BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

B.Tech. – R21 COURSE STRUCTURE
(Applicable from the batch admitted during 2021-22 and onwards)

Department of Civil Engineering

S. No.	Subject Code	Subject	L	T	P	Credits
		I Year I Semester				
			Hours Per Week			**Credits**
1	21MA101BS	Linear Algebra and Calculus	3	1	0	4
2	21PH103BS	Engineering Physics	3	1	0	4
3	21CS101ES	Programming for Problem Solving	3	1	0	4
4	21ME103ES	Engineering Graphics	1	0	4	4
5	21PH104BS	Engineering Physics Lab	0	0	3	1.5
6	21CS102ES	Programming for Problem Solving Lab	0	0	3	1.5
		TOTAL	**10**	**3**	**10**	**19**
		Mandatory Course (Non-Credit)				
7	21MC101ES	Environmental Science	0	0	2	0

S. No.	Subject Code	Subject	L	T	P	Credits
		I Year II Semester				
			Hours Per Week			**Credits**
1	21MA202BS	Advanced Calculus	3	1	0	4
2	21CH201BS	Chemistry	3	1	0	4
3	21ME201ES	Engineering Mechanics	3	1	0	4
4	21ME202ES	Engineering Workshop	1	0	3	2.5
5	21EN201HS	English	2	0	0	2
6	21CH202BS	Engineering Chemistry Lab	0	0	3	1.5
7	21EN202HS	English Language and Communication Skills Lab	0	0	2	1
		TOTAL	**12**	**3**	**8**	**19**

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S. No.	Subject Code	Subject	L	T	P	Credits
II Year I Semester						
1	21CE301PC	Building Materials, Construction & Planning	3	0	0	3
2	21CE302PC	Strength of Materials – I	3	0	0	3
3	21CE303PC	Fluid Mechanics	3	0	0	3
4	21CE305PC	Surveying	3	0	0	3
5	21EE303ES	Basic Electrical and Electronics Engineering	3	0	0	3
6	21CE306PC	Surveying Lab	0	0	3	1.5
7	21CE307PC	Computer Aided Civil Engineering Drawing Lab-I	0	0	3	1.5
8	21EE304ES	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
9	21CE304PC	Fluid Mechanics Lab	0	0	3	1.5
		TOTAL	**15**	**0**	**12**	**21**
		Mandatory Course (Non-Credit)				
10	21MC302	Gender Sensitization Lab	0	0	2	0

II Year I Semester — Hours Per Week: L, T, P; Credits

S. No.	Subject Code	Subject	L	T	P	Credits
II Year II Semester						
1	21MA403BS	Numerical and Statistical Methods	3	1	0	4
2	21CE408PC	Engineering Geology	3	0	0	3
3	21CE410PC	Strength of Materials – II	3	0	0	3
4	21CE412PC	Hydraulics & Hydraulic Machinery	3	0	0	3
5	21CE414PC	Structural Analysis-I	3	0	0	3
6	21CE411PC	Strength of Materials Lab	0	0	2	1
7	21CE413PC	Hydraulics &Hydraulics Machinery Lab	0	0	3	1.5
8	21CE409PC	Engineering Geology Lab	0	0	2	1
9	21MA408BS	Aptitude and critical thinking skills Lab	0	0	3	1.5
		TOTAL	**15**	**1**	**10**	**21**
		Mandatory Course (Non-Credit)				
10	21MC403	Constitution of India	2	0	0	0

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S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	**T**	**P**	

S. No.	Subject Code	Subject	L	T	P	Credits
III Year I Semester						
1	21CE515PC	Water Resource Engineering	3	0	0	3
2	21CE517PC	Geo-Technical Engineering	3	0	0	3
3	21CE519PC	Structural Analysis-II	3	1	0	4
4	21CE520PC	Design of Reinforced Concrete Structures	3	0	0	3
5		**Professional Elective-I**	3	0	0	3
6	21CE516PC	Concrete Technology Lab	0	0	2	1
7	21CE518PC	Geo-Technical Engineering Lab	0	0	3	1.5
8	21EN503HS	Advanced English Communication Skills Lab	0	0	3	1.5
9	21CE552PR	Summer Internship-I	0	0	0	1
TOTAL			15	1	8	21
Mandatory Course (Non-Credit)						
10	21MC504	Intellectual Property Rights	3	0	0	0
11	21MC506	Cyber Security	3	0	0	0

S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	**T**	**P**	
III Year II Semester						
1	21CE622PC2	Environmental Engineering	3	0	0	3
2	21CE624PC	Transportation Engineering	3	0	0	3
3	21CE626PC	Design of Steel Structures	3	0	0	3
4		**Professional Elective-II**	3	0	0	3
5		**Open Elective-I**	3	0	0	3
6	21CE623PC	Environmental Engineering Lab	0	0	3	1.5
7	21CE625PC	Transportation Engineering Lab	0	0	3	1.5
8	21CE621PC	Computer Aided Civil Engineering Drawing Lab-II	0	0	3	1.5
9	21HS601	Social Innovation in Practice	0	0	3	1.5
TOTAL			15	0	12	21
Mandatory Course (Non-Credit)						
10	*21MC605	Environmental Science	3	0	0	0
11	21MC607	Artificial Intelligence	3	0	0	0

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S. No.	Subject Code	Subject	L	T	P	Credits
		IV Year I Semester				
1	21SM701MS	Business Economics &Financial Analysis	3	0	0	3
2	21CE727PC	Estimation, Costing& Project Management	3	1	0	4
3		**Professional Elective-III**	3	0	0	3
4		**Professional Elective-IV**	3	0	0	3
5		**Open Elective-II**	3	0	0	3
6	21CE753PR	Summer Internship – II	0	0	0	1
7	21CE754PR	Project Stage– I	0	0	8	4
		TOTAL	**15**	**0**	**8**	**21**

S. No.	Subject Code	Subject	L	T	P	Credits
		IV Year II Semester				
1		**Professional Elective-V**	3	0	0	3
2		**Professional Elective-VI**	3	0	0	3
3		**Open Elective-III**	3	0	0	3
4	21CE855PR	Project Stage-II	0	0	16	8
		TOTAL	**9**	**0**	**16**	**17**

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List of Subjects

Sl.No	Name of The Subject
1	Building Materials, Construction & Planning
2	Strength of Materials – I
3	Fluid Mechanics
4	Fluid Mechanics Lab
5	Surveying
6	Surveying Lab
7	Computer Aided Civil Engineering Drawing Lab-I
8	Engineering Geology
9	Engineering Geology Lab
10	Strength of Materials – II
11	Strength of Materials Lab
12	Hydraulics & Hydraulic Machinery
13	Hydraulics &Hydraulics Machinery Lab
14	Structural Analysis-I
15	Water Resource Engineering
16	Concrete Technology Lab
17	Geo-Technical Engineering
18	Geo-Technical Engineering Lab
19	Structural Analysis-II
20	Design of Reinforced Concrete Structures
21	Computer Aided Civil Engineering Drawing Lab-II
22	Environmental Engineering
23	Environmental Engineering Lab
24	Transportation Engineering
25	Transportation Engineering Lab
26	Design of Steel Structures
27	Estimation, Costing & Project Management
52	Summer Internship-I
53	Summer Internship-II
54	Project Stage– I
55	Project Stage-II

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List of Professional Electives

Subject code	Professional Elective	Subject name
21CE528PE	**Professional Electives-I**	Construction Technology & Management
21CE529PE		Concrete Technology
21CE530PE		Modern Transportation Engineering
21CE531PE		Rock Mechanics
21CE632PE	**Professional Electives-II**	Foundation Engineering
21CE633PE		Pavement Design
21CE634PE		Irrigation Engineering
21CE635PE		Theory of Elasticity
21CE736PE	**Professional Electives-III**	Watershed Management
21CE737PE		Ground Water Hydrology
21CE738PE		Intelligence Transport Systems
21CE739PE		Environmental Impact Assessment
21CE740PE	**Professional Electives-IV**	Municipal and Hazardous Waste Management
21CE741PE		Finite Element Analysis
21CE742PE		Remote Sensing and GIS
21CE743PE		Air Pollution
21CE844PE	**Professional Electives-V**	Ground Improvement Techniques
21CE845PE		Prestressed Concrete
21CE846PE		Traffic Engineering
21CE847PE		Advanced Structural Analysis
21CE848PE	**Professional Electives-VI**	Earthen Dams and Slopes Stability
21CE849PE		Repair and Rehabilitation of Structures
21CE850PE		Earthquake Engineering
21CE851PE		Solid Waste Management

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MA101BS: LINEAR ALGEBRA AND CALCULUS

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Course Objectives: To learn

- 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.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

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

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT-I: Matrices

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

UNIT-II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: 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 and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Sequences & Series

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

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

UNIT-IV: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

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

Definitions of Limit and continuity.

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

TEXTBOOKS:

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, 9thEdition,Pearson, Reprint, 2002.

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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21PH103BS: ENGINEERING PHYSICS

B.Tech. I Year I Sem.   L   T   P C
                                                                                                       3   1   0 4

Course Objectives:
- 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 engineeringcourses.
- 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.
- 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.
- 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:
- The knowledge of Physics relevant to engineering is critical for converting ideas into technology.
- 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.
- In the present course, the students can gain knowledge on the mechanism of physical bodies upon the action of forces on them, the generation, transmission and the detection of the waves, Optical Phenomena like Interference, diffraction, the principles of lasers and Fibre Optics.
- 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, Problems including constraints and friction, Extension to cylindrical and spherical 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, Mechanical and electrical oscillators, Mechanical and electrical impedance, Steady state motion of forced damped harmonic oscillator, Power observed by oscillator.

UNIT-III: Waves in one dimension
Transverse wave on a string , The wave equation on a string , Harmonic waves, Reflection and transmission of waves at a boundary, Impedance matching , Standing waves and their Eigen frequencies , Longitudinal waves and the wave equations for them, Acoustic waves and speed of sound, Standing sound waves.

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

UNIT-V: Lasers and Fibre Optics
Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

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

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

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CS101ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year I/II Sem.		L	T	P	C
		3	1	0	4

Course Objectives:
- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes: The student will learn
- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

UNIT - 1: 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: Textand 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 a 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, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
2. Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
4. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21ME103ES: ENGINEERING GRAPHICS

B.Tech. I Year I Sem.   L   T   P   C
                                                                                                  1   0   4   4

Pre-requisites: Nil
Course objectives:
- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

Course Outcomes: At the end of the course, the student will be able to:
- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I
Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

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

UNIT – III
Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone,
Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

UNIT – V
Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions

Introduction to CAD: (For Internal Evaluation Weightage only):
Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package
TEXTBOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:
1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21PH104BS: 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. Newton's rings:
    To determine the radius of curvature of the lens by forming Newton's rings.

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

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

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

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

8. LASER:
    To study the characteristics of LASER sources.

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

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

Note: Any 8 experiments are to be performed

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CS102ES: PROGRAMMING FOR PROBLEM SOLVING LAB

B.Tech. I Year I- Sem.   **L   T   P   C**
                                                                              0   0   3   1.5

Course Objectives: The students will learn the following:
- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:
- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

Practice sessions:
a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Simple numeric problems:
a. Write a program for fiend the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
e. 5 x 1 = 5
f.   5 x 2 = 10
g.   5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:
a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. 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)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

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 find the roots of a Quadratic equation.

h. Write a C program to calculate the following, where x is a fractional value. i. 1-x/2 +x^2/4-x^3/6

j. 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 is 3 and x is 5, then the program computes 1+5+25+125.

Arrays and Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.

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

d. Addition of Two Matrices

e. ii. Multiplication of Two Matrices

f. iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.

g. Write C programs that use both recursive and non-recursive functions

h. To find the factorial of a given integer.

i. ii. To find the GCD (greatest common divisor) of two given integers.

j. iii. To find x^n

k. Write a program for reading elements using pointer into array and display the values using array.

l. Write a program for display values reverse order from array using pointer.

m. Write a program through pointer variable to sum of n elements from array.

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 uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

d. Write a C program that does the following:
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)
Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)
The program should then read all 10 values and print them back.

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

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

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

d. To insert a sub-string in to a given main string from a given position.

e. ii. To delete n Characters from a given position in a given string.

f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn_t contain ch.

