I B.TECH I SEMESTER

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I B. Tech. - I SEMESTER

S.No	Subject Name	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Functional English	HS	4	-	-	40	60	100	3
2	Engineering Mathematics	BS	3	1	-	40	60	100	3
3	Mathematical Methods	BS	3	1	-	40	60	100	3
4	Engineering Chemistry	BS	3	1	-	40	60	100	3
5	Programming with C	ES	3	1	-	40	60	100	3
6	Professional Ethics, Values & Patents	HS	4	-	-	40	60	100	3
7	Basic Communication Skills Lab	HS	-	-	3	25	50	75	2
8	Engineering Chemistry Lab	BS	-	-	3	25	50	75	2
9	Computer Programming Lab	ES	-	-	3	25	50	75	2
	TOTAL		**20**	**4**	**9**	**315**	**510**	**825**	**24**

HS: Humanities and Social Sciences

ES: Engineering Sciences

BS: Basic Sciences

PC: Professional Course

PE: Professional Elective

OE: Open Elective

PW: Project Work

MC: Mandatory Course (No Credits)

L: Lecture

T: Tutorial

P: Practical

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I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3

PROGRAMMING WITH C
(Common to ECE,EEE,CIVIL and Mechanical)

COURSE OBJECTIVE:

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

COURSE OUTCOME:

CO1: Study and Understand basics of computer Hardware and Software.
CO2: Study, Analyze and Understand logical structure of computer programming and different constructs to develop programs in C language.
CO3: Understand and Analyze simple data structures and use of pointers and dynamic memory allocation technique.
CO4: Create files and apply file I/O operations.

UNIT - I:
INTRODUCTION: Computer systems, Hardware and Software Concepts,
PROBLEM SOLVING: Algorithm / Pseudo code, flowchart, program development steps, computer languages: machine, symbolic and high-level languages, Creating and Running Programs: Writing, Editing(vi/emacs editor), Compiling(gcc), Linking and Executing in under Linux.
BASICS OF C: Structure of a C program, identifiers, basic data types and sizes. Constants, Variables, Arthmetic , relational and logical operators, increment and decrement operators, conditional operator, assignment operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

UNIT - II:
SELECTION – MAKING DECISION: TWO WAY SELECTION: if-else, null else, nested if, examples, Multi-way selection: switch, else-if, examples.
ITERATIVE: loops- while, do-while and for statements, break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.
ARRAYS: Arrays- concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix.
STRINGS: concepts, c strings.

UNIT - III:
FUNCTIONS MODULAR PROGRAMMING: Functions, basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs, Passing 1-D arrays, 2-D arrays to functions.

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UNIT - IV:
POINTERS: pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT - V:
ENUMERATED, STRUCTURE AND UNION TYPES: Derived types -structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, program applications.

UNIT - VI:
FILE HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs.

TEXT BOOKS:

1. Programming in C, Reema Thareja, OXFORD.
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

REFERENCE BOOKS:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

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I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2

COMPUTER PROGRAMMING LAB
(Common to ECE,EEE,CIVIL and Mechanical)

COURSE OBJECTIVE:

The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

- After completion of this C Programming Lab, students should be able to:
- : Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language.
- Know how to write, compile and debug programs in C Language.
- Understand and analyse data types, typecasting and operator precedence.
- Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.
- Explain and analyse simple data structures, use of pointers and dynamic memory allocation techniques.
- Summarize the role of functions involving the idea of modularity, know how to create files and apply file I/O operations.

SYLLABUS:

EXERCISE 1:

a) Write an Algorithm, Flowchart and Program to calculate the area of triangle using the formula Area = (s (s-a) (s-b) (s-c)) 1/2 where s= (a+b+c)/2.
b) Write an Algorithm, Flowchart and Program to find the largest of three numbers using ternary operator.
c) Write an Algorithm, Flowchart and Program to swap two numbers without using a temporary variable.

EXERCISE 2:

a) Write a C program to find the roots of a quadratic equation.
b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

EXERCISE 3:

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.
b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

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EXERCISE 4:

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.
b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.
c) Write a C Program to check whether the given number is Armstrong number or not.

EXERCISE 5:

a) Write a C program to interchange the largest and smallest numbers in the array.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

EXERCISE 6:

a) Write a C Program to find both the largest and smallest number of an array of integers
b) Write a C Program to find transpose of a matrix.

EXERCISE 7:

Write C programs that use both recursive and non-recursive functions for the following
a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

EXERCISE 8:

Write a C Program for the following.
a) To find Fibonacci sequence
b) Write C programs illustrating call by value and call by reference concepts.

EXERCISE 9:

Write C Programs for the following string operations without using the built in functions - to concatenate two strings
a) To append a string to another string
b) To compare two strings

EXERCISE 10:

Write C Programs for the following string operations without using the built in functions
a) To find the length of a string
b) To find whether a given string is palindrome or not

EXERCISE 11:

Write a C program that uses functions to perform the following operations:
a) To insert a sub-string in to given main string from a given position.
b) To delete n Characters from a given position in a given string.
c) To replace a character of string either from beginning or ending or at a specified location.

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EXERCISE 12:

a) Write a C program to implement a linear search.
b) Write a C program to implement binary search
c) Write a C program to implement sorting of an array of elements.

EXERCISE 13:

a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two arrays using pointers
c) Write a C program to swap two numbers using pointers

EXERCISE 14:

Examples which explores the use of structures, union and other user defined variables

EXERCISE 15:

a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

TEXT BOOKS:

1. Programming in C, Reema Thareja, OXFORD .
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

REFERENCE BOOKS:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

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I B.TECH II SEMESTER

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I B. Tech. - II SEMESTER

S.No	Subject Name	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Interactive English	HS	4	-	-	40	60	100	3
2	Engineering Physics	BS	3	1	-	40	60	100	3
3	Integral Transforms & Vector Calculus	BS	3	1	-	40	60	100	3
4	Engineering Mechanics	ES	3	1	-	40	60	100	3
5	Engineering Drawing	ES	1	-	4	40	60	100	3
6	Environmental Studies	ES	4	-	-	40	60	100	3
7	Enhancing Communication Skills Lab	BS	-	-	3	25	50	75	2
8	Engineering Physics Lab	BS	-	-	3	25	50	75	2
9	Engg Work Shop	ES	-	-	3	25	50	75	2
	TOTAL		**18**	**3**	**13**	**315**	**510**	**825**	**24**

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I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ENGINEERING MECHANICS (Common to ME,CE STUDENTS)							

COURSE OBJECTIVES:

The course is mainly intended

- To impart the basic concepts and fundamentals of Engineering Mechanics and the principles of various force systems under static and dynamic conditions
- To develop the problem solving skills of engineering mechanics essential for mechanical engineering

COURSE OUTCOMES:

At the end of this course student will acquire ability to

- Determine the resultant of the given force systems.
- Construct free body diagrams and develop equilibrium equations.
- Understand the concepts of friction and to apply in real life problems.
- Determine the centroid, center of gravity and Moment of Inertia of areas, bodies and composite sections.
- Understand the dynamic analysis of rigid body motion and analyze the dynamic equilibrium of moving bodies
- Apply the work-energy principle to particles and connected systems

UNIT – I:

Introduction to Engineering Mechanics-Basic concepts

RESULTANT OF COPLANAR CONCURRENT FORCE SYSTEM: Parallelogram law, Graphical method, Method of resolution.

EQUILIBRIUM OF FORCE SYSTEMS: Free body diagrams, Equations of Equilibrium for coplanar concurrent force system, Lami's theorem.

MOMENTS: Moment of Force and its Applications, Principle of moments – Couples and Resultant of Force Systems.

UNIT - II:

FRICTION: Introduction, Classification of friction, Laws of Friction, Coefficent of Friction, Angle of Friction, Angle of Repose, Frictional Forces on moving bodies, Wedge friction, Ladder friction.

UNIT - III:

CENTROID: Centroids of simple figures (from basic principles)-Centroids of composite figures, Centre of Gravity: Centre of Gravity of simple body (from basic principles), Centre of gravity of composite bodies, pappus theorem.

UNIT - IV:

AREA MOMENTS OF INERTIA: Definition, Radius of gyration, Parallel axis theorem, perpendicular axis theorem, Moments of Inertia of composite figures, polar moment of Inertia.

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UNIT – V:

MASS MOMENT OF INERTIA: Moment of Inertia of Rigid body-Moment of Inertia from basic principles-Slender bar, Rectangular Plate, Circular Plate, Moment of Inertia of 3D Bodies Cone, Solid Cylinder, Solid Sphere.

UNIT - VI:

KINETICS: Analysis as a particle, Newton's laws of motion, D'Alembert's principle –simple applications- analysis as a rigid body in translation-fixed axis rotation-Simple applications.

WORK-ENERGY METHOD: Equations for Translation, work-Energy applications to particle motion, connected system-Impulse momentum method-simple applications.

TEXT BOOKS:

1. Engg. Mechanics by S.Timoshenko & D.H.Young., 4th Edn - ,Mc Graw Hill publications.
2. Engg. Mechanics by S.S. Bhavikatti-New age publications

REFERENCES:

1. Engineering Mechanics by Fedinand . L. Singer , Harper – Collins.
2. Engineering Mechanics by A.K.Tayal-Umesh Publications.

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I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	40	60	100	4

ENGINEERING DRAWING
(COMMON TO ME, CE STUDENTS)
(NOTE: USE IST ANGLE PROJECTION ONLY)

COURSE OBJECTIVES:

The course is mainly intended to

- Impart basic knowledge and skills required to prepare engineering drawing which is an universal language of engineers for communication, designing and production
- Get enhanced imagination capacity, visualize and communicate geometrical elements
- Understand the fundamentals of geometry like engineering curves, planes, solids, sections, developments & isometric views and its applications in design and manufacturing of various engineering components

COURSE OUTCOMES:

At the end of this course student will acquire ability to

- Apply principles of drawing to represent dimensions of an object and use the different types of scales for drawing of various sizes of engineering curves
- Draw various polygons and conic sections of Ellipse, Parabola and Hyperbola
- Draw different orientations of points, lines, planes and solids with reference to principal planes.
- Understand Development of surfaces and their representation
- Draw orthographic views (2D) from the given isometric view (3D) and vice versa

UNIT - I:
INTRODUCTION TO ENGINEERING DRAWING: Importance, construction of regular polygons. Conic sections: Construction of Ellipse, parabola & Hyperbola by general Method, ellipse by others methods- Arcs of circles Method, Concentric Circles Method and Oblong Method. Scales: Representation fraction-Construction of plain, diagonal and vernier scale.

UNIT - II:
ORTHOGRAPHIC PROJECTIONS: Principle of orthographic projections, projections, of points. Projection of Straight lines: parallel to both the planes, parallel to one plane and inclined to the other plane.

UNIT - III:
Projection of Straight lines inclined to both the planes, determination of true length, angles of inclination and Traces.

UNIT – IV:
PROJECTIONS OF PLANES: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT - V:

PROJECTIONS OF SOLIDS: prisms, pyramids, cones and cylinders with the axis inclined toone of the planes **DEVELOPMENT OF SURFACES** of right regular solids- Prisms, Cylinder, Pyramids, Cone.

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UNIT - VI:

Conversion of isometric views to orthographic views: Conversion orthographic views to isometric views

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers

REFERENCE BOOKS:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

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I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2

ENIGINEERING WORKSHOP

(COMMON TO ME,CE STUDENTS)

COURSE OBJECTIVES:

- To impart knowledge to students to develop their technical skill sets for creating entities from raw material.
- To give hands on training and practice to students for use of various tools, devices, machines.
- To develop ability of students to understand, plan and implement various processes and operations to be performed on the raw material to create object of desired shape and size.

COURSE OUTCOMES:

- Thorough knowledge of various tools, machines, devices used in engineering practice for creating objects from material.
- Thorough knowledge of carrying out various operations in basic engineering shops.
- Ability of interpretation of job drawing, application of processes and operations to produce basic components from raw material.

LIST OF EXPERIMENTS:

TRADES FOR EXERCISE:

❖ **CARPENTRY**

1. Cross-Lap joint
2. Dove tail joint
3. Mortise & Tenon joint

❖ **FITTING**

1. V-fit
2. Square fit
3. Dovetail fit

❖ **TINSMITHY**

1. Funnel
2. Square box without lid
3. Tapper tray

❖ **HOUSE WIRING**

1. Two lamps series connection & parallel connection
2. Fluorescent Tube Wiring & Stair Case Wiring

TRADES FOR DEMONSTRATION

❖ **BLACK SMITHY**

1. S-Hook
2. Round rod to square rod

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- WELDING
  1. Lap Joint
  2. Butt Joint

TEXT BOOKS:

1. K.C. John, -Mechanical Workshop‖ 2nd Edn., PHI,2010.
2. Kannaiah P. & Narayana K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai, 1999.

REFERENCE BOOKS:

1. Hajra Choudary, -Elements of Workshop Technology-Vol. 1, Asian Publishers, 6th Edn., 1993.
2. G.S. Sawhney, -Mechanical Experiments and Workshop Practice‖, I.K.International Publishing House, New Delhi, 2009.

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II B.TECH - I SEMESTER

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II B.TECH - I SEMESTER COURSE STRUCTURE

S.No	Subject Name	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Probability& statistics	BS	3	1	-	40	60	100	3
2	Building materials and construction	PC	4	-	-	40	60	100	3
3	Building planning and drawing	PC	1	-	4	40	60	100	3
4	Surveying –I	PC	3	1	-	40	60	100	3
5	Fluid mechanics	ES	3	1	-	40	60	100	3
6	Mechanics of solids	ES	3	1	-	40	60	100	3
7	Surveying Laboratory-I	PC	-	-	3	25	50	75	2
8	Mechanic of solids Laboratory	ES	-	-	3	25	50	75	2
9	Verbal Ability (Mandatory Non Credit Course)	MDC	3	-	-	-	-	-	-
	TOTAL		**20**	**4**	**10**	**290**	**460**	**750**	**22**

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3

PROBABILITY AND STATISTICS

(CIVIL)

COURSE OBJECTIVES:

To acquaint students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering.

COURSE OUTCOMES:

Upon Successful completion of the course, the students are able to

- Understand the elementary concepts and techniques of probability, random variables.
- Apply the different kind of distributions and forming the movement generating.
- Understand the means of the population distributions, sampling distributions and the different kinds of esti
- Identify the proper test statistics to test the hypothetical data by Tests of Hypothesis.
- Select suitable curves for fitting the data that available and form the correspond equations by using different types of correlation and Regression.
- Apply Statistical Quality controlling methods to given data.

UNIT-I:

PROBABILITY, RANDOM VARIABLES, DISTRIBUTIONS:

Sample Spaces and Events , Probability ,The Axioms of Probability , Some Elementary Theoromes , Conditional Probability, Bayes' Theorom, Random Variables, The Binomial Distribution, The Mean and the Variance of a Probability Distribution, The Poisson Approximation to the Binomial Distribution, Continuous Random Variables.

UNIT-II:

CONTINUOUS DISTRIBUTIONS & MOMENT GENERATING FUNCTION

The Normal Distribution, The Normal Approximation to the Binomial Distribution, The Gamma Distribution, The Weibull Distribution. Introduction, Moments, Moment generating function, Characteristic Function.

UNIT-III:

SAMPLING DISTRIBUTIONS:

Populations and samples, Sampling distribution of the mean(σ known),Sampling distribution of the mean(σ unknown), Sampling distribution of the variance ,Point Estimation, , Interval Estimation.

UNIT-IV:

TESTS OF HYPOTHESIS

Tests of Hypotheses (Introduction), Null hypotheses and tests of hypothesis, hypothesis concerning one mean, inference concerning two means, hypothesis concerning one variance, hypothesis concerning two variances, Hypotheses concerning one Proportion, Hypotheses concerning several Proportions, goodness of fit.

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UNIT-V: CURVE FITTING, CORRELATION AND REGRESSION

Introduction, Fitting a straight line, second degree curve, exponential curve, power curve by method of least squares. Types of correlation, coefficient of correlation, rank correlation. Regression- regression equations.

UNIT-VI: STATISTICAL QUALITY CONTROL METHODS

Quality Control – control charts for measurements ,control charts for attributes, tolerance limits.

TEXT BOOKS:

1. Miller and John E.Freund, -Probability and Statistics for Engineers‖, Seventh edition, Pearson education, Prentice Hall of India,2005.
2. K. Murugesan,P .Gurusamy, Probability, Statistics and Random Processes ,Anuradha Publications

REFERENCES:

1. S.C. Gupta and V.K. Kapoor, *"Fundamentals of Mathematical Statistics"*, Ninth Revised Edition , Sultan Chand & Sons Educational Publishers, 2007.
2. Probability and Statistics for Engineers and Scientists: Ronald E.Walpole, Sharon L. Mayers and Keying Ye: Pearson
3. Kreyszig E, *"Advanced Engineering Mathematics"*, 8th Edition. John Wiley, Singapore, 2001.
4. S.C. Gupta and V.K. Kapoor, *"Fundamentals of Mathematical Statistics"*, Ninth Revised Edition, Sultan Chand & Sons Educational Publishers, 2007.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
BUILDING MATERIALS & CONSTRUCTION							

COURSE OBJECTIVES:

- In recognizing the good materials to be used for the construction work.
- In supervision of different types of masonry.
- In selection of materials, design and supervision of suitable type of floor and roof.
- In Select suitable materials for buildings and adopt suitable construction techniques
- In Effectively deals with the types of form work and rehabilitation work of building.
- In investigation of soil condition, Deciding and design of suitable foundation for different structures

COURSE OUTCOMES:

After successful completion of the course, the student will able to:

- Students will be able to get knowledge about various building materials.
- Students can select required masonry work and bond for the construction.
- Students will gain knowledge regarding acoustics of building.
- Students are able to know how to use the form work, scaffolding before and after construction, design of suitable foundation for different structures

UNIT-I: STONES, BRICKS AND TILES:

Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile – manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials – their quality.

UNIT- II: MASONRY:

Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and Partionwalls

WOOD: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiver – Reinforced Plastics, Steel, Aluminium.

UNIT- III: LIME AND CEMENT:

Various ingredients of lime- constituents of lime stone classification of lime- various methods of manufacture of lime.

CEMENT: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

UNIT- IV: BUILDING COMPONENTS:

Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs, Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre-fabricated roofs.

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UNIT-V: FINISHINGS:
Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering.
PAINTS: Constituents of paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

UNIT- VI: FOUNDATION:
Function and requirements of good foundation, types of foundation, introduction to spread, combined, strap, mat and pile foundation

TEXT BOOKS:

1. S.S. Bhavikatti, -*Building Materials"* , Vices publications House private ltd.
2. S.S. Bhavikatti, -*Building Construction*‖ Vices publications House private ltd.
3. B.C. Punmia, Laxmi *"Building Materials"* Publications private ltd.
4. B.C. Punmia, Laxmi -*Building Construction*‖ by Publications (p) ltd Sushil Kumar
5.

REFERENCES:

1. S.K.Duggal, *"Building Materials"* New Age International Publications.
2. P.C.Verghese, *"Building Materials"* PHI learning (P) ltd.
3. M.L.Gambhir, *"Building Materials"*, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. P.C.Verghese, *"Building construction"*, PHI Learning (P) Ltd.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	-	4	40	60	100	3
BUILDING PLANNING & DRAWING							

COURSE OBJECTIVES:

- To give knowledge about various building elements and their specifications.
- Presents the basics of planning strategies, building bye laws and acoustics of building
- To draw conventional signs, symbols of materials and building services.
- To draw plan, section and elevations of buildings and various building components.

COURSE OUTCOMES:

By the end of this course students will be able to:

- Plan a building following building rules and bye laws aesthetically
- Various conventional signs, symbols of materials and building services.
- Draw the doors, windows & stair cases
- Drawing plan, section and elevations of buildings and various building components

UNIT-I: BUILDING BYELAWS AND REGULATIONS:

Introduction- terminology- objectives of building byelaws- floor area ratio, floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings– lightening and ventilation requirements. Directions and their characteristics.

UNIT- II: RESIDENTIAL BUILDINGS:

Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types residential buildings.

UNIT- III: PUBLIC BUILDINGS:

Planning of educational institutions, Hospital, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

UNIT-IV: SIGN CONVENTIONS AND BONDS:

Brick, stone, plaster, sand filling, concrete, glass, steel, cast, iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

UNIT-V: DOORS, WINDOWS, STAIR CASES AND ROOFS:

Panelled door, panelled and glassed door, glassed windows, panelled windows, dog legged stair case, open well stair case, foundation, steel roof, Sloped and flat roof buildings: drawing Plans, Elevations and Cross sections of given sloped Roof Buildings.

UNIT VI: PLANNING AND DESIGNING OF BUILDINGS:

Drawing the Plan, Elevation and sections of a Residential & Public buildings from the given line

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TEXT BOOKS:

1. Y.S. Sane,‖*Planning and Design of buildings*‖.
2. Gurucharan Singh and Jagadish Singh, -*Planning, designing and scheduling*‖
3. M. Chakravarthi , -*Building planning and drawing*‖.
4. _A' Series & _B' Series of JNTU Engineering College, Anantapur.
5. Dr. N. Kumara Swamy & A. Kameswararao-*Building planning and drawing"*Charotar.

REFERENCES:

1.Shah and Kale. -*Building drawing"*.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists of five questions in planning portion out of which three questions are to be answered. Part B should consist of two questions from drawing part out of which one is to be answered in drawing sheet. Weight age for Part – A is 60% and Part- B is 40%.

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	3	1	0	40	60	100	3
SURVEYING-I							

COURSE OBJECTIVES:

This course will enable students to:

- Understand the classifications and its basic principles of surveying.
- Learn the measurement of horizontal distances by chaining/taping and concepts of chain surveying.
- Employ conventional surveying data capturing techniques and process the data for computations.
- Analyze the obtained spatial data for draw contours and preparation of maps.

COURSE OUTCOMES:

After a successful completion of the course, the student will be able to:

- Possess a sound knowledge of fundamental principles of surveying.
- Measurement of vertical and horizontal distances to arrive at solutions to basic surveying problems.
- Understand the computations of linear and angular dimensions to arrive at basic surveying problems
- Analyze the obtained spatial data to draw contours and preparation of maps by plane table surveying.

UNIT-I: INTRODUCTION:

Definition of Surveying, Classification of Surveys, Uses of Surveying Units of Measurements, Map & Classification, Survey of India topographical Maps and their numbering, Basic principles of surveying, Errors, Classification, Precision and accuracy.

MEASUREMENT OF HORIZONTAL DISTANCES:

Chain and types, Tape and types, EDM devices, Ranging of lines, Direct and Indirect measurement of distances over sloping grounds, Chain and Tape corrections - Numerical problems.

UNIT-II: CHAIN SURVEYING:

Accessories required, Selection of stations and lines, Offsets and types, Setting out of right angles, Working principle and use of optical square, prism square, cross staff, Linear methods of setting out right angles, Booking of chain survey work, Field book, entries, conventional symbols, Obstacles in chain survey, Numerical problems, Errors in chain survey and precautions to be taken.

UNIT-III: INTRODUCTION TO COMPASS SURVEYING:

Meridians and bearings, Principle, working and use of - Prismatic compass, Surveyor's compass, Magnetic bearing, true bearings, WCB and Reduced bearing. Dip and Declination, Accessories required for compass surveying.

TRAVERSE - closed and open traverse, Computation of bearings of legs of closed traverse given the bearing of one of the legs, Computation of included angles given the bearings of legs of a closed traverse, Compass Traversing Local attraction, determination and corrections, Dependent and independent co-ordinates, Checks for closed traverse and determination of

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closing error and its direction. Bowditch's graphical method of adjustment of closed traverse. Bowditch's rule and transit rule. Omitted measurements (Only Length and corresponding bearing of one line).

UNIT-IV: LEVELLING:

Principles and basic definitions, Fundamental axes and part of a dumpy level, Types of adjustments and objectives, Temporary adjustments of a dumpy level, Sensitiveness of bubble tube, Curvature and refraction correction, Type of levelling, Simple levelling, Reciprocal levelling, Profile levelling, Cross sectioning, Fly levelling, Booking of levels, Rise and fall method and Height of instrument method, comparison Arithmetic checks, Fly back levelling, Errors and precautions.

UNIT-V: CONTOURING:

Contours and their characteristics, Methods of contouring, direct and indirect methods, Interpolation techniques, Uses of contours, Numerical problems on determining inter-visibility, Grade contours and uses.

UNIT-VI: PLANE TABLE SURVEYING:

Plane table and accessories, Advantages and limitations of plane table survey, Orientation and methods of orientation, Methods of plotting – Radiation, Intersection, Traversing, Resection method, Two point and three point problems, Solution to two point problem by graphical method, Solution to three point problem Bessel's graphical method, Errors in plane table survey.

TEXT BOOKS:

1. B.C. Punmia, *"Surveying Vol.1"*, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. S.K. Duggal, *"Surveying Vol.1"*, Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.
3. K.R. Arora, -*Surveying Vol. 1*‖ Standard Book House, New Delhi. – 2010

REFERENCES:

1. R Subramanian, -*Surveying and Leveling, Second edition"*, Oxford University Press, New Delhi
2. KanetkarTPandSVKulkarni,-*Surveying and Leveling PartI"*,PuneVidyarthi GrihaPrakashan, 1988
3. A. Bannister, S. Raymond , R. Baker, -Surveying‖, Pearson, 7th ed., New Delhi.

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	3	1	-	40	60	100	3

FLUID MECHANICS

COURSE OBJECTIVES:

- The Fundamental properties of fluids and its applications.
- Hydrostatic laws and application to practical problem solving.
- Principles of Kinematics and Hydro-Dynamics for practical applications
- Basic design of pipes and pipe networks considering flow, pressure and its losses.
- The basic flow rate measurements

COURSE OUTCOMES:

- Possess a sound knowledge of fundamental properties of fluids and fluid continuum
- Compute and solve problems on hydrostatics, including practical applications
- Apply principles of mathematics to represent kinematic concepts related to fluid flow
- Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications, discharge through pipes and over notches and weirs.

UNIT-I: FLUIDS & THEIR PROPERTIES:

Concept of fluid, Systems of units. Properties of fluid; Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension& Capillarity. Fluid as a continuum, Newton's law of viscosity (theory & problems).Capillary rise in a vertical tube and between two plane surfaces (theory & problems). Vapour pressure of liquid, compressibility and bulk modulus, capillarity, surface tension, pressure inside a water droplet, pressure inside a soap bubble and liquid jet. Numerical problems.

UNIT-II: FLUID PRESSURE AND ITS MEASUREMENTS:

Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Measurement of pressure using simple, differential & inclined manometers (theory & problems). Introduction to Mechanical and electronic pressure measuring devices.

HYDROSTATIC FORCES ON SURFACES: Definition, Total pressure, centre of pressure, total pressure on horizontal, vertical and inclined plane surface, total pressure on curved surfaces. Numerical Problems.

UNIT-III: FUNDAMENTALS OF FLUID FLOW (KINEMATICS):

Introduction, methods of describing fluid motion. Velocity and Total acceleration of a fluid particle. Types of fluid flow, Description of flow pattern. Basic principles of fluid flow, three-dimensional continuity equation in Cartesian coordinate system. Derivation for Rotational and irroational motion. Potential function, stream function, orthogonality of streamlines and equipotential lines. Numerical problems on Stream function and velocity potential. Introduction to flow net.

UNIT-IV: FLUID DYNAMICS:

Introduction, forces acting on fluid in motion. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Modified Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses). Vortex motion; forced vortex, free vortex, problems Momentum equation problems on pipe bends.

APPLICATIONS: Introduction. Venturimeter, Orificemeter, Pitot tube. Numerical Problems.

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UNIT-V: ORIFICE AND MOUTHPIECE:
Introduction, classification, flow through orifice, hydraulic coefficients, Numerical problems. Mouthpiece, classification, Borda's Mouthpiece (No problems).
NOTCHES AND WEIRS: Introduction. Classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs. Numerical problems. Ventilation of weirs, submerged weirs.

UNIT-VI: FLOW THROUGH PIPES:
Introduction, major and minor losses in pipe flow. Darcy-Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow, equation for head loss due to sudden expansion. Numerical problems. Hydraulic gradient line, energy gradient line. Pipe Networks, Hardy Cross method, Numerical problems.

TEXT BOOKS:

1. Modi & Seth , *"Fluid Mechanics, Hydraulic and Hydraulic Machines"*, Standard book house.
2. R.K. Bansal, *"A Text book of Fluid Mechanics and Hydraulic Machines"*, Laxmi Publications, New Delhi
3. S K SOM and G Biswas, -*Introduction to Fluid Mechanics and Fluid Machines"*, Tata McGraw Hill,New Delhi
4.

REFERENCES:

1. K Subramanya, *"Fluid Mechanics and Hydraulic Machines"*, Tata McGraw Hill Publishing Co. Ltd.
2. Mohd.Kaleem Khan, *"Fluid Mechanics and Machinery*‖, Oxford University Press
3. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, -*Fluid Mechanics"*, Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed).

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	3	1	0	40	60	100	3
MECHANICS OF SOLIDS							

COURSE OBJECTIVES:

This course will enable students:

- To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
- To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.
- To analyze and understand different internal forces and stresses induced due to representative loads on structural elements.
- To analyze and understand principal stresses due to the combination of two dimensional stresses on an element and failure mechanisms in materials.
- To evaluate the behavior of torsional members, columns and struts.

COURSE OUTCOMES:

After studying this course, students will be able to:

- Evaluate the strength of various structural elements internal forces such as compression, tension, shear, bending and torsion.
- Suggest suitable material from among the available in the field of construction and manufacturing
- Evaluate the behavior and strength of structural elements under the action of compound stresses and thus understand failure concepts.
- Analyze and design the members subjected to torsion and design the structural elements such as columns and struts.

UNIT-I: SIMPLE STRESSES AND STRAIN:

Introduction- Definition and concept of stress and strain- Hooke's law- Stress-Strain diagrams for ferrous and non-ferrous materials - factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.

UNIT-II: COMPOUND STRESSES:

Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses

THEORIES OF FAILURE: Introduction, maximum principal stress theory (Rankine's theory), Maximum shearing stress theory (Tresca's theory), Strain energy theory (Beltrami and Haigh), and maximum strain theory (St. Venant's theory).

UNIT-III: SHEAR FORCE AND BENDING MOMENT IN BEAMS:

Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.

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UNIT-IV: BENDING AND SHEAR STRESSES IN BEAMS:
Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, _I', and _T' sections.

