rigid jointed frames using stiffness matrix method

UNIT - V

CABLES, SUSPENSION BRIDGES AND PLASTIC ANALYSIS

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.

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Plastic theory - Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.

Learning Outcomes:

At the end of the unit, students should able to

- Perform the calculation to analyse the suspension cables and bridges to find out the BM and thrust.
- Know the concepts of elastic and plastic analysis and where the plastic analysis has used.
- Understand the terms of collapse load, shape factor, plastic hinges, upper and lower bound theorem, etc.
- Analyse the structure using plastic theory.

TEXT BOOKS:

1. Basic Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
2. Indeterminate Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd.
3. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.
4. Vazirani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.
5. R. Vaidyanathan & P. Perumal, Structural Analysis Vol I & II, (Fourth Edition), Laxmi Publications, New Delhi, 2016.
6. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.

REFERENCES:

1. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
2. Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004
3. Reddy.C.S, “Basic Structural Analysis”,Tata McGraw Hill Publishing Company,2005.
4. Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd.,2011.
5. Prakash Rao D.S., Structural Analysis, Universities Press,1996.

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2050121 – STRUCTURAL ENGINEERING – I (RCC)

B. Tech. III Year I Sem **L T P C**

Pre-requisites: Building Materials, Strength of Materials I & II **3 1 0 4**

Course Objectives: The objective of the course is

1. To discuss the fundamentals of reinforced concrete structural properties and behaviors.
2. To state the optimum design criteria and procedures.
3. To explain the basic principles and design methods of reinforced concrete members.
4. To clarify code requirements and specifications and explain the background of code.
5. To outline professional and contemporary issues in the design and fabrication of reinforced concrete members.
6. To sketch reinforcement details of reinforced concrete members.

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

1. Describe the general mechanical behavior of reinforced concrete.
2. Understand basic principles and design methods of reinforced concrete members
3. Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members.
4. Analyze and design reinforced concrete flexural and compression members.
5. Examine and design for deflection and crack control of reinforced concrete members.
6. Design simple connections of reinforced concrete members.

UNIT - I

INTRODUCTION: CONCEPT OF REINFORCED CEMENT CONCRETE

Introduction IS: 456-2000, Materials & other properties, compressive strength, tensile strength, creep, shrinkage, Elastic Deformation, Suitability of steel in concrete, stress-strain relation of steel, Methods of design, Design of slab and beam by Working stress method.

Learning Outcomes:

At the end of the unit, student should able to,

- To get familiar with IS:456-2000 code
- Understand the properties of concrete and steel
- Understand the concept of RCC
- To know the methods of RCC design

UNIT - II

DESIGN OF BEAMS

Loads and Load Combinations, safety factors- Limit State method, Limit State of Collapse **Singly Reinforced Concrete Beams** - Stress Block Parameters, limiting depth of neutral axis, Ultimate moment of resistance. Under reinforced, Balanced & Over reinforced sections.

Doubly Reinforced Concrete Beams: Doubly reinforced concrete beam and its necessity, Design of a doubly reinforced concrete beam, Design of L and T-beams, Economical depth

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Learning Outcomes:
At the end of the unit, student should able to,

- Understand and implement the load calculations for different conditions.
- Analyse and Design RCC beams for different loading conditions.
- Calculate the bearing capacity of slab beam combo in flanged beams.

UNIT - III
BOND, SHEAR AND TORSION
Concept of bond, Permissible bond stresses for plain and deformed bars as per BIS code of practice, minimum length, and standard hook
Design of shear using IS:456-2000, Design of stirrups
Design of shear using IS:456-2000, Design of Torsional Reinforcement

Learning Outcomes:
At the end of the unit, student should able to,

- Analyse the importance and bond between concrete and steel in RCC
- Implement the codal provisions for bond, shear and torsion in design
- Design beams for all loading conditions

UNIT - IV
DESIGN OF SLABS
Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using IS Method, Limit state design for serviceability for deflection, cracking and codal provisions

Learning Outcomes:
At the end of the unit, student should able to,

- Understand the concept of slab
- To be able to distinguish between different varieties of slab and loading conditions
- Introduce to limit state of serviceability

UNIT - V
DESIGN OF COLUMNS AND FOOTINGS
Short Column - Columns with axial loads, uni-axial and bi-axial bending – Use of design charts- Long column – Design of long columns - IS Code provisions

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

Learning Outcomes:
At the end of the unit, student should able to

- Design of Columns
- Understand the codal provisions and load combinations on members
- Implement RCC concepts to analyse and design foundations

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TEXT BOOKS:

1. Dr. B.C. Punmia and A.K.Jain, “Limit State Design of Reinforced Concrete”, Lakshmi Publication, 2007.
2. Dr. H.J. Shah, “Reinforced Concrete (Elementary Reinforced Concrete), Charotar Publishing House Pvt. Ltd., 11th Edition.

REFERENCES:

1. S. Unnikrishna Pillai and Devdas Menon, “Reinforced Concrete Design”, McGraw HillEducation, 3rd Edition.
2. M.L. Gambhir, “Fundamentals of Reinforced Concrete Design” PHI Learning Edition, 2012.
3. Arthus H. Nilson, David Darwin and Chorles W. Dolar, “Design of Concrete Structures”,Tata McGraw Hill, 2011.
4. S.S.Bhavikatti, “Design of RCC Structural Elements” :Vol-1, New Age Publishers, 2008.

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(AUTONOMOUS)

2050141 - CONCRETE TECHNOLOGY
(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Building Materials, Construction and Planning **3 0 0 3**

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.

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

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

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 –

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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 – Posisson'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.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

REFERENCES:

1. Properties of Concrete by A. M. Neville, 5th edition, Pearson Publishers, 2012.
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers
3. IS:10262-2019, Concrete Mix Proportioning — Guidelines (Second Revision), BIS, New Delhi
4. IS:516-2021, Hardened concrete – Method of Test, Part-1 Testing of strength of concrete, BIS, New Delhi.
5. IS:516-2018, Hardened concrete – Method of Test, Part-2 Properties of Hardened Concrete other than Strength, BIS, New Delhi
6. IS:516-2018, Hardened concrete – Method of Test, Part-4 Sampling, Preparing and Testing of concrete cores, BIS, New Delhi
7. IS:516-2018, Hardened concrete – Method of Test, Part-5 Non Destructive Testing of concrete, BIS, New Delhi
8. IS:516-2018, Hardened concrete – Method of Test, Part-8 Determination of modulus of elasticity, BIS, New Delhi

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2050142 – ELEMENTS OF EARTHQUAKE ENGINEERING

(Professional Elective – I)

B. Tech. III Year I Sem	**L**	**T**	**P**	**C**
Pre-Requisites: Structural Engineering-I (RCC)	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

1. To understand Engineering Seismology
2. To explain and discuss single degree of freedom systems subjected to free and forced vibrations
3. To acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
4. To understand importance of ductile detailing of RC structures

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

1. Explain and derive fundamental equations in structural dynamics
2. Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes
3. Evaluate base shear using IS methods
4. Analyze masonry structures subjected to earthquake forces
5. Design and Detail the reinforcement for earthquake forces
6. Know about ductility design of concrete 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 seismogram - Seismoscope, Seismograph, - strong ground motions- Seismic zones of India. Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

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 deign of RC members- Structural models for frame buildings - Seismic methods of analysis- IS code based methods for seismic design - Vertical irregularities - Plan configuration problems- Lateral load resisting systems- Determination of

design lateral forces as per IS 1893 (Part-1):2016- 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 nonstructures- Effects of non-structural elements on structural system- Analysis of non-structural elements Prevention of non-structural damage 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 13920-2016 - Behaviour of beams, columns and joints in RC buildings during earthquakes.

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 Buidling 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. Masory and Timber structures including earthquake Resistant Design – Anand S.Arya, Nem chand & Bros.
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy
6. BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:2000

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2050143 - PREFABRICATED STRUCTURES

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Structural Engineering (I&II) **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

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

1. Know the principle & procedure of prefabrication
2. Design the structural prefabricated elements.
3. Familiarize with joining techniques used for prefabrication
4. Know the manufacturing technology adopted
5. Identify the different techniques for hoisting
6. Know abnormal loads which are hazardous to the prefabricated structures.

UNIT - I

GENERAL PRINCIPLES OF FABRICATION

Types of prefabrication – site and plant prefabrication -Economy of prefabrication – Modular coordination – Standardization- Disuniting of Prefabricates, production, transportation, erection, stages of loading – Applications of Prefabrication.

UNIT - II

PREFABRICATED COMPONENTS

Behavior of structural components - Roof and floor panels- wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing- Columns – Shear walls

UNIT - III

MANUFACTURING TECHNOLOGY

Manufacturing methods – Stationary and mobile production- Storage of precast elements - Dimensional tolerances

UNIT - IV

HOISTING TECHNOLOGY

Equipments for hoisting and erection – Techniques for erection of different types of members like Slabs, Beams, Wall panels and Columns – Advanced techniques - Vacuum lifting pads.

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UNIT - V

DESIGN FOR ABNORMAL LOADS

Progressive collapse-Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., Importance of avoidance of progressive collapse.

TEXT BOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES:

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

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2050144 - INTRODUCTION TO OFFSHORE STRUCTURES

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites:- **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the importance and functions of Offshore structure
2. To know the materials used in marine environment
3. To Know the Installation Methods of Offshore Structures

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

1. understand the functions of Offshore Structures
2. know the materials used for marine structures
3. know the different loads on Offshore Structures
4. understand the basic design of Offshore structures
5. know mooring system, industry standards and rules
6. understand installation method of Offshore Structures

UNIT - I

Introduction to Offshore Structures - Functions of Offshore Structures - Offshore Structure Configurations - Bottom Supported Fixed Structures - Compliant Structures - Floating Structures.