h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

    a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

    b. 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     * * *
```

Sorting and Searching:

    a. Write a C program that uses non recursive function to search for a Key value in a given

    b. list of integers using linear search method.

    c. Write a C program that uses non recursive function to search for a Key value in a given

    d. sorted list of integers using binary search method.

    e. Write a C program that implements the Bubble sort method to sort a given list of

    f. integers in ascending order.

    g. Write a C program that sorts the given array of integers using selection sort in descending order

    h. Write a C program that sorts the given array of integers using insertion sort in ascending order

    i. Write a C program that sorts a given array of names

Suggested Reference Books for solving the problems:

    i. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

    ii. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

    iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

    iv. Hall of India

    v. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)

    vi. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

    vii. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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*21MC101ES: ENVIRONMENTAL SCIENCE

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

Course Objectives:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:
- 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 life style.

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.

REFERENCE BOOKS:

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.

Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MA202BS: ADVANCED CALCULUS
Common for All Branches

B.Tech. I Year II Sem.	L	T	P	C
	3	1	0	4

Course Objectives: To learn
- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- 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
- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelopiped
- 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^{as}, sin ax , cos ax, polynomials in x, $e^{as}V(x)$ and x V(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 parallelopiped).

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.

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, 9thEdition,Pearson, Reprint, 2002.

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CH201BS: CHEMISTRY

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

Course Objectives:
- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- 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:
- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

UNIT - I:
Molecular structure and Theories of Bonding: Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and F_2 molecules. π molecular orbitals of butadiene andbenzene.
Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

UNIT - 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. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

UNIT - 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 quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).
Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.
UNIT - IV:

Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation alanalysis of n- butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions.

Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid.

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

UNIT - V:

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

TEXT BOOKS:
1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition.
5. University Chemistry, by B.M. Mahan, Pearson IV Edition.
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21ME201ES: ENGINEERING MECHANICS

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

                                                                                   3   1   0   4

Course Objectives: The objectives of this course are to
- Explain the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium
- Perform analysis of bodies lying on rough surfaces.
- Locate the centroid of a body and compute the area moment of inertia and mass moment of inertia of standard and composite sections
- Explain kinetics and kinematics of particles, projectiles, curvilinear motion, centroidal motion and plane motion of rigid bodies.
- Explain the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations

Course Outcomes: At the end of the course, students will be able to
- Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

UNIT-I:
Introduction to Engineering Mechanics - Force Systems :Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant-Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

UNIT-II:
Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. – Theorem of Pappus

UNIT-III:
Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem Mass Moment of Inertia : Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia– Mass moment of inertia of composite bodies.

UNIT-IV:
Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

UNIT-V:
Kinetics of Rigid Bodies -Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work Energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

TEXT BOOKS:
1. Shames and Rao (2006) , Engineering Mechanics, Pearson Education
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2010), Singer's Engineering Mechanics – Statics & Dynamics

REFERENCE BOOKS:
1. Timoshenko S.P and Young D.H., ‒Engineering Mechanics‖, McGraw Hill International Edition, 1983.
2. Andrew Pytel, Jaan Kiusalaas, ‒Engineering Mechanics‖, Cengage Learning, 2014.
3. Beer F.P & Johnston E.R Jr. Vector, ‒Mechanics for Engineers‖, TMH, 2004.
4. Hibbeler R.C & Ashok Gupta, ‒Engineering Mechanics‖, Pearson Education, 2010.
5. Tayal A.K., ‒Engineering Mechanics – Statics & Dynamics‖, Umesh Publications, 2011.
6. Basudeb Bhattacharyya, ‒Engineering Mechanics‖, Oxford University Press, 2008.
7. Meriam. J. L., ‒Engineering Mechanics‖, Volume-II Dynamics, John Wiley & Sons, 2008.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

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21ME202ES: ENGINEERING WORKSHOP

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	1	**0**	**3**	**2.5**

Pre-requisites: Practical skill

Course Objectives:
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:
- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

1. TRADES FOR EXERCISES:
At least two exercises from each trade:
  I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
  II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
  III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
  IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
  V. Welding Practice – (Arc Welding & Gas Welding)
  VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
  VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:
Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

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

REFERENCE BOOKS:
  1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
  2. Workshop Manual / Venkat Reddy/ BSP

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

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21EN201HS: 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 contextsand cultures.*

Learning Objectives: The course will help to
  • Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
  • Equip students to study academic subjects more effectively and critically using the theoreticaland practical components of English syllabus.
  • Develop study skills and communication skills in formal and informal situations.

Course Outcomes: Students should be able to
  • Use English Language effectively in spoken and written forms.
  • Comprehend the given texts and respond appropriately.
  • Communicate confidently in various contexts and different cultures.
  • Acquire basic proficiency in English including reading and listening comprehension, writingand speaking skills.

SYLLABUSUNIT –

I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published byCambridge 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' publishedby 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 ofRequisition, Job Application with Resume.

UNIT –III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by CambridgeUniversity 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 byCambridge 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 forEngineers' 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 ofReports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing aReport.

TEXTBOOK:

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

REFERENCE BOOKS:

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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21CH202BS: ENGINEERING CHEMISTRY LAB

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:
- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- To determine the rate constant of reactions from concentrations as an function of time.
- The measurement of physical properties like adsorption and viscosity.
- 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:
- Determination of parameters like hardness and chloride content in water.
- Estimation of rate constant of a reaction from concentration – time relationships.
- Determination of physical properties like adsorption and viscosity.
- Calculation of R_f values of some organic molecules by TLCtechnique.

List of Experiments:
1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe^{2+} by Potentiometry using $KMnO_4$
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of R_f values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

REFERENCE BOOKS:
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 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EN202HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

B.Tech. I Year II Sem.   **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:
- To facilitate computer-assisted multi-media instruction enabling individualized d independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mothertongue influence
- To train students to use language appropriately for public speaking and interviews

Learning Outcomes: Students will be able to attain
- Better understanding of nuances of English language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employability skills

Syllabus
English Language and Communication Skills Lab (ELCS) shall have two parts:
   a. **Computer Assisted Language Learning (CALL) Lab**
   b. **Interactive Communication Skills (ICS) Lab**

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

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
  • Listening for general content
  • Listening to fill up information
  • Intensive listening
  • Listening for specific information

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

➤ **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)**

Exercise – I
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.
Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.
ICS Lab:
Understand: Communication at Work Place- Spoken vs. Written language.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II
CALL Lab:
Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.
ICS Lab:
Understand: Features of Good Conversation – Non-verbal Communication.
Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III
CALL Lab:
Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).
Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
ICS Lab:
Understand: How to make Formal Presentations.
Practice: Formal Presentations.

Exercise – IV
CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks.
Practice: Making a Short Speech – Extempore.

Exercise – V
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21CE301PC: BUILDING MATERIALS, CONSTRUCTION AND PLANNING

II Year I Sem.   **L T/P/D C**

                                                   3 0/0/0 3

Course Objectives: The objectives of the course is to
- List the construction material.
- List the building components and its services
- Explain different construction techniques
- Understand the building bye-laws
- Highlight the smart building materials

Course Outcomes: After the completion of the course student should be able to
- Explain physical properties of construction materials
- Demonstrate various building components and services
- Illustrate different constructions of brick, stone masonry, finishingand form works
- Choose different types of constructions for structural components
- Originate building plan by using rules and bye-laws

UNIT - I
Stones and Bricks: Building stones–classifications and quarrying–properties–structural requirements – dressing; Bricks – Composition of Brick earth – manufacture and structural requirements.
Cement, Wood and Glass: Cement - Ingredients of cement – manufacture – Chemical composition – Hydration. Wood - structure – types and properties – seasoning – defects-alternate materials for wood – GI / fibre reinforced glass bricks, steel & aluminum.

UNIT - II
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 Hazards – Classification of fire-resistant materials and constructions.

UNIT – III
Masonry and Finishing: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick-stone composite Concrete, Reinforced brick.
Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP
Form work: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT - IV
Construction Techniques: Sub Structure Construction - Techniques of Box jacking - Pipe Jacking - under water construction of diaphragm walls and basement-Tunneling techniques - Piling techniques - sinking cofferdam - cable anchoring and grouting - shoring for deep cutting - well points - Dewatering and stand by Plant equipment for underground open excavation; Super Structure Construction- Launching girders, bridge decks, off shore platforms – special forms for
shells - techniques for heavy decks – in-situ pre-stressing in high rise structures.

UNIT – V

Building By Laws: Principles of Building Planning: Aspect, Prospect, Grouping, Sanitation, Elegance, Practical Consideration. Classification of buildings -Building by laws-Objectives, Principles.

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - LaxmiPublications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.
4. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
5. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21CE302PC: STRENGTH OF MATERIALS – I

II Year I Sem.   L T/P/D C
                                                                                     3   0/0/0   3

Pre-Requisites: Engineer Mechanics

Course Objectives: The objective of this Course is
- To understand the nature of stresses developed in simple geometries such as bars, cantileversand beams for various types of simple loads
- To calculate the Shear force and Bending Moment Diagram for beams
- To calculate the elastic deformation occurring in simple members for differenttypes of loading.
- To show the plane stress transformation with a particular coordinate system for differentorientation of the plane.
- To know different failure theories adopted in designing of structural members

Course Outcome: On completion of the course, the student will be able to:
- Determine the stress and strain of various materials
- Sketch the shear force and bending moment diagrams for beams ofvarious supports and loads
- Analyze flexural and shear stresses in a beam
- Determine the deflections in beams under various loading and support conditions
- Evaluate principal stresses, strains and various theories of failure

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

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

UNIT – II
SHEAR FORCE AND BENDING MOMENT: Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

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

Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I and T sections.

UNIT – IV

Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load-Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

Conjugate Beam method: Concept of conjugate beam-Difference between real and conjugate beam.

UNIT – V

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

Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum shear stress theory.

Strain Energy and Shear strain Energy Theory (Von misses Theory).

TEXT BOOKS:
1. Strength of Materials by Rajput and S.Chand Company Pvt. Ltd.
2. Strength of Materials by S. Ramamrutham, Dhanpath Rai Publishing Company, Pvt., Ltd.
3. Strength of Materials by S.S.Bhavikatti, Vikas Publishing House Pvt. Ltd.

REFERENCE BOOKS:
1. Mechanics of material 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 Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Presss.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE303PC: FLUID MECHANICS

II Year I Sem.   **L T/P/D C**

                                                                              3 0/0/0 3

Course Objectives: The objectives of the course are to
- Introduce the concepts of fluid mechanics useful in Civil Engineering applications and provide a first level exposure to the students to fluid statics, kinematics and dynamics.
- Learn about the application of mass, energy and momentum conservation laws for fluid flows
- Train and analyse engineering problems involving fluids with a mechanistic perspective isessential for the civil engineering students
- To obtain the velocity and pressure variations in various types of simple flows
- To prepare a student to build a good fundamental background useful in the application-intensivecourses covering hydraulics, hydraulic machinery and hydrology

Course Outcomes: Upon completion of this course, students should be able to:
- Identify properties and influences of fluids on motion
- Derive the stream function from a velocity field
- Apply the equation of motion in flow measurements
- Determine energy and losses of closed conduit flow
- Analyze boundary layer concept on fluid flow

UNIT – I
Fluid Properties & Statics: Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges and Manometers: differential. Hydrostatic forces on submerged plane, Horizontal, Vertical and inclined Center of pressure; Buoyancy and flotation.

UNIT - II
Fluid Kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotationaland irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions.

UNIT - III
Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flowalong a stream line for flow, (Navier-stokes equations (Explanationary) Momentum equation and its application
Measurement of Flow: Pitot tube, Venturi meter and Orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal notches - Broad crested weirs.

UNIT – IV
Closed Conduit Flow: Reynold's experiment – Characteristics of Laminar & Turbulent flows Laws of Fluid friction – Darcy's equation, variation of friction factor with Reynold's number – Moody's Chart, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line - Siphon, Water hammer

UNIT - V

Boundary Layer Theory: Approximate Solutions of Navier Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers (no derivations) BL in transition, separation of BL, control of BL.

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

REFERENCE BOOKS:
1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
3. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, OxfordUniversity 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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE305PC: SURVEYING

II Year I Sem.   **L T/P/D C**

                                                                     3 0/0/0   3

Course Objectives: The object of the course student should have the capability to:
- Know the principle and methods of surveying and Perform calculations based on the observation
- Identification of source of errors and rectification methods
- Apply surveying principles to determine areas and volumes and Measure horizontal and vertical- distances and angles
- Apply surveying principles to determine the setting out curves
- Use modern surveying equipment's for accurate results