UNIT-V: COLUMNS AND STRUTS:
Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

UNIT-VI: TORSION IN CIRCULAR SHAFT:
Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft, combined bending and torsion.

THIN CYLINDERS: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, longitudinal stress and change in volume.

TEXT BOOKS:

1. R.K.Rajput , -*Strength of Materials"*, S. Chand Publishing (6th Edition) (2015)
2. R K Bansal, *"A Textbook of Strength of Materials"*, 4th Edition, Laxmi Publications, 2010
3. S.S. Rattan *"Strength of Materials*‖ McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).

REFERENCES:

1. Ferdinand P. Beer, E. Russell Johnston and Jr.John T. DeWolf *"Mechanics of Materials"*, Tata McGraw-Hill, Third Edition, SI Units
2. D.H. Young, S.P. Timoshenko *"Elements of Strength of Materials"* East West Press Pvt. Ltd., 5th Edition (Reprint 2014).
3. Egor P. Popov, *"Mechanics of Material"* Pearson; 2 edition (7 April 1976)

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
SURVEYING LABORATORY-I							

COURSE OBJECTIVES:

This course will enable students to:

- Apply the basic principles of engineering surveying and measurements
- Follow effectively field procedures required for a professional surveyor
- Use techniques, skills and conventional surveying instruments necessary for engineering practice.

COURSE OUTCOMES:

After a successful completion of the course, the student will be able to:

- Apply the basic principles of engineering surveying and for linear and angular measurements.
- Comprehend effectively field procedures required for a professional surveyor.
- Use techniques, skills and conventional surveying instruments necessary for engineering practice.

LIST OF EXPERIMENTS:

1. a) To measure distance between two points by direct ranging
   b) To set out perpendiculars at various points on given line using cross staff, optical Square and tape - Setting out building plan
2. Setting out of rectangle, hexagon using tape/chain and other accessories.
3. Measurement of bearing of sides of a closed traverse and adjustment of closing error by Bowditch method and Transit method.
4. To determine the distance between two inaccessible points using chain/tape and compass.
5. To locate points using radiation and intersection method of plane table.
6. To solve 3-point problem in plane using Bessel's graphical solution.
7. To determine difference in elevation between two points using fly levelling technique and to conduct fly back levelling by Height of Instrument method and Rise and Fall methods.
8. To determine difference in elevation between two points using reciprocal levelling and determine the collimation error.
9. To conduct profile levelling for water supply / sewage line and to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level.

TEXT BOOKS:

1. B.C. Punmia, *"Surveying Vol.1"*, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni, *Surveying and Levelling Part I*, Pune VidyarthiGrihaPrakashan, 1988.

REFERENCES:

1. S.K. Duggal, *"Surveying Vol.1"*, Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.
2. K.R. Arora, *"Surveying Vol. 1"* Standard Book House, New Delhi. – 2010.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
MECHANICS OF SOLIDS LABORATORY							

COURSE OBJECTIVES:

The objective of this course is to make students to gain:

- Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
- Ability to function on multi-disciplinary teams in the area of materials testing.
- Ability to use the techniques, skills and modern engineering tools necessary for engineering.
- Understanding of professional and ethical responsibility in the areas of material testing.
- Ability to communicate effectively the mechanical properties of materials.

COURSE OUTCOMES:

After successful completion of the course, the students will be able to:

- Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
- Identify, formulate and solve engineering problems of structural elements subjected to flexure.
- Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

LIST OF EXPERIMENTS:

1. Tension test on mild steel and HYSD bars.
2. Compression test on mild steel, Brick and wood.
3. Torsion test on mild steel of circular sections.
4. Bending Test on Wood Under two point loading
5. Shear Test on Mild steel- single and double shear.
6. Impact test on Mild Steel (Charpy).
7. Impact test on Mild Steel (Izod).
8. Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's.
9. To determined young's modulus of elasticity of material by
   i) simply supported beam and ii) Cantilever beam.
10. Verification of Maxwell's Reciprocal theorem on beams.

REFERENCES:

1. Suryanarayana A K, *"Testing of Metallic Materials"*, Prentice Hall of India Pvt. Ltd. New Delhi.
2. Fenner, *"Mechanical Testing of Materials"*, George Newnes Ltd. London.
3. Relevant IS Codes

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II B.TECH - II SEMESTER

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II B.TECH - II SEMESTER

S.No	Subject Name	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Structural analysis-1	PC	3	1	-	40	60	100	3
2	Hydraulics and hydraulic machinery	PC	3	1	-	40	60	100	3
3	Engineering geology	PC	4	-	-	40	60	100	3
4	Surveying-II	PC	3	1	-	40	60	100	3
5	Hydrology & Irrigation Engineering	PC	3	1	-	40	60	100	3
6	Surveying Laboratory-II	PC	-	-	3	25	50	75	2
7	FM&HM Laboratory	ES	-	-	3	25	50	75	2
8	Engineering geology Laboratory	PC	-	-	3	25	50	75	2
9	Mini Project on surveying field work	PRC	-	-	3	25	50	75	1
10	Quantitative Aptitude and Reasoning	MDC	3	-	-	-	-	-	-
	TOTAL		**19**	**4**	**12**	**300**	**500**	**800**	**22**

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	3	1	-	40	60	100	3
STRUCTURAL ANALYSIS-I							

COURSE OBJECTIVES:

This course will enable students to

- Apply knowledge of mathematics and engineering in calculating slope and deflections
- Identify, formulate and solve engineering problems
- Analyse structural systems and interpret data
- Engage in lifelong learning with the advances in Structural Engineering.

COURSE OUTCOMES:

After studying this course, students will be able to:

- Evaluate the forces in determinate trusses by method of joints and sections.
- Evaluate the deflection of cantilever, simply supported and overhanging beams by different methods, energy principles and energy theorems and its applications to determine the deflections of trusses and bent frames
- Determine the stress resultants in arches and cables.
- Draw influence lines and construct the ILD diagram for the moving loads.

UNIT-I: INTRODUCTION AND ANALYSIS OF TRUSSES:

Introduction and Analysis of Plane Trusses Structural forms - Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non-linear analysis - Static and kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

UNIT-II: DOUBLE INTEGRATION AND MACAULAY'S METHOD:

Deflection of Beams Definition of slope - Deflection and curvature - Sign conventions, Derivation of moment-curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.

UNIT-III: MOMENT AREA AND CONJUGATE BEAM METHOD:

Moment area method: Derivation, Mohr's theorems, Sign conventions, Application of moment area method for determinate prismatic beams. Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams.

UNIT-IV: ENERGY METHODS:

Energy Principles and Energy Theorems Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion, Deflection of determinate beams and trusses using total strain energy, Deflection at the point of application of single load, Castigliano's theorems and its application to estimate the deflections of trusses, beams, Special applications-Dummy unit load method.

UNIT-V: ARCHES AND CABLES:

Arches and Cable Structures Three hinged parabolic arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of

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cables under point loads and UDL. Length of cables for supports at same and at different levels-Stiffening trusses for suspension cables.

UNIT-VI: INFLUENCE LINES:

Influence Lines and Moving Loads Concepts of influence lines-ILD for reactions, SF and BM for determinate beams-ILD for axial forces in determinate trusses Reactions, BM and SF in determinate beams using rolling loads concepts.

TEXT BOOKS:

1. Reddy C S, -*Basic Structural Analysis*‖, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, *"Basic Structural Analysis*‖, 2nd edition, IK International Pvt. Ltd., New Delhi,2015.
3. Bhavikatti, *"Structural Analysis*‖, Vikas Publishing House Pvt. Ltd, New Delhi, 2002.

REFERENCES:

1. Hibbeler R C, *"Structural Analysis*‖, Prentice Hall, 9th edition, 2014
2. Devadoss Menon, *"Structural Analysis*‖, Narosa Publishing House, New Delhi, 2008.

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
HYDRAULICS AND HYDRAULIC MACHINERY							

COURSE OBJECTIVES:

- To get knowledge about open channel hydraulic and the working of hydraulic machinery.

COURSE OUTCOMES:

At the end of course the student will have:

- Knowledge regarding various theories dealing with the flow phenomenon of fluid in an open channel.
- Understanding of basics of the hydro-machinery and the components,
- Function and use of different types of turbines and pumps.
- Ability to use dimensional analysis in solving fluid problems and plan hydraulic similitude studies.

UNIT-I: OPEN CHANNEL FLOW:

Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows.

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: BASIC OF TURBO MACHINERY:

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

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.

UNIT-V: CENTRIFUGAL – PUMPS:

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

UNIT- VI: HYDROPOWER ENGINEERING:

Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.- Case studies.

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TEXT BOOKS:

1. Modi & Seth ,*"Fluid Mechanics, Hydraulic and Hydraulic Machines"*, Standard book house
2. K,Subramanya , -*Open Channel flow"*, Tata Mc.Grawhill Publishers..
3. Narayana pillai ,—Fluid Mechanics & Fluid machines‖, Universities press.

REFERENCES:

1. Dr. R.K. Bansal , *" Fluid mechanics and hydraulic machines"* - Laxmi Publications (P) ltd., New Delhi
2. Ranga Raju, -*Elements of Open channel flow*‖ by Tata Mc.Graw Hill, Publications.
3. Rajput, S.Chand &Co., *"Fluid mechanics and fluid machines*‖
4.V.T.Chow, -Open Channel flow‖ Mc.Graw Hill book company.

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ENGINEERING GEOLOGY							

COURSE LEARNING OBJECTIVES:

The objective of this course is:

- To introduce the Engineering Geology as a subject in Civil Engineering.
- To enable the student to use subject in civil engineering applications.

COURSE OUTCOMES:

Upon the successful completion of this course, the students will be able to:

- Identify and classify the geological minerals. Measure the rock strengths of various rocks
- Classify and measure the earthquake prone areas to practice the hazard zonation. monitor and measure the Landslides and subsidence
- Prepares, analyses and interpret the Engineering Geologic maps Analyses the ground conditions through geophysical surveys
- Test the geological material and ground to check the suitability of civil engineering project construction. Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc…

UNIT-I: INTRODUCTION:

Branches of Geology, Importance of Geology in Civil Engineering with case studies. Weathering: Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

UNIT-II: MINERALOGY AND PETROLOGY:

Definitions of mineral and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT-III: STRUCTURAL GEOLOGY:

Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT-IV: GROUND WATER:

Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes And Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken to prevent their occurrence at Landslides.

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UNIT-V: GEOPHYSICS:

Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT-VI: GEOLOGY OF DAMS, RESERVOIRS AND TUNNELS:

Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling – Case studies.

TEXT BOOKS:

1. Subinoy Gangopadhay, *„Engineering Geology"* Oxford University press.
2. D. Venkat Reddy, *„Engineering Geology"* Vikas Publishing House pvt. Ltd, 2013.
3. N. Chenn Kesavulu, *„Engineering Geology"* Trinity Press and (Laxmi Publications), 2 Edition, 2014.
4. Vasudev Kanithi, *„Engineering Geology"* University Press.

REFERENCES:

1. P.C. Varghese, *_Engineering Geology for Civil Engineers"* PHI learning pvt. Ltd.
2. Alan E Kehew, *„Geology for Engineers and Environmental Society"* person publications, 3rd edition
3. P.G. Bell, *_Fundamentals of Engineering Geology"* B.S.P. Publications, 2012.
4. V.Parthesarathi *„Engineering Geology"* et al., Wiley Publications
5. K.S. Valdiya, *_Environmental Geology,"* McGraw Hill Publications, 2nd ed.

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	3	1	-	40	60	100	3
SURVEYING-II							

COURSE OBJECTIVES:

- The students will understand the working of Theodolite
- The students will understand determination of heights and distances by tachometry
- The students will understand the various types of curves used in practice
- The students will have the knowledge of setting out civil engineering works

COURSE OUTCOMES:

- Students will have skills of using theodolites, in the construction survey.
- Students will have skills of curve setting
- Students will have setting out of works
- Students will have knowledge of preparation of contour maps in digital form using total station.

UNIT-1 THEODOLITE SURVEYING:

Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry – Subtense method - Stadia constants - Anallactic lens.

TRANSIT VERNIER THEODOLITE: setting, use and temporary adjustments. Use of micro-optic theodolite, Measurement of horizontal angles and bearings by repetition and reiteration methods.

UNIT-II: THEODOLITE TRAVERSING AND COMPUTATIONS:

Traversing by included angles, and bearings, conditions of closed traverse, Gale's traverse table, closing errors and its adjustment, accuracy of traverse. Advantage of plotting traverse by coordinates, omitted measurements in traverse and their computations. Errors in theodolite survey.

MEASUREMENT OF VERTICAL ANGLES: Trigonometrical levelling, calculation of elevations and distances of accessible and inaccessible objects, problems. Trigonometrical levelling, geodetic observations, refraction and curvature corrections, axis signal correction, determination of difference in elevation by single and reciprocal observation, problems.

UNIT-III: CURVES:

Theory of simple curves. Setting out simple curves by linear and instrumental methods. Obstructions in curve ranging. Compound curves. Reverse curves.

UNIT-IV: TRANSITIONS AND VERITICAL CURVES:

Transition curves, computations and setting out of transition curves. Vertical curves, computations and setting out of vertical curves.

UNIT-V: TACHOMETRY:

Theory and use of stadia wires in levelling instruments and theodolite. Fixed and movable hair tachometers. Reduction by calculations; tacheometric, tables; use of tacheometric alidade in contouring by plane table. Tangential method of tacheometry, Theory and use of Jeffcott Direct Reading Tacheometer. Use of RD's self-reducing Tacheometer. Principle and use of substance bar and Beaman's stadia arc.

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UNIT-VI: HYDROGRAPHIC SURVEY:
Brief introduction, methods and applications
TOTAL STATION: Features, concepts, types and applications.

TEXT BOOKS:
1. B.C. Punmia, *"Surveying Vol.II"*, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. S.K. Duggal, *"Surveying Vol.II"*, Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.
3. K.R. Arora, -*Surveying Vol.II*‖ Standard Book House, New Delhi. – 2010.

REFERENCES:
1. R Subramanian, -*Surveying and Leveling, Second edition"*, Oxford University Press, New Delhi
2. Kanetkar T P and S V Kulkarni , -*Surveying and Leveling Part I"*, Pune Vidyarthi Griha Prakashan, 1988
3. A. Bannister, S. Raymond , R. Baker, -Surveying‖, Pearson, 7th ed., New Delhi.

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
HYDROLOGY AND IRRIGATION ENGINEERING							

COURSE LEARNING OBJECTIVES:

The course is designed to

- Introduce hydrologic cycle and its relevance to Civil engineering.
- Make the students understand physical processes in hydrology and, Components of the hydrologic cycle.
- Appreciate concepts and theory of physical processes and Interactions.
- Learn measurement and estimation of the components hydrologic Cycle.
- Provide an overview and understanding of Unit Hydrograph theory and its analysis
- Understand flood frequency analysis, design flood, flood routing.
- Introduce the types of irrigation systems
- introduce the concepts of planning and design of irrigation systems
- Discuss the relationships between soil, water and plant and their Significance in planning an irrigation system.
- learn design principles of canal structures.

COURSE OUTCOMES:

At the end of the course the students shall be able to :

- Have a thorough understanding of the theories and principles governing the hydrologic Processes.
- Develop Intensity-Duration-Frequency and Depth-Area Duration Curves to design hydraulic structures
- Develop design storms and carry out frequency analysis. estimate irrigation water requirements
- Design irrigation canals and canal network Plan an irrigation system.

UNIT-I: INTRODUCTION & PRECIPITATION:

Introduction , Hydrologic cycle (Horton's representation). Water budget equation Precipitation: introduction, forms of precipitation, types of precipitation, measurement of precipitation (Simon's gauge & Syphon gauge only), selection of rain gauge station. Adequacy of rain gauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall.

UNIT-II: LOSSES FROM PRECIPITATION & RUN OFF:

Evaporation: Definition, factors affecting, measurement (ClassA pan). Evapo-transpiration: Definition, factors affecting, measurement, Infiltration: Definition, factors affecting, measurement (doublering infiltrometer), infiltration indices, Horton's equation of infiltration. **RUN OFF :** Definition, factors affecting, empirical formulae, stream gauging, flow mass curve and flow duration curve.

UNIT-III: HYDROGRAPHS:

Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems.

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ESTIMATION OF FLOOD
Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method).

UNIT-IV: INTRODUCTION:
Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation: Gravity irrigation, lift irrigation, well irrigation, tubewell irrigation, infiltration galleries, sewage irrigation, supplemental irrigation.

UNIT-V: SOIL-WATER-CROP RELATIONSHIP:
Introduction, soil profile, physical properties of soil, soilclassification. Indian soils, functions of irrigation soils,maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, frequency of irrigation.

WATER REQUIREMENT OF CROPS:
Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Irrigation efficiencies. Assessment of irrigation water.

UNIT-VI: CANALS:
Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods- Problems.

TEXT BOOKS:
1. Subramanya. K,_*Engineering Hydrology"* Tata Mc Graw-Hill Education Pvt. Ltd, (2013), New Delhi.
2. Jayarami Reddy. P, *„Engineering Hydrology",* Laxmi Publications Pvt. Ltd., (2013), New Delhi
3. Chow V.T., D.R Maidment and L.W. Mays, *„Applied hydrology"* Tata McGraw Hill Education Pvt. Ltd., (2011), New Delhi.
4. Ojha C.S.P, R. Berndtsson and P. Bhunya , _Engineering Hydrology' Oxford University Press, (2010).

REFERENCES:
1. _Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. _Hydrology'by Raghunath. H.M., New Age International Publishers, (2010).
3._Engineering Hydrology –Principles and Practice'by Ponce V.M., Prentice Hall International, (1994).
4. _Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

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	-	-	3	25	50	75	2

SURVEYING LAB-II

LIST OF EXPERIMENTS:

1. Study of theodolite in detail - practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and reiteration.
3. Trigonometric Levelling - Heights and distance problem (Two Exercises)
4. Heights and distance using Principles of tacheometric surveying (Two Exercises)
5. Curve setting – different methods. (Two Exercises)
6. Setting out works for buildings & pipe lines.
7. Determination of area using total station
8. Traversing using total station
9. Contouring using total station
10. Determination of remote height using total station
11. Stake-out using total station
12. Distance, gradient, Diff, height between two inaccessible points using total stations.

LIST OF EQUIPMENT:

1. Theodolites, and levelling staffs.
2. Tachometers.
3. Total station.

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	-	-	3	25	50	75	2

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

LIST OF EXPERIMENTS:

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

LIST OF EQUIPMENT:

1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ENGINEERING GEOLOGY LABORATORY							

COURSE OBJECTIVES:

The objective of this course is:

- To identify the megascopic types of Ore minerals & Rock forming minerals.
- To identify the megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

COURSE OUTCOMES:

Upon the successful completion of this course, the students will be able to:

- Identify megascopic minerals & their properties. Identify megascopic rocks & their properties.
- Identify the site parameters such as contour, slope & aspect for topography.
- Know the occurrence of materials using the strike & dip problems.

LIST OF EXPERIMENTS:

1. Physical properties of minerals: Megascopic identification.
2. a) Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite,Gypsum,etc.
   b) Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc.
3. Megascopic description and identification of rocks.
   a) Igneous rocks–Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc.
4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
5. Simple Structural Geology problems.
6. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

LAB EXAMINATION PATTERN:

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Project report on geology.

REFERENCES:

1. M T Mauthesha Reddy, *„Applied Engineering Geology Practicals"* by New Age International Publishers, 2nd Edition.
2. Tony Waltham, *„Foundations of Engineering Geology"* Spon Press, 3rd edition, 2009.

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	0	0	3	25	50	75	1

MINI PROJECT ON SURVEYING FIELD WORK

The field work is needed to be done on any of the mentioned works like contour map, profile leveling, reservoir capacity, alignment of roads, canals, water supply lines, sewage lines, layout of a colony etc., and a report is required to be submitted.

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	3	0	0	0	0	0	0
QUANTITATIVE APTITUDE AND REASONING							

COURSE OBJECTIVES:

- To train students in analyzing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

- Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements
- Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.
- Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
- Will be able solve complex mathematical problems in the shortest time possible by applying shortcuts.

UNIT - I: SIMPLE EQUATIONS:

Definition of Linear Equations, Formation of simple equations, Problems on Ages, Fractions and Digits, Indeterminate system of equations, Special cases in indeterminate system of equations

RATIO AND PROPORTION: Definition of Ratio, Properties of Ratios, Comparison of Ratios, Problems on Ratios Compound Ratio, Problems on Proportion, Mean proportional and Continued Proportion

VARIATION: Direct variation, Inverse variation, Joint variation, Problems on Variations.

UNIT – II: PERCENTAGES:

Introduction, converting a percentage into decimals, Converting a Decimal into a percentage equivalent of fractions, Problems on percentages.

PROFIT AND LOSS: Problems on Profit and Loss percentage, Relation between Cost Price and Selling price, Discount and Marked Price, Two different articles sold at same Cost Price, Two different articles sold at same Selling Price, Gain% / Loss% on Selling Price .

PARTNERSHIP: Introduction, Relation between capitals, Period of investments and Shares

SIMPLE INTEREST: Definitions, Problems on interest and amount, Problems when rate of interest and time period are numerically equal.

COMPOUND INTEREST: Definition and formula for amount in compound interest, Difference between simple interest and compound interest for 2 years on the same, principle and time period.

QUADRATIC EQUATIONS: General form of Quadratic equations, Finding the roots of Quadratic equations, Nature of the roots, Relation between the roots, Maximum and minimum value of Quadratic Expression.

PROGRESSIONS: Arithmetic Progression, Geometric Progression, Harmonic Progression, Arithmetic Mean, Geometric Mean and Harmonic Mean and their relation.

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UNIT – III: DEDUCTIONS:
Finding the conclusions using Venn diagram method. Finding the conclusions using syllogism method.
CONNECTIVES: Definition of a simple statement, Definition of compound statement, +finding the Implications for compound statements, Finding the Negations for compound statements

UNIT – IV: TIME AND DISTANCE:
Relation between speed, distance and time, Converting km/h into m/s and vice versa, Problems on average speed, Problems on relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on races
TIME AND WORK: -Problems on Unitary method, Relation between Men, Days, Hours and Work, Problems on Man-Day-Hours method, Problems on alternate days, Problems on Pipes and Cisterns.

UNIT – V: ANALYTICAL REASONING PUZZLES:
Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on Comparisons.

UNIT – VI: CLOCKS:
Finding the angle when the time is given, Finding the time when the angle is known, Relation between Angle, Minutes and Hours, Exceptional cases in clocks
CALENDARS: Definition of a Leap Year, Finding the number of Odd days, framing the year code for centuries, Finding the day of any random calendar date.
BLOOD RELATIONS: Defining the various relations among the members of a family, Solving Blood Relation puzzles, solving the problems on Blood Relations using symbols and notations.

TEXT BOOKS:
1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , _A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, _Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills .

REFERENCES:
1. www.careerbless.com/**aptitude**/qa/home.php
2. www.affairscloud.com/**quantitative-aptitude**-questions
3. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
4. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practice**aptitude**tests.com/numerical-**reasoning**-tests

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III B.TECH I SEMESTER

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III B.TECH - I SEMESTER COURSE STRUCTURE

S.No	Subject Name	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Structural Analysis-II	PC	3	1	-	40	60	100	3
2	Concrete Technology	PC	4	-	-	40	60	100	3
3	Geotechnical Engineering –I	PC	3	1	-	40	60	100	3
4	Design And Drawing Of Concrete Structures	PC	3	1	-	40	60	100	3
5	Transportation Engineering-I	PC	4	-	-	40	60	100	3
6	Open Elective-I (See The List Of Open Electives)	OE	4	-	-	40	60	100	3
7	Geotechnical Engineering Laboratory	PC	-	-	3	25	50	75	2
8	Concrete Technology Laboratory	PC	-	-	3	25	50	75	2
9	Advanced Communication Skills (Mandatory Non Credit Course)	MDC	3	-	-	-	-	-	-
10	Sports And Games (Mandatory Non Credit Course)	MDC	-	-	2	-	-	-	-
	TOTAL		**24**	**3**	**8**	**290**	**460**	**750**	**22**

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	3	1	0	40	60	100	3
STRUCTURAL ANALYSIS-II							

COURSE OBJECTIVES

- To introduce the students to concept of theory of structural analysis- and methods in structural analysis.

COURSE OUTCOMES:

Students who successfully complete this course will be able to:

- Draw the shearing force and bending moment diagrams for Propped and fixed beams by consistent deformation method.
- Draw the shearing force and bending moment diagrams for Propped and fixed beams and find the forces in indeterminate trusses by strain energy method.
- Apply the Clapeyron's theorem of three moments to analyse continuous beams.
- Apply the slope-deflection method to analyze statically indeterminate structures.
- Apply the moment distribution method to analyze statically indeterminate structures.

UNIT-1

ANALYSIS OF BEAMS: Consistent deformation method – Propped cantilever and fixed beams.

UNIT-II ANALYSIS OF BEAMS AND PLANE TRUSSES BY STRAIN ENERGY

Analysis of beams (Propped cantilever and Fixed beams) and indeterminate trusses using strain energy and unit load methods.

UNIT-III CLAPEYRON'S THEOREM OF THREE MOMENTS

Clapeyron's theorem of three moments – continuous beams and fixed beams.

UNIT-IV SLOPE DEFLECTION METHOD:

Introduction- Sign convention- Development of slope-deflection equations and Analysis of Beams and Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid).

UNIT -V MOMENT DISTRIBUTION METHOD:

Introduction- Definition of terms Distribution factor- Carry over factor- Development of method and Analysis of beams and orthogonal rigid jointed plane frames (nonsway) with kinematic redundancy less than/equal to three. (Members to be axially rigid).

UNIT - VI SWAY ANALYSIS:

Analysis of rigid jointed plane frames (sway- members assumed to be axially rigid and kinematic redundancy ≤ 3) by slope deflection and moment distribution methods. Introduction to Kani's Method.

TEXT BOOKS:

1. R. Vaidyanathan and P. Perumal- Comprehensive Structural Analysis Volume I & II- Laxmi Publications (P) Ltd.
2. Reddy. C.S.- Basic Structural Analysis- Tata McGraw Hill
3. BhavaiKatti- S.S.- "Structural Analysis – Vol. 1 & Vol. 2"- Vikas Publishing Pvt Ltd.- NewDelhi-2008.

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REFERENCES:

1. Hibbeler- RC- Structural analysis- Pearson Education.
2. Daniel L Schodak- Structures- Pearson Education.
3. S.S. Bhavikatti- Structural Analysis II- Vikas Publication Houses (P) Ltd.
4 Wang C. K.- Intermediate Structural Analysis- Tata McGraw Hill.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
CONCRETE TECHNOLOGY							

COURSE OBJECTIVES:

- To study the properties of cement.
- To study properties of aggregates.
- To conduct laboratory tests on concrete materials.
- To know the properties of fresh and hardened concrete.
- To know the different special concrete.
- To know about mix design procedure of different countries.

COURSE OUTCOMES:

On the successful completion of the course- students will be able to

- Explain the properties and tests of various constituents present in Concrete.
- Understand various manufacturing process of concrete and properties and workability tests of fresh concrete.
- Design concrete mix as per IS and ACI standards
- Enumerate the mechanical behavior and properties of hardened Concrete.
- Demonstrate the long term properties of concrete and identify the solutions for field problems.
- Select the suitable type of special concrete for real time situations Concrete making Materials:

UNIT-I

CEMENT- Raw materials- composition - Hydration- chemistry of cement – Types and grades of cement - Tests and specifications – consistency- setting time- soundness and fineness test.

UNIT-II

AGGREGATES - Source- natural and artificial.

FINE AGGREGATES- Gradation- fineness modulus- specific gravity- bulk density - bulking of sand-water absorption- moisture content and measurement methods- presence of deleterious content .

COARSE AGGREGATES – Size and shape- gradation- fineness modulus- specific gravity- bulk density sieve analysis- water absorption. Tests on coarse aggregates- impact- crushing- abrasion and attrition- water absorption- alkali aggregate reaction.

WATER- Qualities of water for concreting- tolerable concentrations of impurities- use of sea water and its effects.

UNIT-III

Admixtures - Types of Admixtures- super plasticisers-plasticisers- retarders- accelerators- air entrained admixtures and pozzolanic admixtures.

CONCRETE PRODUCTION & FRESH CONCRETE:

Batching of Ingredients- mixing- transporting- and placing - Compacting- finishing- and curing of concrete- Workability- bleeding and segregation of concrete - Factors influencing it - Tests on workability of concrete.

UNIT-IV

CONCRETE MIX DESIGN: Concept of Mix design-Quality acceptance criteria as per Indian standard method. Design of concrete mixes as per IS-10262- ACI method (procedure only).

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Mechanical properties of concrete: Compressive strength and parameters affecting it - Tensile strength - direct and indirect- Modulus of elasticity and Poisson's ratio flexural strength of concrete- Non-destructive test - partially destructive test.

UNIT-V

DIMENSIONAL STABILITY AND DURABILITY OF CONCRETE:

Creep - parameters affecting - Shrinkage of concrete - types and its significance - Introduction to durability- relation between durability and permeability - Chemical attacks on concrete- sulphate attack- chloride- acid attacks- sea water attacks- carbonation attacks - Corrosion of steel rebars- corrosion preventive measures.

UNIT-VI

SPECIAL CONCRETES: Properties and applications of: high strength- high performance and reactive powder concrete - Lightweight- heavyweight- and high density concrete- Shot Crete- Self-compacting concrete.

TEXT BOOKS:

1. Shetty M.S.- -Concrete Technology‖- 7th edition- S.Chand and company Limited- 2012.
2. Nevile A.M.- -Properties of concrete‖- 5th edition- Pearson India- 2012.

REFERENCE BOOKS:

1. Mehta- P.K.- "Concrete: Microstructure- Properties and Materials " 4th edition- Tata McGraw Hill Education Private Limited- 2013
2. Gambhir- -Concrete Technology‖- 5th edition- McGraw Hill Education (India) Private Limited- 2013.
3. Santha Kumar A.R.- -Concrete Technology‖- Oxford University Press- New Delhi- 2009.
4. www.nptel.ac.in

IS CODES

1. IS: 10262-2009- recommended guidelines for Concrete Mix Design.
2. IS: 456 - 2000- Plain and Reinforced concrete – code of practice
3. SP: 23-1982- Handbook on concrete.
4. ACI Committee 2111.1- 91- standard practice for selecting proportions for normal- heavy weight and mass concrete- Part I- ACI manual of concrete practice- 1994.