UNIT - II

Materials for Marine Environment - Structural Steel Topside Materials - Advanced Composite materials - Corrosion Control Material - Reliability and Monitoring - Fracture Control.

UNIT - III

Loads on offshore Structures - Gravity Loads, Hydrostatic Loads - Resistance Loads, Current loads on Structures - Current Drag and Lift Force, Steady, Dynamic and Wind Loads on Structures - Wave Loads on Structures - Varying Wind Load - Impulse loads - Introduction to design.

UNIT - IV

Mooring - General layout Areas and Equipment - Helideck Platform Crane Mooring systems : Mooring Hardware components

UNIT - V

Installation Methods of Offshore Structures - Platform Installation Methods: Fixed Platform Substructures - Floating Structures Foundations Subsea Templates.

TEXT BOOKS:

1. Reddy, D.V & Arockiasamy, M., Offshore Structures Vol.1 & 2, Kreiger Publ. Co.1991.
2. Graff, W.J., Introduction to Offshore Structures, Gulf Publ.Co.1981.

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REFERENCES:

1. Morgan, N., Marine Technology, Butter worths, 1990.
2. Dawson, T.H., Offshore Structural Engineering, Prentice Hall, 1983.
3. B.C Gerwick, Jr. Construction of Marine and Offshore Structures, CRC Press, Florida, 2000.

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2050010 - BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B. Tech. III Year I Sem **L T P C**

Prerequisites:- **3 0 0 3**

Course Objectives: To learn the basic business types, impact of the economy on business and firms specifically. To analyze the business from the financial perspective.

Course Outcomes: After completion of syllabus the students will understand the

1. Various forms of business and the impact of economic variables on the business.
2. The demand, supply, production, cost, market structure, pricing aspects are learnt.
3. The students can study the firm's financial position by analyzing the financial statements of a company.

UNIT - I Introduction to Business and Economics

Introduction to Business and Economics: Business: Structure of Business Firm, Types of Business Entities, Limited Liability Companies, Economics: Significance of Economics, Micro and Macro Economic Concepts, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist.

Learning Outcomes:

By going through this unit, technical students can have the scope of learning about different economic concepts, business cycles and nature of business economists.

UNIT - II Demand Analysis: Elasticity of Demand

Demand Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

Learning Outcomes:

By going through this content, student can learn about different types of demand, its determinants and elasticity of demand concepts thoroughly and how to forecast the demand of different things by using different agreed upon techniques.

UNIT - III Production, Cost, Market Structures & Pricing

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

Learning Outcomes :

By reading this chapter, student can learn different pricing techniques in different market structures and different cost functions that determine products life cycle in a long term basis.

UNIT - IV Capital Budgeting

Capital Budgeting: Importance of Capital Budgeting, methods of Capital Budgeting: Traditional Methods: Pay Back Period, Accounting Rate of Return, and Discounting Methods: Net Present Value, Profitability Index, Internal Rate of Return; Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity

Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Learning Outcomes:

By going thoroughly through this unit, students can have the scope of learning about different techniques by which a project can be evaluated from financials perspective and utilization of ratios at different times to assess the business position for decision making.

UNIT - V Financial Accounting

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

Learning Outcomes:

Students can learn the methodology of accounting cycle which is valid from stakeholders' point of view and they can learn the comparison of the different firms at a time, so that they can take appropriate decision of either investment or to become an entrepreneur.

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. I.M. Pandey, Financial Management, 11th Edition, Kindle Edition, 2015.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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2050174 – FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY

B. Tech. III Year I Sem **L T P C**

Prerequisites: Fluid Mechanics **0 0 3 1.5**

Course Objectives: The objective of the course is

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

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

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

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 Keplan Turbine
13. Performance Characteristics of a single stage / multi stage Centrifugal Pump

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2050175 - CONCRETE TECHNOLOGY LABORATORY

B. Tech. III Year I Sem **L T P C**

Prerequisites: Building Materials, Construction and Planning **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.
4. To understand the different properties of materials and different types of procedures adopted for mix design
5. To apply the learning for research work.
6. To summarize the concept of workability and testing of hardened concrete.

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

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

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.

II. TEST ON AGGREGATE

1. Sieve Analysis and gradation zone
2. Bulking of sand.
3. Bulk and compact densities of fine and coarse aggregates

III. TEST ON FRESH CONCRETE

1. Slump test
2. Compaction factor test
3. Vee-bee Test
4. Flow table Test.

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Self-Compacting Concrete

1. Slump cone
2. V funnel
3. L Box

IV. TEST ON HARDENED CONCRETE

1. Compression test on cubes & cylinders
2. Flexure test
3. Splitting Tensile Test
4. Modulus of Elasticity

V. NON DESTRUCTIVE TEST OF CONCRETE

1. Rebound hammer
2. Ultrasound pulse Velocity (UPV).

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty – S. Chand & Co.
2. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons.

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2050176 - ENGINEERING GEOLOGY LABORATORY

B. Tech. III Year I Sem **L T P C**

Pre-requisites: Engineering Geology **0 0 2 1**

Course Objectives: The objective of the course is to give

1. Practical knowledge about physical properties of minerals,
2. Practical knowledge about physical properties of rocks,
3. Drawing of geological maps,
4. Showing faults,
5. Knowledge on uniformities

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

1. Understand the method and ways of investigations required for Civil Engineering projects
2. Understand different classification of rocks
3. Identify the various rocks, minerals depending on geological classifications
4. Know the physical properties of minerals
5. Know the topographical features from geological maps.
6. Understand folds, faults and unconformities

List of Experiments

1. Study of minerals under theory.
2. Study of physical properties of minerals.
3. Study of Rocks referred under theory
4. Study of Rocks properties
5. Study of topographical features from Geological maps. Identification of symbols in maps.
6. Simple structural Geology Problems (Folds, Faults & Unconformities)

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 rock

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2050177 – INTRODUCTION TO ARTIFICIAL INTELLIGENCE

B. Tech. III Year I Sem **L T P C**

Pre-requisites:- **0 2 0 0**

List of Experiments:

Module 1 Overview of artificial intelligence concepts/algorithm in construction
Module 2 Review of various Algorithms
Module 3 Application of algorithms in design of structural elements

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2060122 – HYDROLOGY & WATER RESOURCES ENGINEERING

B. Tech. III Year II Sem **L T P C**

Pre-requisites: Fluid Mechanics & Hydraulics and Hydraulic Machinery **3 0 0 3**

Course objectives: The objective of the course is

1. To study occurrence movement and distribution of water
2. To know the estimation of hydrologic parameters like evaporation, infiltration
3. To understand the concept of unit hydrograph
4. To know the basic principles and movement of groundwater
5. To impart the knowledge of various irrigation techniques , requirements of the crops,
6. To learn about design of irrigation canals which are associated with sediment problem

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

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

1. Understand various components of hydrologic cycle
2. Evaluate various runoff measurements technique
3. Apply the concepts of movement of groundwater beneath the earth
4. Apply the knowledge of various irrigation techniques
5. Analyse the requirements of the crops
6. Use components of designing unlined and lined irrigation canals.

UNIT - I

HYDROLOGY

Hydrologic cycle, types and forms of precipitation, rainfall measurement, computation of average rainfall over a basin, Adjustment of record, Rainfall Double Mass Curve. Evaporation, factors affecting evaporation, measurement of evaporation- Evapotranspiration estimation Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understanding of hydrology and its application in varied areas of civil engineering
- Illustrate the methods measuring rainfall
- Interpret the rainfall over a drainage basin
- Explain the need of measuring the abstractions
- Assess the losses from rainfall

UNIT - II

HYDROGRAPHS

Distribution of Runoff - Factors affecting Runoff - Rational Formulae.

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the runoff cycle
- Interpret the discharge over a basin using hydrographs
- Explain the concept of s-hydrograph
- Assess the runoff from ungauged basin using synthetic unit hydrograph
- Apply the unit hydrograph theory in flood estimation

UNIT - III

GROUNDWATER

Groundwater Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivitty and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of well's, Well Construction - Well Development.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the movement of groundwater
- Explain the groundwater properties that cause flow
- Assess the groundwater properties
- Interpret the flow of water through different subsurface layers
- Understand the well construction and development techniques

UNIT - IV

IRRIGATION

Necessity and Importance of Irrigation, ill effects of irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility - Crop Roation, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, Duty and delta, factors affecting duty- Depth and frequency of Irrigation, irrigation requirements and efficiencies-Water Logging.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need of irrigation in India
- Illustrate different methods of irrigation
- Establish the relation between soil-water-plant
- Assess the duty and delta for crop
- Design the required discharge for crop

UNIT - V CANALS

Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standard for a canal design, canal lining.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify the irrigation canals
- Understand the importance of silt in canal design
- Design the irrigation canals using silt concept
- Illustrate the lining materials
- Apply the silt theories in canal design

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TEXT BOOKS:

1. Engineering hydrology by Jayram Reddy, Laxmi publications pvt. Ltd., New Delhi.
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi.

REFERENCES:

1. Elementary hydrology by V. P. Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House.
3. Water Resources Engineering - I by Dr. G. Venkata Ramana, Acadamic Publishing Company.
4. Irrigation Water Management by D. K. Manjundar, Printice Hall of India.
5. Irrigation and Hydraulic structures by S. K. Grag.
6. Applied hydrology by Ven Te Chow, David R. Maidment larry W. Mays Tata Mc. Graw Hill.
7. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI.

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2060123 – TRANSPORTATION ENGINEERING

B. Tech. III Year II Sem **L T P C**

Pre-requisites:- **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the highway planning process and carry out surveys involved in planning and highway alignment.
2. To remember various geometric elements involved in design of highways and expressway.
3. To understand the various traffic studies and to implement traffic regulation and control measures
4. To understand the engineering properties of pavement materials used in highway construction.