Course Outcomes: Course will enable the student to:
- Apply the concepts of surveying to measure the distances and directions
- Identify different methods of leveling to draw levels and contour maps
- Solve problems on areas and volumes; measure angles by Theodolite
- Extend methods of trigonometry & tachometry and design the simple curves
- Acquaint with EDM, GPS and Total Station

UNIT – I
Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Code of Signals.
Measurement of Distances and Directions: Linear distances-Approximate methods, Direct methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods.
Prismatic Compass: Bearings, included angles, Local Attraction, Magnetic Declination.

UNIT - II
Leveling: Basics definitions, types of levels and leveling staves, temporary adjustments, methods of leveling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.
Contouring: Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

UNIT – III
Areas and Volumes: Determination of areas consisting of irregular boundary and regular boundary, introduction to Planimeter. Computation of areas for level section with and without transverse slopes, and introduction to two level sections, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.
Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible - transition and vertical curves.

UNIT - IV
Traversing: Classifications of traversing and methods of traversing.
Tacheometric Surveying: Principles of Tachometry, stadia and tangential methods of Tacheometry.
Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves, Introduction to compound curves.

UNIT - V

Modern Surveying: Total Station and Global Positioning System: Basic principles, classifications, applications. Electromagnetic wave theory - electromagnetic distance measuring system - principle
of working and EDM instruments, Components of GPS – space segment, control segment and user segment, satellite orbits. Photogrammetry.

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

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

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE303ES: BASIC ELECTRICAL &ELECTRONICS ENGINEERING

B.Tech. II Year I Sem.   **L T P C**
                                                                                                                  3 0 0 3

Course Objectives:
- The basic concepts of electrical circuits which is the foundation for network theory
- To understand about single phase AC circuits.
- To understand functioning of different types of DC machines and transformers.
- To understand the various operations of transistors and special purpose diodes
- To learn basic concepts of diodes, Rectifiers and filters.

Course Outcomes:

   At the end of this course, students will demonstrate the ability to:
- Analyze and solve electrical circuitsusing network laws and theorems
- Analyze the AC circuits and Understand the concepts of reactance, Impedance, Susceptance and Admittance and PowerFactor
- Understand the working principle of DC motors, Transformers
- Study the characteristics of PN Junction diode and zener diode
- Learn the basics of Amplifiers and Rectifiers.

UNIT-I:
Electrical Circuits: Circuits concept, R-L-C Parameters, Voltage and Currentsources, Source Transformation, V–I relationship for Passive elements, Kirchoff'sLaws,Network reduction techniques – series, parallel, series parallel, star-delta & star-delta transformations, Nodal Analysis, Mesh analysis with DC excitations. Network Theorems -Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity Theoremswith DC excitation Calculaion of Power (VI)

UNIT-II:
Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Paralleland Series parallel Combinations of R, L and C with Sinusoidal excitation concept of reactance, Impedance,Susceptance and Admittance –Concept of Power Factor.

UNIT-III:
Transformers and DC Machines::D.C.Machines: Constructional features, Methods of Excitation,
E.M.F. Equation and Applications, Torque development in D.C motor Characteristics of DC motors, losses,Efficiency, Speed control of DC Shunt motors Role of Transformers in the fields of engineering,Transformer principle, Ideal and Practical Transformers Equivalent circuit, Regulation and Efficiency.

UNIT-IV:
P-N Junction Diode - Diode equation, V-I characteristic, Temperature dependence, Bipolar JunctionTransistor (BJT) - Construction, Principle of Operation, CB,CE and CC configurations, Zener Diode, Zenerdiode characteristics, Use of Zener diode as simple regulator.

UNIT-V:
Operational amplifier basics, op amp inverting and Non Inverting amplifier, Rectifiers and Filters - The P-Njunction as a rectifier - A Half Wave Rectifier, Bridge Rectifier, Filters –Inductor Filters, Capacitor Filters.

Text Books:
1. Circuit Theory Analysis and Synthesis by A Chakrabarti, Dhanpatrai& co.
2. Basic Electrical Engineering, P Ramana, M. Suryakalavathi, G. T. Chandra Sekhar,1st Edition, S. Chand Technical Publications, 2018
3. Electronic Devices and Circuits, S. Salivahanan and N Suresh Kumar, 3rd Edition TMH, Revised 2019

References:
1. Network Analysis by M.E Van Valkenburg, Pearson Publications 3rd Edition
2. Principles of electrical machines by V K Mehta, S Chand Publications
3. Electronics devices and circuits by I J NagrathPHI Publications

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE306PC: SURVEYING LAB

B.Tech. II Year I Sem.   **L T/P/D C**
       0 0/3/0 1.5

Pre-Requisites: Surveying Theory

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

Course Outcomes: At the end of the course, the student will be able to:
- Find the distances, directions and positions of stations
- Identify reduced levels for L.S and C.S of road profiles
- Measure the distance, height between two inaccessible points, horizontal and vertical angles
- Determine the area, traverse, elevation, contour and stakeout
- Develop curve and resection for various item of work

List of Experiments

1. Surveying of an area by chain& compass survey (closed traverse) & plotting.
2. Radiation and intersection methods by plane table survey
3. Leveling – Longitudinal & Cross-Sectioning and Plotting.
4. Measurement of Horizontal angle & vertical angle by theodolite
5. Trigonometric leveling using theodolite
6. Height and distances using principles of tachometric surveying
7. Determine the area using total station.
8. Traversing and Contouring using total station
9. Determination of remote height using total station.
10. Distance, gradient, differential height between two inaccessible points using total station
11. Curve settling using total station
12. Stake out using total station.
13. Resection using total station
14. Finding the position of stations using GPS

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE307PC: COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB-I

B.Tech. II Year I Sem.	L	T/P/D	C
	0	0/3/0	1.5

Course Objectives: The objective of this lab is to
- Learn the Auto cad software
- Learn the basic different coordinate systems
- Learn the basic commands of Auto Cad
- Learn the draw the different components by using layers
- Learn drawing fundamentals in various civil engineering applications specially in building drawing

Course Outcomes: At the end of the course, the student will be able to:
- Make use of basic Auto CAD commands for drafting
- Prepare the plans for single and multistoried buildings
- Develop sections and elevations for various buildings
- Draw the detailing of building components
- Construct the plans by using layers

List of Experiments:

1. Introduction to computer aided drafting and different coordinate systems
2. Practice exercises on CAD software (Draw and Modify Tools)
3. Exercise on other tools (Layers, Dimensions, Texting, etc.,)
4. Drawing of plans of buildings using software
   a) Single-storied buildings
   b) Multi-storied buildings
5. Developing sections and elevations for
   a) Single-storied buildings
   b) Multi-storied buildings
6. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD software's
7. Exercises on development of working drawings of buildings

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE304ES: BASIC ELECTRICAL &ELECTRONICS ENGINEERING LAB

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

                                                         0 0 3 1.5

Course Objectives:
- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:
        At the end of this course, students will demonstrate the ability to
- Analyze and solve electrical circuits using network laws and theorems.
- Understand and analyze basic Electric and Magnetic circuits
- Study the working principles of Electrical Machines
- Introduce components of Low Voltage Electrical Installations
- Identify and characterize diodes and various types of transistors.

List of experiments/demonstrations:

PART A: ELECTRICAL
1. Verification of KVL and KCL
2. Verification of Ohm's Law
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. Load test on single phase transformer

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

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

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.

2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, SatyabrataJit, 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) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE304PC: FLUID MECHANICS LAB

B.Tech. II Year I Sem.   **L T/P/D C**
                                                                    0 0/3/0 1.5

Pre Requisites: FM Theory

Course Objectives: To give the student an exposure to various hydraulic devices and PipeFlow.

Course Outcomes: At the end of the course, the student will be able to:
- Determine the C_d for venture meter, various notches and orifice meters
- Find the major and minor losses in pipes
- Verify the Bernoulli's equation and study the flow in open channel
- Analyze the performance of pumps, various turbines and effect of water hammer
- Calculate impact of force of Jet on different types of Vanes

List of Experiments:
1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Determination of Coefficient of discharge for a small orifice.
4. Determination of Coefficient of discharge for a mouthpiece by constant head method.
5. Calibration of contracted Rectangular Notch / Triangular Notch/Trapezoidal Notch.
6. Determination of friction factor of a pipe
7. Determination of Coefficient for minor losses - Sudden Expansion
8. Determination of Coefficient for minor losses- Sudden Contraction
9. Verification of Bernoulli's equation.
10. Study of Water Hammer due to sudden Closure of valve.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21MC302-GENDER SENSITIZATION LAB

B.Tech. II Year I Sem. L T/P/D C
0 0/2/0 0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

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

Learning Outcomes:
- Students will have developed a better understanding of important issues related to gender in
- contemporary India.
- 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.
- Students will attain a finer grasp of how gender discrimination works in our society and how to
- counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and
- economics.
- Men and women students and professionals will be better equipped to work and live together as
- equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide
- protection and relief to women, the textbook will empower students to understand and respond to
- gender violence.

UNIT - I: UNDERSTANDING GENDER
Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. GrowingupMale.FirstlessonsinCaste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- ‒My Mother doesn't Work.‖ ‒Share the Load.‖-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE
The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: ‒*Chupulu".*
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-‒I Fought for my Life‖

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature-Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**
- *Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".*
- **ESSENTIAL READING**: The Textbook, ‒*Towards a World of Equals: A Bilingual Textbook on Gender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:
- ✓ Discussion & Classroom Participation: 20%
- ✓ Project/Assignment: 30%
- ✓ End Term Exam: 50%

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21MA403BS: NUMERICAL AND STATISTICAL METHODS

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

Course Objectives: To learn
- Various methods to the find roots of an equation.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques.
- Evaluation of Correlation, regression , fitting of curves using method of least squares.
- The sampling theory and testing of hypothesis and making inferences.

Course Outcomes (COs)
- Estimate the value for the given data using interpolation and Find the root of a given equation.
- Identify the numerical solutions for a given ODE's
- To evaluate Correlation, regression , fitting of curves using method of least squares ,
- To study the Large sampling theory
- To determine the Small sampling theory.

Syllabus:
Unit I: Numerical Methods – I
Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Centraldifference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation

Unit II: Numerical Methods – II
Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;
Runge-Kutta method of fourth order.

UNIT - III: Discrete and Continuous Distributions:
Discrete Random Variable and their properties, Binomial and Poisson distributions.
Continuous random variables and their properties, Normal distribution.

Unit IV:Testing of Hypothesis-I
Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, levelof significance, critical region. Large sample test for single proportion, difference of proportions, single mean, difference of two means;

Unit V: Testing of Hypothesis-II
Small samples: Test for single mean, difference of means, test for ratio of variances for small samples and chi-square distribution.

Textbooks:
1. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
2. Fundamentals of Mathematical Statistics, Khanna Publications, S C Guptha and V.K. Kapoor.

References:
1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Engineering mathematics volume-III, S.CHAND T.K.V Iyenger. B. Krishna Gandhi, S.Ramganatham

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE408PC: ENGINEERING GEOLOGY

B.Tech. II Year II Sem.   L T/P/D C
                                                            3   0/0/0   3

Course Objectives: The objective of this Course is
- To give the basics knowledge of Geology in civil engineering by going through case histories of failure of civil engineering constructions in the past
- To identify the various rocks and minerals depending on geological classification
- To give the basic knowledge about earth crust and ground water table
- To focus on the core activities of engineering geologists site characterization and geologicalhazard identification and mitigation.
- Planning and construction of major Civil Engineering projects

Course Outcomes: At the end of the course, the student will be able to:
- Explain weathering process and mass movement
- Classify the different minerals and rocks
- Identify the geological structures of the rocks and ground water potential
- Adapt geophysical principles for site selection
- Assess natural hazards and select sites for mass structures

UNIT - I
Basic Geosciences: Definition of Geology and Engineering Geology, Main and applied branches of Geology, Importance of Geology and its branches from civil engineering point of view, Brief study of case histories of failure of some civil engineering constructions due to geological draw backs, Internal structure of the Earth and its composition.
Physical Geology: Weathering, Effect of weathering over the properties of rocks like _granite', Importance of weathering with reference to civil engineering constructions like dams, reservoirs and tunnels; Soil formation, Geological work of Rivers, Geological work of wind.

UNIT - II
Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of rock forming and economics minerals.
Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III
Structural Geology: Outcrop, strike and dip study of common geological structures   associating with the rocks such as folds, faults unconformities, and joints - their important types and case studies.
Ground water: Definition of ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water   exploration.

UNIT - IV

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

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

UNIT - V

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

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

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE410PC: STRENGTH OF MATERIALS – II

B.Tech. II Year II Sem.   L T/P/D C
                                                                                      3 0/0/0 3

Pre-Requisites: Strength of Materials - I

Course Objectives: The objective of this Course is
- To understand the nature of stresses developed in simple geometries shafts and springs
- To evaluate the behavior of columns and struts
- To understand the stresses developed in various structures
- To calculate the stability and elastic deformation occurring cylindrical and spherical shells for various types of simple loads
- To understand the unsymmetrical bending and shear center importance for equilibriumconditions in a structural member of having different axis of symmetry.

Course Outcome: On completion of the course, the student will be able to:
- Determine torsion in springs and shafts
- Evaluate crippling load of columns using various end conditions
- Analyze direct and bending stresses of various structures
- Find the stresses and deformations in thick and thin cylinders
- Analyze unsymmetrical bending and find shear center for various sections

UNIT – I
Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations– Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion.
Springs: Introduction – Types of springs – deflection of close and open coiled helical springs
under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

UNIT – II
Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns-assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent
length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading.
Beam columns: Laterally loaded struts subjected to UDL and Concentric loads.

UNIT - III
Direct and Bending Stresses: Stresses under the combined action of direct loading andbending moment, core of a section – Determination of stresses in the case of chimneys.
Determination of stresses in the case of retaining walls and dams – conditions for stability – stresses due to direct loading and bending moment about both axis.

UNIT – IV

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume ofthin cylinders – Thin spherical shells.

Thick Cylinders: Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

UNIT – V

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

Shear Centre: Introduction - Shear center for symmetrical and unsymmetrical (channel, I, T and L) sections.

TEXT BOOKS:

1. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.
2. Strength of Materials by R. K. Bansal, Lakshmi Publications House Pvt. Ltd.
3. Strength of Materials by R. Subramanian, Oxford University Press.

REFERENCE BOOKS:

1. Mechanics of Materials by R.C. Hibbeler, Pearson Education
2. Engineering Mechanics of Solids by Popov E.P. Prentice-Hall Ltd
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge Publishers
4. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE412PC: HYDRAULICS AND HYDRAULIC MACHINERY

B.Tech. II Year II Sem.   L   T/P/D   C
                                              3   0/0/0   3

Course Objectives: The objective of the course is
- To define the fundamental principles of water conveyance in open channels.
- To Analyze and design of hydraulic machinery and its modeling
- To analyze hydrodynamic forces on vanes
- To Discuss and analyze the open channels in uniform and Non-uniform flow conditions.