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	3	1	0	40	60	100	3
GEO TECHNICAL ENGINEERING – I							

COURSE OBJECTIVES:

- To study the soil structure-
- To study consistency limits and IS Classification of soils.
- To conduct laboratory tests on soils.
- To know the permeability- flow nets- seepage- Boussinesq and Westergaard's analysis.
- To understand the compaction- Liquefaction- Consolidation
- To find out the shear strength of soils.

COURSE OUTCOMES:

At the end of course the student will be able to

- Understand formation of soil properties and basic definition.
- Determined and classify the soil for engineering and index properties of soil.
- Coefficient of permeability and various methods.
- Principle of effective stress and point load different shapes.
- Determination of compaction characteristics of soil and consolidation.
- Determination of shear strength and compressibility of soil application.

UNIT – 1

INTRODUCTION

Soil formation and soil types- Regional soil deposits of India.

BASIC DEFINITIONS AND RELATIONS

Phase diagrams- Simple definitions- some important relationships.

UNIT – II

SOIL CLASSIFICATION

Clay Mineralogy: Introduction to soil classification- Particle size classification as per IS-code- Unified soil classification system- Indian standard soil classification system- Index Properties- Grain size distribution- Atterberg Limits- Significance of other Soil Aggregate properties.

UNIT – III

PERMEABILITY

Capillary rise- Darcy's law and its Validity- Determination of coefficient of permeability - constant and Variable head methods- indirect methods- Factors affecting permeability- Permeability of stratified soil deposits.

UNIT – IV

SEEPAGE THROUGH SOILS

Principle of effective stress- physical meaning of effective stress- Types of head- seepage forces and quicksand condition.

STRESS DISTRIBUTION IN SOIL

Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart.

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UNIT – V

COMPACTION OF SOILS

Introduction- Laboratory tests- Factors affecting compaction- Structure and engineering behavior of Compacted cohesive soils- Compaction in the field- Compaction specifications and field control.

COMPRESSIBILITY OF SOIL AND CONSOLIDATION

Introduction- Compressibility- Time-rate of consolidation- Consolidation test- Computation of Settlement- extrapolation of field consolidation curve- Settlement analysis.

UNIT – VI

SHEAR STRENGTH OF SOILS

Introduction- Stress at a point- Mohr Circle of stress- Mohr–coulomb Failure Criterion- Measurement of Shear Strength- Shear strength of Clayey soils- Shear Strength of Sands- Drainage conditions and Strength parameters.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics – Gopal Ranjan and A.S.R.Rao- New Age International Publishers

2. Soil Mechanics and Foundation Engg (7th edition) by Dr. Arora- K.R.- Standard Publisher and Distributors- Delhi- 2010.

3. A Text book of Soil Mechanics and Foundation Engineering – B.C.Punmia Laxmi Publications.

REFERENCES:

1. Foundation Analysis & Design by Bowles- J.E.- McGraw- Hill Book Co.

2. A Text book of Soil Mechanics and Foundation Engineering – P.Purushotthama Raj- Pearson Education

3. Introduction to Soil Mechanics- Braja M Das

E-LEARNING RESOURCES:

http://nptel.ac.in/courses.php

http://jntuk-coeerd.in/

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
DESIGN AND DRAWING OF CONCRETE STRUCTURES							

COURSE OBJECTIVES:

This course will enable students:

- Familiarize Students with different types of design philosophies.
- Equip student with concepts of design of flexural members.
- Understand Concepts of shear- bond and torsion.
- Familiarize students with different types of compressions members and Design.
- Understand different types of footings and their design.

COURSE OUTCOMES:

After studying this course- students will be able to:

- Work on different types of design philosophies.
- Carryout analysis and design of flexural members- structures subjected to shear- bond and torsion.
- Design different types of compression members and footings.
- Design of slabs and stair case.

UNIT–I: INTRODUCTION

Working stress method Design codes- loading standards –Dead- live- wind and earthquake loads- design constants- modular ratio- neutral axis depth and moment of resistance- balanced-under-reinforced and over-reinforced sections- working stress method- design of singly and doubly reinforced rectangular and T-beams.

LIMIT STATE DESIGN: Concepts of limit state design–Basic statistical principles–Characteristic loads–Characteristic strength–Partial load and safety factors–representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design–stress-block parameters– limiting moment of Resistance.

UNIT–II: DESIGN FORFLEXURE

Limit state analysis and design of singly reinforced sections-effective depth-Moment of Resistance-Doubly reinforced rectangular and flanged (T and L) beam sections-Minimum depth for a given capacity- Limiting Percentage of Steel-Minimum Tension Reinforcement-Maximum Flexural Steel-Design of Flanged Sections(T&L)-Effective width of flange–Behaviour-Analysis and Design.

UNIT–III: DESIGN FOR SHEAR- TORSION AND BOND

Limit state analysis and design of section for shear and torsion–concept of bond- anchorage and development length- I.S .code provisions. Design examples in simply supported and continuous beams- detailing.

LIMIT STATE DESIGN FOR SERVICEABILITY: Deflection- cracking and code provision.

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UNIT–IV:DESIGNOFCOMPRESSION MEMBERS

Effective length of a column- Design of short and long columns –under axial loads- uniaxial bending and biaxial bending–concepts of Braced and un-braced columns– I S Code provisions-SP16 charts.

UNIT–V: DESIGN OF FOOTINGS

Different types of footings–Design of isolated rectangular and circular footings - combined rectangular and trapezoidal footings- subjected to axial loads.

UNIT–VI: DESIGN OF SLABS

CLASSIFICATION OF SLABS: design of one–way slabs- two-way slabs and continuous slabs using IS Coefficients (conventional)- design of waist-slab staircase.

NOTE:

1. The students has to prepare the following charts
   (a) Columns (b) Footings (c) Slabs

TEXT BOOKS:

1. _Limit State Design' by A. K. Jain
2. _Design of Reinforced concrete Structures' by N. Subrahmanyian
3. _Reinforced Concrete Structures' by S. Unnikrishna Pillai & Devdas Menon- Tata McGraw Hill- New Delhi.

REFERENCES:

1. _Design of concrete structures'by Arthus H.Nilson- David Darwin- and Chorles W. Dolar- Tata McGrawHill-3rd Edition- 2005.
2. _Reinforced Concrete Structures' by Park and Pauley- John Wiley and Sons.

IS Codes: (Permitted to use in examination hall) 1) IS -456-2000

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	4	-	0	40	60	100	3
TRANSPORTATION ENGINEERING-I							

COURSE LEARNING OBJECTIVES:

The objective of this courses:

- To impart different concepts in the field of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements
- To learn various highway construction and maintenance procedures.

COURSE OUTCOMES:

Upon the successful completion of this course- the students will be able to:

- Plan highway network for a given area.
- Design highway geometrics.
- Design Intersections and prepare traffic management plans.
- Judge suitability of pavement materials and design flexible and rigid pavements.

UNIT-I

HIGHWAY NETWORK PLANNING AND ALIGNMENT: Different modes of transportation- History of road development- Highway development in India-Classification of Roads- Road Network Patterns- Planning Surveys- preparation of plans- master plan-evaluation by saturation system- 20 year Road Development Plans- Highway Alignment-Factors affecting Alignment-Engineering Surveys–Drawings and Reports.

UNIT–II

HIGHWAY GEOMETRIC DESIGN: importance of geometric design- design controls and criteria- cross section elements- pavement surface characteristics- camber- carriageway-kerbs- road margins- formation- right of way- typical cross sections. Sight distance- stopping sight distance- overtaking sight distance- sight distance at intersections. Design of horizontal alignment- super elevation- transition curves. Design of vertical alignment- gradients-vertical curves.

UNIT–III

TRAFFIC ENGINEERING: Basic Parameters of Traffic-Volume- Speed and Density-Traffic Volume Studies- Speed studies–spot speed and speed& delay studies -Parking Studies-Road Accidents-Causes and Preventive measures-Condition Diagram and Collision Diagrams-PCU Factors- Capacity of Highways–Factors Affecting- LOS Concepts- Road Traffic Signs-Road markings- Types of Intersections- At-Grade Intersections – Design of Plain- Flared-Rotary and Channelized Intersections- Design of Traffic Signals–Webster Method–IRC Method.

UNIT–IV

HIGHWAY MATERIALS: Subgrade soil: classification–Group Index–Subgrade soil strength–California Bearing Ratio–Modulus of Subgrade Reaction. Stone aggregates: Desirable properties–Tests for Road Aggregates – Bituminous Materials: Types–Desirable properties–Tests on Bitumen– Bituminous paving mixes: Requirements– Marshall Method of Mix Design.

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UNIT–V

DESIGN OF PAVEMENTS: Types of pavements- Functions and requirements of different components of pavements- Design Factors

FLEXIBLE PAVEMENTS: Design factors–Flexible Pavement Design Methods– CBR method –IRC method–Burmister method–Group index method– IRC Method for Low volume Flexible pavements.

RIGID PAVEMENTS: Design Considerations – wheel load stresses – Temperaturestresses–Frictionalstresses–Combinationofstresses–Design of slabs–Design of Joints–IRCmethod–Rigid pavements for low volume roads

UNIT–VI

HIGHWAY CONSTRUCTION AND MAINTENANCE: Types of Highway Construction– Earthwork- Construction of Earth Roads- Gravel Roads - Water Bound Macadam Roads- Bituminous Pavements and Construction of Cement Concrete Pavements .Pavement Failures- Maintenance of Highways- pavement evaluation- strengthening of existing pavements.

TEXTBOOKS:

1. Kadiyali L.R. Traffic Engineering and Transport Planning- Khanna Publishers- New Delhi- India- 1997.

2. Khanna- S.K. and C.E.G. Justo Highway Engineering- Nem Chand and Bros- Roorkee- India- 2001.

REFERENCES:.

1. Ministry of Road Transport and Highways. Specifications for Road and Bridge Works- Fourth Edition- Indian Roads Congress- New Delhi- India- 2001.
2. IRC Codes of Practices

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
GEOTECHNICAL ENGINEERING LAB							

COURSE OBJECTIVES:

- To calculate the physical and mechanical properties of soils and to identify their suitability for construction.
- To conduct various field tests on soils for getting the accurate results and avoid approximately.

COURSE OUTCOMES:

After performing the experiments listed in the syllabus- the students will have skills:

- To determine basic soil properties and classify the soil for Engineering application
- To investigate the engineering properties of the soil such as Strength- Compressibility and permeability and apply the same to the engineering problems.

LIST OF EXPERIMENTS:

1. Atterberg's Limits
2. (a) Field density-core cutter
   (b) sand replacement method
3. Grain size analysis
4. (a) Permeability of soil
   (b) Constant and variable head test
5. Compaction test
6. CBR Test
7. Consolidation test
8. Unconfined compression test
9. Tri-axial Compression test
10. Direct shear test.
11. Vane shear test

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
CONCRETE TECHNOLOGY LAB							

COURSE OBJECTIVES:

1. To know the tests on cement.
2. To know the tests on aggregate
3. To know the tests on concrete

COURSE OUTCOMES

1. Conduct test on properties of cement
2. Conduct test on properties of Aggregates
3. Conduct test on properties of concrete

LIST OF EXPERIMENTS:

I. TEST ON CEMENT.

1. Consistency
2. Specific gravity
3. Fineness
4. Soundness

II. TEST ON AGGREGATES

1. Specific gravity
2. Fineness modulus

III. TESTS ON FRESH CONCRETE

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

IV. TESTS ON HARDENED CONCRETE

1. Compressive strength - Cube & Cylinder
2. Flexure test
3. Modulus of Elasticity

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
ADVANCED COMMUNICATION SKILLS							

COURSE OBJECTIVES:

1. To make the students conscious about their Non-Verbal communication
2. Train the students to use the language effectively to face interviews and participate in Group Discussions.
3. To develop effective written communication skills in academic, technical and professional contexts.
4. Develop critical thinking skills necessary to become employable.

COURSE OUTCOMES:

At the end of the course students will be able to

1. Use English language fluently, accurately and appropriately
2. Know how body language is used in communication and interpret non-verbal symbols.
3. Understand the nuances of the written language and write technical reports effectively.
4. Participate in Group discussions and successfully face interviews.

UNIT-I: NON-VERBAL COMMUNICATION

UNIT-II: RESUME PREPARATION

UNIT-III: E-MAIL WRITING & PROFESSIONAL LETTER WRITING

UNIT-IV: ESSAY WRITING & PARAGRAPH WRITING

UNIT-V: GROUP DISCUSSION

UNIT-VI: INTERVIEW SKILLS

REFERENCES:

1. Rajendra Pal, J S KorlahaHi, *Essentials of Business Communication,* Sultan Chand & Sons
2. Andrea J. Rutherford, *Basic Communication Skills for Technology,* Pearson Education Asia
3. V. Prasad, *Advanced Communication Skills,* Atma Ram Publications
4. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press
5. Sanjay Kumar, Pushp Lata, *Communication Skills,* Oxford University Press
6. Meenakshi Raman, Sangeeta Sharma, *Fundamentals of Technical Communication,* Oxford University Press

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III B.TECH - II SEMESTER

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III B.TECH - II SEMESTER COURSE STRUCTURE

S.No	Subject Name	Cat. Code	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Design And Drawing Of Steel Structures	PC	3	1	-	40	60	100	3
2	Environmental Engineering-I	PC	3	1	-	40	60	100	3
3	Geotechnical Engineering –II	PC	3	1	-	40	60	100	3
4	Transportation Engineering-II	PC	4	-	-	40	60	100	3
5	**Professional Elective-I**	PE							
	Advanced Structural Analysis		3	1	-	40	60	100	3
	Alternative Building Materials & Technologies								
	Ground Improvement Techniques								
	Ground Water Hydrology								
	Rural Water Supply & Sanitation								
	Traffic Engineering								
6	Open Elective-II (See The List Of Open Electives)	OE	4	-	-	40	60	100	3
7	Transportation Engineering Laboratory	PC	-	-	3	25	50	75	2
8	Computer Applications In Civil Engineering Laboratory	ES	-	-	3	25	50	75	2
9	Quantitative Aptitude And Reasoning-II (Mandatory Non Credit Course)	MDC	3	-	-	-	-	-	-
	TOTAL		**23**	4	**6**	**290**	**460**	**750**	**22**

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
DESIGN AND DRAWING OF STEEL STRUCTURES							

COURSE OBJECTIVES:

This course will enable students:

- Familiarize Students with different types of Connections and relevant IS codes.
- Equip student with concepts of design of flexural members.
- Understand Design Concepts of tension and compression members in trusses.
- Familiarize students with different types of Columns and column bases and their Design.
- Familiarize students with Plate girder and Gantry Girder and their Design.

COURSE OUTCOMES:

After studying this course- students will be able to:

- Work with relevant IS codes.
- Carryout analysis and design of flexural members- compression members- tension members an trusses
- Design of columns and its foundations
- Design Plate Girder and Gantry Girder

UNIT–I : PLASTIC ANALYSIS & CONNECTIONS

Introduction to plastic analysis- shape factor- load factor- mechanism- upper bound theorem- lower bound theorem.

CONNECTIONS: Riveted connections –definition- rivet strength and capacity- Welded connections: Introduction- Advantages and disadvantages of welding-Strength of welds-Fillet welds- various types of welds- Permissible stresses–IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT–II: DESIGN OF BEAMS

Allowable stresses- design requirements as per IS Code- laterally supported beams- laterally unsupported beams- check for shear- deflection.

UNIT–III: DESIGN OF TENSION MEMBERS- COMPRESSION MEMBERS AND ROOF TRUSSES

General Design of members subjected to direct tension –effective length of columns. Slenderness ratio–permissible stresses. Design of compression members- struts etc.

Different types of trusses–Economical span- Design loads–Load combinations as per IS-875-part-3 Codal recommendations- structural details–Design of simple roof trusses involving the design of purlins-I- angle section- and tubular trusses.

UNIT–IV: DESIGN OF COLUMNS

Built up compression members –Design of lacings and battens. Splicing of columns of same size and different sizes.

UNIT–V: DESIGN OF COLUMN FOUNDATIONS

Design of slab base and gusseted base subjected to axial load.

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UNIT–VI

DESIGN OF GANTRY GIRDER: Impact factors-longitudinal forces- Design of Gantry girder-various checks.

DESIGN OF PLATE GIRDER: Design consideration –IS Code recommendations Design of plate girder-Welded –Curtailment of flange plates- stiffeners– splicing and connections.

NOTE:

1. Either Riveting or Welding connections should be used in Units II – VI.
2. The students has to prepare the following charts
   (a) Lacings and Battens (b) Slab Base and Gusseted Base (c) Gantry Girder and Plate Girder

TEXT BOOKS

1. _Design of Steel Structures' by S.S.Bhavikatti- I.K. International Publishing House Pvt. Ltd.- New Delhi.
2. _Design of steel structures' by S.K. Duggal- Tata Mcgraw Hill- and New Delhi.
3. _Design of Steel Structures' by Ramachandra- Vol – 1- Universities Press.
4. _Steel Structures Design and Practice' by N.Subramanian- Oxford University Press.

REFERENCES

1. _Structural Design in Steel' by Sarwar Alam Raz- New Age International Publishers- New Delhi.
2. _Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers.
3. _Design of Steel Structures' by M. Raghupathi- Tata Mc. Graw-Hill.
4. _Structural Design and Drawing' by N. Krishna Raju; University Press.

IS Codes:

1) IS:800 – 2007
2) IS: 875(Part-3)
3) Steel Tables.

These codes and steel tables are permitted to use in the examinations.

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	3	1	0	40	60	100	3
ENVIRONMENTAL ENGINEERING-I							

COURSE LEARNING OBJECTIVES:

The course will address the following:

- Outline planning and the design of water supply systems for a community/town/city.
- Provide knowledge of water quality requirement for domestic usage
- Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
- Selection of valves and fixture in water distribution systems.
- Impart knowledge on design of water distribution network.

COURSE OUTCOMES:

Upon the successful completion of this course- the students will be able to:

- Plan and design the water and distribution networks and sewerage systems.
- Identify the water source and select proper intake structure.
- Characterisation of water.
- Select the appropriate appurtenances in the water supply.
- Selection of suitable treatment flow for raw water treatments

UNIT–I

INTRODUCTION: Importance and Necessity of Protected Water Supply systems- Water borne diseases- Flow chart of public water supply system- Role of Environmental Engineer-Agency activities.

WATER DEMAND AND QUANTITY ESTIMATION: Estimation of water demand for a town or city- Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand- Design Period- Factors affecting the Design period-Population Forecasting.

UNIT-II

SOURCES OF WATER: Lakes- Rivers- Impounding Reservoirs- comparison of sources with reference to quality- quantity and other considerations- Capacity of storage reservoirs- Mass curve analysis. Groundwater sources of water: springs- Wells and Infiltration galleries.

COLLECTION AND CONVEYANCE OF WATER: Factors governing the selection of the intake structure- Types of Intakes. Conveyance of Water: Gravity and Pressure conduits-Types of Pipes- Pipe Materials- Pipe joints- Design aspects of pipe lines- laying and testing of pipe lines.

UNIT-III

QUALITY AND ANALYSIS OF WATER: Characteristics of water–Physical- Chemical and Biological-Analysis of Water – Physical- Chemical and Biological characteristics. Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water.

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UNIT–IV

WATER TREATMENT: Flowchart of water treatment plant- Treatment methods: Theory and Design of Sedimentation- Flash mixers- flocculators Coagulation- Sedimentation with Coagulation- Filtration.

UNIT-V

DISINFECTION: Theory of disinfection-Chlorination and other Disinfection methods like UV and Ozonation- Softening of Water- Removal of colour and odours - Iron and manganese removal –Adsorption-fluoridation and deflouridation–aeration -Ion exchange–Ultra filtration. – Design- operation and maintenance of Reverse Osmosis units.

UNIT–VI

WATER DISTRIBUTION AND SUPPLY TO BUILDINGS: Requirements- Methods of Distribution system- Layouts of Distribution networks- Pressures in the distribution layouts- Analysis of Distribution networks: Hardy Cross and equivalent pipe methods-Components of Distribution system: valves such as sluice valves- air valves- scour valves and check valves- hydrants- and water meters.

TEXTBOOKS:

1. Garg- S.K.- "Environmental Engineering"- Vol.1 Khanna Publishers- New Delhi- 2005.
2. Modi- P.N. "Water Supply Engineering"- Vol. I Standard Book House- New Delhi- 2005.
3. Punmia- B.C.- Ashok K Jain and Arun K Jain- "Water Supply Engineering"- Laxmi Publications Pvt. Ltd.- New Delhi- 2005
4.K.V.S.G Murali Krishna- –Rural-Muncipal and Industrial water management‖- REEM publications- NewDelhi-2010.

REFERENCES:

1. Government of India- "Manual on Water Supply and Treatment"- CPHEEO- Ministry of Urban Development- NewDelhi-2003
2. Syed R. Qasim and Edward M. Motley Guang Zhu- "Water Works Engineering Planning"- Design and Operation- Prentice Hall of India Private Limited- New Delhi- 2006.
3.MOOC's by JNTUK.EDU.in by K.V.S.G Murali Krishna.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
GEOTECHNICAL ENGINEERING – II							

COURSE OBJECTIVES:

- To know the soil exploration- field tests involved in assessing the quality of soils-
- To calculate the earth pressures.
- To check the stability of stability of slopes and retaining walls.
- To calculate the Safe Bearing Capacity (SBC) of soils.
- To find out settlement analysis
- To find out the importance and suitability of pile and well foundations.

COURSE OUTCOMES:

At the end of course the student will be able to

- Collection of soil sample below ground surface disturbed and undisturbed the soil exploration.
- Find out earth pressure.
- Principle and design of retaining walls & slope stability of soil.
- Design of various types shallow foundation and bearing capacity of soil.
- Understand allowable settlement analysis.
- Understand various types of files and design of well foundation.

UNIT – I

SUB–SOIL INVESTIGATION AND SAMPLING

Introduction; Methods of exploration; Methods of Boring; Soil Samples; Soil samplers and sampling; Number and disposition of trial pits and borings; Depth of exploration; Plate load test; Penetrometer tests.

UNIT – II

LATERAL EARTH PRESSURE

Introduction; Effect of wall movement on Earth Pressure; Earth Pressure at rest; Rankin's theory of Earth pressure; Coulomb's theory of earth pressure; Cullman's graphical method for active earth pressure.

UNIT – III

RETAINING WALLS

Types of retaining walls; Design considerations for retaining walls- Stability of retaining walls.

STABILITY OF SLOPES

Introduction; Infinite slopes and translational slides; Definitions of factor of safety; Finite slopes forms of slip surface; Method of slices; Location of most Critical Circle; Stability of Earth Dam Slopes; Friction Circle Method; Taylor's Stability Number.

UNIT –IV

BEARING CAPACITY OF SHALLOW FOUNDATION

Concept of foundations; Types of foundations and their applicability; General requirements of foundations; Location and Depth of foundation. Terminology relating to bearing capacity; Bearing Capacity of Shallow Foundations – Terzaghi's Bearing Capacity theory; Skempton's Bearing Capacity Analysis for Clay soils; IS-Code Recommendations for Bearing Capacity; Influence of water table on bearing capacity.

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UNIT – V

PILE FOUNDATIONS

Introduction; Uses of Piles-Types of Piles- Cast- in-situ Pile construction- Selection of Pile type-Pile driving-Pile load carrying capacity in compression – Static Pile Load formula- Load tests-Dynamic Pile formulae-Correlations with Penetration test data-Group action of Piles – load carrying capacity and settlement- Negative skin friction.

UNIT – VI

SETTLEMENT ANALYSIS

Settlement of Shallow foundation – types; Methods to reduce differential settlements; Allowable Bearing Pressure; Immediate settlement –Terzaghi's Method; Allowable Bearing pressure of Granular Soils based on Standard Penetration Test Value – Terzaghi's and IS methods.

WELL FOUNDATIONS

Types of wells; Components of well foundation- Shapes of wells- Forces acting on well foundation- Construction and Sinking of wells.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics – Gopal Ranjan and A.S.R.Rao- New Age International Publishers

2. Soil Mechanics and Foundation Engg. (7th edition) by Dr. Arora- K.R.- Standard Publisher and distributors- Delhi- 2010.

3. A Text book of Soil Mechanics and Foundation Engineering – B.C.Punmia Laxmi Publications.

REFERENCES:

1. Foundation Engineering by B. J. Kasmalkar; Pune Vidyarthi Griha Prakashan- Pune Foundation Analysis & Design by Bowles- J.E.- McGraw- Hill Book Company.

2. Foundations of Expansive Soils- F.H. Chen. Elsevier Publications.

3. Geotechnical Engineering by SK Gulati & Manoj Datta- Tata McGraw- Hill Publishing Company Limited.

4. Principles of Foundation Engineering(1999)- B.M. Das.- PWS Publishing Company- 4th edition- Singapore

5. Geotechnical Engineering- - Codutu- Pearson Education.

E-LEARNING RESOURCES:

http://nptel.ac.in/courses.php

http://jntuk-coeerd.in/

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	4	-	-	40	60	100	3
TRANSPORTATION ENGINEERING-II							

COURSE LEARNING OBJECTIVES:

The objective of this course:

- To know various components and their functions in a railway track
- To acquire design principles of geometrics in a railway track.
- To know various techniques for the effective movement of trains.
- To acquire design principles of airport geometrics and pavements.
- To know the planning- construction and maintenance of Docks and Harbors.

COURSE OUTCOMES:

At the end of course- Student can

- Design geometrics in a railway track.
- Provide good transportation network
- Design airport geometric sand airfield pavements.
- Plan- construct and maintain Docks and Harbours.

UNIT–I RAILWAY ENGINEERING

COMPONENTS OF RAILWAY ENGINEERING: Permanent way components– Railway Track Gauge-Cross-section of Permanent Way-Functions of various Components like Rails-Sleepers and Ballast –Rail Fastenings– Creep of Rails- Theories related to creep–Adzing of Sleepers- Sleeper density–Rail joints.

UNIT–II

GEOMETRIC DESIGN OF RAILWAY TRACK: Alignment –Engineering Surveys-Gradients-Grade Compensation- Cant and Negative Super elevation-Cant Deficiency–Degree of Curve–safe speed on curves–Transition curve–Compound curves–Reverse curves–Extra clearance on curves–widening of gauge on curves– vertical curves– cheek rails on curves.

UNIT–III

TURNOUTS CONTROLLERS: Track layouts–Switches–Design of Tongue Rails –Crossings –Turnouts–Layout of Turnout–Double Turnout–Diamond crossing– Scissors crossing. Signal Objectives–Classification–Fixed signals –Stop signals–Signaling systems– Mechanical signaling system– Electrical signaling system– System for Controlling Train Movement– Interlocking –Modern signaling Installations.

UNIT–IV AIRPORT ENGINEERING

AIRPORT PLANNING DESIGN: Airport Master plan–Airport site selection– Aircraft characteristics –Zoning laws–Airport classification–Runway orientation– Wind rose diagram– Runway length– Taxiway design– Terminal area and Airport layout– Visual aids and Air traffic control.

UNIT–V

RUNWAY DESIGN: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design–Airfield Pavement Failures–Maintenance and Rehabilitation of Airfield pavements – Evaluation &Strengthening of Airfield pavements–Airport Drainage–Design of surface and subsurface drainage.

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UNIT–VI

DOCKS&HARBOURS

PLANNING- LAYOUT- CONSTRUCTION & MAINTENANCE OF DOCKS & HARBOURS: Classification of ports–Requirement of a good port– classification of Harbours– Docks-Dry& wet docks–Transition sheds and workhouses–Layouts; Quays–construction of Quay walls–Wharves– Jetties– Tides-Tidal data and Analysis– Breakwaters– Dredging– Maintenance of Ports and Harbours– Navigational aids.

TEXT BOOKS:

1. Chandra S. and M.M. Agarwal- Railway Engineering- Oxford University Press- New Delhi- India- 2007.

REFERENCES:

1. Saxena- S.C. and S.P. Arora- Railway Engineering- Dhanpat Rai and Sons- New Delhi- India- 1997

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ADVANCED STRUCTURAL ANALYSIS							

COURSE OBJECTIVES:

- To introduce the students to concept of- theory of structural analysis- and methods in structural analysis.

COURSE OUTCOMES:

- Students who successfully complete this course will be able to:
- Apply the Kani's method to analyse statically indeterminate structures
- Calculate the internal forces in two hinged parabolic and circular arches.
- Apply flexibility matrix method to analyse statically indeterminate structures.
- Apply stiffness matrix method to analyse statically indeterminate structures.
- Apply the basic principles of Dynamics to periodic and aperiodic motion- harmonic and non-harmonic motion

UNIT-I KANIS METHODS: Introduction- Basic Concept- Analysis of Continuous beams and Analysis of rigid jointed non-sway plane frames.

UNIT-II KANIS METHODS: Introduction- Basic Concept- Analysis of Continuous beams and Analysis of rigid jointed sway plane frames.

UNIT-III ANALYSIS OF ARCHES: Two hinged parabolic arch- Two hinged Circular Arch

UNIT-IV FLEXIBILITY MATRIX METHOD OF ANALYSIS

Introduction- Development of flexibility matrix for beam element- plane truss element and axially rigid plane framed structural elements and Analysis of beam- plane truss and axially rigid plane frames by flexibility method with static indeterminacy ≤ 2.

UNIT-V STIFFNESS MATRIX METHOD OF ANALYSIS

Introduction- Development of stiffness matrix for beam element plane truss element and axially rigid plane framed structural elements. And Analysis of beam plane truss and axially rigid plane frames by stiffness method with kinematic indeterminacy ≤ 2.

UNIT-VI BASIC PRINCIPLES OF DYNAMICS

Basic principles of Vibrations and causes- periodic and aperiodic motion- harmonic and non-harmonic motion. Period and frequency. Forced and Free Vibration- Damping and Equations of Single Degree of Freedom System with and without damping.

TEXT BOOKS:

1. R. Vaidyanathan and P. Perumal- Comprehensive Structural Analysis Volume I & II- Laxmi Publications (P) Ltd.
2. Reddy. C.S.- Basic Structural Analysis- Tata McGraw Hill.
3. BhavaiKatti- S.S- "Structural Analysis – Vol. 1 & Vol. 2"- Vikas Publishing Pvt Ltd.- New Delhi- 2008

REFERENCES:

1. Hibbeler- RC- Structural analysis- Pearson Education
2. Daniel L Schodak- Structures- Pearson Education
3. S.S. Bhavikatti- Structural Analysis II- Vikas Publication Houses (P) Ltd
4 Wang C. K.- Intermediate Structural Analysis- Tata McGraw Hill

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	3	1	-	40	60	100	3
ALTERNATIVE BUILDING MATERIALS & TECHNOLOGIES							

COURSE OBJECTIVES

- To study about the basic alternate building materials- properties and their applications.
- To know the smart building materials- external paints and their uses.
- To understand different types of masonry units and their applications

COURSE OUTCOMES

At the end of the course the student should have learnt

- To identify various building materials and select suitable type of building material for given situation.
- To be aware of various traditional building materials and also the emerging materials in the field of Civil Engineering construction.
- To select suitable type of Agro and industrial wastes- properties and its applications
- To Select Equipment for production of alternative materials as per their need of work.