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

1. Understand highway planning, development and geometric design
2. Determine the traffic volume and design of traffic signals
3. Design highway geometrics.
4. Design intersections and prepare traffic management plans
5. characterization of Highway material and maintenance
6. develop Intelligent Transport System Planning and evaluation

UNIT – I

HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRIC DESIGN

Highway Development in India; Necessity for Highway Planning; Different Road Development Plans; Classification of Roads; Road Network Patterns; Highway Alignment- Factors affecting Alignment; Engineering Surveys; Drawings and Reports; Highway Project.

Importance of Geometric Design; Design controls and Criteria; Highway Cross Section Elements; Sight Distance Elements; Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Design of Horizontal Alignment; Design of Super elevation and Extra widening; Design of Transition Curves- Design of Vertical Alignment; Gradients; Vertical curves.

Learning Outcomes:

- The road development plans that initiated for the development of transportation conveniences.
- The design concepts of horizontal alignments.
- The design concepts of vertical alignments.
- Various factors affecting the road network pattern design concepts.

UNIT – II

TRAFFIC ENGINEERING & REGULATIONS

Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Origin & Destination studies, Parking Studies – On street & Off street Parking - Road Accidents - Causes and Preventive Measures - Accident Data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals – Webster Method.

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Learning Outcomes:

- The concept of traffic parameters and characteristics
- The concept of parking studies and accident studies
- Design concepts of traffic signals.
- The knowledge of traffic rules and regulations, signs, markings.

UNIT – III

INTERSECTION DESIGN

Types of Intersections; Conflicts at Intersections; Requirements of At-Grade Intersections; Types of At-Grade Intersections: Channelized and Channelized Intersections; Traffic Islands; Types of Grade Separated Intersections - Rotary Intersection; Concept of Rotary; Design Factors of Rotary; Advantages and Limitations of Rotary Intersections.

Learning Outcomes:

- The classification of intersections.
- Differentiation of Channelized Intersections and Unchannelized Intersections
- Design concepts of rotary intersections.

UNIT – IV

HIGHWAY MATERIALS, CONSTRUCTION AND MAINTENANCE

Highway material characterization; Subgrade; stone aggregates; bitumen materials; Construction of gravel roads; Construction water Bound macadam roads; Construction of bituminous pavements; Construction of cement concrete roads; Construction of joints in cement concrete pavements; Joint filler and seals; Pavement failures; Highway maintenance.

Learning Outcomes:

- The quality requirements of highway materials like coarse and fine aggregates
- The quality analysis of bitumen.
- The construction methods of different kinds of roads and their constructional requirements.
- The reasons of pavement failures and
- Methods of highway maintenance and drainage systems.

UNIT-V INTELLIGENT TRANSPORT SYSTEMS

ITS user services; Public transportation operations; ITS architecture; ITS planning and evaluation-Standards and their needs; Vehicle to vehicle communications; Vehicle to infrastructure communication.

Learning Outcomes:

- The concepts of ITS.
- The planning concept of ITS
- Communications systems of ITS.

TEXT BOOKS:

1. Highway Engineering – S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Nemchand & Bros., 10th edition, 2018.
2. Traffic Engineering & Transportation Planning – Dr. L. Kadyali, Khanna Publications – 6th Edition, 1997.

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REFERENCES:

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali and Dr. N. B Lal - Khanna Publications.
3. Highway Engineering – S. P. Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)
4. IRC 37-2012 : Tentative guidelines for design of flexible pavement
5. IRC 58-2011: Guidelines for design of plain jointed rigid pavements.
6. IRC 81-1997 : Guidelines for design of overlay using Benkalman Beam Deflection Technique

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2060124 – STRUCTURAL ENGINEERING – II (STEEL)

B. Tech. III Year II Sem **L T P C**

Prerequisites: Structural Engineering -1 (RCC) **3 0 0 3**

Course Objectives: The objective of the course is

1. To learn about the basics of steel sections and their prominence in constructions.
2. To impart knowledge on different types of connections
3. To learn about the design of beams.
4. To learn about design of tension and compression member.
5. To learn about design of lacings and battens.
6. To learn about design of roof truss and purlin.

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

1. To design bolted and welded connections
2. To design laterally supported and unsupported beams.
3. To design tension member.
4. To design compression member
5. To design lacings and battens.
6. To design roof trusses and purlin.

UNIT - I

Introduction: Introduction to steel structures, merits and demerits

Bolted and Riveted Connections: Introduction, advantages and disadvantages of bolting and riveting, General terminology, Strength of bolts and rivets, bearing stress and shear stress, Permissible limits, IS Code requirements.

Welded Connections: Introduction, advantages and disadvantages of welding, Strength of welds, Butt and fillet weld; Permissible stresses, IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

Learning Outcomes:

At the end of the unit, students will be able to understand,

- Basics of steel, its properties, merits and demerits.
- Design of bolted and welded connections.

UNIT - II

Laterally Supported Beams: Design of simple and compound beams, Curtailment of flange plates.

Laterally Unsupported Beams: Design of laterally unsupported beams.

Plate Girder: Design of plate girder

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of laterally supported beams.
- Design of laterally unsupported beams.

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UNIT - III

Tension Members: General Design of members subjected to direct tension and bending, effective length of columns; Slenderness ratio, permissible stresses.

Compression Members: Design of axially loaded compression members, struts; eccentrically loaded columns; Splicing of members using bolting.

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of tension member.
- Design of compression member.

UNIT - IV

Design of Lacings: Design principles as per IS Code. Design of single and double lacing system using bolting for channel and angle sections.

Design of Battens: Design principles and specifications as per IS Code. Design of batten systems using bolting for channel and angle sections.

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of Lacing.
- Design of Battens.

UNIT - V

Roof Truss: Types of Trusses, Loads on trusses, Design of roof trusses

Purlin: Design of purlin

Learning Outcomes:

At the end of the unit, students will be able to,

- Design of roof trusses.
- Design of purlins.

TEXT BOOKS:

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
2. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800,2007 Structures Publications, 2009.
5. IS 800:2007, General Construction In Steel, Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

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CODES/TABLES:

IS: CODES-STEEL TABLES:

1. IS -800, 2007
2. IS - 875, Part III
3. Steel Tables.
4. IS 1367 (PART 3)

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2060125 – GEOTECHNICAL ENGINEERING

B. Tech. III Year II Sem **L T P C**

Pre-requisites:- **3 0 0 3**

Course Objective: The objective of the course is

1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
2. To familiarize the students about the fundamental concepts of compaction,
3. Understand the flow through soil, stress transformation,
4. Analyze stress distribution, consolidation in soil
5. Understand shear strength of soils.
6. To impart knowledge of design of both finite and infinite slopes.

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

1. Classify the soil and assess the engineering properties, based on index properties.
2. Understand the stress concepts in soils
3. Understand and identify the settlement in soils.
4. Analyze stress distribution, consolidation in soil
5. Determine the shear strength of soil
6. Analyze both finite and infinite slopes.

UNIT - I

SOIL CLASSIFICATION AND COMPACTION

History – formation and types of soil – composition - Index properties – clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship –Compaction theory – laboratory and field technology – field Compaction method – factors influencing compaction.

Learning Outcome:

At the end of the unit, students should able to,

- Classify the different types of soils
- Understand the structural arrangement of soils
- Assess the engineering properties of soils
- Understand the concept of compaction of soil
- Apply the concepts in the field.

UNIT - II

EFFECTIVE STRESS AND PERMEABILITY

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Permeability – Factors influencing permeability of soils -Darcy's law – Determination of Permeability – Laboratory Determination (Constant head and falling head methods)

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Learning Outcome:

At the end of the unit, students should able to,

- Understand the relationship between soil and water
- Interpret the stresses in soils
- Understand the concept of flow through different soils
- Evaluate the flow parameters using darcys law
- Identify the factors influencing permeability of soils.

UNIT - III

STRESS DISTRIBUTION AND SETTLEMENT

Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and udl) Use of New marks influence chart –Components of settlement – Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory

Learning Outcome:

At the end of the unit, students should able to,

- Understand the concept of stress distribution and settlement
- Explain the Boussines theory
- Use the new marks influence chart
- Identify the components of settlement
- Understand the Terzaghi's one dimensional consolidation theory

UNIT - IV

SHEAR STRENGTH

Shear strength of cohesive and cohesion less soils – Pore pressure parameters -Factors influences shear strength of soil-Mohr-Coulomb failure theory – shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests

Learning Outcome:

At the end of the unit, students should able to,

- Understand the concept of shear strength of soils
- Identify the factors influencing permeability of soils.
- Explain the Mohr-Coulomb failure theory
- Assess the of shear strength of soils
- Evaluate the shear strength of soils using different equipments

UNIT - V

SLOPE STABILITY

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c - φsoil – Slope protection measures.

Learning Outcome:

At the end of the unit, students should able to,

- Classify the types of slopes
- Understand the Friction circle method
- Use the stability number for slop analysis
- Identify the location of critical slope in different conditions
- Enlighten the slope protection measures

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TEXT BOOKS:

1. Murthy, V.N.S., “Text book of Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd., New Delhi.2014
2. Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, “Basic and Applied Soil Mechanics” New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. NewDelhi, 16th Edition, 2017.

REFERENCES:

1. McCarthy, D.F., “Essentials of Soil Mechanics and Foundations: Basic Geotechnics”. Prentice-Hall,2006.
2. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
3. Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India Private Limited, 8th Edition, 2014.
4. Palanikumar.M., “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi,2013.
5. Venkatramaiah.C., “Geotechnical Engineering”, New Age International Pvt. Ltd., New Delhi, 2017.
6. Purushothama Raj. P., “Soil Mechanics and Foundations Engineering”,2nd Edition, Pearson Education, 2013.