- To Study the characteristics of hydroelectric power plant and its components.

Course Outcomes: At the end of the course the student will able to
- Explain the concepts of channel flows
- Develop empirical relationships of a hydraulic model and prototype
- Determine hydrodynamic forces of jets on various vanes
- Select suitable turbine for given heads
- Estimate the efficiency of centrifugal and reciprocating pumps

UNIT - I
Open Channel Flow: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's formulae for uniform flow– Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub- critical and super critical flows. Non-uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- for surface profiles -
Rapidly varied flow, hydraulic jump, energy dissipation. Surges – Types.

UNIT - II
Hydraulic Similitude: Dimensional Analysis-Rayleigh's method and Buckingham's pi theorem-

study of Hydraulic models – Geometric, kinematic and dynamic similarities, dimensionless numbers – model and prototype relations.

UNIT - III
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

UNIT - IV
Hydraulic Turbines: Layout 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 – theory and function efficiency. Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation and preventive measures

UNIT - V
Centrifugal Pump: installation details-classification-types work done-Manometric head minimum starting speed-losses and efficiencies-specific speed multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH-cavitation.
Reciprocating pump: Basics, types, air vessels, slip Classification of Hydropower plants –

Definition of terms – load factor, utilization factor, capacity factor, estimation of

hydropower potential.

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

REFERENCE BOOKS:

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, SumanChakraborthy, Mc Graw Hill Education (India) Private Limited
5. Hydraulic Machines by Banga & Sharma (Khanna Publishers).

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE414PC: STRUCTURAL ANALYSIS – I

B.Tech. II Year II Sem.   L T/P/D C

                                                                 3   0/0/0 3

Pre-Requisites: Strength of Materials – I

Course Objectives: The objective of the course is to
- Differentiate the statically determinate and indeterminate structures.
- Understand the nature of stresses developed in perfect frames and three hinged arches forvarious types of simple loads
- Analyze the statically indeterminate members such as fixed bars, continuous beams and forvarious types of loading.
- Understand the energy methods used to derive the equations to solve engineeringproblems
- 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
- Evaluate degree of indeterminacy and forces in the frames
- Apply the energy theorems for trusses and analyze three hinged arches
- Analyze the propped cantilever and fixed beam under various loads
- Analyze continuous beams by slope deflection method
- Sketch the influence line diagrams for moving loads

UNIT – I
Introduction to Structures and Indeterminacy: Equilibrium and compatibility equations - types of supports and reactions, Classification of frames- plane and space frames, pin jointed and rigid jointed frames, Static and kinematic indeterminacies of beams and frames. Relative Merits of indeterminate structures over determinate structures.
Analysis of Perfect Frames: Types of frames - Perfect, Imperfect and Redundant pin jointed frames. - Analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT – II
Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Unit Load Method. Deflections of simple beams and pin- jointed plane trusses.
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 in an arch. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Absolute maximum bending moment diagram for a three hingearch.

UNIT - III
Propped Cantilever and Fixed Beams: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads.
Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-effect of sinking of support, effect of rotation ofa support.

UNIT – IV
Continuous Beams: Introduction-Continuous beams. Clapeyron's theorem of three moments-Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - Effects of sinking of supports.

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

UNIT – V

Moving Loads and Influence Lines: Introduction on moving loads, Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span-two-point loads with fixed distance between them and several point loads- Influence lines for forces in members of Pratt and Warren trusses.

TEXT BOOKS:

1. Structural Analysis Vol –I & II by V.N. Vazirani and M.M. Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S.Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt.Ltd.
3. Structural analysis T. S Thandavamoorthy, Oxford university Press

REFERENCE BOOKS:

1. Structural Analysis by R. C. Hibbeler, Pearson Education
2. Basic Structural Analysis by K.U. Muthu *et al.,* I.K. International Publishing House Pvt. Ltd
3. Mechanics of Structures Vol – I and II by H.J. Shah and S.B. Junnarkar, Charotar PublishingHouse Pvt. Ltd.
4. Basic Structural Analysis by C. S. Reddy., Tata McGraw Hill Education Pvt. Ltd.
5. Fundamentals of Structural Analysis by M.L. Gamhir, PHI Learning Pvt. Ltd

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE411PC: STRENGTH OF MATERIALS LAB

B.Tech. II Year II Sem.   **LT/P/DC**
                                                    0 0/3/0 1

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

Course Outcomes: At the end of the course the student will be able to:
- To determine experimental data include universal testing machines and torsion equipment.
- To determine experimental data for spring testing machine, compression testing machine, impact tester, hardness tester.
- To determine stress analysis and design of beams subjected to bending and shearing loads using several methods.
- To determine deflection of a Continuous beam
- To determine experimental stress with fatigue and compression Tests.

List of Experiments:
1. Determine ultimate tensile stress for a mild steel
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Determine modulus of rigidity by Torsion test
5. Determine the Hardness test on a specimen
6. Determine the stiffens modulus of rigidity by Spring test
7. Compression test on wood or concrete
8. Determine the Impact strength of a specimen
9. Determine the Shear strength of a specimen
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges
12. Determine the deflection on Continuous beam.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE413PC-HYDRAULICS & HYDRAULIC MACHINERY LAB

B.Tech. II Year II Sem.   **L T/P/DC**
         0 0/3/0 1.5

Course Objectives

- Student able to learn about different measuring devices, working Principles and their performances

- To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.

- To explain the standard measurement techniques of fluid mechanics and their applications.

- To illustrate the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.

- To analyze the laboratory measurements and to document the results in an appropriate format.

Course Outcomes: Student's exposure to
- Study concept of channel flow
- Study various operating characteristics of Centrifugal pump and Reciprocating pump.
- Learn about different characteristics of Turbines.
- Study various operating characteristics of Kaplan, Francis and Pelton Wheel Turbines
- Learn Coefficient of discharge for the Weir

List of Experiments

1. Impact of jet on vanes

2. Study of Hydraulic jump in Open Channel.

3. Performance test on Pelton wheel turbine.

4. Performance test on Francis turbine.

5. Performance test on Kaplan turbine.

6. Performance characteristics of a single stage centrifugal pump.

7. Performance characteristics of a multi-stage centrifugal pump.

8. Performance characteristics of a reciprocating pump.

9. Study of Flow in Open Channel (Applying Chezy's and Manning's equations).

10. Determination of Coefficient of discharge for the given Weir (Sharp

    crested / Broadcrested / Cippoletti weir).

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE409PC: ENGINEERING GEOLOGY LAB

B.Tech. II Year II Sem. L T/P/D C
0 0/2/0   1

Pre-Requisites: Engineering Geology Theory

Course Objectives: The objective of this lab is that the student will be able to
- Understand the practical knowledge about physical properties of minerals
- Understand the practical knowledge about physical properties of rocks
- Understand the study of Crystals
- Draw of geological maps, showing faults, uniformities etc.
- Solve Simple structural Geology Problems

Course Outcomes: At the end of the course, the student will be able to:
- Understands the method and ways of investigations required for Civil Engineering projects
- Identify the minerals based on their physical properties by simple tests
- Solve various geological problems
- Classify rocks using basic geologic classification systems.
- Interpret the geological structures in the geological maps.

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

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21MA408BS: APTITUDE AND CRITICAL THINKING SKILLS PRACTICE

B.Tech. II Year II Sem.	L	T	P	C
	0	0	3	1.5

Course Objectives:
- To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.
- To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
- To critically evaluate numerous possibilities related to puzzles.

Course Outcomes:

The student will be able to
- Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.
- Solve questions related to Time and distance and time and work etc. from company specific and other competitive tests.
- Understand and solve puzzle related questions from specific and other competitive tests

UNIT I
Numerical Ability:
Simplification, BODMAS, Fractions, Decimals, Squares, Square Roots, Cubes, Cube Roots, Speed Maths, LCM & HCF

UNIT II
Numerical Computation:
Applications based on Numbers, Chain Rule, Ratio Proportion
Numerical Reasoning:
Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

UNIT III
Numerical estimation - I
Applications Based on Time and work, Time and Distance
Combinatory:
Counting techniques, Permutations, Combinations and Probability
Numerical estimation – II
Applications based on Percentages, Profit Loss and Discount, Simple interest and Compound Interest Partnerships.

UNIT IV
Data Interpretation
Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams Application to industry in Geometry and Menstruation

UNIT V
Critical Thinking:
Alphabet Test, Coding-Decoding, Statement and Conclusion, Statement and Arguments, Statement and Assumption, Calendars, Clocks, Cubes and dice, counting of figures.

Books for Practice
1. Quantitative aptitude by R S Agarwal, S Chand Publications
2. Verbal and non-verbal Reasoning by RS Agarwal from S Chand publications

References

1. Barron‟s by Sharon Welner Green and IraK Wolf (Galgotia Publications pvt. Ltd.)
2. Quantitative Aptitude by U Mohan Rao Scitech publications
3. Quantitative Aptitude by Arun Sharma McGrawhill publications
4. Quantitative Aptitude by Ananta Asisha Arihant publications
5. Quantitative Aptitude by Abhijit Guha
6. Quantitative Aptitude by Pearson publications
7. Material from „IMS, Career Launcher and Time Institutes for Competitive exams.
8. Elementary and Higher Algebra by H. S. Hall an S. R. Knight

B.TECH. CE   **R21**
Regulations
BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21MC403-CONSTITUTION OF INDIA

B.Tech. II Year II Sem.   L T/P/D C
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The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the

—basic structure‖ of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of —Constitutionalism‖ – a modern and progressive concept historically developed by the thinkers of –liberalism‖ – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of

–constitutionalism‖ in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of —diversity‖. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be –static‖ and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it—as one of the strongest court in the world‖.

Course content
1.   Meaning of the constitution law and constitutionalism
2.   Historical perspective of the Constitution of India
3.   Salient features and characteristics of the Constitution of India

4.   Scheme of the fundamental rights
5.   The scheme of the Fundamental Duties and its legal status
6.   The Directive Principles of State Policy – Its importance and implementation
7.   Federal structure and distribution of legislative and financial powers
     between the Union and theStates
8.   Parliamentary Form of Government in India – The constitution
     powers and status of thePresident of India
9.   Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

B.TECH. CE   **R21**
Regulations
**BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)**

21CE515PC: WATER RESOURCES ENGINEERING

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

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Course Objectives: The objectives of the course is to
- The description of hydrological cycle and derive various formulas used   in estimation
  of different basic components of surface and Ground water cycle and its components.
- Further it will explain the water requirement for irrigation and connectivity of
  hydrology tothe field requirement.

Course Outcomes: After the completion of the course student should be able to
- Analyze hydro-meteorological data
- Estimate abstractions from precipitation
- Compute yield from surface and subsurface basin
- Develop rainfall-runoff models
- Formulate and solve hydrologic flood routing models

UNIT - I
Introduction to engineering hydrology and its applications, Hydrologic cycle, types and
forms of precipitation, rainfall measurement, types of rain gauges, computation of average
rainfall over a basin, processing of rainfall data - Adjustment of record -Rainfall Double
Mass Curve. Runoff- Factors affecting Runoff – Runoff over a Catchment- Empirical and
Rational Formulae.
Abstraction from rainfall-evaporation, factors affecting evaporation, measurement of

evaporation- Evapotranspiration- Penman and Blaney & Criddle Methods -Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

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

UNIT - III
Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers. Types of wells - Well Construction – Well development.

UNIT - IV
Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility – Crop Rotation, preparation of land for Irrigation, standards of qualityfor Irrigation water.

Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Duty and delta, factors affecting duty-Design discharge for a water course. Depth and frequency of Irrigation, irrigation efficiencies-WaterLogging.

UNIT - V
Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standards for a canal design canal lining.
Design Discharge over a catchment, Computation of design discharge-rational formulae etc.

TEXT BOOKS:
1. Engineering Hydrology by K. Subramanya McGraw Education (India) Pvt Ltd, 2014.
2. Engineering Hydrology by Jayarami Reddy, Laxmi publications pvt. Ltd., New Delhi
3. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House

REFERENCES:
1. Engineering Hydrology by CSP Ojha, R. Brendtsson and P. Bhunya Oxford University Press,2010
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., New Delhi
3. Applied hydrology by V.T. Chow, D.R. Maidment and L. W Mays McGrawEducation (India) Pvt Ltd, 2014.
4. Hydrology in Practice by E. M. Shaw, K. J. Beven, CRC Press, 2015.

Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)

21CE517PC: GEO-TECHNICAL ENGINEERING

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

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Course Objectives: The objectives of the course is to

- Identify the classification of Rocks as per engineering aspects
- Explain the basic laboratory in-situ tests, strengths and its responses
- Understand Rock slopes and its failures, underground and open excavations and its requirements

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

- Able to determine the required rock properties and classify rock mass.
- Analyze the properties and factors of permeability
- Evaluate the various stress distribution of soils
- Understand the principles of compaction and its control., Compute and analyze the consolidation settlements.
- Identify shear strength parameters for field conditions

UNIT – I
Introduction: Soil formation and structure – moisture content – Mass- volume relationship – Relative density.
Index Properties of Soils: Grain size analysis – Sieve–

UNIT – II
Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability –Permeability of layered soils – In-situ permeability tests (Pumping in & Pumping out test).
Effective Stress & Seepage Through Soils: Total, neutral and effective stress – principle of effective stress - quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

UNIT – III
Stress Distribution In Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.
Compaction: Mechanism of compaction – factors affecting compaction effects of compactionon soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV
Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre consolidation pressure and its determination - Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

UNIT - V
Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions-strength envelops – Shear strength of sands - dilatancy – critical void ratio.

TEXT BOOKS:
1. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers, 8th Edition, (2014).
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
3. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd.

REFERENCES:
1. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw Hill Publishers, New Delhi.
2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
3. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).

B.TECH. CE   **R21**
Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)
21CE519PC: STRUCTURAL ANALYSIS-II

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

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

Course Outcomes: After the completion of the course student should be able to
- Analyze the two hinged arches.
- Solve statically indeterminate beams and portal frames using classical methods
- Sketch the shear force and bending moment diagrams for indeterminate structures.
- Formulate the stiffness matrix and analyze the beams by matrix methods
- Formulate Influence Lines For Indeterminate Beams

UNIT – I
Two Hinged Arches: Introduction – Classification of Two hinged Arches – Analysis of two hinged parabolic arches – Secondary stresses in two hinged arches due to temperature and elastic shorteningof rib.
Moment Distribution Method: Analysis of continuous beams with and without settlement

of supportsusing - Analysis of Single Bay Single Storey Portal Frames including side Sway - Analysis of inclined frames - Shear force and Bending moment diagrams, Elastic curve.

UNIT – II

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

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

UNIT – III

Approximate Methods of Analysis: Introduction – Analysis of multi-storey frames for lateral loads: Portal Method, Cantilever method and Factor method - Analysis of multi-storey frames for gravity loads - Substitute Frame method - Analysis of Mill bents.

UNIT – IV

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

UNIT- V

Influence Lines For Indeterminate Beams: Introduction – influence line diagram for shear force and bending moment for two span continuous beam with constant and different moments of inertia - influence line diagram for shear force and bending moment for propped cantilever beams.

TEXT BOOKS:
1. Structural Analysis Vol –I &II by Vazarani and Ratwani, Khanna Publishers.
2. Structural Analysis Vol I & II by G.S. Pandit S.P. Gupta Tata McGraw Hill Education Pvt. Ltd.
3. Indeterminate Structural Analysis by K.U. Muthu et al., I.K. International Publishing House Pvt.Ltd

REFERENCE BOOKS:
1. Structural analysis T. S Thandavamoorthy, Oxford university Press
2. Mechanics of Structures Vol –II by H.J. Shah and S.B. Junnarkar, Charotar Publishing

HousePvt. Ltd.
3. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
4. Examples in Structural Analysis by William M.C. McKenzie, Taylor & Francis.
5. Structural Analysis by R. C. Hibbeler, Pearson Education
6. Structural Analysis by Devdas Menon, Narosa Publishing House.
Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros

B.TECH. CE **R21**
Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)
21CE520PC: DESIGN OF REINFORCED CONCRETE STRUCTURES

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

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Course Objectives: Structural elements are subjected to different loading to with stand the structures, for external loading we need to design the structures for its safety and serviceability.

Course Outcomes: At the end of the course, the student will be able to:
- Design of reinforced concrete beams by limit state method.
- Design of reinforced concrete shear and torsional reinforcement
- Design of reinforced concrete slabs.
- Design of reinforced concrete footings.
- Design of reinforced concrete columns.

UNIT - I
Introduction- Structure - Components of structure - Different types of structures - Safety and Stability - Loads – Different types of – Different types of materials –RCC, PSC and Steel – Planning of structural elements- Concepts of RCC Design – Different methods of Design- Working Stress Method and Limit State Method – Load combinations as per Limit state method - Materials - Characteristic Values – Partial safety factors – Behaviour and Properties of Concrete and Steel- Stress Block Parameters as per IS 456 -2000.
Limit state Analysis and design of sections in Flexure – Behaviour of RC section under flexure - Rectangular, T and L-sections, singly reinforced and doubly reinforced Beams – .Detailing of reinforcement

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

UNIT - III
Design of Two-way slabs with different end conditions, one-way slab, and continuous slab Using I S Coefficients - Design of dog-legged staircase – Limit state design for serviceability for deflection, cracking and codal provisions.

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

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

TEXT BOOKS:
1. Limit state designed of reinforced concrete – P.C. Varghese, PHI Learning Pvt. Ltd.
2. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill.
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers.

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

Note: Students would be allowed to use the following hand books and codes of practice in the internal and end examinations.
1. IS 456:2000 IS Plain and reinforced concrete - code of practice
SP16:1980 Design aids for reinforced concrete

B.TECH. CE **R21**

Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)
21CE528PE: CONSTRUCTION TECHNOLOGY & MANAGEMENT
(Professional Elective-I)

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

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Course Objectives:
- This subject deals with overall planning, coordination and control of projects.
- This course gives the students scientific principles involved in construction, an understanding of the behavior of construction materials and fundamentals of structural mechanics.

Course Outcomes: At the end of the course, the student should be able to:
- Understand the roles and responsibilities of a project manager
- Prepare schedule of activities in a construction project
- Identify the equipment used in construction
- Understand safety practices in construction industry
- Prepare tender and contract document for a construction project

UNIT - I
Management -Fundamentals of construction project management: Introduction, Project Initiation and Planning.

UNIT - II
Planning of construction facilities - Earthwork construction - Equipment for construction- Construction Finances – decision making- Cement concrete construction- Construction of Piles - Construction of Cofferdams - Construction of Tunnels.

UNIT - III
Development of project activity networks, Precedence Diagram Method, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Line Balance Methods in scheduling, Time Value of Money, Investment Analysis, Cost-Benefit Analysis.

UNIT - IV
Introduction to Building Information Modelling (BIM), Lean construction, and Integrated Project Delivery in construction, Crashing of project, Cost Optimization, Invoicing, Preparation of RA bill, Safety in construction, Estimation.

UNIT - V
Contracts: Contracts in construction, fundamentals of delay analysis and claims; Advances in construction management, tender and tender document - Deposits by the contractor - Arbitration. Negotiation - M. Book - Muster roll - stores.

REFERENCES:

1. Bennett, F. Lawrence., The management of construction: a project life cycle approach. Rutledge, 2003.
2. Oberlender, Garold D., Project management for engineering and construction. Vol. 2. New York: McGraw-Hill, 1993.
3. Peurifoy, Robert Leroy, Cliff J. Schexnayder and Shapira A. Construction planning, equipment, and methods. No. 696 pp. McGraw-Hill, 2010.
4. Chitkara, K. K. Construction Project Management, Tata McGraw-Hill Education, 2014.

B.TECH. CE   **R21**

Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)
21CE529PE: CONCRETE TECHNOLOGY
(Professional Elective-I)

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

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Course Objectives: The object of the course student should have the capability to:
- Concrete is the basic construction material in the advancements present construction industry Lot of advances are taking place in the concrete technology on par with development taking place in the engineering.
- The present- d a y industry needs the knowledge of concrete technology thoroughly.
- The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

Course Outcomes: At the end of the course, the student will be able to:
- Identify Quality Control tests on concrete making materials
- Understand the behavior of fresh and hardened concrete
- Design concrete mixes as per IS and ACI codes
- Understand the durability requirements of concrete
- Understand the need for special concretes

UNIT - I
Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

UNIT - II
Aggregates: Classification of aggregate – Particle shape & texture –, 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 & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

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 and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT - IV
Hardened Concrete : Water / Cement ratio – Abram's Law – Gel-pace ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors

affecting strength – Relation between compressive and tensile strength - Curing.

Testing of Hardened Concrete: Compression tests – Tension tests– Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – code provisions for NDT
Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V
Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by– BIS method and ACI mix design.
Special Concretes: Introduction to light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fiber reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

TEXT BOOKS:
1. Properties of Concrete by A. M. Neville Pearson 5th edition Education ltd 2016.
2. Concrete Technology by M. S. Shetty. – S. Chand & Co. 2004.
3. Concrete Technology by Job Thomas -Cengage learning India Pvt Ltd 2015.
4. Concrete Engineering by K. Chandrasekhar, M.Palanisamy - Scientific International Publishing House.

REFERENCES:
1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete: Micro structure, Properties and Materials – P. K. Mehta and J. M.Monteiro, McGraw Hill Publishers.

B.TECH. CE   **R21**

Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)
21CE530PE: MODERN TRANSPORTATION ENGINEERING
(Professional Elective-I)

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

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Course Objectives: The object of the course student should have the capability to:
- Introduce different transportation systems and their importance and their role in development
- Understand standards and norms of National and International organizations which are framed for efficient functioning of existing transport systems
- Impart Knowledge regarding the functioning of various components like rails, sleepers, Tracks, Geometric curves, Runways, Taxiways Aprons Wear houses, Jetties etc.,
- Design elements like horizontal curves, vertical curves, super elevation etc.,

Course Outcomes: At the end of the course, the student will be able to:
- Illustrate classification of highway system
- Outline the features of port and harbour engineering
- Make use of GIS applications in transportation engineering
- Develop an effective railway transportation system
- Adapt airport engineering techniques

UNIT-I
Functional Classification of Highway System: Design Controls – Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design specifications; Pavement Surface characteristics – Skid Resistance, Road Roughness; Camber, Objectives, design standards - Specifications for hill roads.

UNIT-II
Port and Harbour Engineering: Requirements of Port And Harbour, Classification of Port & Harbour, Features of A Harbour, Planning of Harbour, Breakwaters, Dry Docks, Jetties, Aprons, Transit Shed And Warehouses, Navigational Aids, Maintenance of Port And Harbours, Inland Water Transport.

UNIT-III
Application of GIS in Transportation Engineering: Intelligent information system for road accessibility study. GIS data base design for physical facility planning, Decision support systems for land use planning.

UNIT-IV
Railway Engineering: Introduction Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways Permanent way – Components and their

functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings. Track Geometric design – Points & Crossings – Track drainage –Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

UNIT-V

Airport Engineering: Factors affecting Selection of site for Airport – Aircraft Characteristics- Geometric Design of Runway - Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram – Runway Lighting system.

REFERENCES:

1. Highway, Railway, Airport and Harbour Engineering, Dr. K.P. Subramanian, Scitech Publications India Pvt. Ltd.
2. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna.
3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
4. Airport Engineering, Rangwala, Charotar Publishing House.

B.TECH. CE   **R21**

Regulations
BALAJI INSTITUTE OF
TECHNOLOGY & SCIENCE(UGC-
AUTONOMOUS)
21CE531PE: ROCK MECHANICS
(Professional Elective-I)

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

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Course Objectives: the objective of the course is to
- Identify the classification of Rocks as per engineering aspects
- Explain the basic laboratory in-situ tests, strengths and its responses
- Understand Rock slopes and its failures, underground and open excavations and its requirements

Course Outcomes: At the end of the course
- Able to determine the required rock properties and classify rock mass.
- Determination of bearing capacity of rocks.
- The students will be able to predict strength of rock mass with respect to various CivilEngineering applications.
- Checking the stability of slopes.
- Design underground and open excavation.

UNIT- I

Engineering Classification of Rocks: Classification of intact rocks, Rock mass classifications, Rock Quality Designation (RQD), Rock Structure Rating (RSR), Rock Mass Rating (RMR), Norwegian Geotechnical Classification (Q-system), Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoengineering classification.

UNIT- II

Laboratory and In-Situ Testing of Rocks: Physical properties, Compressive strength, Tensile strength, Direct shear test, Triaxial shear test, Slake durability test, Schmidt rebound hardness test, Sound velocity test, In-Situ Tests: Seismic methods, Electrical resistivity method, In situ stresses, Plate loading test, Goodman jack test, Plate jacking test, In-situ shear test, Field permeability test.

UNIT- III

Strength, Modulus and Stresses-Strain Responses of Rocks: Factors influencing rock response, Strength criteria for isotropic intact rocks, Modulus of intact rocks, effect of confining pressure, Uniaxial Compressive strength, Strength criteria for intact rocks, Strength due to induced anisotropy in rocks,. Stress Strain Models: Constitutive relationships, Elastic, Elasto-plastic, Visco-elastic, Elasto- viscoplastic stress-strain models.

UNIT- IV

Introduction to Rock Slopes: Introduction to Rock slopes, Modes of failure, Rotational failure, Plane failure, Design charts, Wedge method of analysis, Buckling failure, Toppling failure, Improvement of slope stability and protection.

UNIT- V

Underground and Open Excavations: Blasting operational planning, Explosive products, Blast Design, Underground blast design, Controlled blasting techniques, blasting damage and control, Safe practice with explosives and shots.

TEXT BOOKS:

1. Goodman – Introduction to Rock mechanics, Willey International
2. Ramamurthy, T. - Engineering in Rocks for slopes, foundations and tunnels, Prentice Hall of India (2007)

REFERENCE BOOKS:

1. Jaeger, J. C. and Cook, N. G. W. – Fundamentals of Rock Mechanics, Chapman and Hall, London. (1979)
2. Hoek, E. and Brown, E. T. - Underground Excavation in Rock, Institution of Mining and Metallurgy, 1982.
3. Brady, B. H. G. and Brown, E. T. - Rock Mechanics for Underground Mining, Chapman & Hall, 1993.

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE516PC: CONCRETE TECHNOLOGY LAB

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

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   Course Objectives: The objectives of the course are to
- To learn laboratory tests and their procedures cement, fine aggregate, course aggregates and bitumen.
- To Evaluate fresh concrete properties
- To Understand the test procedures for characterization of Concrete and bituminous mixes

Course Outcomes: At the end of the course, the student will be able to:
- Understand the Properties of cement.
- Understand the Properties of Aggregate.
- Understand the concept of fresh concrete.
- Understand the properties hardened concrete.
- Conduct Non-destructive tests on concrete

List of Experiments:

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

II. Test on Aggregate
   1. Sieve Analysis and gradation chairs
   2. Bulking of sand.
   3. Bulk and compact densities of fine and coarse aggregates

III. Test on Fresh Concrete
   1. Slump test
   2. CF (Compaction Factor test)
   3. Vee-bee Test
   4. Flow Table Test

   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

V. Non-Destructive test of concrete
   1. Rebound hammer
   2. Ultrasound pulse Velocity (UPV)

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

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE518PC: GEO-TECHNICAL ENGINEERING LAB

B.Tech. III Year I Sem.   **L T P C**
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Course Objectives: To obtain index and engineering properties of locally available soils, andto understand the behavior of these soil under various loads.

Course Outcomes: At the end of the course, the student will be able to:
- Determine index properties of soils
- Classify soils.
- Determine engineering properties of soils.
- Determine the coefficient of consolidation.
- Determine the shear strength parameters of soil.

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EN503HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year I Semester

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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 perform the 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:

1. 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.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. 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:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary -
   Starting a conversation – responding appropriately and relevantly – using the right body language– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing –improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM Sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.
5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, Intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced 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
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5thEdition.

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 University Press 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-Hill2009

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MC504: INTELLECTUAL PROPERTY RIGHTS

B.Tech. III Year I Sem.   L T/P/D   C
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UNIT – I
Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II
Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III
Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV
Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V
New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:
1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21MC506: CYBER SECURITY

B.Tech. III Year I/II Semester

L T P C
3 0 0 0

Prerequisites: NIL
Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes: The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I
Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II
Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of
International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV
Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web
threats for organizations, security and privacy implications, social media marketing: security risks and
perils for organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V
Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of
Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime,
Financial Frauds in Cyber Domain.

TEXT BOOKS:
1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer
Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,
Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE622PC: ENVIRONMENTAL ENGINEERING

B.Tech. III Year II Sem.   **L T P C**
                                                                                                    3 0 0 3

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

Course Outcomes: At the end of the course, the student will be able to:
- Analyze characteristics of water and wastewater.
- Estimate the quantity of drinking water and domestic wastewater generated.
- Design components of water supply systems design sewerage system.
- Design skimming tank, grit chambers, sedimentation tanks, septic tank and sludge digestion tank.
- Ability to analyze, examine different physical, chemical and biological properties of water.

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- Miscellaneous treatment methods.

UNIT – III
Distribution systems requirement –method and layouts -Design procedures- Hardy Cross and equivalent pipe methods pipe – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house - Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water overflows combined flow

UNIT - IV
characteristics of sewage – cycles of decay – 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 – components requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming – dilution.

UNIT – V
Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters – standard and high rate – 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.

TEXT BOOKS:

1. Environmental Engineering by H.S Peavy, D. R. Rowe, G. Tchobanog lous, McGrawHill Education (India) Pvt Ltd, 2014
2. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
3. Water Supply & Environmental Engineering by A.K. Chatterjee.
4. Water Supply and sanitary Engineering by G.S. Bindi, Dhanpat Rai & SonsPublishers.