UNIT-I

INTRODUCTION: Environmental friendly and cost effective building technologies- Requirements for building of different climatic regions- Traditional building methods and vernacular architecture- Green building ratings – IGBC and LEED manuals – mandatory requirements.

UNIT-II

ALTERNATIVE MASONRY UNITS: Characteristics of building blocks for walls- Stones and Laterite blocks- Bricks and hollow clay blocks- Concrete blocks- Stabilized blocks: mud blocks- steam cured blocks- Fal-G Blocks- stone masonry block .

UNIT-III

FIBRE REINFORCED CONCRETE: Properties and applications- Fibre reinforced plastics- Matrix materials- Fibers: organic and synthetic- Properties and applications building materials from

AGRO AND INDUSTRIAL WASTES: Types of agro wastes- Types of industrial and mine wastes- Properties and applications- Field quality control test methods.

UNIT-IV

FERROCEMENT AND FERROCONCRETE: Properties- Ferro cement and Ferro concrete building components- Materials and specifications- Properties- Construction methods- Applications .

UNIT-V

STRUCTURAL MASONRY UNITS: Compressive strength of masonry elements- Factors affecting compressive strength- Strength of units- prisms / wallet's and walls- Effect of brick work bond on strength- Bond strength of masonry: Flexure and shear- Elastic properties of masonry Materials and masonry.

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UNIT-VI

EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS: Machines for manufacture of concrete- Equipments for production of stabilized blocks- Moulds and methods of production of precast elements.

TEXT BOOKS:

1. -Alternative Building Materials and Technologies‖- KS Jagadish- BV Venkatarama Reddy and KS Nanjunda Rao- New Age International pub.
2. Sushil Kumar- -Building Construction‖- Standard Publishers-1992.

REFERENCES:

1. -Structural Masonry‖- Arnold W. Hendry
2. -Building materials in Developing Countries‖- RJS Spence and DJ Cook- Wiley pub. 1983
3. LEED India- Green Building Rating System- IGBC pub.
4. IGBC Green Homes Rating System- CII pub.

E-LEARNING RESOURCES:

http://nptel.ac.in/courses.php
http://jntuk-coeerd.in/

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
GROUND IMPROVEMENT TECHNIQUES							

COURSE LEARNING OBJECTIVES:

The objective of this course is:

- To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils.
- To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
- To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
- To make the student learn the concepts- purpose and effects of grouting.

COURSE OUTCOMES:

- By the end of the course- the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
- The student should be in a position to design a reinforced earth embankment and check its stability.
- The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.
- The student should be able to understand the concepts and applications of grouting.

UNIT-I INTRODUCTION: Need for engineered ground improvement- classification of ground modification techniques; suitability- feasibility and desirability of ground improvement technique; objectives of improving soil.

UNIT-II: IN-SITU DENSIFICATION METHODS IN GRANULAR SOILS: Introduction- Vibration at the ground surface- impact at the ground surface- vibration at depth- impact at depth.

IN-SITU DENSIFICATION METHODS IN COHESIVE SOILS: Introduction- preloading- sand drains- sand wicks- band drains- stone and lime columns.

UNIT-III DEWATERING SYSTEMS: open sumps and ditches- well point system- deep well system- vaccum dewatering- Electro-Osmosis method.

UNIT-IV STABILIZATION OF SOILS: Methods of soil stabilization- mechanical- cement- lime- bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT-V REINFORCED EARTH: Principles- components of reinforced earth- governing design of reinforced earth walls- stability checks- soil nailing.

GEOSYNTHETICS: Introduction- types of geotextiles- functions and their applications- tests for geotextiles- geogrids and its functions.

UNIT- VI GROUTING: Objectives of grouting- grouts and their applications- methods of grouting- stage of grouting. Case studies indicating the efficiency and importance of ground improvement Technique.

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TEXT BOOKS:

1. _Ground Improvement Techniques' by Purushotham Raj- Laxmi Publications- New Delhi.
2. Hausmann M.R (1990) Engineering Principles of ground modification- McGraw-Hill International edition.
3. _Ground Improvement Techniques' by Nihar Ranjan Patro- Vikas Publishing House (P) Limited- New Delhi.

REFERENCES:

1. Current Practices in Geotechnical Engineering Vol.-I- Alam Singh and Joshi- International Book Traders- New Delhi.
2. _An introduction to Soil Reinforcement and Geosynthetics' by G.L.Siva Kumar Babu- Universities Press.
3. _Ground Improvement' by MP Moseley- Blackie Academic and Professional- USA.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
GROUND WATER HYDROLOGY							

COURSE OBJECTIVES

- Objective of this course is to introduce the students to the fundamentals of hydrology and its hydrological cycle
- Objective of this course is to introduce the students to the fundamentals of ground water flow.
- Distribution of ground water- concept of aquifers- flow in confined and unconfined aquifers-
- Interference among wells- well hydraulics- ground water development- ground water exploration by different techniques.
- To know about the conservation and management of the ground water.

COURSE OUTCOMES

At the end of the course- students must be in a position to

- Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood flows for design of hydraulic structures
- Enable the students to understand the basic aquifer parameters and groundwater resources for different hydro-geological boundary conditions
- Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood flows for design of hydraulic structures
- The student is exposed to the application of systems concept- advanced optimization techniques to cover the socio-technical aspects in the field of water resources.

UNIT-I HYDROLOGY- PRECIPITATION: Hydrological cycle- Meteorological measurements – Requirements- types and forms of precipitation-Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods Interception- Evaporation.

UNIT-II ABSTRACTIONS OF HYDROLOGY: Precipitations- Evaporation- Infiltration and minor losses and its measurement methods. Horton's equation- pan evaporation measurements and evaporation suppression-Infiltration-Horton's equation-double ring infiltrometer- infiltration indices.

UNIT-III HYDROGEOLOGICAL PARAMETERS: Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability- specific yield- transmissivity and storage coefficient – Methods of Estimation – Ground water table fluctuation and its interpretations – Groundwater development and Potential in India – GEC norms.

UNIT-IV WELL HYDRAULICS: Objectives of Groundwater hydraulics – Darcy's Law - Groundwater equation – Flow net Theory – steady state flow - Dupuit Forchheimer assumption - Unsteady state flow – Theis method - Jacob method -Slug tests - Image well theory – Partial penetrations of wells.

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UNIT-V GROUNDWATER CONSERVATION: Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation- Contamination source inventory- remediation schemes: Physical- Chemical- Biological- Ground water Pollution and legislation.

UNIT-VI GROUNDWATER AND MANAGEMENT: Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas.

TEXTBOOKS

1. Subramanya .K. Engineering Hydrology- Tata McGraw Hill- 2013.
2. Jayarami Reddy .P. Hydrology- Tata McGraw Hill- 2008.
3. Raghunath H.M.- Ground Water Hydrology- New Age International (P) Limited- New Delhi- 2010.
4. Todd D.K.- Ground Water Hydrology- John Wiley and Sons- New York- 2000.

REFERENCES:

1. David Keith Todd. Groundwater Hydrology- John Wiley & Sons- Inc. 2007
2. Ven Te Chow- Maidment- D.R. and Mays- L.W. Applied Hydrology- McGraw Hill International Book Company- 2010.
3. Raghunath .H.M.- Hydrology- Wiley Eastern Ltd.- 2004 PTAI7002 INTEGRATED WATER RESOURCES MANAG.
4. Fitts R Charles. Ground water Science. Elsevier- Academic Press- 2002.
5. Ramakrishnan- S- Ground Water- K.J. Graph arts- Chennai- 1998.

E-LEARNING RESOURCES:

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	3	1	0	40	60	100	3
RURAL WATER SUPPLY AND SANITATION							

COURSE OBJECTIVES

- To educate the students on the principles of rural water supply and sanitation and to develop understanding of factors governing the aspects in rural water supply and sanitation.
- Identify- formulate- analyze- and develop processes and technologies to meet desired environmental protection needs of society and formulate solutions that are technically sound- economically feasible- and socially acceptable.

COURSE OUTCOMES:

- At the end of the course the student will be able to:
- Identify the problems pertaining to rural water supply and sanitation.
- Design water supply and sanitation system for rural community.
- Design low cost waste management systems for rural areas.
- Plan and design an effluent disposal mechanism.

UNIT-I Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered- difficulties. National policy.

UNIT-II WATER SUPPLY: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas. Development of proffered sources of water springs. Wells- infiltration wells- radial wells and infiltration galleries- collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

UNIT-III Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS)- diatomaceous earth filter- cloth filter- slow sand filter- chlorine diffusion cartridges. Pumps- pipe materials- appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas.

UNIT-IV Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas.

UNIT-V

Treatment and Disposal of waste water. Compact and simple waste water treatment units and systems in rural areas such as stabilization ponds- septic tanks- Imhoff tank- soak pit etc. Disposal of waste water soakage pits and trenches.

UNIT-VI

Disposal of Solid Wastes. Composting- land filling- incineration- Biogas plants- Rural health. Other specific issues and problems encountered in rural sanitation.

TEXTBOOKS.

1. _Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.
2. _Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N.- WHO
3. _Water Supply and Sewerage'- by E.W.Steel & T.J.Mcghee- McGraw Hill.

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REFERENCES:

1. Manual on Water Supply and Treatment'- CPHEEO- Mini. Of Urban Development- Govt. of India.

2. Manual on Sewerage and Sewage Treatment'- CPHEEO- Mini. Of Urban Development- Govt. of India 6. _Environmental Engineering' by D. Srinivasan- PHI Learning Pvt. Ltd. 2009

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
TRAFFIC ENGINEERING							

COURSE OBJECTIVES:

- To know various components and characteristics of traffic.
- To know various traffic control devices and principles of highway safety.
- To understand the detrimental effects of traffic on environment
- To know highway capacity and level of service concepts.

COURSE OUTCOMES:

- At the end of the course- the student will be able to:
- Estimate basic characteristics of traffic stream
- Conduct traffic studies and analyze traffic data
- Design traffic signal systems
- Determine the capacity of highways

UNIT-I COMPONENTS OF TRAFFIC SYSTEM: Introduction- Human-vehicle-environment system- Characteristics of road users- highways and vehicles- Fundamental parameters of traffic and relationship. Traffic characteristics: Microscopic and macroscopic flow characteristics- Time headways- temporal- spatial and flow patterns- Interrupted and un-interrupted traffic- Microscopic and macroscopic speed characteristics.

UNIT-II TRAFFIC STREAM MODELS: Traffic flow modelling analogies- Macroscopic flow models- Microscopic flow models- Mesoscopic models- Shockwave analysis with examples Capacity and level of service analysis.

UNIT-III HIGHWAY CAPACITY AND LEVEL OF SERVICE- Factors affecting- capacity analysis and LOS criteria- case studies on capacity and level of service estimation.

UNIT-IV TRAFFIC SIGNAL DESIGN: Introduction about the signal and warrants- Signal phasing and development of phase plans; Cycle length- fixed and vehicle actuated signals- Webster method; Drew method; IRC method- Signal coordination- Area traffic control system- problems on signal design.

UNIT-V DESIGN OF AT-GRADE INTERSECTIONS: Types of intersections- Plain intersections- rotary and Mini Roundabout: Design aspects.

UNIT-VI PARKING SYSTEM ANALYSIS: Parking Inventory Studies- Parking Statistics- On-street and Off-street parking facilities- Worked out examples.

TEXTBOOKS

1. L.R. Kadiyali- Traffic Engineering and Transportation Planning- Khanna Publishers- 2011.
2. Roger P. Roess- Elena S. Prassas and William R. McShane- Traffic Engineering- Prentice Hall- 4th edition- 2010.

REFERENCES:

1. May- A.D. Traffic Flow Fundamentals- Prentice Hall- 1st Edition- 1989.
2. Fred L. Mannering- Scott S. Washburn- Kilareski Walter P.- Principles Of Highway Engineering And Traffic Analysis- Wiley India Pvt Ltd.- 4th edition- 2011.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
TRANSPORTATION ENGINEERING LAB							

COURSE LEARNING OBJECTIVES

The objective of this course is:

- To carry out surveys for traffic volume- speed and parking.
- To test crushing value- impact resistance- specific gravity and water absorption- percentage attrition- percentage abrasion- flakiness index and elongation index for the given road aggregates.
- To know penetration value- ductility value- softening point- flash and fire point- viscosity and stripping for the given bitumen grade.
- To test the stability for the given bitumen mix.

COURSE OUTCOMES

- Conduct traffic studies for estimating traffic flow characteristics
- Perform quality control tests on pavement materials
- Estimate earth work from longitudinal and cross-section details

I. EARTHWORK CALCULATIONS FOR ROAD WORKS

II. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

III. ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

IV. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

IV. BITUMINOUS MIX:

1.Marshall Stability test

REFERENCES:

1. Mc Shane- WR and RP Roess- Traffic Engineering- Prentice Hall.
2. Pignataro LJ. Traffic Engineering: Theory and Practice; Prentice hall- Inc.
3. L.R. Kadiyali- Traffic Engineering and Transportation Planning- Khanna Publishers.
4. All laboratory tests are as per IS- ASTM- AASHTO- TRL- IRC- BS procedures / specifications and guidelines.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
COMPUTER APPLICATIONS IN CIVIL ENGINEERING LABORATORY							

COURSE OBJECTIVES:

- To carry out Analysis of beams.
- To carry out Analysis of frames.
- To carryout Analysis of Trusses.

COURSE OUTCOMES:

At the end of course the student will be able to

- Analyse the beams
- Deisgn space frame.
- Deisgn of two-storied R.C.C frame building.

UNIT – I

1. Analysis of beams.
2. Analysis of Frames.
3. Analysis of Trusses.

UNIT - II

1. Design of Space frame subjected to gravity loads and lateral load (wind load)
2. Design of Isolated footing.
3. Design of one-way slab.
2. Design of two way slab
4. Design of Retaining wall.

UNIT -III

1. Analysis and design of two-storied R.C.C.Framed building.
2. Analysis and design of Industrial steel framed building.

SOFTWARE'S TO BE USED (ANY ONE)
STAAD PRO V8i
AUTO CAD
ROBOT STRUCTURAL ANALYSIS
E TABS

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II MCA IIISEM, II MBA IIISEM, III B.TECH ISEM.	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
QUANTITATIVE APTITUDE AND REASONING - II							

COURSE OBJECTIVES:

- To train students in analysing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements.

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

- Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements
- Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.
- Will be able to demonstrate various principles involved in solving mathematical
- problems and thereby reducing the time taken for performing job functions.

UNIT I: NUMBERS, TIME AND DISTANCE, TIME AND WORK, AVERAGES, MIXTURES AND ALLEGATIONS

1. Numbers

a) Classification of numbers
b) Divisibility rules
c) Finding the units digit
d) Finding remainders in divisions involving higher powers
e) LCM and HCF Model

2.Time and Distance

a) Relation between speed, distance and time
b) Converting km/h into m/s and vice versa
c) Problems on average speed
d) Problems on relative speed
e) Problems on trains
f) Problems on boats and streams
g) Problems on circular tracks
h) Problems on races

3. Time and Work

a) Problems on Unitary method
b) Relation between Men, Days, Hours and Work
c) Problems on Man-Day-Hours method
d) Problems on alternate days
e) Problems on Pipes and Cistern

4 Averages, Mixtures and Allegations

a) Definition of Average
b) Rules of Average
c) Problems on Average
d) Problems on Weighted Average
e) Finding average using assumed mean method
f) Problems on mixtures
g) Allegation rule
h) Problems on Allegation

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UNIT II: DATA INTERPRETATION, DATA SUFFICIENCY, MENSURATION, PERMUTATION AND COMBINATIONS, PROBABILITY

1. **Data Interpretation**
   a) Problems on tabular form
   b) Problems on Line Graphs
   c) Problems on Bar Graphs
   d) Problems on Pie Chart

2. **Data Sufficiency**
   a) Different models in Data Sufficiency
   b) Problems on data redundancy

3. **Mensuration**
   a) Formulas for Areas
   b) Formulas for Volumes of different solids
   c) Problems on Areas
   d) Problems on Volumes
   e) Problems on Surface Areas

4. **Permutation and Combinations**
   a) Definition of permutation
   b) Problems on Permutations
   c) Definition of Combinations
   d) Problems on Combinations

5. **Probability**
   a) Definition of Probability
   b) Problems on coins
   c) Problems on dice
   d) Problems on Deck of cards
   e) Problems on Years

SYLLABUS FOR REASONING

UNIT III: CUBES, VENN DIAGRAMS, BINARY LOGIC

1. **Cubes**
   a) Basics of a cube
   b) Formulae for finding volume and surface area of a cube
   c) Finding the minimum number of cuts when the number of identical pieces are given
   d) Finding the maximum number of pieces when cuts are given
   e) Problems on painted cubes of same and different colors
   f) Problems on cuboids
   g) Problems on painted cuboids
   h) Problems on diagonal cuts

2. **Venn diagrams**
   a) Representing the given data in the form of a Venn diagram
   b) Problems on Venn diagrams with two sets
   c) Problems on Venn diagrams with three sets
   d) Problems on Venn diagrams with four sets

3. **Binary Logic**
   a) Definition of a truth-teller
   b) Definition of a liar
   c) Definition of an alternator
   d) Solving problems using method of assumptions
   e) Solving analytical puzzles using binary logic

UNIT IV: NUMBER AND LETTER SERIES, NUMBER AND LETTER ANALOGIES, ODD MAN OUT

1. **Number and letter series**
   a) Difference series
   b) Product series
   c) Squares series
   d) Cubes series
   e) Alternate series
   f) Combination series
   g) Miscellaneous series
   h) Place values of letter

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2. Number and Letter Analogies
   a) Definition of Analogy
   b) Problems on number analogy
   c) Problems on letter analogy
   d) Problems on verbal analogy
3. **Odd man out**
   a) Problems on number Odd man out
   b) Problems on letter Odd man out
   c) Problems on verbal Odd man out

UNIT V: CODING AND DECODING, DIRECTION SENSE, CRITICAL REASONING, LATERAL REASONING PUZZLE

1. **Coding and decoding**
a) Coding using same set of letters
b) Coding using different set of letters
c) Coding into a number
d) Problems on R-model

2. **Direction sense**
a) Solving problems by drawing the paths
b) Finding the net distance travelled
c) Finding the direction
d) Problems on clocks
e) Problems on shadows
f) Problems on damaged compass
g) Problems on direction sense using symbols and notations

3. **Critical Reasoning**
a) Problems on assumption
b) Problems on conclusions
c) Problems on inferences
d) Problems on strengthening and weakening of arguments
e) Problems on principle
f) Problems on paradox

4. **Lateral reasoning puzzle**
a) Problems on common balance
b) Problems on digital balance
c) Problems on coins
d) Problems on lockers
e) Problems on heights
f) Digit puzzles using basic arithmetic operation

TEXT BOOKS

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , _A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, _Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

REFERENCES:

7. www.careerbless.com/**aptitude**/qa/home.php
8. www.affairscloud.com/**quantitative-aptitude**-questions
9. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
10. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
11. www.indiabix.com
12. www.practice**aptitude**tests.com/numerical-**reasoning**-tests

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	4	-	-	40	60	100	3

PRINCIPLES OF WATER QUALITY MANAGEMENT

COURSE OBJECTIVES:

- To build understanding of water quality parameters- procedures for quantitative analysis- and their relation to public health and environment.

COURSE OUTCOMES:

- Understand meaning of important parameters for measuring water quality.
- Water quality criteria and standards- and their relation to public health- environment and urban water cycle.
- Plan water quality surveillance for a given aquatic environment and to understand what a test result means in terms of the health of the ecosystem.

UNIT - I INTRODUCTION :World water resources- water resources in India- water as finite resource- variability of water in time & space- history of water resources development- water infrastructure-problems and perspectives- present institutional framework for water management. **WATER LAWS:** Constitutional provisions- National Water Policy- riparian rights / ground water owner ship- prior appropriation- permit systems- acquisition and use of rights- scope for privatization.

UNIT-II ECONOMICS & PARADIGM SHIFT IN WATER MANAGEMENT

ECONOMICS OF WATER :Water as economic good- intrinsic value- principles of water pricing & water allocation- capital cost- opportunity cost- internal rate of return- benefit cost analysis- principles of planning and financing of water resources project : Discussion on any two case studies.

PARADIGM SHIFT IN WATER MANAGEMENT:

Global and national perspectives of water crisis- water scarcity- water availability and requirements for human and nature- concepts of _blue water'- _Green water'- and _virtual water'- and their roles in water management. Sustainability principles for water management- framework for planning a sustainable water future.

UNIT- III: BASIN SCALE HYDROLOGY

Estimation of surface water- estimation of ground water draft/recharge import/export of water (inter basin water transfer)- recycling and reuse and storage- control of water logging- salinity- & siltation of storages.

FLOOD & DROUGHT MANAGEMENT: causes of floods- structural and non-structural measures- mitigation plan- flood damage assessment- use of geo informatics for flood management- Types of droughts- severity index- drought forecasting- damage assessment- mitigation plan- use of geo informatics for drought management.

UNIT- IV: WATER DEMAND AND SUPPLY BASED MANAGEMENT

Consumptive & non consumptive demands- irrigation demand estimation- water utilization- irrigation efficiency- water management in irrigation sector- Demand estimation in hydro/thermal/nuclear power sector- estimation & forecasting of water demands of domestic & industrial sector- navigation and recreational water demands

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UNIT V: ENVIRONMENTAL AND SOCIAL ASPECTS

ENVIRONMENTAL MANAGEMENT: protection of vital ecosystem- water requirements for environmental management- aquaculture- minimum flows- water quality management for various uses.

SOCIAL IMPACT OF WATER RESOURCES DEVELOPMENT: direct/ indirect benefits- employment generation- industrial growth- agro-industry- enhanced living standards- education & health- co-operative movement- management of rehabilitation & resettlement.

UNIT VI: BASIN PLANNING &WATERSHED MANAGEMENT

PERSPECTIVE PLAN FOR BASIN DEVELOPMENT & MANAGEMENT- Decision support system for Integrated Water Resources Management (IWRM)- use of data driven techniques like Artificial Neural Networks- Genetic programming- Model Tree in water resources planning- development & management.

WATER QUALITY PARAMETERS: Physical- Chemical and Biological analysis of water- WHO- BIS- ICMR standards for water quality.

TEXT BOOKS:

1) Water Resources Systems Engg- D. P. Loucks- Prentice Hall
2) Water Resources Systems Planning and Management- Chaturvedi- M.C. Tata McGraw Hill
3) Economics of Water Resources Planning- James L.D and Lee R.R- McGraw Hill
4) Water resources hand book; Larry W. Mays- McGraw International Edition
5) Design of Water Resources Systems- Arthur Mass- MacMillan 1962

REFERENCE BOOKS:

1) Economics of Water Recourses Planning- L. D. James & R.R.Leo- McGraw Hills- NY 1971.
2) Water Resources Systems Engineering- W. A. Hill & J. A. Dracup.
3) Water shed Management – B.M. Tideman
4) Watershed management –J. V. S. MURTY- new Age International Publisher.

E – RESOURCES

1. nptel.iitm.ac.in/courses /webcourse-contents / IISc-Bang/water resource management.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
REMOTE SENSING AND GIS							

COURSE LEARNING OBJECTIVES:

- The course is designed to
- Introduce the basic principles of Remote Sensing and GIS techniques.
- Learn various types of sensors and platforms
- Learn concepts of visual and digital image analyses
- Understand the principles of spatial analysis
- Sustainable planning and management of civil Engineering projects.

COURSE OUTCOMES

- At the end of the course the student will be able to
- Be familiar with ground- air and satellite based sensor platforms.
- Interpret the aerial photographs and satellite imageries
- Create and input spatial data for GIS application
- Apply RS and GIS concepts in water resources engineering

UNIT – I

INTRODUCTION TO REMOTE SENSING: Basic concepts and fundamentals of remote sensing- electromagnetic radiation- electromagnetic spectrum- remote sensing terminology and units- interaction with atmosphere- energy interaction with the earth surfaces characteristics of remote sensing systems.

SENSORS AND PLATFORMS: Introduction- types of sensors- airborne remote sensing- spaceborne remote sensing- image data characteristics- digital image data formats-band interleaved by pixel- band interleaved by line- band sequential- over view of Indian Remote sensing satellites and sensors IRS- LANDSAT- SPOT.

UNIT – II

IMAGE ANALYSIS: Introduction- elements of visual interpretations- digital image processing- image preprocessing- image enhancement- image classification- supervised classification- unsupervised classification- Classification accuracy assessment.

UNIT – III

GEOGRAPHIC INFORMATION SYSTEM: Introduction- key components- Fundamental operations of GIS- A theoretical framework for GIS. Application areas of GIS- map projections

DATA ENTRY AND PREPARATION: spatial data input- raster data models- vector data models. Fundamental concepts of GPS- Types of GPS- GPS satellite- Application of GPS in resource surveys- mapping and navigation.

UNIT – IV

SPATIAL DATA ANALYSIS: Introduction- overlay function-vector overlay operations- raster overlay operations- arithmetic operators- comparison and logical operators- conditional expressions- overlay using a decision table- network analysis-optimal path finding- network allocation- network tracing.

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UNIT – V

RS AND GIS APPLICATIONS GENERAL: Land cover and land use- agriculture- forestry- geology- geomorphology- urban applications; Assessment of physical transformation in an urban area.

UNIT – VI

APPLICATION TO HYDROLOGY AND WATER RESOURCES: Flood zoning and mapping- groundwater prospects and potential recharge zones- watershed management- Reservoir sedimentation and Identification of sites for artificial Recharge structures.

TEXT BOOKS:

1. Bhatta B (2008)- _Remote sensing and GIS‘- Oxford University Press
2. Lillesand- T.M- R.W. Kiefer and J.W. Chipman (2013) _Remote Sensing and Image Interpretation‘- Wiley India Pvt. Ltd.- New Delhi
3. Schowenger- R. A (2006) _Remote Sensing‘ Elsevier publishers.
4. _Fundamentals of Remote Sensing‘ by George Joseph- Universities Press- 2013.
5. _Fundamentals of Geographic Information Systems‘ by Demers- M.N- Wiley India Pvt. Ltd- 2013.

REFERENCES:

1. _Remote Sensing and its Applications‘ by Narayan LRA- Universities Press- 2012.
2. _Concepts and Techniques of Geographical Information System‘ by Chor Pang Lo and A K W Yeung- Prentice Hall (India)- 2006
3. _Introduction to Geographic Information Systems‘ by Kand Tsung Chang- McGraw Hill Higher Education- 2009.
4. _Basics of Remote sensing & GIS‘ by Kumar S- Laxmi Publications- New Delhi- 2005.
5. _Principals of Geographical Information Systems‘ by Burrough P A and R.A. McDonnell- Oxford University Press- 199

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DISASTER MANAGEMENT							

COURSE LEARNING OBJECTIVES:

The objective of this course is:

- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
- Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phasesof each are parallel and how they differ.
- Understand the ‗relief system' and the ‗disaster victim.'
- Describe the three planning strategies useful in mitigation.
- Identify the regulatory controls used in hazard management.
- Describe public awareness and economic incentive possibilities.
- Understand the tools of post-disaster management.

COURSE OUTCOMES:

Upon the successful completion of this course, the students will be able to:

- Affirm the usefulness of integrating management principles in disaster mitigation work
- Distinguish between the different approaches needed to manage pre during and post- disaster periods
- Explain the process of risk management
- Relate to risk transfer

UNIT-I NATURAL HAZARDS AND DISASTER MANAGEMENT: Introduction of DM – Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action- Case study methods of the following: floods, draughts –Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides.

UNIT-II MAN MADE DISASTER AND THEIR MANAGEMENT ALONG WITH CASE STUDY METHODS OF THE FOLLOWING: Fire hazards – transport hazard dynamics – Civil Engineering solid waste management – post disaster – bio terrotirism -threat in megacities, rail and air craft's accidents, and Emerging infectious diseases & Aidsand their management.

UNIT-III RISK AND VULNERABILITY: Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.

UNIT-IV ROLE OF TECHNOLOGY IN DISASTER MANAGEMENTS: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities- roads and bridges- mitigation programme for earth quakes -multimedia technology in disaster risk management and trainingtransformable indigenous knowledge in disaster reduction.

UNIT-V EDUCATION AND COMMUNITY PREPAREDNESS: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

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UNIT-VI MULTI-SECTIONAL ISSUES: Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction.- Institutional capacity in disaster management.

TEXT BOOKS:

1. _Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R Krishnamurthy (2009), Universities press.
2. _Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. _Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCES:

1. _Disaster Management' edited by H K Gupta (2003),Universities press.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
BUILDING SERVICES							

COURSE OBJECTIVES:

- To introduce the concepts of basic services and its applications.
- To equip students with the required information and technologies of building services.
- Application of this knowledge in architectural design project.
- Evolving understanding in students to choose appropriate systems and integrate the same in their design projects.

LEARNING OUTCOMES:

Students will be able to

- understand the measures to be taken while planning for sanitation and installation of various sanitary units.
- identify the minimizing and disposal techniques of waste and garbage.
- evaluate the illumination strategies by consuming less energy resources.
- acquaint with distribution of electricity to all units of the project.
- provide fire protection units at service points.

UNIT - I: WATER SUPPLY:

Tapping of water- Storage and distribution of water in premises- Pipes- piping network- specials- materials- joinery- installation of network both open and concealed- all appurtenances required for installations e.g. taps- faucets- mixing units- valves- flushing cisterns- flushing valves and other fittings.

UNIT - II: DRAINAGE AND SANITATION:

Study of sanitary fittings with reference to use- materials and functions- traps and their uses- classification of traps as per use and shape- pipes and piping systems- specials- vent and anti-siphonage systems- jointing and installations- storm water and roof drainage systems and their installations- underground drainage systems with application of ventilation- self cleansing velocity- laying of drains to required gradients and testing of drains- disposal of sewage within the premises using septic tanks- effluent treatment plants- their function and layouts.