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2060145 – INTRODUCTION TO FINITE ELEMENT METHODS

(Professional Elective – II)

B. Tech. III Year II Sem **L T P C**

Prerequisites: Structural Analysis I & II **3 0 0 3**

Course Objectives:

1. To equip the students with the finite element analysis fundamentals.
2. To enable the students to formulate the design problems into FEA.
3. To introduce basic aspects of finite elements technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, ad solution of the resulting algebraic systems.

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

1. Develop shape functions and stiffness matrices for bar and beam elements
2. To understand isoparametric formulation, static condensation etc.
3. Analyse continuous beam by stiffness matrix approach
4. Formulate CST and LST element
5. Understand the background of mathematical equations used for development of modeling software modules to develop the various structural related applications
6. Identify mathematical model for solution of common engineering problems.

UNIT – I

Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

UNIT – II

Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D & 3D – Element – shape functions upto quadratic formulation.

Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain relation

UNIT – III

FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

UNIT – IV

FEA Two dimessional problem – CST – LST element – shape function – stress – strain. Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element.

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UNIT - V

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

REFERENCES:

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook *et al.*, Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G. Ramamurty, I. K. International Publishing House Pvt. Ltd.

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2060146 – ADVANCED STRUCTURAL DESIGN

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Structural Engineering I & II, Structural Analysis **3 0 0 3**

Course Objective: To make the student more conversant with the design principles of critical structures using limit state approach

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

1. Enhance the capabilities to design the special structural elements as per Indian standard code of practice.
2. Design and Detailing of cantilever type of Retaining walls
3. Design of Flat slabs and Ribbed slabs
4. Design of RCC Circular water tank
5. Design of Reinforced Concrete Slab Bridge decks
6. Design of steel gantry girder.

UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counterfort Retaining walls.

UNIT – II

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears

Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

UNIT – III

Design of RCC Circular Water Tanks resting on ground – Flexible, Rigid and Hinged base water tanks

UNIT – IV

Design of strip and raft RC foundation

UNIT – V

Introduction to Gantry Girders - Design Principles - Design of Steel Gantry Girders.

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TEXT BOOKS:

1. Advanced RCC by N.Krishna Raju, CBS Publishers & distributors, New Delhi.
2. Advanced RCC by P.C.Varghese, PHI Publications, New Delhi.
3. Reinforced concrete design by S.Unnikrishna Pillai and Devdas Menon, 4th Edition, Tata Mc Graw Hill.
4. Design Reinforced Concrete Structures by N.Subramanian, 1st Edition, Oxford University Press, 2014.

REFERENCES:

1. RCC Designs by Sushil Kumar, Standard publishing house.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S.Chand Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by N.Krishna Raju, Univ. Press, New Delhi
4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi.
5. Design of Steel Structures by S.K.Duggal, 3rd Edition, Tata Mc Graw Hill, 2017.

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2060147 – REPAIR AND REHABILITATION OF STRUCTURES

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course Objectives: To understand the various concepts of rehabilitation and retrofitting of structures

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

1. Develop various maintenance and repair strategies.
2. Understand corrosion of steel its causes and prevention
3. Assess damages by Non Destructive Testing
4. Understand the common types of repair and method of retrofitting
5. Evaluate the existing buildings through field investigations.
6. Understand and use the different techniques for structural retrofitting and health monitoring of structures

UNIT – I

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

UNIT – II

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

UNIT – III

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

UNIT – IV

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting & Shotcrete – Underpinning.

Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

UNIT – V

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

TEXT BOOKS:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa kumar, Oxford University press

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REFERENCES:

1. Defects and Deterioration in Buildings, EF & N Spon, London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
4. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A.Richardson, (1991).

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2060148 – PRESTRESSED CONCRETE

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Reinforced Concrete Design **3 0 0 3**

Course Objectives: The objectives of the course are to

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

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

1. Understand principles of prestressing
2. Know the method and system of prestressing and evaluate losses of prestressing
3. Analysis of section for flexure
4. Analysis of section for shear
5. Acquire the knowledge of evolution of process of prestressing.
6. Analysis of composite beam and deflection

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 - Flexural analysis of prestressed concrete beam including load balancing concept.

UNIT - II

Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

Losses of Prestress: Loss of prestress in pre-tensioned and post-tensioned 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.

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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.

TEXT BOOKS:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. 6th Edition, New Delhi, 2018
2. Prestressed concrete by K.U.Muthu, Azmi Ibrahim, Maganti Janardhana, M.Vijayanand, PHI Learning Pvt.Ltd, Delhi, 2016.

REFERENCES:

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, 3rd Edition, New York, 2010.
2. Prestressed concrete by S. Ramamrutham, Dhanpat Rai & Sons, 5th Edition, Delhi, 2013.
3. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House, 2nd Edition, 2017.
4. IS:1343-2012, Prestressed concrete – Code of practice, BIS, New Delhi.

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2060101 – AIR AND NOISE POLLUTION CONTROL

(Open Elective – I)

B. Tech. III Year II Sem **L T P C**

Prerequisites:- **3 0 0 3**

Course Objective

To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

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

1. Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. identify meteorological aspects of air pollution dispersion
3. Determine the ambient air quality
4. identify, formulate and solve air and noise pollution problems
5. know how to Control gaseous contaminants
6. monitor and control noise pollution

UNIT - I

Air pollution: composition and structure of atmosphere, global implications of air pollution. Classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

UNIT - II

Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

UNIT - III

Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

UNIT - IV

Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

UNIT - V

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on

health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

TEXT BOOKS:

1. Rao C.S., Environmental Pollution Control Engineering, New Age International editors and publishers, 3rd Edition, 2018.
2. Rao M.N. and Rao H.V.N., Air Pollution Control, Tata McGraw Hill, 2014.
3. S.P. Singal, Air Quality Monitoring and Control Strategy, Narosa Publishing House Pvt. Ltd., 2012.

REFERENCES:

1. Cunniff P.F., Environmental Noise Pollution, John Wiley & Sons, 2014.
2. Anjaneyalu Y, Air Pollution and Control Technologies, Allied Publishers, 2011.
3. Khopkar S M., Environmental Pollution Monitoring and Control, New Age International editors and publishers, 2018.
4. Lawrence K Wang, Norman C. Pereria, Hand Book of Environmental Engineering, Advanced Air and Noise Pollution Control, Humana Press Inc. 2018.

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2060178 - GEOTECHNICAL ENGINEERING LABORATORY

B. Tech. III Year II Sem **L T P C**

Pre-Requisites: Geotechnical Engineering **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To obtain index and engineering properties of locally available soils, and to understand the behavior of these soil under various loads.

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

1. Classify and evaluate the behavior of the soils subjected to various loads.
2. determine the atterberg limits
3. determine specific gravity of soil
4. evaluate permeability of soil
5. determine coefficient of consolidation
6. apply direct and vane shear test

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

REFERENCE:

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

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2060179 - TRANSPOTATION ENGINEERING LABORATORY

B. Tech. III Year II Sem **L T P C**

Pre-requisites: Transportation Engineering **0 0 3 1.5**

Course Objectives: The objective of the course is

1. To gain the practical knowledge of properties of Highway materials
2. To gain the practical knowledge of traffic surveys.
3. To gain the practical knowledge of Bitumen mix designs.

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

1. determine crushing, abrasion and impact value of Highway materials
2. determine specific gravity and water absorption of Highway materials
3. determine Flakiness and elongation Indices of coarse Aggregates
4. identify ductility value of bitumen
5. identify Softening Point value of bitumen
6. Determination of Traffic Volume and parking studies

Note: In the following list of 15 experiments the student has to complete minimum of 12 experiments

List of Experiments:

SECTION I: ROAD AGGREGATES

1. Determination of Aggregate Crushing value.
2. Determination of Aggregate Impact Test.
3. Determination of Specific Gravity and Water Absorption.
4. Determination of Abrasion value of aggregate.
5. Determination of Flakiness and elongation Indices of coarse Aggregates.
6. Determination of Attrition value of aggregate.

SECTION II: BITUMINOUS MATERIALS

7. Determination of Penetration Value.
8. Determination of Ductility value of bitumen.
9. Determination of Softening Point value.
10. Determination of Marshal Stability value
11. Determination of Flash and fire point temperature.

SECTION III: TRAFFIC STUDIES

12. Determination of Traffic Volume Counts-Mid Blocks
13. Determination of Traffic Volume Counts-Junctions
14. Determination of Spot speed study.
15. Determination of Parking Studies

TEXT BOOKS:

1. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay Highway Material Testing by Khanna S.K., Justo C.E.G, Nem Chand & Bros.
2. Principles and practice of Highway Engineering, L.R Kadiyali & N.B.Lal, Khanna, 2007.
3. Traffic Engineering and Transportation planning, L.R Kadiyali, Khanna publications, 2007.

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2060075 – ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

B. Tech. III Year II Sem **L T P C**

Pre-requisites: Communicative English **0 0 2 1**

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd 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 globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and performthe following:

Gathering ideas and information to organize 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.

3. SYLLABUS:

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

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.

Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resumewriting/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

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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.

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 English Communication Skills (AECS) Laboratory shall have the following infrastructural 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. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.Oxford Advanced Learner's Compass, 7th Edition
DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.Lingua TOEFL CBT Insider, by Dream tech
TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt.Ltd. 2nd Edition.
1. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford UniversityPress, 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill, 2009.

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2060180 – INTRODUCTION TO MACHINE LEARNING

B. Tech. III Year II Sem **L T P C**

Pre-requisites:- **0 2 0 0**

List of Experiments:

Module 1 Overview of machine learning concepts in construction - construction process - computerisation in construction

Module 2 Artificial Neural Network

Module 3 Overview of Building Information Modelling

Module 4 Overview of 3D Printing

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2050141 - CONCRETE TECHNOLOGY
(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Building Materials, Construction and Planning **3 0 0 3**

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.

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

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

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.