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. HammarJr.Wiley, 2007.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21CE624PC: TRANSPORTATION ENGINEERING

B.Tech. III Year II Sem.   **L T P C**
                                                                          3 0 0 3

Course Objectives: It deals with different components of Transportation Engineering like highway Geometric Design and different elements in Transportation Engineering.

Course Outcomes: At the end of the course, the student will be able to:
- Understand the plan and highway network
- Design highway geometrics.
- Understand the traffic engineering parameters & its regulation.
- Understand the patterns of interaction design
- Design flexible and rigid pavements.

UNIT - I
Highway Development and Planning: 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.

UNIT – II
Highway Geometric Design: 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.

UNIT – III
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 – Onstreet & 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.

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

UNIT - V
Pavement Design: Design of Pavements: Design of Flexible pavement by CBR method as per IRC 37-2012 and theory of empirical mechanistic method. Stresses in rigid pavement by westergards and IRC methods. Design of overlay by Benkelman beam method.

TEXT BOOKS:
1. Highway Engineering – S. K. Khanna & C. E. G. Justo, Nemchand & Bros., 7thedition (2000).
2. Traffic Engineering & Transportation Planning – Dr. L. . Kadyali, KhannaPublications – 6th Edition – 1997.

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. BLal - 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 DeflectionTechnique

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE626PC: DESIGN OF STEEL STRUCTURES

B.Tech. III Year II Sem.   **L T P C**
                                                                               3 0 0 3

Course Objectives: The objective of the course is to make the student conversant with the design principles of steel structural elements as per IS Code provisions

Course Outcomes: At the end of the course, the student will be able to
- Design tension and compression members
- Design beams and beam columns
- Design bolt and weld connections
- Design built up members and Column base
- Design of plate girders and Roof Trusses

UNIT – I
Materials – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads – and combinations local buckling behavior of steel. Concept of limit State Design – Limit States – Design Strengths- deflection limits – serviceability – stability check. Bolted connections – Riveted connections – IS – 800 – 2007 - specifications – Design strength – efficiency of joint – prying action. Welded connections – Types of welded joints – specifications - design requirements.

UNIT – II
Design of tension members – Design strength – Design procedure splice - lug angle.
Design of compress in members – Buckling class – slenderness ratio / strength design – laced
– battened columns – splice – column base – slab base.

UNIT – III
Plastic Theory, Plastic hinge, Theorems of plastic Analysis Classifications of beams as perI.S 800-2007.
Design of Beams – Plastic moment – Bending and shear strength / buckling – Built upsections – laterally /
supported beams - Design of eccentric connections – Framed – stiffened
/ seat connection.

UNIT – IV
Design of plate girders – elements – economical depth – design of main section – connectionsbetween web and flange – design of stiffness bearing – intermediate stiffeners – Design of Web splices & Flange splices.

UNIT – V
Design of roof trusses – Types of roof trusses, loads on trusses – purlin design – truss design,Design of joints and end bearings.

TEXT BOOKS:
1. Design of steel structures – N. Subramanian, Oxford University Press – 2009.
2. Limit State Design of steel structures, S.K. Duggal, Tata McGraw-Hill, 2010

REFERENCES:
1. Fundamental of Structural Steel Design by M L Gambhir MC Graw Hill EducationPvt Ltd 2013
2. Design of Steel Structures Edwin H. Gaylord, Jr. Charles N. Gaylord and JamesStallmeyer Tata McGraw-Hill Education pvt. Ltd.
3. Design of steel structures, S.S. Bhavikatti, IK International Publication House, NewDelhi, 2010.
4. Structural Design and Drawing by N. Krishna Raju, Universities Press.
5. Design of Steel structures by K.S. Sai Ram, Person Education.

Note: Students would be allowed to use the following hand books and codes of practice in the internal and end examinations.
1. IS 800:2007, IS General construction in steel - code of practice.
2. IS 875-Part-1, 2, 3 & 4 (1987): Code of Practice for Design Loads. Steel Tables.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE632PE: FOUNDATION ENGINEERING
(Professional Elective-II)

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

Course Objectives: To impart the knowledge on various soil exploration techniques, and analyse and design of various substructures, such as slopes, retaining walls, shallow foundations, and pile foundations.

Course Outcomes: At the end of the course, the student will be able to:
- Analyze the of need and methods of soil exploration
- Apply knowledge for stability of slopes of earth dams under different conditions.
- Students should be able to understanding earth pressure theories and design of retaining walls.
- Ability to learn the theory of shallow foundation.
- Ability to learn the theory of Pile and Well foundations.

UNIT – I
Soil Exploration: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test – pressure meter – planning of soil exploration programme 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: At-rest earth pressures, Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method, effect of pore water, earth pressure due to surcharge loads.
Retaining Walls: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity modes of failure, Drainage from backfill, introduction to reinforced earth walls.

UNIT – IV
Shallow Foundations - Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

UNIT - V
Pile Foundation: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT and CPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction
Well Foundations: Types – different shapes of wells – forces on wells - components of wells-Grip length – sinking of wells – tilts and shifts.

TEXT BOOKS:
1. Das, B.M., - (2011) Principles of Foundation Engineering –7th edition, CengagePublishing.
2. Foundation Design Principles and Practices, Donald P. Coduto, 2nd Edition, PearsonPublishers.
3. Bowles, J.E., (2012) Foundation Analysis, and Design – 5th Edition, McGraw-HillPublishing company, Newyork.

REFERENCES:
1. Geotechnical Engineering by S. K. Gulhati & Manoj Datta – Tata Mc Graw HillPublishers New Delhi. 2005.

2. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers, andDistributors.
3. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New ageInternational Pvt. Ltd, New Delhi
4. Analysis and Design of Substructures – Swami Saran, Oxford, and IBH Publishingcompany Pvt Ltd (1998).
5. Soil Mechanics and Foundation Engineering by B. N. D. Narasinga Rao, Wiley(2015).
6. Geotechnical Engineering by Debsashis Mitra Universities Press (2016).

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE633PE: PAVEMENT DESIGN
(Professional Elective-II)

B.Tech. III Year II Sem.   **L T P C**
                                                                        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:
- Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes
- Analyze flexible pavements
- Analyze rigid pavements
- Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods
- Design a rigid pavement using IRC, and AASHTO methods

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
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 & SonsInc
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, AppliedScience Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE634PE: IRRIGATION ENGINEERING
(Professional Elective-II)

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

- explain site selection for dams and reservoirs
- analyze gravity dams and its stability
- design earth dams and spillways
- outline diversion head works
- construct cross drainage works using design principles

UNIT – I
Introduction to Dams: Types of dams, merits and demerits, factors affecting selection of type of dam, factors governing selecting site for dam, types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve.

UNIT – II
Gravity dams: Forces acting on a gravity dam, concepts and criteria; causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage 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, types of spillway gates - cavitation's on spillway - design feature- design principles and design of spillways - chute spillways -energy dissipation - stilling basins.

UNIT – IV
Diversion Head works: Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. Causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory, Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient, functions of u/s and d/s sheet piles.

UNIT – V
Cross drainage works: Types, selection of site, design principles of aqueduct, siphon aqueduct and super passage. Canal structures I: types of falls and their location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall. Canal structures II:canal regulation works, principles of design of distributory and head regulators, canal outlets, types of canal modules.

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

REFERENCE BOOKS:
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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE635PE: THEORY OF ELASTICITY
(Professional Elective-II)

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

Course Objectives:
- To Introduce fundamental elasticity model of deformation in rectangular and polar coordinate.
- To give foundation for 2D and 3D study in solid mechanics problems.
- To Introduce to torsion and warping of prismatic structure

Course Outcomes: At the end of the course the student will able to
- The more fundamental elasticity model of deformation should replace elementary strength of material analysis.
- Able to understand theory, formulate and to present solutions to a wide class of problems in 2D.
- Able to understand theory, formulate and to present solutions to a wide class of problems in 3D.
- Acquire the foundation for advanced study in areas of solid mechanics
- Analyze stress and strain in three-dimension Stresses.

UNIT - I
Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium - boundary conditions – Strain Displacement Relations - compatibility equations - stress function

UNIT - II
Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venants principle - determination of displacements - bending of simple beams – Simple Supported and Cantilever Beam.

UNIT - III
Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section.

UNIT - IV
Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses Stress Tensor – Strain Tensor-Homogeneous deformation - principal axes of strain-rotation. General Theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem Strain Energy.

UNIT - V

Torsion of Circular Shafts - Torsion of Straight Prismatic Bars – Saint Venants Method - torsion of prismatic bars - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrow rectangular bars - solution of torsional problems by energy method - torsion of shafts, tubes, bars etc. Torsion of rolled profile sections.

TEXT BOOKS:
1. Theory of Elasticity by Timoshenko, McGraw-Hill Publications.
2. Theory of Plasticity by J. Chakarbarthy, McGraw-Hill Publications.

REFERENCE BOOKS:
1. Theory of Elasticity by Y.C.Fung.
2. Theory of Elasticity by Gurucharan Singh.

B.TECH. CE   R21 Regulations
BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE656OE: DISASTER MANAGEMENT
(Open Elective-I)

B.Tech. III Year II Sem.   **L T P C**
                                                                                               3 0 0 3

Course Objectives: The objectives of the course is to
- Identify the major disaster types and their environmental impacts.
- Develop an understanding of 2. why and how the modern disaster management is involved with Pre-disaster and post-disaster activities.
- Know the key personnel or specialists related to disaster management and associate them with the types of disasters and phases in which they are useful.
- Recognize and develop awareness of the chronological phases of natural disaster response and refugee relief operations.
- Understand how the phases of each are parallel and how they differ.
- Understand the key concepts of a) disaster management related to development, and b) the relationship of different disaster management activities to the appropriate disaster phase.
- Understand the relationship of disaster phases to each other and the linkage of activities from one phase to the next.

Course Outcomes: After the completion of the course student should be able to
- analyze impact of disasters
- choose suitable disaster management mechanism
- make use of appropriate measures for capacity building to reduce risks
- develop strategies to cope up with disasters
- build disaster management 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 - 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 districtdisaster management plans.

TEXT BOOKS:
1. Manual on Disaster Management, National Disaster Management, Agency Govt ofIndia.
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)

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE623PC: ENVIRONMENTAL ENGINEERING LAB

B.Tech. III Year II Sem.   **L T P C**
                                                                0 0 3 1.5

Course Objectives: The laboratory provides knowledge of estimating various parameters like PH, Chlorides, Sulphates, and Nitrates in water. For effective water treatment, the determination of optimum dosage of coagulant and chloride demand is also included. The estimation status of industrial effluents will also be taught in the laboratory by estimating BOD and COD of effluent.

Course Outcomes: Students will able to find various properties of water
- Categorize the different physical, chemical & biological properties of water
- Find the PH in given water sample.
- Find the chemicals content in water sample.
- Determine the alkalinity & acidity the water sample.
- Determine the optimum coagulant dose in water treatment.

List of Experiments:

1. Determination of pH and Turbidity

2. Determination of Conductivity and Total dissolved solids (Organic and Inorganic)

3. Determination of Alkalinity/Acidity.

4. Determination of Chlorides.

5. Determination of iron.

6. Determination of Dissolved Oxygen.

7. Determination of Nitrates.

8. Determination of Optimum dose of coagulant

9. Determination of Chlorine demand

10. Determination of B.O.D

11. Determination of C.O.D

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE625PC: TRANSPORTATION ENGINEERING LAB

B.Tech. III Year II Sem.   **L T P C**
                                                              0 0 3 1.5

Course Objectives: To gain the practical knowledge of properties of Highway materials andsurveys.
Course Outcomes: Students will able to find various properties of water
- Identify the properties and behavior of highway material for different loading patterns.
- Understand the properties of highway material by conducting specific gravity & water absorption.
- Understand techniques to characterize various pavement materials through relevant test.
- Understand the different types of traffic studies.
- Able to understand the types of parking studies.

List of Experiments:

1. **ROAD AGGREGATES:**
   1. Aggregate Crushing value
   2. Aggregate Impact Test.
   3. Specific Gravity and Water Absorption.
   4. Abrasion Test
   5. Flakiness and elongation Indices of coarse Aggregates.

2. **BITUMINOUS MATERIALS:**
   1. Penetration Test.
   2. Ductility Test.
   3. Softening Point Test.
   4. Marshal stability Test

3. **TRAFFIC STUDIES**
   1. Traffic volume counts-Mid Blocks
   2. Traffic volume counts-Junctions
   3. Spot speed studies.
   4. Parking Studies

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE621PC: COMPUTER AIDED CIVIL ENGINEERING DRAWING LAB-II

B.Tech. III Year II Sem. **L T P C**
0 0 3 1.5

Course Objectives: To make students understand detailing of all kinds of structures such asreinforced concrete, plain concrete, steel structures.

Course Outcomes: At the end of the course, the student will be able to
• Detailing of reinforcement in Cantilever, simply supported and continuous beams.
• Detailing of reinforcement in canopy & columns.
• Detailing of reinforcement in RC isolated footings square, one-way to two-way slabs, rectangular, circular and combined footings, dog-legged staircases.
• Drawing of steel bolted, welded connections, steel compression and tension members.
• Drafting of steel beams-built-up sections, steel plate girder and steel roof truss.

List of Experiments:

1. Detailing of reinforcement in Cantilever, Simply supported and Continuous Beams (BothSingly & Doubly Reinforced Beams)

2. Detailing of reinforcement in canopy & columns (both uniaxial & biaxial)

3. Detailing of reinforcement in RC isolated footings square, rectangular, circular and combined footings.

4. Detailing of reinforcement in RC one-way, two-way slabs and dog-legged staircases.

5. Drawing of Steel bolted and welded connections.

6. Drawing of steel compression and tension members.

7. Drafting of steel beams-built-up sections.

8. Drafting of steel plate girder

9. Drafting of steel roof truss.

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21HS601: SOCIAL INNOVATION IN PRACTICE

B.Tech. III Year II Sem.   **L T P C**
                                                                                                       0 0 3 1.5

Course Objectives:
- The course should enable the students to:
- Understand social innovation concepts and approaches.
- Understand the community problems, social and economic change.
- Identify new and unaddressed social needs.
- Analysis of social innovation disclosures in different sectors.
- Design innovative solutions with Social impact through application of new models of leadership, collective intelligence and creativity techniques.

UNIT-I
Introduction to Social Innovation:
Core definitions, core elements and common features of social innovation, a topology of social innovations, history of social innovation, social and economic change, Swatch Bharat, Unnat Bharat Abhiyan, National Service Scheme (NSS).

UNIT-II
Interaction and Engagement with Society:
Engage with community, interact with them to understand the community problems, Understanding social and economic change individuals, organizations and movements.

UNIT-III
Process of Social Innovation:
Understanding the pain/need, description and problem definition, social and economic constraints for affordable and appropriate technology.

UNIT-IV
Social Innovation across Four Sectors in India and Global Scenario
The four sectors the non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors

UNIT-V
Social Innovation Case Studies:
Designing and implementing social innovations, report writing and documentation, presentation of the case studies with a focus on impact and vision on society**.**

TEXT BOOKS:
1. The Power of Social Innovation: How Civic Entrepreneurs Ignite Community Networks for Good 1st Edition by Stephen Goldsmith, Michael R. Bloomberg, Gigi Georges, Tim Glynn Burke.
2. The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovation Paperback March, 2010 by Robin Murray, Julia Caulier-Grice, Geoff Mulgan.

REFERENCE BOOKS:
1. Social innovator series: ways to design, develop and grow social innovation, the open book of social innovation by robin murray julie caulier-grice geoff mulgan.
2. The International Handbook on Social Innovation: Collective Action, Social Learning and Transdisciplinary Research Paperback by Frank Moulaert, Diana Mac Callum. Guide to Social Innovation by Johannes HAHN and Laszlo ANDOR.

B.TECH. CE   **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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*21MC605: ENVIRONMENTAL SCIENCE