UNIT - III: ROOM ACOUSTICS:

Key terms & Concepts- Introduction- Acoustic principles- Sound power and pressure levels- Sound pressure level- absorption of sound- Reverberation time-
Transmission of sound. Sound pressure level in a plant room- out door sound pressure level- Sound pressure level in intermediate space- noise rating- Data requirement- output data.

UNIT - IV: LIGHTING AND VENTILATION:

Indoor lighting- natural and artificial- systems of lighting such as direct- indirect- diffused- applications of lighting systems with reference to levels of illumination for various uses and lumen method calculations- light fittings/ luminaries-All types of energy efficient lamps- optic fiber- led etc. Ventilation - Introduction- Ventilation requirements- Natural and Mechanical systems- Removal of heat gains Psychrometric cycles- Ventilation rate measurement- Material for ventilation duct work.

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UNIT - V: ELECTRIFICATION:

Introduction to generation and distribution of electric power in urban areas- substations for small schemes in industrial units- electrical system installations in a building from the supply mains to individual outlet points- including meter board- distribution board and layout of points with load calculations- electrical wiring systems for small and large installations including different material specification electrical control and safety devices- switches- fuse- circuit breakers- earthing- lightning conductors etc.

UNIT - VI: FIRE PROTECTION- PLANT AND SERVICE AREAS

Key terms and concepts- introduction- Fire classification- Portable existing gushers- Fixed – Fire fighting installation- fire detectors and alarus- smoke ventilation. Key terms and conditions- Introduction- Mains and services- Plant room space requirements- service ducts- pipe- duct and cable supports- plant connections- Co-ordinated service drawings boiler room ventilation.

TEXT BOOKS:

1. S.C.Rangwala- Water supply and sanitary engineering- Charotar publishing house.
2. A. Kamala & DL Kanth Rao- Environmental Engineering- Tata McGraw – Hill publishing company Limited.

REFERENCE BOOKS:

1. Technical teachers Training Institute (Madras)- Environmental Engineering- Tata McGraw Hill publishing Company Limited.
2. M.David Egan- Concepts in Building Fire Safety.28
3. V.K.Jain- Fire Safety in Building.
4. E.G.Butcher- Smoke control in Fire-safety Design.
5. National Building Code 2016.

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IV Year – I SEMESTER

T	P	C
3+1*	0	3

CE701-ENVIRONMENTAL ENGINEERING – II

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city.
2. Provide knowledge of characterisation of wastewater generated in a community.
3. Impart understanding of treatment of sewage and the need for its treatment.
4. Summarize the appurtenance in sewerage systems and their necessity.
5. Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems.
6. Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers.

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

a. Plan and design the sewerage systems
b. Characterisation of Sewage
c. Select the appropriate appurtenances in the sewerage systems
d. Selection of suitable treatment flow for sewage treatment
e. Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river

SYLLABUS:

UNIT – I:

Introduction to sanitation – systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage –

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classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers.

UNIT – II:

Pumping of wastewater: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.

House Plumbing: systems of plumbing-sanitary fittings and other accessories–one pipe and two pipe systems – Design of building drainage.

UNIT – III:

Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations.

Treatment of sewage : Primary treatment-Screens-grit chambers-grease traps–floatation– sedimentation – design of preliminary and primary treatment units.

UNIT – IV:

Secondary treatment: Aerobic and anaerobic treatment process-comparison.

Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons.

Attached Growth Process: Trickling Filters–mechanism of impurities removal- classification–design-operation and maintenance problems. RBCs, Fluidized bed reactors.

UNIT V:

Miscellaneous Treatment Methods: Nitrification and Denitrification – Removal of Phosphates –UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–disposal of septic tank effluent.

UNIT – VI:

Bio-solids (Sludge) management: Characteristics- handling and treatment of sludge-thickening – anaerobic digestion of sludge.

Disposal of sewage: methods of disposal – disposal into water bodies-Oxygen Sag Curve-disposal on land- sewage sickness.

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Text Books

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3r^{d} Edition.

References

1. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by Garg, S.K.; Khanna Publishers.
2. Sewage treatment and disposal by Dr. P.N. Modi& Sethi.
3. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
4. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

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IV Year – I SEMESTER

T	P	C
3+1*	0	3

CE702-PRESTRESSED CONCRETE

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Familiarize Students with concepts of prestressing.
2. Equip student with different systems and devices used in prestressing.
3. Understand the different losses of prestress including short and long term losses.
4. Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion.

Course Outcomes:

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

a. Understand the different methods of prestressing.
b. Estimate the effective prestress including the short and long term losses.
c. Analyze and design prestressed concrete beams under flexure and shear.
d. Understand the relevant IS Codal provisions for prestressed concrete

SYLLABUS:

UNIT-I

Basic concepts of Prestressing- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Stress Corrosion- Durability, Fire Resistance, Cover Requirements.

UNIT-II

Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems, Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section-

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pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

UNIT-III

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design.

UNIT-IV

Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing- Prediction of short term and long term deflections.

UNIT-V

Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

UNIT-IV

Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

TEXT BOOKS

1. 'Prestressed Concrete' by N. Krishna Raju, Tata McGraw hill
2. 'Prestressed Concrete' by S. Ramamrutham

REFERENCES:

1. 'Prestressed Concrete' by P. Dayaratnam
2. 'Prestressed Concrete' by T. Y. Lin & Burns, Wiley Publications

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IV Year – I SEMESTER

T	P	C
3+1*	0	3

CE703-CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To introduce to the student the concept of project management including network drawing and monitoring.
2. Tto introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery.
3. To introduce the importance of safety in construction projects.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

1. Appreciate the importance of construction planning.
2. Understand the functioning of various earth moving equipment.
3. Know the methods of production of aggregate products and concreting.
4. Apply the gained knowledge to project management and construction techniques.

SYLLABUS:

UNIT- I

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method.

UNIT -II

Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

UNIT- III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks.

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and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers.

UNIT -IV

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets.

UNIT -V

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing.

UNIT -VI

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

TEXT BOOKS:

1. 'Construction Planning , Equipment and Methods' by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill.
2. 'Construction Project Management Theory and Practice'by Kumar Neeraj Jha (2011), Pearson.
3. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati, Oxford University press.

REFERENCES:

1. 'Construction Project Management - An Integrated Approach' by Peter Fewings , Taylor and Francis
2. 'Construciton Management Emerging Trends and Technologies' by Trefor Williams , Cengage learning .

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IV Year – I SEMESTER

T	P	C
3+1*	0	3

CE704-WATER RESOURCES ENGINEERING–II

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to

1. introduce the types of irrigation systems
2. introduce the concepts of planning and design of irrigation systems
3. discuss the relationships between soil, water and plant and their significance in planning an irrigation system.
4. understand design methods of erodible and non-erodible canals
5. know the principles of design of hydraulic structures on permeable foundations.
6. know the concepts for analysis and design principles of storage and diversion head works.
7. learn design principles of canal structures

Course Outcomes

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

a. estimate irrigation water requirements
b. design irrigation canals and canal network
c. plan an irrigation system
d. design irrigation canal structures
e. plan and design diversion head works
f. analyse stability of gravity and earth dams
g. design ogee spillways and energy dissipation works

SYLLABUS:

UNIT-I

Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of

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irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT-II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT III

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

Outlets: types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

UNIT-IV

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-V

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

UNIT-VI

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

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TEXT BOOKS:

1. 'Irrigation and Water Power Engineering'by Punmia B C,P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi.
2. 'Irrigation and Water Resources Engineering'by Asawa G L (2013), New Age International Publishers.
3. 'Irrigation Engineering'by Raghunath H.M (2012), Wiley India.
4. 'Irrigation Water Resources and Water Power Engineering'by Modi P N (2011), Standard Book House, New Delhi.

REFERENCES:

1. 'Water Resources Engineering' by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2. 'Irrigation Engineering' by Sharma R.K. and Sharma, T.K (2012), S.Chand & Co Publishers.
3. 'Water Resources Engineering'by Satyanarayana Murthy Challa (2008), New Age International Publishers.

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IV Year – I SEMESTER

T	P	C
0	3	2

CE707-ENVIRONMENTAL ENGINEERING LAB

Lecture :	--	Internal Assessment :	Marks
Tutorial :	--	Semester End Examination :	Marks
Practical :	3 hrs/week	Credits :	2

Course Learning Objectives:

The course will address the following:

1. Estimation some important characteristics of water and wastewater in the laboratory.
2. It also gives the significance of the characteristics of the water and wastewater.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

a. Estimation some important characteristics of water and wastewater in the laboratory.
b. Draw some conclusion and decide whether the water is potable or not.
c. Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments.
d. Estimation of the strength of the sewage in terms of BOD and COD.

SYLLABUS:

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil.
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.

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8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.

NOTE: At least 10 of the above experiments are to be conducted.

List of Equipments

1) pH meter
2) Turbidity meter
3) Conductivity meter
4) Hot air oven
5) Muffle furnace
6) Dissolved Oxygen meter
7) U–V visible spectrophotometer
8) COD Reflux Apparatus
9) Jar Test Apparatus
10) BOD incubator
11) Autoclave
12) Laminar flow chamber
13) Hazen's Apparatus

Text Books

1. Standard Methods for Analysis of Water and Waste Water – APHA.
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi.

Reference

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

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IV Year – I SEMESTER

T	P	C
0	3	2

CE806-GIS & CAD LAB

Lecture :	--	Internal Assessment :	30 Marks
Tutorial :	--	Semester End Examination :	70 Marks
Practical :	3 hrs/Week	Credits :	2

Course Learning Objectives:

The course is designed to

1. introduce image processing and GIS software
2. familiarize structural analysis software
3. understand the process of digitization, creation of thematic map from toposheets and maps.
4. learn to apply GIS software to simple problems in water resources and transportation engineering.
5. learn to analyse 2 D and 3D frame steel tubular truss using structural analysis software.
6. learn to analyse and design retaining wall and simple towers.

Course outcomes

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

a. work comfortably on GIS software
b. digitize and create thematic map and extract important features
c. develop digital elevation model
d. use structural analysis software to analyse and design 2D and 3D frames.
e. design and analyse retaining wall and simple towers using CADD software.

GIS:

SOFTWARES:

1. Arc GIS 9.0
2. ERDAS 8.7
3. Mapinfo 6.5

Any one or Equivalent.

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EXCERCISES IN GIS:

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

COMPUTER AIDED DESIGN AND DRAWING:

SOFTWARE:

1. STAAD PRO / Equivalent/
2. STRAAP
3. STUDDS

EXCERCISIES:

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple Tower Analysis and Design

TEXT BOOK:

1. 'Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

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IV Year – II SEMESTER

T	P	C
3+1*	0	3

CE801-ESTIMATING, SPECIFICATIONS & CONTRACTS

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

Course Outcomes:

Upon the successful completion of this course:

a. The student should be able to determine the quantities of different components of buildings.
b. The student should be in a position to find the cost of various building components.
c. The student should be capable of finalizing the value of structures.

SYLLABUS:

UNIT – I

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

UNIT – II

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

UNIT-III

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

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UNIT – IV

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

UNIT-V

Detailed Estimation of Buildings using individual wall method.

UNIT -VI

Detailed Estimation of Buildings using centre line method.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

TEXT BOOKS:

1. 'Estimating and Costing' by B.N. Dutta, UBS publishers, 2000.
2. 'Civil Engineering Contracts and Estimates' by B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. 'Construction Planning and Technology' by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. 'Estimating and Costing' by G.S. Birdie.

REFERENCES:

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 & Civil Engg Works – B.I.S.)
3. 'Estimation, Costing and Specifications' by M. Chakraborthi; Laxmi publications.
4. National Building Code

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IV Year – II SEMESTER

T	P	C
0	0	9

Project Work

CE805-PROJECT WORK

Contact Hours :	9 hrs/Week	Internal Assessment :	60 Marks
Tutorial :	---	Semester End Examination :	140 Marks
Practical :	---	Credits :	9

The main objective of the Project work is

a. To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.
b. To enable the student capable for prblem solving / problem shooting.
c. To instill and inculcate team spirit/ team work in to the minds of the students.
d. To enable/ train the students report making/ documnetation.
e. To provide students an opportunity to use any civil engineering software for their project work.

Out comes of the Project work.

Up on completion of the Project work, the student will be able to

1. Apply all levels of Engineering knowledge in solving the Engineering problems.
2. Work together with team spirit.
3. Use Civil Engineering software at least one.
4. Document the projects

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III Year – II SEMESTER

T	P	C
3+1*	0	3

(Open Elective)

CE606 (a) - ENVIRONMENTAL POLLUTION AND CONTROL

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid waste management.
2. Provide basic knowledge on sustainable development.
3. Introduces some basics of sanitation methods essential for protection of community health.
4. Differentiate the solid and hazardous waste based on characterization.

Course Learning Outcomes:

By the end of successful completion of this course, the students will be able to:

a. Identify the air pollutant control devices
b. Have knowledge on the NAAQ standards and air emission standards
c. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
d. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
e. Appreciate the methods of environmental sanitation and the management of community facilities without spread of epidemics.
f. Appreciate the importance of sustainable development while planning a project or executing an activity.

SYLLABUS:

UNIT – I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.

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Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT –II

Industrial wastewater Management: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

UNIT – III

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing - Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling.

UNIT – IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT – V

Hazardous Waste: Characterization - Nuclear waste – Biomedical wastes – Electronic wastes - Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

UNIT- VI

Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.
2. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell: McGraw Hill Publishing.

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REFERENCES:

1. Air Pollution and Control by M.N. Rao & H.N. Rao
2. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI New Delhi.
3. Environmental Engineering by Gerard Kiley, Tata McGraw Hill.
4. Environmental Sanitation by KVSG Murali Krishna, Reem Publications, New Delhi.
5. Industrial Water Pollution Control by Nemerow Jr., McGraw Hill Publishing.
6. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
7. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
8. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.

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CE606 (b) - DISASTER MANAGEMENT

(Open Elective)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
2. Develop an 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.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

a. Affirm the usefulness of integrating management principles in disaster mitigation work
b. Distinguish between the different approaches needed to manage pre-during and post- disaster periods
c. Explain the process of risk management
d. Relate to risk transfer

SYLLABUS:

UNIT-I

Natural Hazards And Disaster Management: Introduction of DM – Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: floods, draughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides.

UNIT-III

Man Made Disastar And Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics –

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solid waste management – post disaster – bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-III

Risk And Vulnerability: Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.

UNIT-IV

Role Of Technology In Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes –flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training-transformable indigenous knowledge in disaster reduction.

UNIT-V

Education And Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

UNIT-VI

Multi-sectional Issues: Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction.-Institutional capacity in disaster management -The Red cross and red crescent movement.-Corporate sector and disaster risk reduction-A community focused approach.

TEXT BOOKS:

1. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy(2009),Universities press.
2. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. 'Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. 'Disaster Management' edited by H K Gupta (2003),Universities press.

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CE606 (c) -INDUSTRIAL WATER & WASTE WATER MANAGEMENT

(Open Elective)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. To impart knowledge on selection of treatment methods for industrial wasteswater.
3. To know the common methods of treatment in different industries.
4. To acquire knowledge on operational problems of common effluent treatment plant.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

a. Suggest treatment methods for any industrial wastewater.
b. Learn the manufacturing process of various industries.
c. Student will be in a position to decide the need of common effluent treatment plant for the industrial area in their vicinity.

SYLLABUS:

UNIT – I

Industrial water Quantity and Quality requirements: Boiler and cooling waters–Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills.

UNIT – II

Miscellaneous Treatment: Use of Municipal wastewater in Industries – Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour.

UNIT – III

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis -

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Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction – Neutralization – Equalization and proportioning- recycling, reuse and resources recovery.

UNIT – IV

Industrial wastewater disposal management: discharges into Streams, Lakes and oceans and associated problems, Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastes- Effluent Disposal Method.

UNIT – V

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants.

UNIT – VI

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Pharmaceutical Plants.

Text book

1. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.
2. Industrial Wastewater Treatment by KVSG Murali Krishna.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning, Delhi.
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3r^{d} Edition.

References

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc-GrawHill, Third Edition
2. Wastewater Engineering by Metcalf and Eddy Inc., Tata McGrawhill Co., New Delhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall of India.
4. Unit Operations and Processes in Environmental Engineering by Reynolds Richard, Cengage Learning.

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NARASARAOPET - 522 601.
Guntur (Dist.), A.P.

CE606 (d) - ARCHITECTURE AND TOWN PLANNING

(Open Elective)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.
4. To enable the student to understand town planning from ancient times to modern times.
5. To impart the concepts of town planning standards, land scaping and expansion of towns.

Course Outcomes:

Upon the successful completion of this course:

a. The student should be able to distinguish architectural styles of eastern and western world.

b. The student should understand the importance of Orders of architecture.

c. Should be able to compose spaces of buildings using design concepts, planning principles.

d. Should understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

SYLLABUS:

UNIT – I

History of Architecture: Western Architecture:Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole,

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Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT – II

Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT - III

Principles of Planning: Principles of planninga residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

Post-classic Architecture: Introduction of post-classic architecture-contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

UNIT – IV

Histroical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT – V

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning-Neighborhood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT – VI

Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns-floating towns- sky scrapers-pyramidal cities.

TEXTBOOKS:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S. Sane.

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3. 'Professional Practice' by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, New Delhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning'by G.K. Haraskar.

REFERENCES:

1. 'Drafting and Design for Architecture' by Hepler, Cengage Learning
2. 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning'by A.J.Brown and H.M.Sherrard.
5. 'Town Design'by Federik Glbbard, Architectural press, London.

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CE606 (e) - FINITE ELEMENT METHOD

(Open Elective)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Equip the students with the fundamentals of Finite Element Analysis
2. Enable the students to formulate the design problems into FEA.
3. Enable the students to solve Boundary value problems using FEM.

Course Outcomes:

Upon completion of the course, the student will be able to

a. Solve simple boundary value problems using Numerical technique of Finite element method.
b. Develop finite element formulation of one and two dimensional problems and solve them.
c. Assemble Stiffness matrices, Apply boundary conditions and solve for the displacements.
d. Compute Stresses and Strains and interpret the result.

SYLLABUS:

UNIT-I

Introduction: Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation.

UNIT-II

Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane stain and axi symmetric bodies of revolution with axi symmetric loading.

UNIT-III

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix – Selection of approximate displacement functions- solution of a plane truss- transformation matrix- Galerkin's method for 1-D truss – Computation of stress in a truss element.

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UNIT-IV

Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

UNIT-V

Finite element formulation for plane stress and plane strain problems-Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces

UNIT-VI

Iso-parametric Formulation: An isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

TEXT BOOKS

1. 'A first course in the Finite Element Method'by Daryl L. Logan, Thomson Publications.
2. 'Introduction to Finite Elements in Engineering' by Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.
3. 'Introduction to Finite Element Method' by Desai & Abel CBS Publications.

REFERENCES:

1. 'Concepts and applications of Finite Element Analysis'by Robert D. Cook, Michael E Plesha, John Wiley & sons Publications.
2. 'Text book of Finite Element Analysis'by P. Seshu, Prentice Hall of India.

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CE606 (f) - GREEN TECHNOLOGIES

(Open Elective)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To present different concepts of green technologies.
2. To acquire principles of Energy efficient technologies.
3. To impart knowledge on the methods of reducing CO_2 levels in atmosphere.
4. To gain knowledge of the importance of life cycle assessment
5. To learn the importance of green fuels and its impact on environment.

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

a. Enlist different concepts of green technologies in a project
b. Understand the principles of Energy efficient technologies
c. Estimate the carbon credits of various activities
d. Identify the importance of life cycle assessment
e. Recognize the benefits of green fuels with respect to sustainable development.

SYLLABUS:

UNIT- I

Introduction : Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology.

UNIT- II

Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion – Barriers – Role of Industry, Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.

UNIT- III

Cleaner Production Project Development and Implementation: Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance,

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CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.

UNIT- IV

Pollution Prevention and Cleaner Production Awareness Plan – Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment - Elements of LCA – Life Cycle Costing – Eco Labelling.

UNIT -V

Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non-conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.

UNIT- VI

Green Fuels – Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economical and social impacts- public policies and market-driven initiatives.
Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.

TEXT BOOKS:

REFERENCES:

1. 'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw Hill International.
2. 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, Washington D.C.
3. 'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and Mandar Parasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
4. 'Handbook of Organic Waste Conversion' by Bewik M.W.M.
5. 'Energy, The Solar Hydrogen Alternative' by Bokris J.O.
6. 'Non-conventional Energy Sources' by Rai G.D.
7. 'Solar Energy' by Sukhatme S.P.
8. 'Waste Energy Utilization Technology' by Kiang Y. H.

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IV Year – I SEMESTER

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Elective-I

CE705 (a) - GROUND IMPROVEMENT TECHNIQUES

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose and effects of grouting.

Course Outcomes:

a. By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
b. The student should be in a position to design a reinforced earth embankment and check its stability.
c. The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.
d. The student should be able to understand the concepts and applications of grouting.

SYLLABUS:

UNIT- I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

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UNIT -II

Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT- IV

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT- V

Geosynthetics – geotextiles – types – functions , properties and applications – geogrids , geomembranes and gabions - properties and applications.

UNIT-VI

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

TEXT BOOKS:

1. 'Ground Improvement Techniques'by Purushotham Raj, Laxmi Publications, New Delhi.
2. 'Ground Improvement Techniques' by Nihar Ranjan Patro, Vikas Publishing House (P) Limited, New Delhi.
3. 'An introduction to Soil Reinforcement and Geosynthetics' by G.L.Siva Kumar Babu, Universities Press.

REFERENCE BOOKS:

1. 'Ground Improvement' by MP Moseley, Blackie Academic and Professional, USA.
2. 'Designing with Geosynethetics' by RM Koerner, Prentice Hall.

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CE705 (b) - AIR POLLUTION AND CONTROL

(Elective-I)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course will address the following:

1. To know the analysis of air pollutants
2. To know the Threshold Limit Values (TLV) of various air pollutants
3. To acquire the design principles of particulate and gaseous control
4. To learn plume behaviour in different environmental conditions
5. To learn carbon credits for various day to day activities

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:

a. Decide the ambient air quality based the analysis of air pollutants.
b. The design principles of particulate and gaseous control measures for an industry.
c. Judge the plume behaviour in a prevailing environmental condition
d. Estimate carbon credits for various day to day activities.

SYLLABUS:

UNIT – I

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into $\mu g/m^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution - Climate Change and its impact - Carbon Trade.

UNIT-II

Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases like SOx, NOx, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT – III

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of

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Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams, Plume Rise Models.

UNIT-IV

Ambient Air Quality Management: Monitoring of SPM, SO2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion.

UNIT-V

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters– scrubbers, Electrostatic precipitators.

UNIT – VI

Air Pollution Control Methods: Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

TEXT BOOKS:

1. Air Pollution by M.N. Rao and H.V.N. Rao – Tata McGraw Hill Company.
2. Air Pollution and Control by KVSG Murali Krishna, Laxmi Publications, New Delhi.

REFERENCE:

1. An Introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air pollution by Wark and Warner - Harper & Row, New York.

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CE705 (c) - MATRIX METHODS OF STRUCTURAL ANALYSIS

(Elective-I)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Learn the fundamental concepts of matrix structural mechanics, such as the stiffness method.
2. The concepts of structural analysis learnt in mechanics of solids and structures course.
3. Understanding the analysis of statically determinate and indeterminate structures such as trusses, beams, frames and plane stress problems.
4. Learn the concepts of the stiffness method and apply it to a variety of structural problems involving trusses, beams, frames, and plane stress.

Course Outcomes:

Upon completion of the course, the student will be able to

a. Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent deformations, force and equilibrium methods.
b. Perform structural analysis using the stiffness method.
c. Solve multiple degree of freedom two dimensional problems involving trusses, beams, frames and plane stress.

SYLLABUS:

UNIT-I

Introduction of Matrix methods of analysis – Properties of Matrices, singular matrix, Rank of a Matrix and Rank deficiency- Static indeterminacy and Kinematic indeterminacy – Degree of freedom – Structure idealization-stiffness and flexibility methods – Suitability.

UNIT-II

Generation Element stiffness matrix for truss element, beam element and torsional element- Element force - displacement equations.

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UNIT-III

Stiffness method for beam Elements – Element and global stiffness equation – coordinate transformation and global assembly – structure stiffness matrix equation – analysis of continuous beams.

UNIT-IV

Stiffness method for plane trusses and Grid elements – development of stiffness matrix – coordinate transformation. Examples of pin jointed trusses and simple grid problems.

UNIT-V

Additional topics in stiffness methods – Discussion of band width – semi band width – static condensation – sub structuring –Loads between joints-Support displacements.

UNIT-VI

Space trusses and frames - Member stiffness for space truss and space frame– Transformation matrix from Local to Global – Analysis of simple trusses, beams and frames.

TEXT BOOK :

1. 'Matrix Methods of Structural Analysis' by Pundit and Gupta
2. 'Matrix Methods of Structural Analysis'by Weaver and Gere, CBS Publishers.

REFERENCES:

1. 'Matrix analysis of structures' by Robert E Sennet- Prentice Hall-Englewood cliffs-New Jercy.
2. 'Advanced structural analysis' by Dr. P. Dayaratnam- Tata Mc Graw hill publishing company limited.

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CE705 (d) - URBAN HYDROLOGY

(Elective-I)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to:

1. appreciate the impact of urbanization on catchment hydrology
2. understand the importance of short duration rainfall runoff data for urban hydrology studies.
3. learn the techniques for peak flow estimation for storm water drainage system design.
4. understand the concepts in design of various components of urban drainage systems.
5. learn some of the best management practices in urban drainage.
6. understand the concepts of preparation master urban drainage system.

Course Outcomes

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

a. develop intensity duration frequency curves for urban drainage systems.
b. develop design storms to size the various components of drainage systems.
c. apply best management practices to manage urban flooding.
d. prepare master drainage plan for an urbanized area.

SYLLABUS:

UNIT I

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology.

UNIT II

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF)curves, design storms for urban drainage systems.

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UNIT III

Approaches to urban drainage: Time of concentration, peak flow estimation approaches , rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse , major and minor systems.

UNIT IV

Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control.

UNIT V

Analysis and Management: Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for stormwater management.

UNIT IV

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes , planning objectives, comprehensive planning , use of models in planning.

TEXT BOOKS:

1. 'Manual on Drainage in Urbanised area'by Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 - 2 volumes), UNESCO,
2. 'Urban Hydrology' by Hall M J (1984), Elsevier Applied Science Publisher.
3. 'Hydrology – Quantity and Quality Analysis' by Wanielista M P and Eaglin (1997), Wiley and Sons.
4. 'Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling' by Akan A.O and R.L. Houghtalen (2006), Wiley International.

REFERENCES

1. 'Stormwater Detention for Drainage' by Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. 'Urban water cycle processes and interactions' by Marsalek et al (2006), Publication No. 78, UNESCO, Paris (http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf)
3. 'Frontiers in Urban Water Management – Deadlock or Hope' by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing.

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CE705 (e) - ADVANCED SURVEYING

(Elective-I)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is to enable the students to,

1. Understand the basics of Geodetic Surveying and triangulation systems.
2. Understand the hygrographic surveying and prediction of tides.
3. Understand the Photogrammetric Surveying and Astronomical Surveying.
4. Understand the importance and applications of total stations and GPS.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

a. The student should be able to conduct different types of surveys for obtaining better results.
b. The student should be able to utilize the total stations for getting the required information.
c. The student should be capable of using the GPS instrument to obtain appropriate information of the objectsand their positions.

SYLLABUS:

UNIT – I

Geodetic Surveying: Definition, importance, triangulation system, order of triangulation, size and shape of triangulation, strength of figure criterion, triangulation fieldwork, base line measurement- tape corrections, problems in baseline measurement, measurement of angles.

UNIT –I I

Hydrographic Surveying: Tides-lunar tides, solar tides, spring and neap tides, measurement of tides- shore lines, soundings, sounding equipments, locating soundings by cross rope method and range and time intervals-mean sea level-prediction of tides.

UNIT – III

Photogrammetric Surveying: Basic principles,-photo theodolite, horizontal and vertical angles from terrestrial photographs, elevation of a point by

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photographic measurement, determination of focal length of the lens, Aerial camera- scale of vertical photograph, scale of tilted photograph, combined effects of tilt and relief, stereoscopic vision, mosaics.

UNIT – IV

Astronomical Surveying: Spherical Trigonometry, latitude and longitude, solar system, astronomical teams, coordinate systems-altitude, azimuth system, declination, hour angle system, time and astronomical work-sidereal time, apparent solar time, mean solar time, standard time, standard time, application of astronomy in surveying, corrections to astronomical observations.

UNIT – V

Total stations: Importance, measurement of horizontal angles, vertical angles, horizontal distance, slope distance, height of object-remote elevation measurement (REM), remote distance measurement (RDM)-radial and continuous distances for measuring the lengths and sides of the closed circuits, areas and perimeters calculations.

UNIT – VI

Global Positioning System: Principles of GPS, components of GPS, types of GPS and accuracy, applications of GPS, sources of error GPS and limitations.

TEXT 'BOOKS:

1. 'Surveying and Levelling' by R. Subramanian, Oxford University Press, New Delhi.
2. A text book of Surveying' by C. Venkatramaiah, University Press, New Delhi.
3. 'Surveying Vol. II and Vol. III (Higher Surveying)' by Dr. B. C. Punmia, Ashok K. Jain and Arun K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.
4. 'Advanced Surveying' by Satheesh Gopi, R. Sathikumar and N. Madhu, Pearson, New Delhi.

REFERENCES:

1. 'Remote Sensing and its Applications' by L A R Narayan, Universities Press, New Delhi.
2. 'Geographical Information Science' by Narayan Panigrahi, Universities Press, New Delhi.
3. 'Basics of Remote Sensing and GIS' by Dr. S. Kumar, University Science Press, New Delhi.

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CE705 (f) - INTERIOR DESIGNS AND DECORATIONS

(Elective-I)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is to enable the students to

1. Understand the elements and principles of interior designs and decorations.
2. Learn the importance of art elements in the composition of building spaces.
3. Learn the new design concepts for developing interiors of buildings.
4. Learn the application of colors, lightings, furniture in creating beautiful interiors.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

a. understand the importance of interior designs and decorations.
b. Should realize the use of art elements in the composition of building spaces.
c. Should learn the new design concepts for developing interiors of buildings.
d. Learn be able to apply colors, lightings, furniture in creating beautiful interiors.