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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 – Posisson'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.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

REFERENCES:

1. Properties of Concrete by A. M. Neville, 5th edition, Pearson Publishers, 2012.
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers
3. IS:10262-2019, Concrete Mix Proportioning — Guidelines (Second Revision), BIS, New Delhi
4. IS:516-2021, Hardened concrete – Method of Test, Part-1 Testing of strength of concrete, BIS, New Delhi.
5. IS:516-2018, Hardened concrete – Method of Test, Part-2 Properties of Hardened Concrete other than Strength, BIS, New Delhi
6. IS:516-2018, Hardened concrete – Method of Test, Part-4 Sampling, Preparing and Testing of concrete cores, BIS, New Delhi
7. IS:516-2018, Hardened concrete – Method of Test, Part-5 Non Destructive Testing of concrete, BIS, New Delhi
8. IS:516-2018, Hardened concrete – Method of Test, Part-8 Determination of modulus of elasticity, BIS, New Delhi

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2050142 – ELEMENTS OF EARTHQUAKE ENGINEERING

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Structural Engineering-I (RCC) **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand Engineering Seismology
2. To explain and discuss single degree of freedom systems subjected to free and forced vibrations
3. To acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes
4. To understand importance of ductile detailing of RC structures

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

1. Explain and derive fundamental equations in structural dynamics
2. Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes
3. Evaluate base shear using IS methods
4. Analyze masonry structures subjected to earthquake forces
5. Design and Detail the reinforcement for earthquake forces
6. Know about ductility design of concrete 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 seismogram - Seismoscope, Seismograph, - strong ground motions- Seismic zones of India. Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous system Lumped mass idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement-Forced vibrations-Harmonic excitation-Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

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 deign of RC members- Structural models for frame buildings - Seismic methods of analysis- IS code based methods for seismic design - Vertical irregularities - Plan configuration problems- Lateral load resisting systems- Determination of

design lateral forces as per IS 1893 (Part-1):2016- 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 nonstructures- Effects of non-structural elements on structural system- Analysis of non-structural elements Prevention of non-structural damage 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 13920-2016 - Behaviour of beams, columns and joints in RC buildings during earthquakes.

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 Buidling 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. Masory and Timber structures including earthquake Resistant Design – Anand S.Arya, Nem chand & Bros.
5. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy
6. BIS Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:2000

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2050143 - PREFABRICATED STRUCTURES

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Structural Engineering (I&II) **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

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

1. Know the principle & procedure of prefabrication
2. Design the structural prefabricated elements.
3. Familiarize with joining techniques used for prefabrication
4. Know the manufacturing technology adopted
5. Identify the different techniques for hoisting
6. Know abnormal loads which are hazardous to the prefabricated structures.

UNIT - I

GENERAL PRINCIPLES OF FABRICATION

Types of prefabrication – site and plant prefabrication -Economy of prefabrication – Modular coordination – Standardization- Disuniting of Prefabricates, production, transportation, erection, stages of loading – Applications of Prefabrication.

UNIT - II

PREFABRICATED COMPONENTS

Behavior of structural components - Roof and floor panels- wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing- Columns – Shear walls

UNIT - III

MANUFACTURING TECHNOLOGY

Manufacturing methods – Stationary and mobile production- Storage of precast elements - Dimensional tolerances

UNIT - IV

HOISTING TECHNOLOGY

Equipments for hoisting and erection – Techniques for erection of different types of members like Slabs, Beams, Wall panels and Columns – Advanced techniques - Vacuum lifting pads.

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UNIT - V

DESIGN FOR ABNORMAL LOADS

Progressive collapse-Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., Importance of avoidance of progressive collapse.

TEXT BOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES:

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

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2050144 - INTRODUCTION TO OFFSHORE STRUCTURES

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites:- **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the importance and functions of Offshore structure
2. To know the materials used in marine environment
3. To Know the Installation Methods of Offshore Structures

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

1. understand the functions of Offshore Structures
2. know the materials used for marine structures
3. know the different loads on Offshore Structures
4. understand the basic design of Offshore structures
5. know mooring system, industry standards and rules
6. understand installation method of Offshore Structures

UNIT - I

Introduction to Offshore Structures - Functions of Offshore Structures - Offshore Structure Configurations - Bottom Supported Fixed Structures - Compliant Structures - Floating Structures.

UNIT - II

Materials for Marine Environment - Structural Steel Topside Materials - Advanced Composite materials - Corrosion Control Material - Reliability and Monitoring - Fracture Control.

UNIT - III

Loads on offshore Structures - Gravity Loads, Hydrostatic Loads - Resistance Loads, Current loads on Structures - Current Drag and Lift Force, Steady, Dynamic and Wind Loads on Structures - Wave Loads on Structures - Varying Wind Load - Impulse loads - Introduction to design.

UNIT - IV

Mooring - General layout Areas and Equipment - Helideck Platform Crane Mooring systems : Mooring Hardware components

UNIT - V

Installation Methods of Offshore Structures - Platform Installation Methods: Fixed Platform Substructures - Floating Structures Foundations Subsea Templates.

TEXT BOOKS:

1. Reddy, D.V & Arockiasamy, M., Offshore Structures Vol.1 & 2, Kreiger Publ. Co.1991.
2. Graff, W.J., Introduction to Offshore Structures, Gulf Publ.Co.1981.

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REFERENCES:

1. Morgan, N., Marine Technology, Butter worths, 1990.
2. Dawson, T.H., Offshore Structural Engineering, Prentice Hall, 1983.
3. B.C Gerwick, Jr. Construction of Marine and Offshore Structures, CRC Press, Florida, 2000.

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2050177 – INTRODUCTION TO ARTIFICIAL INTELLIGENCE

B. Tech. III Year I Sem **L T P C**

Pre-requisites:- **0 2 0 0**

List of Experiments:

Module 1 Overview of artificial intelligence concepts/algorithm in construction
Module 2 Review of various Algorithms
Module 3 Application of algorithms in design of structural elements

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2060145 – INTRODUCTION TO FINITE ELEMENT METHODS

(Professional Elective – II)

B. Tech. III Year II Sem **L T P C**

Prerequisites: Structural Analysis I & II **3 0 0 3**

Course Objectives:

1. To equip the students with the finite element analysis fundamentals.
2. To enable the students to formulate the design problems into FEA.
3. To introduce basic aspects of finite elements technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, ad solution of the resulting algebraic systems.

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

1. Develop shape functions and stiffness matrices for bar and beam elements
2. To understand isoparametric formulation, static condensation etc.
3. Analyse continuous beam by stiffness matrix approach
4. Formulate CST and LST element
5. Understand the background of mathematical equations used for development of modeling software modules to develop the various structural related applications
6. Identify mathematical model for solution of common engineering problems.

UNIT – I

Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

UNIT – II

Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D & 3D – Element – shape functions upto quadratic formulation.

Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain relation

UNIT – III

FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

UNIT – IV

FEA Two dimessional problem – CST – LST element – shape function – stress – strain. Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis - formulation of CST element.

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UNIT - V

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

REFERENCES:

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook *et al.*, Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G. Ramamurty, I. K. International Publishing House Pvt. Ltd.

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2060146 – ADVANCED STRUCTURAL DESIGN

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Structural Engineering I & II, Structural Analysis **3 0 0 3**

Course Objective: To make the student more conversant with the design principles of critical structures using limit state approach

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

1. Enhance the capabilities to design the special structural elements as per Indian standard code of practice.
2. Design and Detailing of cantilever type of Retaining walls
3. Design of Flat slabs and Ribbed slabs
4. Design of RCC Circular water tank
5. Design of Reinforced Concrete Slab Bridge decks
6. Design of steel gantry girder.

UNIT – I

Design and Detailing of cantilever type of Retaining walls – Stability Check. Principles & Design of Counterfort Retaining walls.

UNIT – II

Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears

Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

UNIT – III

Design of RCC Circular Water Tanks resting on ground – Flexible, Rigid and Hinged base water tanks

UNIT – IV

Design of strip and raft RC foundation

UNIT – V

Introduction to Gantry Girders - Design Principles - Design of Steel Gantry Girders.

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TEXT BOOKS:

1. Advanced RCC by N.Krishna Raju, CBS Publishers & distributors, New Delhi.
2. Advanced RCC by P.C.Varghese, PHI Publications, New Delhi.
3. Reinforced concrete design by S.Unnikrishna Pillai and Devdas Menon, 4th Edition, Tata Mc Graw Hill.
4. Design Reinforced Concrete Structures by N.Subramanian, 1st Edition, Oxford University Press, 2014.

REFERENCES:

1. RCC Designs by Sushil Kumar, Standard publishing house.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S.Chand Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by N.Krishna Raju, Univ. Press, New Delhi
4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi.
5. Design of Steel Structures by S.K.Duggal, 3rd Edition, Tata Mc Graw Hill, 2017.

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2060147 – REPAIR AND REHABILITATION OF STRUCTURES

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course Objectives: To understand the various concepts of rehabilitation and retrofitting of structures

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

1. Develop various maintenance and repair strategies.
2. Understand corrosion of steel its causes and prevention
3. Assess damages by Non Destructive Testing
4. Understand the common types of repair and method of retrofitting
5. Evaluate the existing buildings through field investigations.
6. Understand and use the different techniques for structural retrofitting and health monitoring of structures

UNIT – I

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

UNIT – II

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

UNIT – III

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

UNIT – IV

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting & Shotcrete – Underpinning.

Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

UNIT – V

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

TEXT BOOKS:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa kumar, Oxford University press

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REFERENCES:

1. Defects and Deterioration in Buildings, EF & N Spon, London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
4. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A.Richardson, (1991).

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2060148 – PRESTRESSED CONCRETE

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Reinforced Concrete Design **3 0 0 3**

Course Objectives: The objectives of the course are to

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

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

1. Understand principles of prestressing
2. Know the method and system of prestressing and evaluate losses of prestressing
3. Analysis of section for flexure
4. Analysis of section for shear
5. Acquire the knowledge of evolution of process of prestressing.
6. Analysis of composite beam and deflection

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 - Flexural analysis of prestressed concrete beam including load balancing concept.