B.Tech. III Year - II Sem.   L T P   C
                                                                                            3 0 0   0

Course Objectives:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:
- 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 life style.

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.

REFERENCE BOOKS:

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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MC605: ARTIFICIAL INTELLIGENCE

B.Tech. III Year I/II Semester   L T P C
                                                                   3 0 0 0

Course Objectives: To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT - I
Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents
Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II
Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning
Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III
Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes
Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV
Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V
Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:
1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

REFERENCE BOOKS:
1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21SM701MS: BUSINESS ECONOMICS & FINANCIAL ANALYSIS

B.Tech. IV Year I Semester

L T P C
3 0 0 3

Course Objective:
- To learn the basic Business types, impact of the Economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

Course Outcome:
- The students will understand the various Forms of Business and the impact of economic variables on the Business.
- The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
- The Students can study the firm's financial position by analysing the Financial Statements of a Company

UNIT – I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV

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, Preparation of Final Accounts.

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

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.

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.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE727PC: ESTIMATION, COSTING& PROJECT MANAGEMENT

B.Tech. IV Year I Sem. **L T/P/D C**
3 1/0/0 4

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

Course Outcomes: On completion of the course, the students will be able to:
- Understand the different types of estimates and prepare detailed estimate.
- Estimate bar requirement for different RC elements and the earthwork quantities for roads and canals.
- Evaluate the rates for various items of work in the rate analysis.
- Apply standard specifications, prepare contract documents and evaluate the valuation of building.
- Understand the construction project planning and network.

UNIT – I
General items of work in Building – Standard units principles of working out quantities for detailed andabstract estimates – Approximate method of Estimating. Detailed Estimates of Buildings

UNIT – II
Reinforcement bar bending and bar requirement schedules Earthwork for roads and canals.

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

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

UNIT- V
Construction Project Planning: Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.
Networks: Basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks.

TEXT BOOKS:
1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications,2016
4. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014

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

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE736PE: WATERSHED MANAGEMENT
(Professional Elective-III)

B.Tech. IV Year I Sem.   **L T P C**
                                                                                  3 0 0 3

Course Objectives:
- To understand different watershed behaviour.
- To be able to interpret runoff data and quantify erosion by using various modelling methods.
- 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 able to
- illustrate concept of watershed and its sustainable development
- identify causes of soil erosion
- design rain water harvesting structure
- propose the methods of artificial recharge for groundwater
- explain measures for reclamation of saline soils

UNIT - I
Introduction, concept of watershed, need for watershed management, concept of sustainable development. Hydrology of small watersheds.

UNIT - II
Principles of soil erosion- causes of soil erosion, types of soil erosion, estimation of soil erosion from small watersheds, Control of soil erosion, methods of soil conservation – structural and non-structural measures.

UNIT - III
Principles of water harvesting, methods of rainwater harvesting. Design of rainwater harvesting structures.

UNIT – IV
Artificial recharge of groundwater in small watersheds-, methods of artificial recharge.

UNIT – V
Reclamation of saline soils -. Micro farming -, biomass management on the farm.

TEXT BOOKS:
1. Murthy, V.V.N. and M.K. Jha Land and Water Management, Kalyani Publishers.
2. Watershed Management Muthy, J. V. S.,New Age International Publishers.

REFERENCE BOOKS:
1. Watershed Hydrology by R Suresh, Standard Publishers and Distributors, Delhi.
2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India.

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21CE737PE: GROUND WATER HYDROLOGY
(Professional Elective-III)

B.Tech. IV Year I Sem.   **L T P C**
                                                                      3 0 0 3

Course Objectives: The objectives of the course is to
- To study occurrence movement and distribution of water that is a prime resource for development of a civilization.
- know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology.
- know the basic principles and movement of ground water and properties of groundwater flow.

Course Outcomes: On successful completion of this course, students should be able to:
- Identify different fundamental equations and concepts as applied in the Groundwater studies
- Discuss and derive differential equation governing groundwater flow in three Dimensions
- Solve groundwater mathematical equations and analyze pumping tests in steady and non-steady flow cases.
- Analyze Surface and sub-surface Investigation.
- Distinguish and understand the saline water intrusion problem in costal aquifers.

UNIT- I
Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, Vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as aquifers, types of aquifers, porosity, specific yield and specific retention. 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 flow ground water flow towards a well in confined and unconfined aquifers-Dupit's and Theism's 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, Thesis solution, Jocob and Chow's simplifications, Leak aquifers.

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 Hydrology by David Keith Todd, John Wiley & Son, New York.
2. Ground water by H.M. Raghunath, Wiley Eastern Ltd.
3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

REFERENCE BOOKS:

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 HillPublications.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE738PE: INTELLIGENCE TRANSPORT SYSTEMS
(Professional Elective-III)

B.Tech. IV Year I Sem.   **L T P C**
                                                         3 0 0 3

Course Objectives: The objectives of the course is to
- Understanding and Appreciation of the concepts related to ITS technologies and industry applications of the field.
- Conduct a comprehensive independent research project, on topics related to ITS, to enhance their understanding of a specific topic of their interest.
- Understand the operation of a transportation management center and field applications of ITS technologies

Course Outcomes: On successful completion of this course, students should be able to:
- explain the fundamentals of ITS
- outline the sensor technologies and data requirements of ITS
- identify various ITS user services
- select appropriate ITS technology based on site conditions
- design and implement ITS components

UNIT- I
Fundamentals of Intelligence Transport Systems (ITS): Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS

UNIT- II
Sensor technologies and Data requirements of ITS: Importance of telecommunications in the ITS. Information Management, Traffic Management Centers (TMC).Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

UNIT- III
ITS User Needs and Services and Functional areas: Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO). Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).

UNIT- IV
ITS Architecture: Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.

UNIT- V
ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems.

TEXT BOOKS
1. Highway, Railway, Airport and Harbour Engineering, Dr. K.P. Subramanian, Scitech Publications India Pvt. Ltd.
2. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna.

REFERENCE BOOKS:
1. Highway Engineering, C.E.G. Justo and S.K.Khanna, Nem Chand and Brothers.
2. Airport Engineering, Rangwala, Charotar Publishing House.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE739PE: ENVIRONMENTAL IMPACT ASSESSMENT
(Professional Elective-III)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course is
- To study the importance of EIA
- To know the role of public in EIA studies
- To Understand phenomena of impacts in the environment
- To Know the impact quantification of various projects on the environment

Course Outcomes: At the end of the course the student will be able to
- Identify the environmental attributes to be considered for the EIA study
- Formulate objectives of the EIA studies
- Identify the methodology to prepare rapid EIA
- Prepare EIA reports and environmental management plans

UNIT- I
Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II
EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III
Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV
Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.
Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria- case studies.
UNIT- V
Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand ReinholdCo., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., NewYork

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE740PE: MUNICIPAL AND HAZARDOUS WASTE MANAGEMENT
(Professional Elective-IV)

B.Tech. IV Year I Sem. L T P C
3 0 0 3

Course Objectives: The objectives of the course is to
- Distinguish between the quality of domestic and industrial water requirements and Wastewater quantity generation
- Understand the industrial process, water utilization and waste water generation
- Impart knowledge on selection of treatment methods for industrial wastewater
- Acquire the knowledge on operational problems of common effluent treatment plants.

Course Outcomes: At the end of the course the student will be able to
- explain the sources of solid waste and its impact
- describe the process of solid waste and its management
- illustrate the process of handling hazardous wastes
- classify various biomedical waste management systems
- apply e-waste management techniques

UNIT- I
Solid Waste: Definition of solid wastes, types of solid wastes, sources, Industrial, mining, agricultural and domestic, characteristics, solid waste problems, impact on environmental health.

UNIT- II
Collection, Segregation, Transport and Management of Municipal Solid Wastes: Handling and segregation, Collection and storage of municipal solid wastes; analysis of Collection systems. Transfer stations, labelling and handling of hazardous wastes. Solid waste processing technologies. Mechanical and thermal volume reduction. Biological and chemical techniques for energy and other resource recovery: composting, types, vermicomposting, termigradation, fermentation. Incineration of solid wastes. Disposal in landfills: site selection, design, and operation of sanitary landfills; Leachate and landfill gas management; landfill closure and post-closure environmental monitoring; landfill remediation. Regulatory aspects of municipal solid waste management.

UNIT- III
Hazardous Waste and Management: Hazardous waste definition. Physical and biological routes of transport of hazardous substances, sources and characterization. Sampling and analysis of hazardous wastes, proximate analysis, survey analysis, directed analysis, handling, collection, storage and transport.
Hazardous waste treatment technologies TSDF concept, Physical, chemical and thermal treatment of hazardous waste: solidification, chemical fixation, encapsulation, pyrolysis and incineration. Hazardous waste landfills, Site selections, design and operation. HW reduction, recycling and reuse, Regulatory aspects of HWM/HWM rules.

UNIT- IV
Biomedical Waste Management: Classification, collection, segregation treatment and disposal. radioactive waste: definition, low level and high level radioactive wastes and their management, radiation standards.

UNIT- V
E-Waste Management: Waste characteristics, generation, collection, transport and disposal, regulatory aspects of e waste, global strategy, recycling.

TEXT BOOKS:
1. Hazardous waste management Charles A. Wentz. Second edition 1995. TMH.
2. Integrated solid waste management George Tchobanoglous, Hilary Theisen & Sammuel A. Vigil.

REFERENCE BOOKS:
1. Hazardous waste management by Prof. Anjaneyulu.
2. Criteria for hazardous waste landfills — CPCB guidelines 2000.
3. Standard handbook of Hazardous waste treatment and disposal by Harry M.Freeman,TMH.

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21CE741PE: FINITE ELEMENT ANALYSIS
(Professional Elective-IV)

B.Tech. IV Year I Sem.   **L TP C**
                                                                                              3 0 0 3

Course Objectives: The objectives of the course is to
- The basic concepts of Finite Element methods and its applications to complex engineering problems.
- The characteristics and selection of different finite elements used in finite element methods.
- The equilibrium equations and stress-strain relations for different boundary conditions Encountered in structural and heat transfer continuum problems.
- The application of the FEM technique to dynamic problems and validate the solutions through simulation software for real time application

Course Outcomes: At the end of the course the student will be able to
- explain the fundamentals of FEA
- formulate the stiffness matrix for 1-D element
- compute the stiffness matrix for 2-D and 3-D element
- analyze the plates using FEA
- apply non-linear finite element analysis

UNIT- I
Introduction: Concepts of FEA - steps involved - merits and demerits - energy principles - Discretization - Raleigh - Ritz method of functional approximation. Principles of Elasticity: Stress equations - strain displacement relationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT- II
One dimensional element: Stiffness matrix for beam and bar elements - shape functions for 1-D elements. Two dimensional element: Different types of elements for plane stress and plane strain analysis - displacement models - generalized coordinates - shape functions - convergent and compatibility requirements - geometric invariance - natural coordinate system - area and volume coordinates - generation of element stiffness and nodal load matrices.

UNIT- III
Isoparametric formulation: Concept - different isoparametric elements for 2D analysis -formulation of 4-noded and 8-noded isoparametric quadrilateral elements - Lagrange elements - serendipity elements.
Axi-Symmetric Analysis: bodies of revolution – axi-symmetric modeling - strain displacement relationship - formulation of axi-symmetric elements. Three dimensional FEM: Different 3-D elements-strain-displacement relationship –formulation of hexahedral and isoparametric solid element.

UNIT- IV
Finite Element Analysis of Plates: Introduction, Basic theory of plate bending - thin plate theory - stress resultants - Mindlin's approximations - formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.

UNIT- V
Non-linear finite analysis: Introduction to non-linear finite analysis - basic methods - application to special structures.

TEXT BOOKS:
1. Introduction to Finite Element Analysis, S.Md.Jalaludeen, Anuradha Publications, Print-2012.
2. Introduction to Finite element Method, JN Reddy, McGraw Hill Higher Education.

REFERENCE BOOKS:
1. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu, PHI.
2. Finite element analysis, theory and programming by GS Krishna Murthy, TMH.
3. Finite Element Analysis, S.S. Bhavikatti, New Age International Publishers.

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE742PE: REMOTE SENSING AND GIS
(Professional Elective-IV)

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

3 0 0 3

Course Objectives: The objectives of the course is to
- Apply the concepts of Photogrametry and its applications such as determination of heights of objects on terrain.
- Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
- Illustrate Energy interactions with atmosphere and with earth surface features, Interpretation of satellite and top sheet maps
- Understand different components of GIS and Learning about map projection and coordinate system

Course Outcomes: After the completion of the course student should be able to
- Describe different concepts and terms used in Remote Sensing and its data
- Introduction to GIS.
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- Evaluate the accuracy of Data and implementing a GIS
- Understand the applicability of RS and GIS for various applications.

UNIT - I:
Concepts of Remote Sensing Basics of remote sensing: Eelements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT - II:
Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co- ordinate systems, Map projections, Map transformation, Geo-referencing,

UNIT - III:
Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization **Data models and data structures:** Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

UNIT - IV:
Spatial Data input and editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macrocomponents of accuracy, sources of error in GIS.
Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT - V: Implementing a GIS and Applications

Implementing a GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS.

Applications of GIS: GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

TEXT BOOKS:

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw Hill Education (Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 7th Edition, 2015.
2. Geographic Information systems – An Introduction by Tor Bernhard Sen, Wiley India Publication, 3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi,   R.Sathi Kumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE743PE: AIR POLLUTION
(Professional Elective-IV)

B.Tech. IV Year I Sem.   **L T P C**
                                                                                              3 0 0 3

Course Objectives: The objectives of the course is to
- To provide general understanding of quality of air and impact on local an global effects of air pollution on human, materials, properties and vegetation.
- To study the fate and transport of air pollutants and its measurement techniques.
- To discuss the various types of air pollution control equipment and their design principles and limitation.

Course Outcomes: At the end of the course the student will be able to
- Introduction to Air Pollution.
- Identify sampling and analysis techniques for air quality assessment.
- Describe the plume behavior for atmospheric stability conditions.
- Apply plume dispersion modelling and assess the concentrations.
- Design air pollution controlling devices.

UNIT- I
Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution - Global effects – Ambient Air Quality and standards – Monitoring air pollution, Sampling and analysis of Pollutants in ambient air - Stack sampling.

UNIT- II
Meteorology and Air Pollution: Factors influencing air pollution, Wind rose, Mixing Depths, Lapse rates and dispersion - Atmospheric stability, Plume behavoiur, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT- III
Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution - Control mechanism - Dust removal equipment – Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.

UNIT- IV
Control of Gaseous Pollutants: Process and equipment for the removal by chemical methods - Working principles and operation of absorption and adsorption equipment - Combustion and condensation equipment.

UNIT- V
Automobile and Indoor Pollution: Vehicular pollution – Sources and types of emission – Effect of operating conditions-Alternate fuels and emissions-Emission controls and standards, Strategies to control automobile pollution– Causes of indoor air pollution-changes in indoor air quality-control and air cleaning systems-indoor air quality.

TEXT BOOKS:

1. M.N. Rao and HVN Rao, Air Pollution, Tata McGraw Hill Publishers
2. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999.

REFERENCE BOOKS:

1. Air Pollution Control Engineering by Nevers, , McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.
3. Air Pollution and Health by T. Holgate, Hillel S. Koren, Jonathan M. Samet, Robert L. Maynardpublisher Academic Press.

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21CE757OE: ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-II)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course is to
- Study the importance of EIA
- Know the role of public in EIA studies
- Understand phenomena of impacts in the environment
- Know the impact quantification of various projects on the environment

Course Outcomes: At the end of the course the student will be able to
- Identify the environmental attributes to be considered for the EIA study
- Formulate objectives of the EIA studies
- Identify the methodology to prepare rapid EIA
- Prepare EIA reports and environmental management plans

UNIT- I
Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II
EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III
Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV
Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.
Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria- case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:
1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S.Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:
1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand ReinholdCo., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., NewYork.

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE844PE: GROUND IMPROVEMENT TECHNIQUES
(Professional Elective-V)

B.Tech. IV Year II Sem.   **L T P C**
                                                                                                      3 0 0 3

Course Objectives: The objectives of the course is to
- Understand the expansive soil properties and apply the same for the design of structures on expansive soils.
- Design dewatering system, and using dewatering methods for ground improvement
- Apply knowledge on expansive soils, ground improvement techniques, Earth retaining structures, drainage, dewatering and grouting techniques
- Apply mechanical modification, using deep compaction Techniques, Blasting, Vibro-compaction, Dynamic and Compaction Piles
- Learn about different methods of ground improvement in cohesive and granular soil.

Course Outcomes: at the end of the course the student able to
- Classify the field problems related to problematic soils.
- Explain the ground improvement techniques like vibro compaction.
- Design the drainage &dewatering system for the field problems.
- Classify physical and chemical modification.
- Outline the Soil modification by inclusions and confinement

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- Vibro compaction- 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 Hillpublications
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis

REFERENCE BOOKS:
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, Indianedition, 2012.

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE845PE: PRESTRESSED CONCRETE
(Professional Elective-V)

B.Tech. IV Year II Sem.   **L T P C**
                                                                 3 0 0 3

Course Objectives: The objectives of the course are to
- Understand the principles & necessity of prestressed concrete structures.
- Know different techniques of prestressing.
- Get the knowledge on various losses of prestress.
- Understand Analysis and design of prestressed concrete members.

Course Outcomes: After the completion of the course student should be able to
- Understand the principles of& necessity of prestressed concrete structures.
- Acquire the knowledge of various prestressing techniques
- Develop skills in design of prestressed concrete members as per IS code.
- Understand analysis and design of prestressed concrete members.
- Analysis and design of composite beams.

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

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

UNIT - III
Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line – Cable profile and cable layout.
Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions**.**

UNIT - IV
Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in posttensioned 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.

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

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE846PE: TRAFFIC ENGINEERING
(Professional Elective-V)

B.Tech. IV Year II Sem.   **L T P C**
                                                                                        3 0 0 3

Course Objectives: The objectives of the course is to
- Understand the basic concepts of highway development of India
- Remember the basic concepts of classification of roads and road patterns.
- Develop the knowledge in highway geometric design.
- Develop the knowledge to students about the design of vertical and horizontal alignment.
- Know the necessity and importance of traffic engineering & regulations.

Course Outcomes: at the end of the course the student able to
- identify traffic stream characteristics and studies
- explain traffic capacity and level of service
- analyze parking problems and provide traffic safety
- design traffic signal cycle and traffic island capacity
- classify various traffic-environment problems

UNIT - I
Traffic Characteristics Measurement and Analysis: Basic traffic Characteristics - Speed, Volume and Concentration. Relationship between flow, Speed and Concentration. Traffic Measurement and Analysis - Volume Studies - Objectives, Methods; Speed studies – Objectives, Definition of Spot Speed, time mean speed and space mean speed; Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies.

UNIT - II
Highway Capacity and Level of Service: Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways, Multilane highways and freeways.

UNIT - III
Parking Analysis: Types of parking facilities – On-street parking and Off-street Parking facilities; Parking studies and analysis- Parking Inventory Study, Parking Usage Study By Patrolling, Questionnaire Survey, Cordon Surveys; Evaluation of parking parameters; Parking accumulation, Parking Load, Parking Turnover, Parking Index, Parking Volume.

Traffic Safety: Traffic Safety - Accident studies and analysis; Causes of accidents - The Road, The vehicle, the road user and the Environment, Engineering, Enforcement and Education measures for the prevention of accidents.

UNIT - IV
Traffic Signals: Traffic Signals –Types of Signals; Principles of Phasing; Timing Diagram; Design of Isolated Traffic Signal by Webster method, Warrants for signalization. Signal Coordination, Signal Coordination methods, Simultaneous, Alternate, Simple progression and Flexible progression Systems.

UNIT - V

Traffic and Environment: Detrimental effects of Traffic on Environment, Air pollution; Noise Pollution; Measures to curtail environmental degradation due to traffic. Sustainable Transportation: Sustainable modes, Transit Oriented Development, ITS based benefits for Environment.

TEXT BOOKS:
1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers.
2. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.

REFERENCE BOOKS:
1. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication.
2. Highway Capacity Manual -2000.

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE847PE: ADVANCED STRUCTURAL ANALYSIS
(Professional Elective-V)

B.Tech. IV Year II Sem.   **L T P C**
                                                                           3 0 0 3

Course Objectives: The objectives of the course is to
- To impart knowledge on the analysis of indeterminate structures like continuous Beams
- To impart knowledge on the analysis of indeterminate structures like trusses
- To impart knowledge on the analysis of indeterminate structures like portal frames

Course Outcomes: After the completion of the course student should be able to
- analyze portal frame using various methods
- analyze two hinged arches
- analyze multi storey frames using various approximate methods
- analyze the continuous beams and frames using matrix method
- construct influence lines for beams and analyze trusses

UNIT- I
Introduction to matrix methods of analysis statically indeterminacy and kinematics indeterminacy- degree of freedom-coordinate system-structure idealization stiffness and flexibility matrices-suitability element stiffness equations-elements flexibility equations-mixed force-displacement equations-for truss element, beam element and tensional element
Transformation of coordinates-element stiffness matrix-and load vector-local and global coordinates.

UNIT- II
Assembly of stiffness matrix from element stiffness matrix-direct stiffness method-general procedure- bank matrix-semi bandwidth-computer algorithm for assembly by direct stiffness matrix method.

UNIT- III
Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.

UNIT- IV
Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.

UNIT- V
Special analysis procedures-static condensation and sub structuring-initial and thermal stresses. Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.

TEXT BOOKS:
1. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.
2. Advanced Structural Analysis by A.K. Jain Nemchand Publishers

REFERENCE BOOKS:
1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Pandit and Gupta.
3. Matrix methods of structural analysis by J Meek.
4. Structural Analysis by Ghali and Neyveli.

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BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CE848PE: EARTHEN DAMS AND SLOPES STABILITY
(Professional Elective-VI)

B.Tech. IV Year II Sem.   **L T P C**
                                                                                                      3 0 0 3

Course Objectives: The objectives of the course is
- To enable participants to design and inspect embankment and earthworks effectively
- To fully understand the related science and engineering principles
- To interpret test results and standards
- To make the best choices on embankment construction and inspection methods
- To learn the most common techniques for slope and embankment stabilization

Course Outcomes: After the completion of the course student should be able to
- outline the behaviour and design criteria of earthen dams
- illustrate failures in dams and their control measures
- analyze slope stability of earthen dams
- explain various methods of slope stability
- adapt suitable techniques for slope stabilization

UNIT- I
Earthen Dams: General features, Selection of site; Merits and demerits of the earthen dams, Classification of earth dams, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.

UNIT- II
Failures, Damages and Protection of Earth Dams: Nature and importance of failure, Piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters, Treatment of upstream and downstream of slopes, Drainage control, Filter design.

UNIT- III
Slope Stability Analysis: Types of Failure: Failure surfaces - Planar surfaces, Circular surfaces, Non-circular surfaces, Limit equilibrium methods. Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long-term stability in slopes. Taylor Charts.

UNIT- IV
Methods of Slope Stability: Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure Surfaces: Janbu Analysis, Sliding Block Analysis, Seismic stability.

UNIT- V
Stabilization of slopes: Soil reinforcement (geo-synthetics / soil nailing/micro piles etc), soil treatment (cement/lime treatment), surface protection (vegetation/erosion control mats/shotcrete).

TEXT BOOKS:
1. Bharat Singh and Sharma, H. D. – Earth and Rockfill Dams.

REFERENCE BOOKS:
1. Sherard, Woodward, Gizienski and Clevenger. Earth & Earth-Rock Dams. John Wiley & Sons.
2. Abramson, L. W., Lee, T. S. and Sharma, S. - Slope Stability and Stabilization methods–John Wiley & son

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE849PE: REPAIR AND REHABILITATION OF STRUCTURES
(Professional Elective-VI)

B.Tech. IV Year II Sem.   **L T P C**
                                                                                        3 0 0 3

Course Objectives: The objectives of the course is to

Course Outcomes: After the completion of the course student should be able to
- identify the preventive measures against damages of structures
- assess steel-reinforcement behaviour subject to corrosion & fire
- predict damages and distress using NDT techniques
- use repairing and strengthening techniques for structures
- adapt health monitoring techniques for various 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 - Shot Create Underpinning. Strengthening of Structures - Strengthening Methods Retrofitting - Jacketing.

UNIT- V
Health Monitoring of Structures - Definition & motivation for SHM, SHM - a way for smart materials and structures, SHM and bio mimetic - analog between the nervous system of a man and a structure with SHM, SHM as a part of system management, Passive and Active SHM, NDE, SHM and NDECS, basic components of SHM, materials for sensor design.

TEXT BOOKS:
1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santakumar, Oxford University press.
3. Maintenance Repair and Rehabilitation and Minor Works of Buildings, P.C. Varghese, PHI.

REFERENCE BOOKS:
1. Defects and Deterioration in Buildings, EF & N Spon, London.
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE850PE: EARTHQUAKE ENGINEERING
(Professional Elective-VI)

B.Tech. IV Year II Sem.   **L T P C**
                                                                        3 0 0 3

Course Objectives: The objectives of the course are to
- Understand Engineering Seismology
- Explain and discuss single degree of freedom systems subjected to free and forced vibrations
- Acquire the knowledge of the conceptual design and principles of earthquake resistantdesigns as per IS codes
- understand importance of ductile detailing of RC structures

Course Outcomes: After the completion of the course student should be able to
- Explain and derive fundamental equations in structural dynamics
- Discuss and explain causes and Theories on earthquake, seismic waves, measurement ofearthquakes
- Evaluate base shear using IS methods
- Design and Detail the reinforcement for earthquake forces

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 v ibratory 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- Structuralmodels 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 andbands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses-Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - V

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non- structures- Effects of non-structural elements on structural system- Analysis of non-structural elements-Prevention of non-structural damage.

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 buildingsduring 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, PrenticeHall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly,John Wiley & Sons.
2. Eartquake 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, Nemchand & 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 456:200

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE851PE: SOLID WASTE MANAGEMENT
(Professional Elective-VI)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course are to
- **Define** the terms **and Understands** the necessity of solid waste management
- **Explain** the strategies for the collection of solid waste
- **Describe** the solid waste disposal methods
- **Categorize** Hazardous Waste

Course Outcomes: At the end of the course the student will able to:
- Identify the physical and chemical composition of solid wastes
- Analyze the functional elements for solid waste management.
- Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
- Identify and design waste disposal systems

UNIT- I
Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II
Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques;

UNIT- III
Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolysis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT- IV
Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT- V
Hazardous waste Management: Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, EngineeringPrinciples and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole ThomsonLearning Inc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering', McGraw HillInc., New York, 1985.
2. Qian X, Koerner RM and Gray DH, 'Geotechnical Aspects of Landfill Design andConstruction' Prentice Hall, 2002.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CE858OE: REMOTE SENSING AND GIS
(Open Elective-III)

B.Tech. IV Year II Sem. **L T P C**
3 0 0 3

Course Objectives: The objectives of the course is to
- Identify the causes of deterioration in structures and suggest suitable remedial measures.
- Generalize the types of damages and understand their mechanisms.
- Infer the causes and prevention mechanisms of corrosion in steel reinforcement and fire induced damages.
- Learn to inspect and assess the structures using techniques of visual inspection and NDT
- Evaluate a structural damage and recommend suitable repair and strengthening methods.
- Identify the latest health monitoring and building instrumentation methods.

Course Outcomes: After the completion of the course student should be able to
- Describe different concepts and terms used in Remote Sensing and its data
- Introduction to GIS.
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- Evaluate the accuracy of Data and implementing a GIS
- Understand the applicability of RS and GIS for various applications.

UNIT - I
Concepts of Remote Sensing: Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT - II
Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co- ordinate systems, Map projections, Map transformation, Geo-referencing,

UNIT - III
Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization.

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

UNIT - IV
Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macrocomponents of accuracy, sources of error in GIS. **Spatial Analysis:** Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

REFERENCE BOOKS:
1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, WileyPublishers, 7th Edition, 2015.\
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication,3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.

UNIT – V

Implementing a GIS and Applications: Awareness, developing system requirements, evaluation of alternative systems,decision making using GIS

Applications of GIS: GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

TEXT BOOKS:
1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw Hill Education(Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, WileyPublishers, 2012.

REFERENCE BOOKS:
5. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, WileyPublishers, 7th Edition, 2015.\
6. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication,3rd Edition, 2010.
7. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R.SathiKumar, N. Madhu, Pearson Education, 1st Edition, 2007.
8. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.