SYLLABUS:

UNIT-I

Development of interior design concepts- importance for interiors in modern buildings, changing trends and salient features, objectives of aesthetic planning - beauty, expressiveness, functionalism, economy- good taste - meaning and importance- developing skill in aesthetics.

UNIT-II

Designs- concepts, meaning, purpose, types - structural and decorative characteristics, forms to function relationship, elements of designs - line and direction, form and shape, size, colour, light, pattern, texture and space - application of elements to form designs.

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UNIT-III

Application of colour harmonies in the interiors and exteriors –effects of light on colour, Illusion of colour, psychology of colour, effect of colour on each other-uses and application of colours- walls, wall finishes, ceilings, roofs, decorative exteriors.

UNIT-IV

Importance of lighting – artificial lighting - light sources, types and uses of light, specific factors in lighting- measurements of lighting, psychological aspects of light, glare, types of glare and prevention– selection of lamps, lighting fixtures, lighting for various areas and activities.

UNIT-V

Principles of design – balance, rhythm, emphasis, harmony, proportion - meaning and application of design concepts in the interior and exterior houses and other commercial buildings- development of design from motifs, elements of art-selection of different art forms, display of art pieces.

UNIT –VI

Interior furnishings- floors, floor coverings, soft furnishings, furniture-selection and arrangement, placement of accessories, home accessories-interior decorations- flower arrangement, floor decorations, interior decoration trends in India.

TEXT BOOKS:

1. 'Interior Design and Decoration' by Premavathy Seetharaman and Praveen Pannu, CBS Publishers and distributors, New Delhi, 2005.
2. 'Building Construction' by Rangawala, S.C, Charter publishing house, Anand, 1963.
3. 'Interior Design Principles and practice' by Pratap R.M., Standard publishers distribution, Delhi, 1988.

REFERENCES:

1. 'How to see, how to paint it' by Judy M., Harpen Colling publishers,London, 1994.
2. 'Lighting for a beautiful Home' by Jan Orcharchd, Dunestyle publishing Ltd., U.S.A., 1993.
3. 'The Complete Home Decorator' by Stewart and Sally .W., Annes publishers Ltd., New York, 1997.

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IV Year – II SEMESTER

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3+1*	0	3

(Elective-II)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

CE706 (a) - ENGINEERING WITH GEO-SYNTHETICS

Course Learning Objectives:

The Objectives of the course are to impart to the student

1. An overview of the evolution of new construction materials in geotechnical engineering and to initiate geosynthetic materials.
2. Understanding the properties and the testing methods of different types of materials of gosynthetics.
3. The knowhow of manufacturing methods, uses and applications of geotextiles, geogrids, geomembranes and geocomposites.
4. The concepts of designing geosynthetics for the functions of separation, reinforcement, stabilization, filtration, drainage and moisture barriers.
5. Designing criteria of reinforced earth retaining walls, gabions, pond liners, covers for reservoirs, canal liners, landfill liners, caps and closures, dams and embankments.
6. Additional advantages of geocomposites, geowebs and geocells, and moisture barriers and natural geotextiles etc. for applications to meet various functions.

Course Outcomes:

At the successful completion of this course the student will be able to

4. Realize the need and demand for the use of geosynthetic materials in the field of geotechnical construction works.
5. Conduct required laboratory and field tests to obtain the properties of different materials of geosynthetics.
6. Distinguish and describe various manufacturing methods of geotextiles, geogrids, geomembranes and geocomposites.

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7. Understand concepts and could design the geosynthtics for the functions of separation, reinforcement, stabilization, filtration, drainage and moisture barriers.
8. Design reinforced earth retaining walls, gabions, pond liners, covers for reservoirs, canal liners, landfill liners, caps and closures.
9. Distinguish survivability requirements of geocomposites and could design geowebs, geocells, and moisture barriers and natural geotextiles etc.

SYLLABUS:

UNIT-I

Geosynthetics : Introduction to Geosynthetics – Basic description – Polymeric materials– Uses and Applications. Properties of Geotextiles – Geogrids – Geomembranes – Geocomposites.

UNIT-II

Geotextiles: Design criteria for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers.
Geogrids: Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods.

UNIT-III

Use of Geosynthetics in Roads: Geosynthetics in road ways- applications-role of subgrade conditions-desidn criteria-survivability-application in paved roads.

UNIT-IV

Reinforced Earth Retaining Walls: Components - External stability – Internal stability-Design of reinforced earth walls with strip, sheet and grid reinforcement.

UNIT-V

Geomembranes: Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners– Caps and closures, moisture barriers.
Geocomposites: An added advantage – Geocomposites in Separation – Reinforcement – Filtration – Geocomposites as Geowebs and Geocells.

UNIT-VI

Natural Geotextiles: Natural fibres as geotextiles- factors governing the use-jute fibres-coir geotextiles-bamboo/timber-combination of geotextiles.

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TEXT BOOKS:

1. 'Designing with Geosynthetics by Robert M. Koerner, Prantice Hall, Eaglewood Cliffs, NJ 07632.
2. 'An Introduction to Soil Reinforcement and Geosynthetics' by G.L.Sivakumar Babu (2009), Universities Press (India) Pvt. Ltd.
3. 'Engineering with Geosynthetics', by G. Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.

REFERENCES:

1. 'Construction and Geotechnical Engineering using Synthetic Fabries' by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
2. 'Foundation Analysis and Design' by J.E. Bowles McGraw Hill Publications.

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CE706 (b) -ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

(Elective-II)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To impart knowledge on different concepts of Environmental Impact Assessment.
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods.
4. To pre-requisites for ISO 14001 certification
5. To know the procedures for environmental clearances and audit
6. To appreciate the importance of stakeholder participation in EIA

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

a. Prepare EMP, EIS, and EIA report
b. Identify the risks and impacts of a project
c. Selection of an appropriate EIA methodology
d. Evaluation the EIA report
e. Estimate the cost benefit ratio of a project
f. Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS:

UNIT – I

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map-Classification of environmental parameters – role of stakeholders in the EIA preparation –stages in EIA.

UNIT – II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis/ EIS and EMP.

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UNIT-III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT – V

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment

UNIT-VI

EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment, Canter Larry W.,McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.

REFERENCES:

1. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers.
2. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K. Katania & Sons Publication, New Delhi.
3. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd., Delhi.

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CE706 (c) - ADVANCED STRUCTURAL ENGINEERING

(Elective-II)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Familiarize Students with Raft Foundations and Retaining walls.
2. Equip student with concepts of design of different types of RCC water tanks.
3. Understand Concepts of flat slabs
4. Familiarize different types of Bunkers, Silos and Chimneys.
5. Understand different types of transmission towers.

Course Outcomes:

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

a. Design raft foundations and different types of RCC retaining walls
b. Carryout analysis and design of different types of RCC water tanks
c. Solve the problems design of RCC Bunkers, Silos and Chimneys
d. Understand various types of transmission towers and loading on them.

SYLLABUS:

UNIT – I

Analysis and Design of Raft Foundations – Design of RCC Retaining walls: Cantilever and Counter fort

UNIT – II

Analysis and Design of RCC Water Tanks, Circular and Rectangular types- Intze tank including staging.

UNIT – III

Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check for Punching shear.

UNIT - IV

Analysis and Design of Bunkers and Silos- Concepts of Loading.

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UNIT-V
Analysis and Design of Chimney, Concepts of loading

UNIT-VI
Introduction to Transmission Towers- Principles and procedures

TEXT BOOKS:

1. 'Reinforced Concrete Structures' Vol-2 by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. 'Reinforced Concrete Structures' by N. Subrahmanian, Oxford Publishers
3. 'Design Drawing of Concrete and Steel Structures' by N. Krishna Raju University Press 2005.

REFERENCES:

1. 'Essentials of Bridge Engineering' by D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. 'Reinforced concrete design' by S. U, Pillai and D. Menon, Tata Mc.Grawhill Publishing Company

Codes: Relevant IS: codes.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

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CE706 (d) - GROUND WATER DEVELOPMENT AND MANAGEMENT

(Elective-II)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to

1. Appreciate groundwater as an important natural resource.
2. Understand flow towards wells in confined and unconfined aquifers.
3. Understand the principles involved in design and construction of wells.
4. Create awareness on improving the groundwater potential using various recharge techniques.
5. Know the importance of saline water intrusion in coastal aquifers and its control measures.
6. Appreciate various geophysical approaches for groundwater exploration.
7. Learn groundwater management using advanced tools.

Course Outcomes

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

a. Estimate aquifer parameters and yield of wells.
b. Analyse radial flow towards wells in confined and unconfined aquifers.
c. Design wells and understand the construction practices.
d. Interpret geophysical exploration data for scientific source finding of aquifers.
e. Determine the process of artificial recharge for increasing groundwater potential.
f. Take effective measures for controlling saline water intrusion.
g. Apply appropriate measures for groundwater management.

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SYLLABUS:

UNIT – I

Introduction

Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation.

Well Hydraulics

Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

UNIT – II

Well Design

Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT III

Well Construction and Development

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT IV

Artificial Recharge

Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge.

Saline Water Intrusion

Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT – V

Geophysics

Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

UNIT – VI

Groundwater Modelling and Management

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Basic principles of groundwater modelling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

TEXT BOOKS:

1. 'Groundwater' by Raghunath H M, New Age International Publishers, 2005.
2. 'Groundwater Hydrology'by Todd D.K., Wiley India Pvt Ltd., 2014.
3. 'Groundwater Hydrology'by Todd D K and L W Mays, CBS Publications, 2005.

REFERENCES:

1. 'Groundwater Assessment and Management' by Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. 'Groundwater Hydrology' by Bouwer H, McGraw Hill Book Company, 1978.
3. 'Groundwater Systems Planning and Management' by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. 'Groundwater Resources Evaluation' by Walton W C, Mc Graw Hill Book Company, 1978.

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CE706 (e) - TRAFFIC ENGINEERING

(Elective-II)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To know various components and characteristics of traffic.
2. To know various traffic control devices and principles of highway safety.
3. To understand the detrimental effects of traffic on environment
4. To know highway capacity and level of service concepts.
5. To learn about intelligent vehicle highway systems.

Course Outcomes:

At the end of course, Student can

a. Determine traffic speed, volume, travel time and density.
b. Design traffic signals
c. Determine highway capacity

SYLLABUS:

UNIT- I

Components Of The Traffic System: Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies:Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies.

UNIT- II

Traffic Characteristics: Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car-following theories; Density measurement techniques; Density contour maps.

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UNIT- III

Traffic Control Devices & Highway Safety: Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method; Drew's Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT- IV

Environmental Considerations: Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control.

UNIT- V

Highway Capacity And Level Of Service: Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

UNIT- VI

Intelligent Vehicle – Highway Systems: Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS.

TEXT BOOKS

1. 'Traffic Engineering: Theory and Practice' by Pignataro LJ., Prentice hall, Inc.
2. 'Traffic and Transport planning' by Kadiyali L.R., Khanna Publishers.

REFERENCES:

1. 'Traffic Engineering Hand Book' by Institute of Transportation Engineers, 4 Ed., Prentice Hall
2. 'Traffic Engineering' by Mc Shane, WR and RP Roess, Prentice Hall.
3. 'Highway Traffic analysis and design' by Salter RJ and NB Hounsell, 3rd ed., Macmillan.
4. 'Traffic Planning and Engineering' by Hobbs FD., Pergamon press
5. 'Traffic flow fundamentals' by May, AD., Prentice Hall.

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CE706 (f) - INFRASTRUCTURE MANAGEMENT

(Elective-II)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

Infrastructure Management focuses on the processes necessary for the planning and development of new infrastructure, and on maintaining and operating mature infrastructure for sustainability. A wide variety of management topics are covered, such as infrastructure planning, infrastructure economics, infrastructure management systems, optimal maintenance management, reliability of infrastructure systems, asset valuation and utilization, and infrastructure planning under risk and uncertainty.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

SYLLABUS:

UNIT-I

Performance Measures & Deterioration Modeling: Defining performance, Common characteristics of infrastructures, Condition assessment and condition indices; Different types of deterioration models; Empirical and Mechanistic models, Markov and Semi-Markov models, Risk-based deterioration modeling

UNIT-II

PRIORITIZATION AND MAINTENANCE PLANNING & POLICY: Needs Analysis, Ranking by single criteria, Ranking by fixed and variable trigger points,Single/multiple-year prioritization; Different types of maintenance planning, Maintenance policy.

UNIT-III

INFRASTRUCTURE ECONOMICS: Costs and benefits, Trade-off Analysis, Cost-effectiveness technique and Budget allocation.

UNIT-IV

OPTIMIZATION: Objective functions, decision variables and constraints, Optimization techniques, Optimal maintenance planning.

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UNIT-V

Asset Management System: Management System, Components of Asset Management System.

UNIT-VI

Tools and Technology: Destructive Testing, Nondestructive Testing, Database Management System for Inventory Data Control, Other Information Technology.

TEXT BOOKS:

1. 'Infrastructure Management' by Hudson, Haas and Uddin, McGraw-Hill, 1997.
2. 'Infrastructure Engineering and Management'Grigg, N., John Wiley & Sons, 1998.
3. 'Infrastructure Condition: Art, Science and Practice' by Saito, M., ASCE, 1997.

REFERENCES:

1. 'Markov Chains' by Norris, J. R., Cambridge University Press, 1997.
2. 'Pavement Management for Airports, Roads and Parking Lots' by Kluwer, Shahin M, Kluwer Academic Publisher, 1994.

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IV Year – II SEMESTER

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3+1*	0	3

(Elective-III)

CE803 (a) - ADVANCED FOUNDATION ENGINEERING

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To enable the student to appreciate how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.
2. To teach the student special methods of computation of settlements and the corrections to be applied to settlements.
3. To enable the student to understand the advanced concepts of design of pile foundations.
4. To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
5. To enable the student to learn the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

Course Outcomes:

Upon successful completion of this course, student will be able to

a. Compute the safe bearing capacity of footings subjected to vertical and inclined loads.
b. Understand the advanced methods of settlement computations and proportion foundation footings.
c. Appreciate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.
d. Appreciate the problems posed by expansive soils and the different foundation practices devised.
e. Appreciate the difference between isolated footings and combined footings and mat foundations.

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SYLLABUS:

UNIT-I

Bearing capacity of Foundations using general bearing capacity equation – Meyerhof's, Brinch Hansen's and Vesic's methods.

UNIT-II

Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann & Hartman method – De Beer and Martens method - Immediate settlement in clays – Janbu's method – correction for consolidation settlement using Skempton and Bjerrum's method – Correction for construction period.

UNIT-III

Mat foundations – Purpose and types of isolated and combined footings – Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils – compensated rafts.

UNIT-IV

Earth-retaining structures – cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

UNIT-V

Pile foundations – single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

UNIT-VI

Foundations in expansive soils – definitions of swell potential and swelling pressure – determination of free swell index – factors affecting swell potential and swelling pressure – foundation practices – sand cushion method – CNS layer - drilled piers and belled piers – under-reamed piles – moisture control methods.

TEXT BOOKS:

1. 'Basic and applied soil mechanics' by Gopal Ranjan and ASR Rao, New Age Publishers.

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2. 'Soil Mechanics and Foundation Engineering' by VNS Murthy, CBS Publishers.
3. 'Principles of Foundation Engineering' by BM Das, Thomson Brooks/Cole.

REFERENCE BOOKS:

1. 'Foundation Analysis and Design' by JE Bowles, John Wiley.
2. 'Foundation Design' by WC Teng, Prentice Hall Publishers.

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CE803 (b) - SOLID WASTE MANAGEMENT

(Elective-III)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.
2. To acquire the principles of treatment of municipal solid waste
3. To know the impact of solid waste on the health of the living beings
4. To learn the criterion for selection of landfill and its design
5. To plan the methods of processing such as composting the municipal organic waste.

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

a. Design the collection systems of solid waste of a town
b. Design treatment of municipal solid waste and landfill
c. To know the criteria for selection of landfill
d. To characterise the solid waste and design a composting facility

SYLLABUS:

UNIT- I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT- II

Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

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UNIT- III

Transfer and Transport: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

UNIT- IV

Separation and Transformation of Solid Waste:unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

UNIT- V

Processing and Treatment: Processing of solid waste - Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT- VI

Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

TEXT BOOKS

1. George Techobanoglous "Integrated Solid Waste Management", McGraw Hill Publication, 1993

REFERENCES

1. Vesilind, P.A., Worrell, W., Reinhart, D. "Solid Waste Engineering", Cenage learning, New Delhi, 2004
2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

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CE803 (c) - EARTHQUAKE RESISTANT DESIGN

(Elective-III)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Familiarize Students with Engineering Seismology
2. Equip student with concepts of Structural Dynamics
3. Understand Concepts of Seismic Design
4. Familiarize with Design philosophies for Seismic loading
5. Familiarize students with various IS codal provisions for ductile design and detailing

Course Outcomes:

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

a) Explain fundamentals of Engineering Seismology
b) Acquaint with the principles Structural dynamics
c) Solve SDOF Systems and suggest ductile design
d) Compute equivalent lateral seismic loads and carryout a seismic design as per IS codal provisions

SYLLABUS:

UNIT-I

Engineering seismology – rebound theory – plate tectonics – seismic waves - Earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

UNIT-II

Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – Formulation of the Equations of Motion– Elements of a Vibratory system – Degrees of Freedom - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor.

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UNIT-III

Seismic design concepts – EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) – Building system – frames – shear wall – braced frames – layout design of Moment Resisting Frames (MRF) – ductility of MRF – Infill wall – Non-structural elements.

UNIT-IV

Calculation of equivalent lateral force- Design Base Shear- Storey Shear, Estimation of Natural period of Structure, Computation of Response acceleration Coefficient- Zone factor- Seismic weight- Response reduction factors- Seismic Coefficient Method.

UNIT-V

Design and ductile detailing of Beams and columns of frames -Concept of strong column weak beams, Ductility criteria for earthquake resistant design, Ductile detailing of flexural members as per IS 13920- Longitudinal reinforcement, Shear reinforcement, Anchorage of reinforcement- Development length, Lap Splices.

UNIT-VI

Seismic Analysis and design of simple 2-storied RC Building frame – Equivalent static lateral force method and response spectrum method.

TEXT BOOK

1. 'Earthquake Resistant Design of Structures' -Pankaj Agarwal and Manish ShriKhande, Prentice – Hall of India, 2007, New Delhi.
2. 'Earthquake Resistant Design of Building Structures' by Vinod Hosur, Wiley India Ltd.
3. 'Reinforced Concrete Design'by A. K. Jain.

REFERENCES

1. 'Introduction to the Theory of Seismology' by Bullen K.E., Great Britain at the University Printing houses, Cambridge University Press 1996.
2. Relevant code of practices.

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CE803 (d) - WATERSHED MANAGEMENT

(El3ective-III)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to:

1. introduce the concept of watershed management
2. understand the watershed characteristics
3. learn the principles of soil erosion and measures to control erosion
4. appreciate various water harvesting techniques.
5. learn land management practices for various land use/land cover.
6. introduce concepts of watershed modelling.

Course outcomes

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

a. calculate watershed parameters and analyse watershed characteristics to take appropriate management action.
b. quantify soil erosion and design control measures.
c. apply land grading techniques for proper land management .
d. suggest suitable harvesting techniques for better watershed management.
e. apply appropriate models for watershed management.

SYLLABUS:

UNIT-I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

UNIT-II

Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

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UNIT-III

Principles of Erosion: Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation.
Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams , rock-fill dams, brushwood dam, Gabion.

UNIT-IV

Water Harvesting: Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT-V

Land Management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

UNIT-VI

Watershed Modelling: Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models.

TEXT BOOKS:

1. 'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. 'Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007.
3. 'Watershed Management' by Murthy J V S, New Age International Publishers, 2006.

REFERENCES:

1. 'Water Resource Engineering'by Wurbs R A and James R A, Prentice Hall Publishers, 2002.
2. 'Watershed Hydrology' by Black P E, Prentice Hall, 1996.

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CE803 (e) - PAVEMENT ANALYSIS AND DESIGN

(Elective-III)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To know various factors affecting pavement design
2. To know various concepts for the stresses in pavements.
3. To understand material characterisation and mix design concepts.
4. To acquire design principles of flexible and rigid pavements.
5. To acquire design principles of shoulders, overlays and drainage.

Course Outcomes:

At the end of course, Student can

a. Design flexible and rigid pavements using various methods
b. Design shoulders, overlays and drainage.

SYLLABUS:

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; ***Stress 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, Introduction to DAMA, KENLAYER & KENSLABS Programs.

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UNIT-III

Material Characterisation & Mix Design Concepts: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics; Marshall's and Hveem's Methods of Bituminous Concrete Mix Design, Field Implications of Stability and Flow Values, Introduction to Super Pave Mix Design, IRC Cement Concrete Mix Design.

UNIT-IV

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, Road Note No 29 & IRC Methods, Design of Runways & Taxiways, Design of Low Volume Rural Roads.

UNIT-V

Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design, Rigid Pavement Design for Low Volume Rural Roads.

UNIT-VI

Design Of Shoulders, Overlays & Drainage: Shoulder Design Considerations, Traffic Prediction, Parking, Regular & Encroaching Traffic, Thickness Design Specifications for Flexible & Rigid Shoulders; Types & Design of Overlays: AI's Principal Component Analysis & IRC Methods of Overlay Design, Importance of Profile Correction Course; Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications.

TEXT BOOKS:

1. 'Pavement Analysis and Design' by Yang H. Huang, Pearson Education, Second Edition.
2. 'Principles of Pavement Design' by Yoder.J. & Witczat Mathew, W. John Wiley & Sons Inc.
3. 'Pavement Design' by Srinivasa Kumar R, Universities Press, Hyderabad.

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REFERENCES:

1. 'Design of Functional Pavements' by Nai C. Yang, McGraw Hill Publications.
2. 'Concrete Pavements' by AF Stock, Elsevier, Applied Science Publishers.
3. 'Pavement and Surfacings for Highway & Airports' by Micheal Sargious, Applied Science Publishers Limited.
4. 'Dynamics of Pavement Structures' by G. Martineek, Chapmen & Hall Inc.
5. 'Principles of Transportation Engineering' by Patha Chakroborty and Animesh Das, PHI Learning Private Limited, Delhi.

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CE803 (f) - GREEN BUILDINGS

(Elective-III)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

SYLLABUS:

UNIT-I

Green Buildings: Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage

UNIT- II

Environmentally friendly building materials and technologies: Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, ferro-cement and ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

UNIT - III

Energy and resource conservation: Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings-water harvesting in buildings – waste to energy management in residential complexes or gated communities.

UNIT- IV

Use of renewable energy resources: Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy based buildings in India.

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UNIT- V

Climate Design: Local climatic conditions – temperature, humidity, wind speed and direction-impact of climate change on built environment - comforts: the desirable conditions – Principles of thermal design - means of thermal –light and lighting-building acoustics- energy efficient lighting, Ventilation and air quality requirement, various techniques for passive cooling, garden roofs, case studies for passive cooling and thermal comfort.

UNIT- VI

Green Building Rating Systems: Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment - Modular wastewater treatment systems for built environment - Building automation and building management systems.

TEXT BOOKS:

1. 'Alternative building materials and technologies' by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
2. 'Non-Conventional Energy Resources' by G. D. Rai, Khanna Publishers.

REFERENCES:

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IV Year – II SEMESTER

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(Elective-IV)

CE804 (a) - SOIL DYNAMICS AND MACHINE FOUNDATIONS

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The basic course in soil mechanics/geotechnical engineering generally introduces the fundamental concepts, principles and applications of soil as engineering material with properties under static loading.

This course on 'Soil Dynamics' discusses

1. About the fundamentals of vibrations
2. about the behaviour and properties/response of soil as a material which is subjected to various types of dynamic or cyclic time-dependent loadings.
3. the design and analysis for machine foundations come along with this course to consider the dynamic properties of both soil and foundation as combined mass. Behaviour of various geotechnical structures such as shallow and deep foundations, retaining structures due to various types of time-dependent dynamic loading are discussed here along with the reference to design code provisions.
4. Phenomena like liquefaction and lateral spreading of soil are also discussed.
5. Discusses about the laboratory and filed tests to compute the dynamic soil properties of the soil mass.

Course Outcomes:

On successful completion of these course, the student able to

a. Use theory of vibrations to find the behavior of soil under dynamic loading.
b. Design machine foundations under different loads and soil conditions.
c. Understand the liquefaction phenomina.
d. Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its interpretation.

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e. Design vibration isolators under any vibratory machines.

SYLLABUS:

UNIT-I

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping - Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.

UNIT-II

Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung's solutions -- Pauw's Analogy – Heigh's Theory.

UNIT-III

Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test – Determination of Damping factor.

UNIT-IV

Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure
Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

UNIT-V

Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.

UNIT-VI

Vibration Isolation: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes
Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction - Dynamic bearing capacity, Earth retaining structures under dynamic loads.

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TEXT BOOK:

1. 'Vibrations of Soils and Foundations'by Richart Hall and Woods

REFERENCES:

1. 'Vibration Analysis and Foundation Dynamics'by NSV Kameswara Rao, Wheeler Publishing, New Delhi.
2. 'Foundations of Machines- Analysis and Design' by Prakash and Puri.
3. 'Analysis and design of Foundations for Vibrations' by P J Moore
4. 'Fundamentals of Soil Dynamics' by B M Das
5. 'Dynamics of bases and Foundations' by D D Barkar

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CE804 (b) - ENVIRONMENTAL AND INDUSTRIAL HYGIENE

(Elective-IV)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To provide with information regarding Occupational health, Hygiene, workplace safety.
2. To make aware of regulations, codes of practice in industrial hygiene.
3. To impart basic knowledge on industrial fatigue and ergonomics.
4. To know the basic right of an employee on safety aspects.

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

1. Identify aspects related to occupational health, Hygiene, workplace safety in an industry.
2. Know the regulations, codes of practice available with reference to industrial hygiene.
3. Enlist the common points related to ergonomics.
4. Know the safety equipment and the basic right of an employee on safety aspects.

SYLLABUS:

UNIT- I

Introduction: Need for developing Environment, Health and Safety systems in work places. Status and relationship of Acts, Regulations and Codes of Practice. Role of trade union safety representatives.

UNIT- II

Occupational Health and Hygiene: Definition of the term occupational health and hygiene. Categories of health hazards. Exposure pathways and human responses to hazardous and toxic substances. Advantages and limitations of environmental monitoring and occupational exposure limits. Hierarchy of control measures for occupational health risks. Control methods and reduction strategies for noise, radiation and excessive stress. OHSAS.

UNIT- III

Workplace Safety and Safety Systems: Features of the satisfactory design of work premises, ventilation. Safe installation and use of electrical supplies.

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Fire safety and first aid provision. Significance of human factors in the establishment and effectiveness of safe systems. Safe systems of work for manual handling operations. Control methods to eliminate or reduce the risks arising from the use of work equipment. Requirements for the safe use of display screen equipment. Procedures and precautionary measures necessary when handling hazardous substances- Contingency arrangements for events of serious and imminent danger.

UNIT -IV

Techniques of Environmental Safety: Methods of effective implementation and review of health & safety policies. Functions and techniques of risk assessment, Investigation of accidents- Principles of quality management systems in health and safety management.

UNIT- V

Industrial Fatigue and Ergonomics:

Fatigue: Types of fatigue - circadian rhythms- sleep cycle-sleep debt-effects of fatigue-factors contributing to fatigue- mitigation of fatigue.

Ergonomics: definition-boundaries of ergonomics- objectives and principles of ergonomics-ergonomics relation with health and safety-ergonomics problems in work place-ergonomics improvements-identification of poor posture and risks.

UNIT- VI

Education and Training: Relationship between quality manuals, safety policies and written risk assessments. Records and other documentation required by an organisation for health and safety. Principles and methods of effective training- Feedback and evaluation mechanism.

TEXT BOOKS:

REFERENCES:

1. 'Environmental and Health and Safety Management' by Nicholas P. Cheremisinoff and Madelyn L.Graffia, William Andrew Inc. NY, 1995
2. 'The Facility Manager's Guide to Environmental Health and Safety' by Brian Gallant, GovernmentInst Publ., 2007.
3. 'Effective Environmental, Health, and Safety Management Using the Team Approach' by BillTaylor, Culinary and Hospitality Industry Publications Services 2005.

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CE804 (c) - REPAIR AND REHABILITATION OF STRUCTURES

(Elective-IV)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Familiarize Students with deterioration of concrete in structures
2. Equip student with concepts of NDT and evaluation
3. Understand failures and causes for failures in structures
4. Familiarize different materials and techniques for repairs
5. Understand procedure to carryout Physical evaluation of buildings and prepare report.

Course Outcomes:

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

a. Explain deterioration of concrete in structures
b. Carryout analysis using NDT and evaluate structures
c. Assess failures and causes of failures in structures
d. Carryout Physical evaluation and submit report on condition of the structure.

SYLLABUS:

UNIT - I

Deterioration of concrete in structures: Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures. - Cracks:Cracks in concrete, type, pattern, quantification, measurement & preventive measures.

UNIT- II

Non Destructive Testing- Non destructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting- Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

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UNIT-III

Failure of buildings: Definition of building failure-types of failures- Causes of Failures- Faulty Design, Accidental over Loading, Poor quality of material and Poor Construction practices- Fire damage - Methodology for investigation of failures-diagnostic testing methods and equipments-repair of cracks in concrete

UNIT-IV

Materials for repair and rehabilitation -Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT: V

Repair Techniques: Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes.

UNIT: VI

Investigation of structures: Distress, observation and preliminary test methods. Case studies: related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures.

TEXT BOOKS:

1. 'Maintenance & Repair of Civil Structures' by B.L. Gupta & Amit Gupta.
2. 'Rehabilitation of Concrete Structures' by B. Vidivelli, Standard Publishers.
3. 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation' by V. K. Raina.

REFERENCES:

1. 'Concrete Structures- protection Repair and Rehabilitation' by R. Doodge Woodson, BH Publishers

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CE804 (d) - WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT

(Elective-IV)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to

1. introduce the concepts of system analysis in the planning, design, and operation of water resources.
2. appreciate mathematical optimization methods and models.
3. learn and apply basic economic analysis tools to water resources projects.
4. understand linear, nonlinear and dynamic programming techniques and apply them to various water resources systems planning and design problems.
5. appreciate simulation and management techniques in water resources systems.

Course Outcomes

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

a. apply optimization methods to solve problems related to water resource systems.
b. perform basic economic analysis to evaluate the economic feasibility of water resources projects
c. formulate optimization models for decision making in water resources systems.
d. use simulation models for planning and design of Water Resources Systems.