UNIT - II

Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

Losses of Prestress: Loss of prestress in pre-tensioned and post-tensioned 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.

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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.

TEXT BOOKS:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. 6th Edition, New Delhi, 2018
2. Prestressed concrete by K.U.Muthu, Azmi Ibrahim, Maganti Janardhana, M.Vijayanand, PHI Learning Pvt.Ltd, Delhi, 2016.

REFERENCES:

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, 3rd Edition, New York, 2010.
2. Prestressed concrete by S. Ramamrutham, Dhanpat Rai & Sons, 5th Edition, Delhi, 2013.
3. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House, 2nd Edition, 2017.
4. IS:1343-2012, Prestressed concrete – Code of practice, BIS, New Delhi.

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2060101 – AIR AND NOISE POLLUTION CONTROL

(Open Elective – I)

B. Tech. III Year II Sem **L T P C**

Prerequisites:- **3 0 0 3**

Course Objective

To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

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

1. Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. identify meteorological aspects of air pollution dispersion
3. Determine the ambient air quality
4. identify, formulate and solve air and noise pollution problems
5. know how to Control gaseous contaminants
6. monitor and control noise pollution

UNIT - I

Air pollution: composition and structure of atmosphere, global implications of air pollution. Classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

UNIT - II

Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

UNIT - III

Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

UNIT - IV

Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

UNIT - V

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on

health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

TEXT BOOKS:

1. Rao C.S., Environmental Pollution Control Engineering, New Age International editors and publishers, 3rd Edition, 2018.
2. Rao M.N. and Rao H.V.N., Air Pollution Control, Tata McGraw Hill, 2014.
3. S.P. Singal, Air Quality Monitoring and Control Strategy, Narosa Publishing House Pvt. Ltd., 2012.

REFERENCES:

1. Cunniff P.F., Environmental Noise Pollution, John Wiley & Sons, 2014.
2. Anjaneyalu Y, Air Pollution and Control Technologies, Allied Publishers, 2011.
3. Khopkar S M., Environmental Pollution Monitoring and Control, New Age International editors and publishers, 2018.
4. Lawrence K Wang, Norman C. Pereria, Hand Book of Environmental Engineering, Advanced Air and Noise Pollution Control, Humana Press Inc. 2018.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060180 – INTRODUCTION TO MACHINE LEARNING

B. Tech. III Year II Sem	**L T P C**
Pre-requisites:-	**0 2 0 0**

List of Experiments:

Module 1 Overview of machine learning concepts in construction - construction process - computerisation in construction

Module 2 Artificial Neural Network

Module 3 Overview of Building Information Modelling

Module 4 Overview of 3D Printing

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070126 – ENVIRONMENTAL ENGINEERING

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Environmental Science **3 0 0 3**

Course Objectives: The objective of the course is

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

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

1. Assess characteristics of water and wastewater and their impacts
2. Understand layout and application of water treatment units.
3. Estimate quantities of water and waste water and plan conveyance components
4. Examine sewage and disposal of sewage.
5. Design components of water and waste water treatment plants
6. Be conversant with issues of air pollution and control.

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.

TEXT BOOKS:

1. Environmental Engineering, I and II by SK Garg, Khanna Publications.
2. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014.
3. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
4. Environmental Engineering, I and II by BC Punmia, Std. Publications.
5. Environmental Pollution and Control Engineering CS Rao,Wiley Publications.

REFERENCES:

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070127 - ESTIMATION, QUANTITY SURVEYING AND VALUATION

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Concrete Technology, Structural Engineering (I&II) **3 0 0 3**

Course Objectives: The objective of the course is

1. To Provides process of estimations required for various work in construction.
2. To have knowledge analysis of rates on various works, contracts and Valuation.

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

1. Know different types of Estimation and principles of working out quantities of works.
2. Workout Detailed estimation of building and bar-bending schedule
3. Do estimation of Roads and Canals.
4. Analysis of rate for different item of works in buildings
5. Understand contracts and valuation of various construction works.
6. Understand general and detailed specification of buildings.

UNIT – I

General items of work in Building – Standard Units - Principles of working out quantities for detailed and abstract estimates – Types of Estimate - Approximate method of Estimating.

UNIT – II

Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedules

UNIT – III

Introduction - Earthwork for roads and canals

UNIT – IV

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

UNIT - V

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation – General specifications and Detailed Standard specifications for different items of works in building construction.

TEXT BOOKS:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie Dhanpat Rai Publisher.

REFERENCES:

1. Standard Schedule of rates and standard data book by public works department.
2. S.1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engg– B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.

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4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070011 – FUNDAMENTALS OF MANAGEMENT

B.Tech. IV Year I Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course Objectives: To understand the Management Concepts in both theoretical and Practical aspects of business development Skills. The students can explore the Management Practices in their domain area.

Course Outcomes: At the end of the course the students will be able to

1. Assess the Managerial Roles, Levels of Management and the various approaches of Management
2. Understand the various Types of Plan, Programmed and Non Programmed Decisions and Decision Making Process
3. Interpret the various types of Organization Structures and Organizational Culture
4. Examine the Talent Management Models, Recruitment, Selection, Training and Development in Human Resource Management
5. Analyze and classify the theory X and theory Y and Motivational theories
6. Distinguish between Budgetary and Non Budgetary Controls and its Characteristics.

UNIT – I Introduction to Management

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II Planning and Decision Making

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work

UNIT - III Organizations and HRM

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT – IV Leading and Motivation

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and

Crisis; Handling Employee and Customer Complaints, Leadership. Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT – V Controlling

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non-Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES :

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

WEB REFERENCES

https://lecturenotes.in/subject/836/fundamentals-of-management-fom

https://www.docsity.com/en/study-notes/management/principles-of-management/

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(AUTONOMOUS)

2070149 – BRIDGE ENGINEERING

(Professional Elective – III)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Structural Engineering, Soil Mechanics, Foundation Engineering, and Water Resources Engineering **3 0 0 3**

Course Objectives: The objective of the course is

1. To study different types of bridges, forces that act on bridges, Design of different types of Bridges

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

1. Understand classification of bridges and Design standards and specifications
2. Design of Slab culvert and T beam bridges.
3. Design of steel bridges
4. Design of Bridge bearings.
5. Design of Pier and abutment.
6. Design of bridge foundations.

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 road 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. solid slab and T-beam bridges.

UNIT- III

Design Consideration for Steel Bridges: Various types of steel bridges (brief description of each), design of plate girder bridge.

UNIT- IV

Design loads for Piers and abutments - Brief description about approaches, bearings, joints, articulation and other details.

UNIT - V

Bridge Foundation: Various types, necessary investigations and design criteria of well foundation. Design of well foundation.

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REFERENCES:

1. Essentials of Bridge Engineering, D. J. Victor, Oxford & IBH Pub, New Delhi.
2. Design of Bridges, N. Krishna Raju, Oxford & IBH, New 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, New Delhi.
5. IRC:112-2011, Code of practice for concrete road bridges
6. IRC:5-1998, Standard specification and code of practice for road bridges (General features of Design)
7. IRC:6-2017, Standard specification and code of practice for road bridges (Loads & Load Combinations)

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(AUTONOMOUS)

2070150 – RAILWAY, AIRPORT AND HARBOUR ENGINEERING

(Professional Elective – III)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Transportation Engineering **3 0 0 3**

Course Objectives: the objectives of the course are to

1. Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
2. Introduce component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail.
3. Explain the classes of harbors, features, planning and design of port facilities.

Course Outcomes: At the end of this course, the students will be able to:

1. Design runways and taxiways.
2. Design the infrastructure for large and small airports
3. Design various crossings and signals in Railway Projects.
4. Do geometric design of railway track
5. Understand track maintenance and operation
6. Plan the harbors and ports projects including the infrastructure required for new ports and harbors.

UNIT – I

Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics – Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram

UNIT - II

Introduction to Railways: Role of Indian Railways in national development – Railways for Urban Transportation – LRT , Mono Rail, Metro Rail & MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast, Subgrade and Embankments, Ballast less Tracks.

UNIT – III

Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.

UNIT – IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards – Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.

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UNIT – V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

TEXT BOOKS:

1. Venkataramaiah C (2016), “Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels”, Universities Press (India) Private Limited, Hyderabad.
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017.

REFERENCES:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportaion Engineering by R. Srinivasa Kumar, University Press India

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(AUTONOMOUS)

2070151 – TRAFFIC ENGINEERING

(Professional Elective – III)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Transportation Engineering **3 0 0 3**

Course Objectives: To provide engineering techniques to achieve the safe and efficient movement of people and goods on roadways.

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

1. Understand basics principles of Traffic Engineering
2. Analyze parking data and model accidents
3. Determine capacity and LOS.
4. Design signal and signal coordination
5. Develop engineering techniques to achieve Safe and efficient movement of people and goods on roadways
6. Develop transportation system management.

UNIT - I

Traffic Studies (Part- I) : Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

UNIT - II

Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling; Road Safety Auditing, Measures to increase Road safety.

UNIT - III

Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments - Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

UNIT - IV

Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal setting for Fixed Time signals, Warrants for Signals, Time Plan Design for Pre-Timed Control- Lane group analysis,

Saturation flow rate, and Adjustment factors, Uniform and Incremental Delay, Vehicle Actuated Signals, Signal Coordination.

UNIT - V

Transportation System Management - Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

TEXT BOOKS:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication
3. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.

REFERENCES:

1. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.
2. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas, Prentice Hall, 1977.
3. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication
4. Fundamentals of Traffic Engineering – McShane & Rogers.
5. Highway Capacity Manual -2000.

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2070152 – PAVEMENT ANALYSIS AND DESIGN

(Professional Elective – III)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Transportation Engineering **3 0 0 3**

Course Objectives: The study factors affecting pavement design, material characteristics, design of flexible, rigid pavements and low volume roads.

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

1. Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes
2. Analyze flexible pavements
3. Analyze rigid pavements
4. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods
5. Design a rigid pavement using IRC, and AASHTO methods
6. Design of pavement for 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 Stabilization 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

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Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, and 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.

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 Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design.

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2070153 – DESIGN OF HYDRAULIC STRUCTURES

(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Hydraulics, Hydrology & Water Resources Engineering **3 0 0 3**

Course Objectives: To study various types of storage works and, diversion headwork, their components and design principles for their construction.

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

1. Know types of water retaining structures for multiple purposes and its key parametersconsidered for planning and designing
2. Understand details in any Irrigation System and its requirements
3. Design of earth dam
4. Design of spillway
5. Understand diversion headwork
6. Know, Analyze and Design of a irrigation system components

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 Canalescapes - 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

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., NewDelhi.

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.

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2070154 – WATERSHED MANAGEMENT

(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Hydrology & Water Resource Engineering **3 0 0 3**

Course Objectives:

1. To understand different watershed behaviour
2. To be able to interpret runoff data and quantify erosion by using various modeling methods.
3. To understand land use classification and impact of land use changes on hydrological cycle parameters.

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

1. Understand the concept of sustainable development
2. Identify causes of soil erosion and design soil conservation measures in a watershed
3. Know the principle of water harvesting
4. Design of rainwater harvesting structures.
5. Plan and design water harvesting and groundwater recharge structures
6. Plan measures for reclamation of saline soils

UNIT - I

Definition and concept of Watershed: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

UNIT - II

Characteristics of Watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT - III

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

UNIT - IV

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks. Land Management: Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

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UNIT - V

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, silvi pasture, horticulture, social forestry and afforestation.

Applications: Planning of watershed management activities, people's participation, preparation of action plan, administrative requirements. Social aspects of watershed management, community participation, private sector participation, industrial issues, socio-economy, integrated development, water legislation and implementations, case studies, applications of geospatial techniques in watershed management systems.

TEXT BOOKS:

1. Watershed Management by JVS Murthy, New Age International publ., New Delhi, 1998.
2. Water Resources Engineering by R. Awurbs and WP James, Prentice Hall Publishers.
3. Land Water Management by VVN Murthy, Kalyani Publishers.

REFERENCES:

1. Irrigation and Water Management by D.K. Majumdar, Prentice Hall, New Delhi, 2000.
2. Hydrologic Modeling of Small Watersheds by C.T. Haan, H.P. Johnson, D.L. Brakensiek, ASAE, Michigan, 1982.

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2070155 – WATER SUPPLY NETWORK

(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Hydrology & Water Resource Engineering **3 0 0 3**

Course Objectives: The objectives of the course are

To study water and life, sources of water, supply of water and industry water

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

1. Gives a broad outline of the various facets of water usage in daily life.
2. Narrates the origin of Natural waters and also to synthesize it for regular use.
3. How to conservative drinking water and how to utilize non-potable water for various other uses.
4. Explains how the water from a reservoir reaches the consumer.
5. Explains how an industry requires specific water for its operations and also characteristics of waste water it generates and their general treatment before disposal.
6. Know the quality of water used for industry

UNIT - I

Water and life: Necessity of water – Domestic demand – Public demand – Irrigation – Transportation – Sanitation – Dilution of wastewaters – Dust palliative – Recreation – Fire protection.

UNIT - II

Sources of water: Surface sources – Ground sources – Water from atmosphere – Desalination – Recycling of waste water – Recharging of aquifers.

UNIT - III

Dual supply of water: Potable and non-potable water – Protected water – Grey water – Black water – Water borne diseases – water related diseases – Sewage Irrigation.

UNIT - IV

Distribution of water: Based on topography – Gravity distribution – Direct pumping – Combined pumping and gravity flow. Service Reservoirs – Continuous supply – Intermittent supply – Networks of distribution – Hardy cross method – Emergency water supply as in case of fire accidents – Valves, hydrants and meters.

UNIT - V

Industries and water: Location of Industry with reference tosurface sources of water – Quality of water required for industrial operations – characteristics of waste water produced – Standards for letting industrial effluents into sources of water.

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TEXT BOOKS:

1. Environmental Engineering by S.K. Duggal
2. Water and Waste water technology by Hammer and Hammer
3. Environmental engineering by Peery, Rowe and Tehabanaglous

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2070156 – GROUNDWATER HYDROLOGY

(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Hydraulics and Fluid Mechanics **3 0 0 3**

Course objectives: The objectives of the course are:

1. To explain the concepts of Groundwater Development and Management.
2. To demonstrate and derive the basic equations used in Groundwater development and management and the corresponding equations
3. To know the investigations, field studies to conduct basic ground water studies.

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

1. Identify different fundamental equations and concepts as applied in the Groundwater studies
2. Derive differential equation governing groundwater flow in three dimensions
3. Analyses plumbing test data
4. To solve groundwater mathematical equations and analyze pumping tests in steady and non steady flow cases
5. Investigate surface and subsurface exploration
6. Distinguish and understand the saline water intrusion problem in costal aquifers

UNIT - I

Groundwater Occurrence

Groundwater hydrologic cycle, origin of groundwater, 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. 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 and their applications.

UNIT - II

Analysis of Pumping Test Data-I

Steady groundwater flow towards a well in confined and unconfined aquifers-Dupuit and Theis equations, assumptions, formation constants, yield of an open well interface and well tests.

UNIT - III

Analysis of Pumping Test Data-II

Unsteady flow towards well-Non-Equilibrium equations, Theis solution, Jocob and Chow's Simplifications, Leak aquifers.

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UNIT - IV

Surface and sub-surface Investigation

surface methods of exploration-Electrical resistivity method and Seismic refraction methods.

Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

UNIT - V

Saline water intrusion in aquifer

Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

TEXT BOOKS:

1. Ground water by H.M. Raghunath, Wiley Eastern Ltd.
2. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

REFERENCES:

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C.W. Fetta, CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

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2070102 – REMOTE SENSING AND GIS

(Open Elective – II)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Surveying **3 0 0 3**

Course Objectives: This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

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

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems
6. Create GIS and cartographic outputs for presentation

UNIT – I

Introduction to Photogrammetry: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process.

Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the

Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters- Commonly used Map Projections - Projected coordinate Systems

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

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UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015.

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.Mc Donnell, Oxford Publishers, 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

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2070181 - ENVIRONMENTAL ENGINEERING LABORATORY

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Environmental Engineering **0 0 2 1**

Course Objectives: The objectives of the course are to

1. Perform the experiments to determine water and waste water quality
2. Understand the water &waste water sampling, their quality standards
3. Estimate quality of water, waste water, Industrial water

Course outcomes: At the end of the course, the students will be able to:

1. Understand about the equipment used to conduct the test procedures
2. Determination of pH, Electrical Conductivity
3. Determination of Acidity and Alkalinity
4. Examine and Estimate water, waste water, air and soil Quality
5. Compare the water, air quality standards with prescribed standards set by the local governments
6. Develop a report on the quality aspect of the environment

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

REFERENCES:

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 Edition2008.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York1985.
4. Met Calf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw- Hill, New Delhi.
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.

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6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil,1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

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2070182 - COMPUTER AIDED DESIGN LABORATORY

B.Tech. IV Year I Sem **L T P C**

Prerequisites: Computer Aided Civil Engineering Drawing or Auto CAD Principles –Excel- Structural Engineering -1 & 2 **0 0 2 1**

Course Objectives: The objectives of the course are to

1. Learn the usage of any fundamental software for design
2. Create geometries using pre-processor
3. Analyse and Interpret the results using post processor
4. Design the structural elements

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

1. Model the geometry of real-world structure Represent the physical model of structural element/structure
2. Analysis & Design of determinate structures using a software
3. Analysis & Design of continuous beams and frames
4. Analysis & Design of residential building
5. Analysis & Design of Roof Trusses
6. Design and detailing of RCC and steel 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
5. Analysis & Design of residential building
6. Analysis & Design of Roof Trusses
7. Detailing of RCC beam and RCC slab
8. Design and detailing of built up steel beam
9. Detailing of Steel built up compression member
10. Developing a design programme for foundation using EXCEL Spread Sheet

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

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2080157 - CONSTRUCTION PROJECT MANAGEMENT

(Professional Elective – V)

B. Tech. IV Year II Sem	**L**	**T**	**P**	**C**
Pre-Requisites:-	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

1. To understand different management techniques suitable for planning and constructional projects.
2. To know the management system for accomplishing the task efficiently in terms of both time and cost.

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

1. Apply the project management techniques in solving the constructional problems efficiently.
2. Different PMT to be applied in respective areas.
3. The course of a work from the start to the finish to analysed before the commencement of the project.
4. Know the principles of cost control and bill of quantities
5. Identify the concept of network techniques
6. Impart knowledge about Department works, contract system

UNIT - I

Project management concepts-objectives, planning, scheduling Controlling and role of decision in project management. Traditional management system, Gantt's approach, Load chart. Progress Chart, Development of bar chat, Merits and Demerits.

UNIT - II

Project Network-Events Activity, Dummy, Network Rules, Graphical Guidelines for Network, Umbering the events, Cycles, Development of Network-planning for Network Construction, Models of Network construction, steps in development of Network. Work Break Down Structure, hierarchies. Concepts: critical path method-process, activity time estimate, Earliest Event time, Lastest allowable Occurrence time, start and finish time of activity, float, critical activity and critical path problems.

UNIT - III

Cost model-Project cost, direct cost, indirect cost, slope curve, Total project cost, optimum duration contracting the network for cost optimization. Steps in cost optimization, updating, resource allocation-resource smoothing, resource leveling.

UNIT - IV

PERT network, introduction to the theory of probability and statistics. Probabilistic time estimation for the activities for the activities of PERT Network.