SYLLABUS:

UNIT – I

Introduction: Concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

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UNIT – II

Linear programming: Formulation of linear programming models, graphical method, simplex method, application of linear programming in water resources, revised simplex method, duality in linear programming, sensitivity analysis.

UNIT – III

Dynamic programming: Principles of optimality, forward and backward recursive dynamic programming, curse of dimensionality, application for resource allocation.

UNIT – VI

Non-linear optimization techniques: Classical optimization techniques, Lagrange methods, Kuhn-Tucker conditions, Search techniques, overview of Genetic Algorithm

UNIT – V

Water Resources Economics: Basics of engineering economics, economic analysis, conditions of project optimality, benefit and cost analysis

UNIT – VI

Simulation and management: Application of simulation techniques in water resources, planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

TEXT BOOKS:

1. 'Water Resources System Analysis' by Vedula S and P P Mujumdar, McGraw Hill Company Ltd, 2005.
2. 'Water Resources Economics' by James D and R. Lee, Oxford Publishers, 2005.

REFERENCES:

1. 'Water Resources Systems Planning and Management - An Introduction to Methods, Models and Applications'by Loucks D P and E V Bee,UNESCO Publications, 2005 (http://ecommons.cornell.edu/bitstream/1813/2804/21/00_intro.pd)
2. 'Optimal design of water distribution networks' by Bhave, P. R, Narosa Publishing house, 2003.

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CE804 (e) - URBAN TRANSPORTATION PLANNING

(Elective-IV)

Lecture :	3 hrs/Week	Internal Assessment :	Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. To learn various procedures for travel demand estimation .
2. To various data collection techniques for OD data.
3. To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
4. To develop alternative urban transport network plans.

Course Outcomes:

At the end of course, Student can

a. Estimate travel demand for an urban area.
b. Plan the transportation network for a city.
c. Identify the corridor and plan for providing good transportation facilities.
d. Evaluate various alternative transportation proposals.

SYLLABUS:

UNIT -I

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT -II

Data Collection And Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

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UNIT -III

Trip Generation & Distribution:UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT -IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

UNIT -V

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

UNIT -VI

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies

TEXT BOOKS:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering - An Introduction' by Khisty C.J., Prentice Hall.
3. 'Fundamentals of Transportation Planning' by Papacostas, Tata McGraw Hill.

REFERENCES:

1. 'Urban Transportation Planning: A decision oriented Approach' by Mayer M and Miller E, McGraw Hill.
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill.
4. 'Traffic Engineering and Transportation Planning' by Kadiyali.L.R., Khanna Publishers, New Delhi.

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CE804 (f) - SAFETY ENGINEERING

(Elective-IV)

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

Course Learning Objectives:

1. To import concepts of safety w.r.t construction Industry
2. To understands various hazards in construction industry and preventive measures
3. To learn safety operation of construction machinery
4. To learn techniques to distinguish civil structures safety
5. To understand fire safety principles

Course Outcomes:

Students will have ability to

a. Develop management plans to prevent accidents in construction industry.
b. Prepare plans to safe guard workers in construction of high risk buildings.
c. Ensure safety while operating construction machinery
d. Outline safety plans for demolition of buildings
e. Prepare fire safety plans for a given building

SYLLABUS:

UNIT-I

Accidents Causes And Management Systems : Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activates, preconstruction meeting - design aids for safe construction – permits to work – quality assurance in construction - compensation – Recording of accidents and safety measures – Education and training.

UNIT-II

Hazards Of Construction And Prevention : Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work,

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dismantling – tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water - road works – power plant constructions – construction of high rise buildings.

UNIT-III

Working At Heights: Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings , requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection , safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

UNIT-IV

Construction Machinery : Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors - concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling.

UNIT-V

Safety In Demolition Work : Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

UNIT-VI

Fire Safety: Fire –fire load-control and institutional fire protection systems, Fire Hydrant and extinguishers, Electrical Hazards, protection and interlock-Discharge rod and earthling device, safety in the use of portable tools. Emergency planning and preparedness. Marking of Route Fire Exist.

TEXT BOOKS:

1. 'Safety in the Build Environment' by Jnathea D.Sime, London, 1988.
2. 'Reliability Maintenance and Safety Engineering, by Gupta A. K, Laxmi Publications, New Delhi.

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3. 'Safety Management' by John V. Grimoldi, AITBS Publishers and Distributors, New Delhi.

REFERENCES:

1. 'Construction hazard and Safety Hand book' by Hudson, R., Butter Worth's, 1985.
2. 'Construction Safety Hand Book'by V.J.Davies and K.Thomasin, Thomas Telford Ltd., London, 1990.
3. 'Handbook of OSHA Construction Safety and Health'by Charles D. Reese & James V. Edison.

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CE804 (g) - BRIDGE ENGINEERING

(Elective-IV)

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Familiarize Students with different types of Bridges and IRC standards.
2. Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts.
3. Understand concepts of design of Plate Girder Bridges
4. Familiarize with different methods of inspection of bridges and maintenance.

Course Outcomes:

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

a. Explain different types of Bridges with diagrams and Loading standards
b. Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing
c. Carryout analysis and design of Plate girder bridges
d. Organize for attending inspections and maintenance of bridges and prepare reports.

SYLLABUS:

UNIT-I

Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

UNIT-II

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of

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slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method.

UNIT-III

T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

UNIT-IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V

Box Culverts: Loading –Analysis and Design- Reinforcement detailing.

UNIT-VI

Inspection and Maintenance of Bridges: Procedures and methods for inspection – Testing of bridges- Maintenance of Sub Structures and Superstructures- Maintenance of bearings- Maintenance Schedules.

TEXT BOOK

1. 'Essentials of Bridge Engineering' by Jhonson Victor D
2. 'Design of Bridge Structures' by T. R. Jagadeesh, M.A. Jayaram, PHI
3. 'Design of RC Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications.

REFERENCES:

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani.
2. 'Design of Steel Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications.
3. 'Design of Bridges' by Krishna Raju.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

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DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE

I M.TECH I SEMESTER

S.NO	SUBJECT NAME	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Advanced Mathematics	4		-	40	60	100	3
2	Theory of Elasticity	4		-	40	60	100	3
3	Matrix Analysis of Structures	4		-	40	60	100	3
4	Structural Dynamics	4		-	40	60	100	3
5	Elective –I							
	Design of Tall Structures Masonry Structures Repair & Rehabilitation of Structures Pre Stressed concrete	4		-	40	60	100	3
6	Elective –II							
	Design of Industrial Structures Special concretes Soil Dynamics & Foundation Engineering Advanced Structural Analysis	4	-	-	40	60	100	3
7	Advanced Structural Engineering Laboratory	-	-	6	40	60	100	3
	TOTAL	24	-	6	280	420	700	21

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I M.TECH II SEMESTER

S.NO	SUBJECT NAME	L	T	P	Internal Marks	External Marks	Total Marks	Credits
1	Finite Element Method	4		-	40	60	100	3
2	Earthquake Resistant Design	4		-	40	60	100	3
3	Stability of Structures	4		-	40	60	100	3
4	Theory of Plates & Shells	4		-	40	60	100	3
5	Elective –III							
	Design of concrete bridges Geotechnical Earthquake Engineering Advanced Rein forced concrete design Experimental Stress Analysis	4		-	40	60	100	3
6	Elective –IV							
	Plastic Analysis & Design Advanced Steel Design Mechanics of Composite Materials Alternative Building Materials	4	-		40	60	100	3
7	CAD Laboratory		-	6	40	60	100	3
	TOTAL	24		6	280	420	700	21

II M.TECH III & IV SEMESTER

S.NO	SUBJECT NAME	Total marks	Credits
1	Seminar	100	1
2	Comprehensive Viva-Voce	100	2
3	Project Work	-	35
	Total	200	38

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ADVANCED MATHEMATICS							

Course Objectives:

- To create awareness of the importance of various techniques in statistics, Numerical methods which are applicable for engineering problem.

Course Outcomes:

- Capable of applying Numerical techniques in engineering applications.
- Ability to ese linear & nonlinear homogenous ordinary and partial differential equations for engineering problems.

UNIT-I : Statistic: Elements of statistic, frequency distribution; Concept of mean, median, mode and different types of distribution; Standard deviation and variance; Curve fitting by least square method; Correlation and Regression, Testing of Hypothesis; Basic type of factorial design and Analysis of Variance.

UNIT-II: Partial differential equations: Finite differences, wave equation- one and two dimensions, heat equation- one dimension and two dimension.

UNIT-III: Numerical Solutions of Elliptic(5-point formula, diagonal formula), Parabolic equations(Bender Smith, Crank Nickalson's formula)

UNIT-IV: Numerical method: Interpolation by Polynomial, Error analysis, Solution of system of linear equation by Gauss Seidal iterative method, Newton Rapson method Numerical Integration by Gauss quadrature, Solution of ordinary differential equation by Rayligh-Ritz method.

UNIT-V: Ordinary Differential Equation: i) 2nd order homogeneous equation ii) Euler Cauchys equation iii) non homogeneous linear equation.

UNIT-VI: Calculations of variations: Introduction, Functionals, Euler's equation, Solutions of Euler's equations, Geodesics, Isoperimetric Problems, Several Dependent Variables, Functional involving higher order derivatives, weighted residual method, Galerkin's method, Hamilton's principle, Lagrange's equations.

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TEXT BOOK :

1. Dr. B.S. Grewal "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, 2012.
2. Introductory Methods of Numerical Analysis by S. S. Sastry (PHI)

REFERENCE BOOKS:

1. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain (New Age)
2. An Outline of Statistical Theory, Vol. I, II by A. M. Goon, M. K. Gupta, B. Dasgupta (The World Press Pvt. Ltd.)
3. The Design of Experiments to Find Optimal Conditions by Yu. P. Adler, E. V. Markova, Ylu V. Granovsky (MIR, 1975, Moscow)
4. Advanced Engineering Mathematics by Erwin Kreyszig (John Wiley & Sons, Inc)
5. Advanced Engineering Mathematics by Stanley Grossman & William R. Derrick (Harper & Row Publisher.

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I M.TECH-ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
THEORY OF ELASTICITY							

Course Objectives:
This subject is taught to impart knowledge on theory of elasticity.

Course Outcomes:
Upon completion of this course, the student will be able to

- Analyse the stresses and strains for two dimensional and three dimensional elements.
- Understand the equilibrium and compatibility conditions.
- Solve the problems on Torsion for different shaped bars.

UNIT-I
Definition And Notation: Stress, Stress at a Point, Equilibrium Equations, Principal Stresses, Mohr's Diagram, Maximum Shear Stress, Boundary Conditions.
Strain At A Point: Compatibility Equations, Principal Strains, Generalised Hooke's law, Methods of Solution of Elasticity Problems – Plane Stress-Plane Strain Problems.

UNIT-II
Two Dimensional Problems: Cartesian co-ordinates – Airy's stress functions –Investigation of Airy's Stress function for simple beam problems – Bending of a narrow cantilever beam of rectangular cross section under edge load – method of Fourier analysis – pin ended beam under uniform pressure.

UNIT-III
Three Dimensional Problems: Principal stresses in three dimensions, stress invariants, equilibrium equations, octahedral stresses, Mohr's stress circle, construction of Mohr Circle for three dimensional stress systems,

UNIT-IV
General Equations In Cylindrical Co-Ordinates: Thick cylinder under uniform internal and / or external pressure, shrink and force fit, stress concentration.

UNIT-V
Stresses In An Infinite Plate (with a circular hole) subjected to uniaxial and biaxial loads, stress concentration, stresses in rotating discs and cylinders.

UNIT-VI
Torsion Of Circular, Elliptical And Triangular bars: membrane analogy, torsion of thin open sections and thin tubes.

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TEXT BOOKS:
1. Advanced Mechanics of solids, L. S. Srinath, Tata Mc. Graw Hill, 2003
2. Theory of Elasticity: S. P. Timoshenko and J. N Gordier, Mc. Graw Hill International, 3rd edition, 1972

REFERENCE BOOKS
1. Theory of Elasticity: Dr. Sadhu Singh, Khanna Publications, 1988
2. Elasticity, Theory, Applications &Numericals: Martin H Sadd, Elsevier, 2005
3. Applied Elasticity, Seetharamu&Govindaraju, Interline Publishing
4. Applied Elasticity, C.T. WANG Sc. D. Mc. Graw Hill Book Co.

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I M.TECH-ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
MATRIX ANALYSIS OF STRUCTURES							

Course Objectives:

- The course is intended to teach the basic concepts of Matrix Methods of Structural Analysis.
- Different methods will be taught in the class and their use will be explained in the class.

Course Outcomes:

Upon completion of this course, the student will be able to

- Solve the different structures by using stiffness methods.
- Analyze the substructures, frames and trusses.
- Use the different structural analysis software.

UNIT-I

General Introduction. A Few Historical Remarks.Matrix Methods of Analysis of Skeletal Structures.Methods of Analysis. Displacement Method: Stiffness Relationships.

UNIT-II

The Matrix Displacement Approach.Introduction. Stiffness Matrix of a Bar Element subjected to Axial Force. Co-ordinate Transformations.Global Stiffness Matrix.Application to Pin-Jointed Frames.Stiffness Matrix of a Beam Element.Application to Continuous Beams.

UNIT-III

Matrix Displacement Analysis of Planar Rigid-Jointed Frames. Neglect of Axial Strain in the Analysis of Planar Rigid-Jointed Frames.InclinedSupports.Other Kinds of Loading & Other Kinds of Frames.

UNIT-IV

Matrix Displacement Analysis of Grillage or Grid.Co-ordinate Transformations.Element Stiffness Matrix & its Application.

UNIT-V

Matrix Displacement Analysis of Three-Dimensional Structures.Co-ordinate Transformations.Application to Space Trusses & Space Frames.

UNIT-VI

Computer Applications & Use of Computer Packages.

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TEXT BOOKS:

1.Matrix& Finite Element Displacement Analysis of Structures: D.J.Dawe.
2.Computer Analysis of Structural Systems: John F. Fleming.
3.Matrix Methods of Structural Analysis: C.K.Wang.
4.Matrix Analysis of Framed Structures: Gere & Weaver.
5.Introduction to Matrix Methods of Structural Analysis: Martin,H.C.

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I M.TECH-ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
STRUCTURAL DYNAMICS							

Course Objectives:

The objectives of this course are

- To make students to learn principles of Structural Dynamics,
- To implement these principles through different methods and to apply the same for free and forced vibration of structures.
- To evaluate the dynamic characteristics of the structures

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of Structural Dynamics
- Design and develop analytical skills.
- Summarize the Solution techniques for dynamics of Multi-degree freedom systems
- Understand the concepts of damping in structures.

UNIT-I

Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles Dynamics of Single-degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems. Methods of evaluation of damping.

UNIT-II

Response of Single-degree-of-freedom systems to harmonic loading (rotation unbalance, reciprocating unbalance) including support motion, vibration isolation, transmissibility, Numerical methods applied to Single-degree-of-freedom systems - Duhamel integral, principle of vibration-measuring instruments – seismometer and accelerometer.

UNIT-III

Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building concept, free vibration of undamped multi-degree-of-freedom systems - Natural frequencies and mode shapes – orthogonality property of modes.

UNIT-IV

Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach, condition of damping uncoupling.

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UNIT-V

Approximate methods: Rayleigh's method Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Free longitudinal vibration of bars, flexural vibration of beams with different end conditions,

UNIT-VI

Stiffness matrix, mass matrix (lumped and consistent); equations of motion for the discretised beam in matrix form.

REFERENCE BOOKS:

1. Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed., Anil K. Chopra, Pearson Education.
2. Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (india)
3. Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH
4. Structural Dynamics- Mario Paz : CBS publishers.
5. Structural Dynamics- Clough &Penzien : TMH 6. Vibration Problems in Engineering Timoshenko, S, Van-Nostrand Co.

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I M.TECH-ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
DESIGN OF TALL STRUCTURES							

Course Objectives:

The objectives of this course is

- To make students to learn principles of stability of tall buildings,
- To design the tall buildings for earthquake and wind resistance.
- To evaluate the performance of tall structures for strength and stability.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of strength and stability
- Design and develop analytical skills.
- Summarize the behavior of various structural systems.
- Understand the concepts of P-Delta analysis.

UNIT-I

Design Criteria: Design philosophy, loading, sequential loading, and materials – high performance concrete, fiber reinforced concrete, lightweight concrete, design mixes. Loading and Movement: Gravity loading: Dead and live load, methods of live load reduction, Impact, Gravity loading, Construction loads

UNIT-II

Wind loading: static and dynamic approach, Analytical and wind tunnel experimentation method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading, working stress design, Limit state design, Plastic design.

UNIT-III

Behavior of Various Structural Systems: Factors affecting growth, Height and structural form; High rise behavior, Rigid frames, braced frames, in-filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, Futigger – braced and hybrid mega system.

UNIT-IV

Analysis and Design: Modeling for approximate analysis, accurate analysis and reduction techniques, analysis of building as total structural system considering overall integrity and major subsystem interaction, analysis for member forces; drift and twist, computerized general three dimensional analyses.

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UNIT-V

Stability of Tall Buildings: Overall buckling analysis of frames, wall frames, approximate methods, second order effects of gravity of loading,

UNIT-VI

P-Delta analysis, simultaneous first order and P-Delta analysis, Transnational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation. Structural elements: sectional shapes, properties and resisting capacities, design, deflection, cracking, pre-stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire

REFERENCE BOOKS:

1. Taranath B.S, "Structural Analysis and Design of Tall Buildings"- McGraw Hill
2. Wilf gang Schuller, "High rise building structures"- John Wiley
3. Bryan Stafford Smith &Alexcoull, "Tall building structures Analysis and Design"- John Wiley
4. T.Y Lin &D.Stotes Burry, "Structural concepts and system for Architects and Engineers"- John Wiley
5. Lynn S.Beedle, "Advances in Tall Buildings"- CBS Publishers and Distributors.
6. Dr. Y.P. Gupta – Editor, "Proceedings National Seminar on High Rise Structures- Design and Construction practices for middle level cities"- New Age International Limited.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
MASONRY STRUCTURES							

Course Objectives:

- To make students to learn performance of masonry structures,
- To design the masonry structures for earthquake resistance.
- To evaluate the strength and stability of the masonry structures.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of design and construction of masonry structures
- Design and develop analytical skills.
- Summarize the masonry Characteristics.
- Evaluate the strength and stability of the masonry structures.

UNIT-I

Introduction, Masonry units, materials and types: History of masonry Characteristics of Brick, stone, clay block, concrete block, stabilized mud block masonry units – strength, modulus of elasticity and water absorption. Masonry materials – Classification and properties of mortars, selection of mortars.

UNIT-II

Strength of Masonry in Compression: Behaviour of Masonry under compression, strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, prediction of strength of masonry in Indian context, Failure theories of masonry under compression. Effects of slenderness and eccentricity, effect of rate of absorption, effect of curing, effect of ageing, workmanship on compressive strength.

UNIT-III

Flexural and shear bond, flexural strength and shear strength: Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures for evaluating flexural and shear strength.

UNIT-IV

Design of load bearing masonry buildings: Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns,

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UNIT-V

Opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels; Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, freestanding wall; Design of load bearing masonry for buildings up to 3 to 8 storeys using BIS codal provisions.

UNIT-VI

Earthquake resistant masonry buildings: Behaviour of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codalprovisions. Masonry arches, domes and vaults: Components and classification of masonry arches, domes and vaults, historical buildings, construction procedure.

REFERENCE BOOKS:

1. Hendry A.W., "Structural masonry"- Macmillan Education Ltd., 2nd edition
2. Sinha B.P & Davis S.R., "Design of Masonry structures"- E & FN Spon
3. Dayaratnam P, "Brick and Reinforced Brick Structures"- Oxford & IBH
4. Curtin, "Design of Reinforced and Prestressed Masonry"- Thomas Telford
5. Sven Sahlin, "Structural Masonry"-Prentice Hall
6. Jagadish K S, Venkatarama Reddy B V and Nanjunda Rao K S, "Alternative Building Materials and Technologies"- New Age International, New Delhi & Bangalore
7. IS 1905, BIS, New Delhi.
8. SP20(S&T),New Delhi

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
REPAIR AND REHABILITATION OF STRUCTURES							

Course Objectives:

The objectives of this course is

- To investigate the cause of deterioration of concrete structures,
- To strategise different repair and rehabilitation of structures.
- To evaluate the performance of the materials for repair.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the cause of deterioration of concrete structures.
- Design and develop analytical skills.
- Summarize the principles of repair and rehabilitation of structures
- Understands the concept of Serviceability and Durability.

UNIT-I

General: Introduction, Cause of deterioration of concrete structures, Diagnostic methods & analysis, preliminary investigations, experimental investigations using NDT, load testing, corrosion mapping, core drilling and other instrumental methods Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking.

UNIT-II

Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection.

UNIT-III

Maintenance and Repair Strategies: Definitions: Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects. Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration-testing techniques.

UNIT-IV

Materials for Repair: Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete.

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UNIT-V

Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

UNIT-VI

Examples of Repair to Structures: Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, fire, leakage, marine exposure, engineered demolition techniques for dilapidated structures - case studies

REFERENCE BOOKS:

1. Sidney, M. Johnson "Deterioration, Maintenance and Repair of Structures".
2. Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenance and Repair"- Longman Scientific and Technical
3. R.T.Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons 4. Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"- R&D Center (SDCPL)

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I M.TECH-ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
PRE-STRESSED CONCRETE							

Course Objectives:

- This subject is thought to give the concepts of pre stress
- To impart the knowledge about analysis and design of pre stressed concrete members.

Course Outcomes:

Upon completion of this course, the student will be able to

- Know the concepts, methods and materials of pre stressing systems.
- Design the pre stressed concrete members.
- Calculate the deflections in pre stressed concrete members.
- Design anchorage zones and composite pre stressed concrete members.

UNIT-I

General Principles of Prestressed Concrete : Pre–tensioning and post – tensioning – Prestressing by straight, concentric, eccentric, bent and parabolic tendons – Different methods and systems of prestressing like Hoyer system, Freyssinet system, MagnelBlaton system – Lee-Mc call system.

UNIT-II

Losses of Prestress : Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage, bending of member and frictional loss – Analysis of sections for flexure.

UNIT-III

Design of Section for Flexure : Allowable stresses – Elastic design of simple beams having rectangular and I-section for flexure – kern lines – cable profile and cable layout. Design of Sections for Shear : Shear and Principal stresses – Improving shear resistance by different prestressing techniques – horizontal, sloping and vertical prestressing – Analysis of rectangular and I–beam – Design of shear reinforcement – Indian code provisions.

UNIT-IV

Deflections of Prestressed Concrete Beams : Short term deflections of uncracked members– Prediction of long-time deflections – load – deflection curve for a PSC beam – IS code requirements for max. deflections.

UNIT-V

Transfer of Prestress in Pretensioned Members : Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by approximate, Guyon and Magnel methods – Anchorage zone reinforcement.

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UNIT-VI

Statically Indeterminate Structures : Advantages & disadvantages of continuous PSC beams – Primary and secondary moments – P and C lines – Linear transformation concordant and nonconcordant cable profiles – Analysis of continuous beams and simple portal frames (single bay and single story)

REFERENCEBOOKS :

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book -- Co ., New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. RamamruthamDhanpat Rai & Sons, Delhi.

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	4	0	0	40	60	100	3
DESIGN OF INDUSTRIAL STRUCTURES							

Course Objectives:

The objectives of this course is

- To make students to learn principles of Design of industrial building ,
- To design different components of industrial structures and to detail the structures.
- To evaluate the performance of the Pre- engineered buildings.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the industrial building and the components.
- Design and develop analytical skills.
- Summarize the principles of Structural Design and detailing
- Understands the concept of Pre- engineered buildings.

UNIT-I

Analysis of industrial building for Gravity and Wind load. Analysis and design of framing components namely, girders,

UNIT-II

Analysis of industrial building for Gravity and Wind load. Analysis and design of framing components namely trusses, gable frames.

UNIT-III

Analysis and design of gantry column (stepped column / column with bracket), purlins, girts, bracings including all connections.

UNIT-IV

Analysis of transmission line towers for wind load and design of towers including all connections.

UNIT-V

Forms of light guage sections, Effective width computation of unstiffened, stiffened, multiple stiffened compression elements of cold formed light guage sections. Concept of local buckling of thin elements.Limiting width to thickness ratio. Post buckling strength.

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UNIT-VI

Concept of Pre- engineered buildings, Design of compression and tension members of cold formed light guage sections, Design of flexural members (Laterally restrained / laterally unrestrained).

REFERENCE BOOKS:

1. Bureau of Indian Standards, IS800-2007, IS875-1987, IS-801-1975. Steel Tables, SP 6 (1) – 1984
2. N Subramanian- "Design of Steel Structure" oxford University Press
3. B.C. Punmia, A.K. Jain "Design of Steel Structures", Laxmi Publications, New Delhi.
4. .Ramchandra and VirendraGehlot" Design of Steel Structures " Vol 1 and Vol.2, Scientific Publishers, Jodhpur 5. Duggal "Limit State Design of Steel Structures" TMH

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	4	0	0	40	60	100	3
SPECIAL CONCRETES							

Course Objectives:

- To make students to learn principles of Concrete mix design.
- To differentiate between different types of concrete.
- To characterize the high Performance concrete.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of Concrete mix design
- Design and develop analytical skills.
- Summerize the Light Weight concrete, Fibre reinforced concrete and High Performance concrete.
- Understand the concepts of high Performance concrete.

UNIT-I

Components of modern concrete and developments in the process and constituent materials : Role of constituents,

UNIT-II

Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash, recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.

UNIT-III

Light Weight concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems. High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.

UNIT-IV

Ferro cement: Ferrocement materials, mechanical properties, cracking of ferrocement, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, ferrocement constructions, durability, and applications.

UNIT-V

Fibre reinforced concrete: Fibre materials, mix proportioning, distribution and orientation, interfacial bond, properties in fresh state, strength and behavior in tension, compression and flexure of steel fibre reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

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UNIT-VI

High Performance concrete: constituents, mix proportioning, properties in fresh and hardened states, applications and limitations. Ready Mixed Concrete, Self Compacting Concrete, Reactive powder concrete, bacterial concrete.

REFERENCE BOOKS:

1. Neville A.M, "Properties of Concrete" Pearson Education Asis, 2000
2. P. Kumar Mehta, Paul J.N.Monterio, CONCRETE, "Microstructure, Properties and Materials"- Tata McGraw Hill
3. A.R.Santhakumar, (2007) "Concrete Technology"-Oxford University Press, New Delhi, 2007
4. Gambhir "Concrete Technology" TMH.
5. Short A and Kinniburgh.W, "Light Weight Concrete"- Asia Publishing House, 1963
6. Aitcin P.C. "High performance concrete"-E and FN, Spon London 1998
7. Rixom.R. andMailvaganam.N., "Chemical admixtures in concrete"- E and FN, Spon London 1999
8. Rudnai.G., "Light Wiehgt concrete"- Akademiaikiado, Budapest, 1963

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	4	0	0	40	60	100	3
SOIL DYNAMICS & FOUNDATION ENGINEERING							

Course Objectives:
Student will be able to

- Use the techniques, skills, and modern engineering tools necessary for engineering practice.
- Understand the impact of engineering solutions in economic and environmental context.
- Design, analyze and interpret data related to the geotechnical engineering.

Course Outcomes:
On successful completion of this course, it is expected that students should be able to

- Accentuate the understanding of the basic principles and exposes the student to the latest developments, with a strong research orientation. ¬ Identify, formulate and solve foundation related problems.
- Understand the latest trends, modern standards and state-of-the-art techniques for geotechnical engineering.

UNIT-I
Types of machine foundations - general requirements design - criteria for machine foundations, permissible amplitudes and bearing pressure.

UNIT-II
Resonance and its effect - free and forced Vibrations with and without damping - constant force and rotating mass type excitation - magnification steady state vibrations - logarithmic decrement.

UNIT-III
Natural frequency of foundation - soil system - Barkan's and I.S. methods of determining natural frequency.

UNIT-IV
Elastic properties of soil for dynamical purpose and their experimental determination - Elastic waves and their characteristics -'Experimental determination of shear modulus from wave theory.

UNIT-V
Apparent soil mass - bulb of pressure concept - Pauw's analogy of foundation - soil systems (concept only) - Theory of elastic half space - lamb and the dynamic Boussinesq's problem - Relsner's solution and its limitations - Quinlan and Sung's modifications - Hsiegh's equations for vertical vibration.

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UNIT-VI
Principles of design of foundations for reciprocating and impact type of machine - as per I.S. Codes. Vibration isolation - types and methods of isolation - isolating materials and their properties.

TEXT BOOKS:
1. Hand Book of Machine Foundations by S. Srinivasulu and Vaidganathan.
2. Soil Mechanics & Foundation Engineering by B.C.Punmia.
3. Analysis and Design of Foundation and retaining structures-Sham Sher Prakets, Etal.

REFERENCE BOOKS:
1. Vibration of Soils & Foundations - Richant Hall & Woods.

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	4	0	0	40	60	100	3
ADVANCED STRUCTURAL ANALYSIS							

UNIT-I
Unsymmetrical bending, flexural stresses due to bending in two planes, shear center, bending of unsymmetrical section.

UNIT-II
Bending of beams with large initial curvature. Application of analysis of hooks, bends and curved links, etc.

UNIT-III
Beams curved in plans loaded perpendicular to there plane, Fixed and continuous curved beams.

UNIT-IV
Theories of failure, Max stress theory, max shear stress theory, max strain theory, Von Mises &Trescas failure theories.

UNIT-V
Beams on Elastic foundation, Beams of unlimited length, Semi infinite lengths and finite lengths on elastic foundation.

UNIT-VI
Analysis deep beams, determination of stresses and deflection.

REFERENCE BOOKS:
1. Timoshenko S., "Strength of Materials Vol – I & II", CBS Publishers
2. Shames I. H., "Mechanics of Deformable Solids", Prentice Hall India
3.Boresi A. P., "Advanced Mechanics of Material", John Wiley & Sons.
4.Srinath L. S., " Advanced Mechanics of Solids", Tata McGraw Hill

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	0	0	6	40	60	100	3
ADVANCED STRUCTURAL ENGINEERING LABORATORY							

1. Mix design of concrete of different grades & using admixtures.
2. Tensile and Flexural strength of concrete of different grades.
3. Tensile strength of different types of steel rebars, rolled steel sections.
4. Testing of simply supported RCC beams for flexural failure
5. Testing of simply supported RCC beams for shear failure
6. Testing of RCC column
7. Non-destructive testing of concrete including rebound hammer and ultrasonic pulse method.
8. Permeability of concrete
9. Vibration analysis of beams and plates
10. Buckling load of struts.