UNIT - V

Introduction: Creating a New project, building task. Creating resources and assessing costs, Refining your project. Project Tracking-Understanding tracking, recording actual. Reporting on progress. Analyzing

financial progress.

TEXT BOOKS:

1. Dr. B.C. Punmia and K.K. Khandelwal-Project planning and control woth PERT/CPM, Laxmi publications, New Delhi, 1987.
2. Elaine Marmel, Microsoft office Project 2003 Bible, Wiley Dreamtect (P) Ltd., New Delhi, 2004.
3. Sam Kubba, “Green Construction Project Management and Cost Oversight”, Elsevier, 2010

REFERENCES:

1. S.P. Mukhopadyay, “Project Management for architects and Civil Engineers”, IIT, Kharagpur 1974.
2. Jerome D. Wiest and Ferdinand K. Levy, “A Management guide to PERT/CPM”, prentice hall of Indian pub. Ltd. New Delhi 1982.
3. SR.A. Burgess and G. White, “Building production and project management”, the construction press, London 1979.

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2080158 - INDUSTRIAL WASTE WATER TREATMENT

(Professional Elective – V)

B. Tech. IV Year II Sem	**L**	**T**	**P**	**C**
Pre-Requisites: Environmental Engineering	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

1. To enrich the knowledge on sources and characteristics of industrial wastewater.
2. To discuss the different methods of waste water treatment such as de-nitrification, membrane separation, air stripping, etc.
3. To understand the characteristics and composition of wastewater generated from industrial processes.
4. To design and operate effluent treatment plants for joint treatment of raw industrial wastewater and domestic sewerage.

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

1. Distinguish between the quality of domestic and industrial water requirements and Wastewater quantity generation.
2. Understand the industrial process, water utilization and waste water generation.
3. Acquire the knowledge on operational problems of common effluent treatment plants.
4. Impart knowledge on selection of treatment methods for industrial wastewater.
5. Specify design criteria for physical, chemical, and biological unit operations.
6. Understand the characteristics and composition of different Industries

UNIT – I

Sources of Pollution – Physical, Chemical, Organic and Biological properties of Industrial Wastes – Differences between industrial and municipal waste waters – Effects of industrial effluents on sewers and Natural Water Bodies.

UNIT – II

Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by Floatation – Waste Reduction - Volume Reduction – Strength Reduction.

UNIT – III

Waste Treatment Methods – Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane Separation Process – Air Stripping and Absorption Processes – Special Treatment Methods – Disposal of Treated Waste Water.

UNIT – IV

Characteristics and Composition of waste water and Manufacturing Processes of Industries like Sugar, Characteristics and Composition of Industries like Food Processing Industries, Steel, Petroleum Refineries.

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UNIT – V

Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries - Joint Treatment of Raw Industrial waste water and Domestic Sewage – Common Effluent Treatment Plants (CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects.

TEXT BOOKS

1. Industrial Waste Water Pollution Control by W. Wesley Eckenfelder – McGraw-Hill.
2. Industrial Waste Treatment by Rao & Datta.

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2080159 - WASTE MANAGEMENT

(Professional Elective – V)

B. Tech. IV Year II Sem	**L T P C**
Pre-Requisites: Environmental Engineering	**3 0 0 3**

Course Objectives: The objective of the course is

1. To study about waste water treatment methods

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

1. Identify the physical and chemical composition of wastes
2. Analyze the functional elements for solid waste management.
3. Analyze the functional elements for liquid waste management.
4. Understand the effluent treatment Plants and its disposal
5. Know the Industrial wastes treatment methods
6. Acquired knowledge in effluent disposal methods.

UNIT – I

Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.

UNIT – II

Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans and problems.

UNIT – III

Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.

UNIT - IV

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects, and treatment methods.

UNIT – V

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

TEXT BOOKS:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

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REFERENCES:

1. Solid Waste Engineering by WA. Worrell, P.A Vesilind Cengage Learning, 2012.
2. Solid and Hazardous waste Management M.N Rao and R. Sulthana. B.S Publications, 2012.
3. Liquid waste of Industry by Nemerow Addison- Wesely Educational Publisher.

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2080160 - ENVIRONMENTAL IMPACT ASSESSMENT

(Professional Elective – V)

B. Tech. IV Year II Sem **L T P C**

Pre-Requisites: Environmental Engineering **3 0 0 3**

Course Objectives: The objective of the course is

1. To understand the aspects of Environment Impact Assessment methodologies
2. To analyze the impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.
3. To learn the different Act's related to Environment

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

1. Identify the environmental attributes to be considered for the EIA study.
2. Assessment of impact of development activities on vegetation and wildlife
3. Identification and incorporation of mitigation measures
4. Procure soil quality and prediction of impact.
5. Identify the suitable methodology and prepare Rapid EIA.
6. Know the environmental protection act.

UNIT – I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT- II

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT- III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

UNIT – IV

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT - V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

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TEXT BOOKS:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

REFERENCES:

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers Rutledge, London, 1992.

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2080161 – FOUNDATION ENGINEERING

(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**

Prerequisites: Reinforced Concrete Design **3 0 0 3**

Course Objectives:

1. To Plan Soil exploration programme for civil Engineering Projects
2. To check the stability of slopes
3. To determine the lateral earth pressures and design retaining walls
4. To determine the Bearing capacity of Soil
5. To design pile group foundation

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

1. Understand the principles and methods of Geotechnical Exploration
2. Stability analysis by various methods
3. Understand earth pressure theories
4. Stability analysis of retaining wall
5. Analyse and design of shallow foundations
6. Analyse and design of deep foundations

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.

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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

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 Braja M. 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, Newyork.

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2080162 – GROUND IMPROVEMENT TECHNIQUES

(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**

Prerequisites: Geo-Technical Engineering, Foundation Engineering **3 0 0 3**

Course Objectives:

1. To know the need of ground improvement
2. To acquire the knowledge on the various ground improvement techniques available and their applications for different types of soils
3. To understand suitable ground improvement technique for given soil conditions.

Course Outcomes: At the end of the course the students will be able to

1. Identify soil type and Know the necessity of ground improvement
2. Understand shallow and deep compaction techniques
3. Design of dewatering system
4. Understand the various ground improvement techniques available
5. Apply physical and chemical modification
6. Select & design suitable ground improvement technique for existing soil conditions in the field

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.

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, 2nd edition, Pearson, Indian edition, 2012.

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2080163 – INTRODUCTION TO COMPOSITE MATERIALS

(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**

Prerequisites:- **3 0 0 3**

Course Objectives:

1. To know the classification and characteristics of composite materials
2. To understand the mechanical behavior of composite materials
3. To get acquired knowledge in various cement composites and its engineering applications

Course Outcomes: At the end of the course the students will be able to

1. Formulate constitutive behavior of composite materials
2. Categorize the materials as per orthotropic and anisotropic behavior.
3. Estimate strain constants using theories applicable to composite materials.
4. Understand the mechanical behavior and applications of cement composites
5. Analyse and design structural elements made of cement composites.
6. Know the application of cement composite

UNIT – I Introduction

Definition- Classification and Characteristics of Composite Materials- Basic Terminology, Advantages and applications- Stress-Strain Relations- Orthotropic and Anisotropic Materials- Functional requirements of reinforcement and matrix- Laminae-Laminates

UNIT – II Mechanical Behaviour

Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity- Reinforcements and Matrices for various Types of Composites and its behavior.

UNIT – III Cement Composites

Cement Composites and its types - Constituent Materials and their Properties - Construction Techniques for Fibre Reinforced Concrete – Ferro cement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT – IV Mechanical Properties of Cement Composites

Behavior of Ferro cement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT – V Engineering Applications of Cement Composites

FRC and Ferro cement - Housing, Water Storage, Boats and Miscellaneous Structures. Composite

Materials - Analysis and Design of Cement Composite Structural Elements – Ferro cement, SIFCON and Fibre Reinforced Concrete.

TEXT BOOKS:

1. Surendra P. Shah, Perumalsamy N. Balaguru, Fiber-Reinforced Cement Composites, McGraw-Hill Inc.,US, 1992.
2. Brandt, Cement-Based Composites, Taylor & Francis, 2020.
3. Antoine E. Naaman, Fiber Reinforced Cement and Concrete Composites, Techno Press, 2018.

REFERENCE BOOKS:

1. Mechanics of Composite Materials, Jones R. M, 2nd Ed., Taylor and Francis, BSP Books, 1998.
2. Ferrocement – Theory and Applications, Pama R. P., IFIC, 1980.
3. New Concrete Materials, Swamy R.N., 1st Ed., Blackie, Academic and Professional, Chapman & Hall, 1983.

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(AUTONOMOUS)

2080164 – REMOTE SENSING AND GIS

(Professional Elective – VI)

B.Tech. IV Year II Sem	**L T P C**
Prerequisites: Surveying	**3 0 0 3**

Course Objectives: This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

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

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems
6. Create GIS and cartographic outputs for presentation

UNIT – I

Introduction to Photogrammetry: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process.
Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters- Commonly used Map Projections - Projected coordinate Systems

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

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UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

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(AUTONOMOUS)

2080103 – DISASTER MANAGEMENT

(Open Elective – III)

B.Tech. IV Year II Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course Objectives: The subject provides different disasters, tools and methods for disaster Management.

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

1. Understand Disasters, man-made Hazards and Vulnerabilities
2. Know the concepts of risk management and planning for relief
3. Assess Strengthening Capacity for Reducing Risk
4. Develop Coping Strategies and plan for industrial safety
5. Understand disaster management mechanism
6. Formulate disaster risk reduction plan

UNIT - I

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

UNIT - II

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

UNIT - III

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

UNIT - IV

Coping with Disaster: Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

UNIT - V

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for

disaster management in India - Preparation of state and district disaster management plans

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015.

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)