ESSENTIAL READING:
1. A.M. Neville & J.J. Brooks, Concrete Technology, Pearson Education, Delhi, 2004.
2. A.R. Santhakumar, Concrete Technology, Oxford University Press, 2007, New Delhi

SUPPLEMENTARY READING:
1. Structural Engineering laboratory manual.
2. Relevant BIS Codes of practice for mix design, rebar testing, concrete design etc.

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	4	0	0	40	60	100	3
FINITE ELEMENT METHOD							

Course objectives:

- To make students to learn principles of Analysis of Stress and Strain,
- To apply the Finite Element Method for the analysis of one and two dimensional problems
- To evaluate the stress and strain parameters and their inter relations of the continuum.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of stress-strain behaviour of continuum
- Design and develop analytical skills.
- Describe the state of stress in a continuum
- Understand the concepts of elasticity and plasticity.

UNIT-I

Basic concepts of elasticity – Kinematic and Static variables for various types of structural problems – approximate method of structural analysis – Rayleigh – Ritz method – Finite difference method – Finite element method. Variation method and minimization of Energy approach of element formulation.

UNIT-II

Principles of finite element method – advantages & disadvantages – Finite element procedure. Finite elements used for one, two & three dimensional problems – Element aspect ratio – mesh refinement vs. higher order elements – Numbering of nodes to minimize band width.

UNIT-III

Nodal displacement parameters – Convergence criterion – Compatibility requirements – Geometric invariance – Shape function – Polynomial form of displacement function. Generalized and Natural coordinates – Lagrangian interpolation function – shape functions for one, two & three dimensional elements.

UNIT-IV

Isoparametric elements - Internal nodes and higher order elements – Serendipity and Lagrangian family of Finite Elements – Sub parametric and Super parametric elements – Condensation of internal nodes – Jacobian transformation Matrix. Development of strain – displacement matrix and stiffness matrix, consistent load vector, numerical integration.

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UNIT-V

Application of Finite Element Method for the analysis of one & two dimensional problems - Analysis of simple beams and plane trusses – Application to plane stress / strain axisymmetric problems using CST & Quadrilateral Elements.

UNIT-VI

Application to Plates & Shells- Choice of displacement function (C 0 , C 1 and C 2 type) – Techniques for Non – linear Analysis.

REFERENCE BOOKS:

1. Krishnamoorthy C S, "Finite Element Analysis"- Tata McGraw Hill
2. Desai C and Abel J F, "Introduction to the Finite Element Method"- East West Press Pvt. Ltd., 1972 3. Bathe K J, "Finite Element Procedures in Engineering Analysis"- Prentice Hall
4. Rajasekaran. S, "Finite Element Analysis in Engineering Design"-Wheeler Publishing
5. Cook R D, Malkan D S &Plesta M.E, "Concepts and Application of Finite Element Analysis" - 3 rd Edition, John Wiley and Sons Inc., 1989
6. Shames I H and Dym C J, "Energy and Finite Element Methods in Structural Mechanics"- McGraw Hill, New York, 1985

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	4	0	0	40	60	100	3
EARTHQUAKE RESISTANT DESIGN							

Course objectives:

- To make students to learn principles of engineering seismology,
- To design the reinforced concrete buildings for earthquake resistance.
- To evaluate the seismic response of the structures.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of engineering seismology
- Design and develop analytical skills.
- Summarize the Seismic evaluation and retrofitting of structures.
- Understand the concepts of earthquake resistance of reinforced concrete buildings.

UNIT-I

Introduction to engineering seismology, Geological and tectonic features of India, Origin and propagation of seismic waves, characteristics of earthquake and its quantification –Magnitude and Intensity scales, seismic instruments.

UNIT-II

Earthquake Hazards in India, Earthquake Risk Evaluation and Mitigation. Structural behavior under gravity and seismic loads, Lateral load resisting structural systems, Requirements of efficient earthquake resistant structural system, damping devises, base isolation systems.

UNIT-III

The Response history and strong motion characteristics. Response Spectrum – elastic and inelastic response spectra, tripartite (D-V-A) response spectrum, use of response spectrum in earthquake resistant design.Computation of seismic forces in multi-storeyed buildings – using procedures (Equivalent lateral force and dynamic analysis) as per IS-1893.

UNIT-IV

Structural Configuration for earthquake resistant design, Concept of plan irregularities and vertical irregularities, Soft storey, Torsion in buildings. Design provisions for these in IS-1893. Effect of infill masonry walls on frames, modelling concepts of infill masonry walls. Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, Slenderness concept of masonry walls, concepts for earthquake resistant masonry buildings – codal provisions.

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UNIT-V

Design of Reinforced concrete buildings for earthquake resistance-Load combinations, Ductility and energy absorption in buildings.confinement of concrete for ductility, design of columns and beams for ductility, ductile detailing provisions as per IS-1893. Structural behaviour, design and ductile detailing of shear walls.

UNIT-VI

Seismic response control concepts – Seismic demand, seismic capacity, Overview of linear and nonlinear procedures of seismic analysis. Performance Based Seismic Engineering methodology, Seismic evaluation and retrofitting of structures.

REFERENCE BOOKS:

1. Dynamics of Structures – Theory and Application to Earthquake Engineering- 2nd ed. – Anil K. Chopra, Pearson Education.
2. Earthquake Resistant Design of Building Structures, Vinod Hosur, WILEY (India)
3. Earthquake Resistant Design of Structures, Duggal, Oxford University Press
4. Earthquake resistant design of structures - Pankaj Agarwal, Manish Shrikande - PHI India
5. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993
6. Design of Earthquake Resistant Buildings, Minoru Wakabayashi, McGraw Hill Pub.
7. Seismic Design of Reinforced Concrete and Masonry Buildings, T Paulay and M J N Priestley, John Wiley and Sons

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	4	0	0	40	60	100	3
STABILITY OF STRUCTURES							

Course objectives:

- To make students to learn principles of stability of structures,
- To analyse the structural elements for stability.
- To evaluate the use of strain energy in plate bending and stability.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of strength and stability
- Design and develop analytical skills.
- Appraise the Stability analysis by finite element approach.
- Understand the concepts of Lateral buckling of beams.

UNIT-I

Beam – column – Differential equation. Beam column subjected to (i) lateral concentrated load, (ii) several concentrated loads, (iii) continuous lateral load. Application of trigonometric series, Euler's formulation using fourth order differential equation for pined – pined, fixed – fixed, fixed – free and fixed – pinned column.

UNIT-II

Buckling of frames and continuous beams.Elastica.Energy method – Approximate calculation of critical loads for a cantilever. Exact critical load for hinged – hinged column using energy approach.Buckling of bar on elastic foundation. Buckling of cantilever column under distributed loads. Determination of critical loads by successive approximation.Bars with varying cross section.Effect of shear force on critical load. Column subjected to non – conservative follower and pulsating forces.

UNIT-III

Stability analysis by finite element approach – deviation of shape function for a two nodded Bernoulli – Euler beam element (lateral and translation of) – element stiffness and element geometric stiffness matrices – assembled stiffness and geometric stiffness matrices for a discretised column with different boundary condition – calculation of critical loads for a discretised (two elements) column (both ends built in). Buckling of pin jointed frames (maximum of two active dof) – symmetrical single bay portal frame.

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UNIT-IV

Lateral buckling of beams – differential equation – pure bending – cantilever beam with tip load – simply supported beam of I section subjected to central concentrated load. Pure Torsion of thin – walled bars of open cross section. Non – uniform Torsion of thin – walled bars of open cross section.

UNIT-V

Expression for strain energy in plate bending with in plate forces (linear and non – linear). Buckling of simply supported rectangular plate – uniaxial load and biaxial load.

UNIT-VI

Buckling of uniformly compressed rectangular plate simply supported along two opposite sides perpendicular to the direction of compression and having various edge condition along the other two sides.

REFERENCE BOOKS:

1. Stephen P.Timoshenko, James M Gere, "Theory of Elastic Stability"-2nd Edition, McGraw – Hill, New Delhi.
2. Robert D Cook et.al, "Concepts and Applications of Finite Element Analysis"-3rd Edition, John Wiley and Sons, New York.
3. S.Rajashekar, "Computations and Structural Mechanics"-Prentice – Hall, India.
4. Ray W Clough and J Penzien, "Dynamics of Structures" - 2nd Edition, McGraw Hill, New Delhi
5. H.Zeiglar, "Principles of Structural Stability"-Blaisdall Publication

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	4	0	0	40	60	100	3
Theory of Plates and Shells							

Course objectives:

- The objectives of this course is to make students to learn different methods of analysis of plates and shells,
- To critically detail the plates and shells.
- To evaluate the performance of spatial structures.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge ofanalysis and development of problem solving skills.
- Understand the principles of Analysis and Design
- Analyse and develop analytical skills.
- Summarize the performance of shells
- Understand the concepts of energy principle..

UNIT-I

Introduction: Assumptions in the theory of thin plates – Pure bending ofPlates – Relations between bending moments and curvature - Particular cases of pure bending ofrectangular plates,

UNIT-II

Cylindrical bending - immovable simply supported edges – Synclastic bending and Anticlastic bending – Strain energy in pure bending of plates in Cartesian and polarco-ordinates – Limitations.

UNIT-III

Laterally Loaded Circular Plates:- Differential equation of equilibrium – Uniformly loaded circular plates with simply supported and fixed boundary conditions – Annular plate with uniform moment and shear force along the boundaries.Laterally Loaded Rectangular Plates: - Differential equation of plates – Boundary conditions

UNIT-IV

Navier solution for simply supported plates subjected to uniformly distributed load and point load – Levy's method of solution for plates having two opposite edges simply supported with various symmetrical boundary conditions along the other two edges loaded with u. d. l. – Simplysupported plates with moments distributed along the edges - Approximate Methods. Effect of transverse shear deformation - plates of variable thickness – Anisotropic plates-thickplates, orthotropic plates and grids - Large Deflection theory.

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UNIT-V

Deformation of Shells without Bending:- Definitions and notation, shells in the form of a surfaceof revolution, displacements, unsymmetrical loading, spherical shell supported at isolated points,membrane theory of cylindrical shells, the use of stress function in calculating membrane forcesof shells.

UNIT-VI

General Theory of Cylindrical Shells:- A circular cylindrical shell loaded symmetrically with respect to its axis, symmetrical deformation, pressure vessels, cylindrical tanks, thermal stresses,in extensional deformation, general case of deformation, cylindrical shells with supported edges,approximate investigation of the bending of cylindrical shells, the use of a strain and stressfunction, stress analysis of cylindrical roof shells.

Text Books:

1. S.P Timoshenko and S.W Krieger, Theory of Plates and Shells, McGraw Hill, 1989.

Reference Books:

1. R. Szilard, Theory and Analysis of Plates – Classical Numerical Methods', Prentice Hall inc, 1974.
2. P.L Gould, Analysis of Shells and Plates, Springer-Verlag, New York, 1988.

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	4	0	0	40	60	100	3
DESIGN OF CONCRETE BRIDGES							

Course Objectives:

The objectives of this course is

- To make students to learn principles of Structural Design,
- To design different types of structures and to detail the structures.
- To evaluate performance of the structures.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Explain the Bridge substructures and superstructures
- Design and develop analytical skills.
- Summarize the principles of design and detailing of bridges
- Understands the different types of bridges.

UNIT-I

Introduction: Historical Developments, Site Selection for Bridges, Classification of Bridges Forces on Bridges. Bridge substructures: Abutments, piers and wing walls Balanced Cantilever Bridge: Introduction and proportioning of components, Design of simply supported portion and design of cantilever portion, design of articulation.

UNIT-II

Box Culvert: Different Loading Cases IRC Class AA Tracked, Wheeled and Class A Loading, working out the worst combination of loading, Moment Distribution, Calculation of BM & SF, Structural Design of Slab Culvert, with Reinforcement Details.

UNIT-III

T Beam Bridge Slab Design: Proportioning of Components Analysis of interior Slab & Cantilever Slab Using IRC Class AA Tracked, Wheeled Class A Loading, Structural Design of Slab, with Reinforcement Detail.

UNIT-IV

T Beam Bridge Cross Girder Design: Analysis of Cross Girder for Dead Load & Live Load Using IRC Class AA Tracked, Wheeled Class A Loading A Loads, Structural Design of Beam, with Reinforcement Detail.

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UNIT-V

T Beam Bridge Main Girder Design: Analysis of Main Girder for Dead Load & Live Load Using IRC Class AA Tracked, Wheeled Class A Loading Using COURBON'S Method. Analysis of Main Girder Using HENDRY-JAEGER and MORICELITTLE Method for IRC Class AA Tracked vehicle only, BM & SF for different loads, Structural Design of Main Girder With Reinforcement Details.

UNIT-VI

PSC Bridges: Introduction to Pre and Post Tensioning, Proportioning of Components, Analysis and Structural Design of Slab, Analysis of Main Girder using COURBON's Method for IRC Class AA tracked vehicle, Calculation of pre-stressing force, cable profile and calculation of stresses, Design of End block and detailing of main girder.

REFERENCE BOOKS:

1. "Essentials of Bridge Engineering"- D Johnson Victor, Oxford & IBH Publishing Co New Delhi
2. "Design of Bridges"- N Krishna Raju, Oxford & IBH Publishing Co New Delhi
3. "Principles and Practice of Bridge Engineering"- S P BindraDhanpat Rai & Sons New Delh
4. IRC 6 – 1966 "Standard Specifications And Code Of Practice For Road Bridges"- Section II Loads and Stresses, The Indian Road Congress New Delhi
5. IRC 21 – 1966 "Standard Specifications And Code Of Practice For Road Bridges"- Section III Cement Concrete (Plain and reinforced) The Indian Road Congress New Delhi
6. IS 456 – 2000 "Indian Standard Plain and Reinforced Concrete Code of Practice"- (Fourth Revision) BIS New Delhi
7. IS 1343 – "Indian Standard Prestressed Concrete Code of Practice"- BIS New Delhi
8. Raina V.K., "Concrete Bridge Practice"- Tata McGraw Hill
9. Bakht B &Jaeggar, "Bridge Analysis Simplified"- McGraw Hill
10. Ponnuswamy .S, "Bridge Engineering"- Tata McGraw Hill.
11. Derrick Beckett, "An Introduction to Structural Design of Concrete Bridges"- Surrey University Press

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I M.TECH-IISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
GEOTECHNICAL EARTHQUAKE ENGINEERING							

Course outcomes:

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

- demonstrate the principles of earthquake loading
- quantify earthquake intensity and ground motion
- estimate seismic soil design parameters
- analyse and design seismic resistant foundation for buildings
- prepare soil risk and micro-zonation maps

Course objectives:

- To explain the mechanism of earthquake and its related causes to build structures and in-situ soils
- To explain how ground motion is recorded and how do quantify the earthquake intensity and frequency related parameters
- To explain how seismic site investigation will be done and seismic soil design parameters are estimated
- To explain how seismic resistant design of foundation will be done and also explain the concept of liquefaction and related causes including codal recommendations
- To explain how to do hazard assessment and mitigation and explain how do prepare a risk and microzonation mapping

UNIT-I

Seismology and Earthquakes:Introduction, Seismic Hazards, seismic waves, internal structure of earth, Continental drift and plate tectonics, faults, elastics rebound theory, geometric notations, location of earthquakes, size of earthquakes.

UNIT-II

Strong Ground Motion:Strong ground motion measurement, ground motion parameters, estimation of ground motion parameters.

UNIT-III

Seismic Hazard Analysis:Identification and Evaluation of Earthquake Sources, deterministic seismic hazard analysis, probabilistic seismic hazard analysis.

UNIT-IV

Wave propagation:Waves in unbounded media, waves in a semi – infinite body, waves in a layered media, attenuation of stress waves.

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UNIT-V

Dynamic soil properties: Measurement of dynamic soil properties using field and laboratory tests (overview), stress strain behavior of cyclically loaded soils, strength of cyclically loaded soils.Ground Response AnalysisOne – Dimensional Ground response Analysis – Linear and Non-Linear Approaches. Local Site Effects: Effect of local site conditions on ground motion, design parameters, development of design parameters.

UNIT-VI

Liquefaction:Flow liquefaction, cyclic mobility, evaluation of liquefaction hazards, liquefaction susceptibility, initiation of liquefaction, effects of liquefaction.
Soil Improvement for Remediation of Seismic Hazards:Densification techniques, Reinforcement Techniques, Grouting and Mixing techniques, Drainage techniques.

TEXT BOOKS:

1. Geotechnical Earthquake Engineering by Steven L. Kramer, prentice Hall, 1st edition, 1996.

REFERENCE BOOKS:

1. Geotechnical Earthquake Engineering Handbook by Robert W. Day, McGraw-Hill. 2nd edition, 2010.

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	4	0	0	40	60	100	3
ADVANCED REINFORCED CONCRETE DESIGN							

Course Objectives:

The objectives of this course is

- To make students to learn principles of Structural Design,
- To design different types of structures and to detail the structures.
- To evaluate performance of the structures.

Course Outcomes:

On completion of this course, students are able to

- Achieve Knowledge of design and development of problem solving skills.
- Understand the principles of Structural Design
- Design and develop analytical skills.
- Summarize the principles of Structural Design and detailing
- Understands the structural performance.

UNIT-I

Yield line method of design of slabs. Design of flat slabs.

UNIT-II

Design of grid floors.

UNIT-III

Design of continuous beams with redistribution of moments.

UNIT-IV

Design of Chimneys,

UNIT-V

Design of silos and bunkers.

UNIT-VI

Art of detailing earthquake resistant structures. Expansion and contraction joints

REFERENCE BOOKS:

1. A Park and Paulay, "Reinforced Reinforced and Prestressed Concrete"
2. Lin TY and Burns N H, "Reinforced Concrete Design".
3. Kong KF and Evans T H "Design of Prestressed Concrete Structures
4. P.C.Varghese, "Advanced Reinforced Concrete Design", Prentice-Hall of India, New Delhi, 2005.
5. Dr.B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Comprehensive RCC Design"

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	4	0	0	40	60	100	3
EXPERIMENTAL STRESS ANALYSIS							

Course Objectives:

- This subject is taught to impart knowledge about the instruments and its applications.

Course Outcomes:

Upon completion of this course, the student will be able to

- Know the working principle of strain gauges.
- Do the model analysis using different theorems.
- Know the concepts of photo elasticity and its applications.
- Use the various Non-destructive testing methods.

UNIT-I

Basic equations and Plane Elasticity Theory: Introduction, Strain equations of Transformation, Compatibility, Stress-Strain Relations-Two dimensional State of Stress. The Plane-Elastic problem, The Plane-Strain Approach, Plane Stress, Airy's Stress function-Cartesian Co-ordinates

UNIT-II

Two dimensional problems in Polar Co-ordinates, Polar Components of Stress in terms of Airy's Stress function, Forms. Principles of Experimental Approach: Merit of Experimental Analysis introduction, uses of experimental stress analysis-Advantages of experimental stress analysis, Different methods, Simplification of problems.

UNIT-III

Strain Measurement using Strain Gauges: Definition of strain and its relation to Experimental Determinations, properties of strain-gauge systems, Types of strain gauges, Mechanical and Optical strain gauges. Electrical Strain Gauges - Introduction, LVDT - resistance strain gauge - various types - gauge factor, Materials for adhesion base, etc. Strain Rosettes: Introduction, The three element rectangular Rosette - The delta rosette - Corrections for Transverse strain effects.

UNIT-IV

Brittle Coating Method: Introduction, Coating stresses - Failure theories - Brittle coating Crack pattern - Crack detection - Types of Brittle coating - Test procedures for brittle coating analysis - Calibration procedures - Analysis of brittle coating data.

UNIT-V

Theory of Photo Elasticity: Introduction, Temporary double refraction - The stress optic law - Effects of stressed model in a Polaris cope for various arrangements - Fringe sharpening, Brewster stress optic law.

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UNIT-VI
Two Dimensional Photo Elasticity: Introduction, Isochromatic Fringe patterns - Isoclinic fringe patterns, passage of light through plane Polaris cope and circular Polaris cope, Isoclinic fringe pattern - Compensation techniques - calibration methods, separation methods, scaling Model to Proto type stress- Materials for photo - elasticity, properties of photo elastic materials.

REFERENCEBOOKS :

1. Experimental Stress Analysis by J.W.Dally and W.F.Riley
2. Experimental Stress Analysis by Dr. Sadhu Singh
3. Experimental Stress Analysis by Dove and Adams

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	4	0	0	40	60	100	3
PLASTIC ANALYSIS & DESIGN							

Course Objectives:

- To familiarize on plastic behaviour , plastic moment & plastic mechanism of steel structures like simple beams & portal frames.
- To design simple beams continuous beams & portal frames
- Introduction to stability

Course Outcomes:

Upon completion of this course, the student will be able to

- Develop confidence levels in understanding the plastic analysis, plastic mechanism& apply to simple beams & frames
- Able to analyse minimum weight structures for stability

UNIT-I
Plastic behavior, review cures of structural steel, plastic moments, shape factors, load factors, plastic hinge, types of collapse, collapse mechanism, collapse load factor.

UNIT-II
Upper and lower bound, uniqueness theorems, principle of virtual work, statical method, minimum and maximum theorems, step by step method.

UNIT-III
Methods of release of restrains, load interacting diagrams, method of inequalities.

UNIT-IV
Plastic Moment Distribution applied to continuous beams & portal frames (Max. Two bays single storey)
Effect of Axial force & Shear force on plastic moment of resistance.

UNIT-V
Design of beams , continuous beams and portal frames up to two story-two bays.

UNIT-VI
Minimum weight analysis, introduction to stability.

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References

- Baker, J.F., Horne, M.R. and Heyman, J., The Steel Skeleton, Volume II,
- Plastic Behaviour and Design, Cambridge University Press, 1956.
- Heyman, J.,Beams and Framed Structures, 2nd Edn., Pergamon Press, 1974.
- Heyman, J., Elements of the Theory of Structures, Cambridge University Press, 1996.
- Hodge, P.G., Plastic Analysis of Structures, McGraw-Hill, New York, 1959.
- McKenzie, W.M.C., Examples in Structural Analysis, Taylor and Francis, Abington, 2006.
- Neal, B.G., Structural Theorems and their Applications, Pergamon Press, 1964.
- Thompson, F., and Haywood, G.G., Structural Analysis Using Virtual Work, Chapman and b
  Hall, 1986.
- Rees, D.W.A., Mechanics of Solids and Structures, Imperial College Press, London, 2000.

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	4	0	0	40	60	100	3
ADVANCED STEEL DESIGN							

Course Objectives:

- Structural steel design is as important as concrete design.
- The speed of construction in the case of steel structure is quite fast compared with concrete.
- Hence for industrial buildings steel is preferred to RCC.

Course outcomes:

- General principle in the design of steel structures
- Various types of connections
- Analysis and design of industrial structures
- Analysis and design of truss grader bridges
- Analysis and design of bunkers & silos

UNIT-I

Simple Connections –Riveted, Bolted Pinned And Welded Connections: Riveted connections- Bolted Connections- Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip – Critical Connections – Praying Action – Combined Shear and Tension for Slip- Critical Connections.

UNIT-II

Design of Groove welds- Design of Fillet Welds- Design of Intermittent fillet welds- Failure of Welds.

UNIT-III

Eccentric And Moment Connections: Introduction – Beams – Column Connections- Connections Subjected to Eccentric Shear – Bolted Framed Connections- Bolted Seat Connections – Bolted Brackete Connections. Bolted Moment Connections – Welded Framed Connections – Welded Brackete Connections - Moment Resistant Connections.

UNIT-IV

Analysis and Design of Industrial Buildings : Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Design of bracings.

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UNIT-V

DESIGN OF STEEL TRUSS GIRDER BRIDGES : Types of truss bridges, component parts of a truss bridge, economic proportions of trusses, self weight of truss girders, design of bridge compression members, tension members; wind load on truss girder bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing.

UNIT-VI

Design of Steel Bunkers and Silos Introduction – Janseen's Theory – Airy's Theory – Design of Parameters – Design Criteria – Analysis of Bins – Hopper Bottom –Design of Bins.

REFERENCES BOOKS:

1. Design of Steel Structures. P. Dayaratnam, Publisher : S. Chand, Edition 2011 – 12.
2. Design Steel Structures Volume – II, Dr. Ramachandra &VivendraGehlotScientitic Publishes Journals Department.
3. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Private Ltd. New Delhi.
4. Design of Steel Structures Galyord& Gaylord, Publisher ; Tata Mc Graw Hill, Education. Edition 2012. 5. Indian Standard Code – IS – 800-2007

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	4	0	0	40	60	100	3

MECHANICS OF COMPOSITE MATERIALS

Course Objectives:

- To study the behaviour of composite materials and to investigate the failure and fracture characteristics.

Course outcomes:

- On completion of this course students will have sufficient knowledge on behavior of variouscomposite materials and they have an idea of failure and fracture mechanisms.

UNIT-I

Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials- Homogeneous materials, composite materials.

UNIT-II

Macro mechanical Properties of composite Laminae: Introduction. Assumptions and Idealizations, Stress Strain relationships for composite Laminae- Isotropic, Orthotropic laminae, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminae. Macro mechanical Analysis of composite Laminae: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminac- Stress-Strain relationships in continuous, discontinuous fibre laminae, Strength characteristics of glass reinforced laminae- Strengths in continuous, discontinuous fibre laminae.

UNIT-III

Behaviour of Glass Fibre-Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites-Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites- Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates-uni-directionally and multi directionally continuously reinforced laminates, Discontinuously reinforced laminates – Stiffness and Strength properties.

UNIT-IV

GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive, mechanical, Combinational, Transformed sections.

UNIT-V

Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performanceModulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.

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UNIT-VI
Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

REFERENCE BOOKS:

1. GRP in Structural Engineering M.Holmes and D.J.Just.
2. Mechanics of Composite materials and Structures by ManjunathMukhopadhyay; Universities Press

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	4	0	0	40	60	100	3
ALTERNATIVE BUILDING MATERIALS							

Course Objectives:
- Introduce the students to the concept of low-energy and low-cost building, locally available materials and technologies

Course outcomes:
After a successful completion of the course, the student will be able to:
- The knowledge on use of different materials for walls,roofs and other building materials
- Their usage as alternative

UNIT-I
Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry. Environmental friendly and cost effective building technologies, Requirements for building of different climatic regions, Traditional building methods and vernacular architecture, Green building ratings – IGBC and LEED manuals – mandatory requirements.

UNIT-II
Alternative Masonry Units: Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks: mud blocks, steam cured blocks, Fal-G Blocks, stone masonry block LIME-POZZOLANA CEMENTS
Raw materials, Manufacturing process, Properties and uses.

UNIT-III
Fibre Reinforced Concrete Matrix materials, Fibers: metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibers: organic and synthetic, Properties and applications building materials from Agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications, Field quality control test methods.

UNIT-IV
FerrocementAndFerroconcreteProperties, Ferrocement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications Alternative Roofing Systems Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes.

UNIT-V
Structural Masonry Compressive strength of masonry elements, Factors affecting compressive strength, Strength of units, prisms / wallettes and walls, Effect of brick work bond on strength, Bond strength of masonry : Flexure and shear, Elastic properties of

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masonry materials and masonry, IS Code provisions, Design of masonry compression elements, Concepts in lateral load resistance.

UNIT-VI

Cost Effective Building Design Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

Equipment For Production Of Alternative Materials Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements

TEXT BOOKS:

"Alternative Building Materials and Technologies", KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao, New Age International pub.

REFERENCE BOOKS:

1. "Structural Masonry", Arnold W. Hendry
2. "Building materials in Developing Countries", RJS Spence and DJ Cook, Wiley pub. 1983
3. LEED India, Green Building Rating System, IGBC pub.
4. IGBC Green Homes Rating System, CII pub.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	6	40	60	100	3
CAD LABORATORY							

Development of Finite Element Programming for analysis of beams, trusses, frames.
Analysis of plates and shells using commercial softwares

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I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
PROGRAMMING WITH C (Common to ECE,EEE,CIVIL and Mechanical)							

Course Objectives:

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

Course Outcomes:

- Study and Understand basics of computer Hardware and Software.
- Study, Analyze and Understand logical structure of computer programming and different constructs to develop programs in C language.
- Understand and Analyze simple data structures and use of pointers and dynamic memory allocation technique.
- Create files and apply file I/O operations.

UNIT I:

INTRODUCTION: Computer systems, Hardware and Software Concepts,

Problem Solving: Algorithm / Pseudo code, flowchart, program development steps, computer languages: machine, symbolic and high-level languages, Creating and Running Programs: Writing, Editing (vi/emacs editor), Compiling (gcc), Linking and Executing in under Linux.

BASICS OF C: Structure of a C program, identifiers, basic data types and sizes. Constants, Variables, Arithmetic , relational and logical operators, increment and decrement operators, conditional operator, assignment operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

UNIT II:

SELECTION – MAKING DECISION: TWO WAY SELECTION: if-else, null else, nested if, examples, Multi-way selection: switch, else-if, examples.

ITERATIVE: loops- while, do-while and for statements, break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.

ARRAYS: Arrays- concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix.

STRINGS: concepts, c strings.

UNIT III:

FUNCTIONS- MODULAR PROGRAMMING: functions, basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs, Passing 1-D arrays, 2-D arrays to functions.

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UNIT IV:

POINTERS: pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT V:

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, program applications

UNIT VI:

FILE HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs

Text Books:

1. Programming in C, Reema Thareja, OXFORD.
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

Reference Books:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

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I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
			3	25	50	75	2
COMPUTER PROGRAMMING LAB (Common to ECE,EEE,CIVIL and Mechanical)							

Course Objective:

- The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

Course Outcomes:

After completion of this C Programming Lab, students should be able to:

- Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language.
- Know how to write, compile and debug programs in C Language.
- Understand and analyse data types, typecasting and operator precedence.
- Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.
- Explain and analyse simple data structures, use of pointers and dynamic memory allocation techniques.
- Summarize the role of functions involving the idea of modularity, know how to create files and apply file I/O operations.

Exercise I

a) Write an Algorithm, Flowchart and Program to calculate the area of triangle using the formula Area = (s (s-a) (s-b) (s-c)) 1/2 where s= (a+b+c)/2.
b) Write an Algorithm, Flowchart and Program to find the largest of three numbers using ternary operator.
c) Write an Algorithm, Flowchart and Program to swap two numbers without using a temporary variable.

Exercise 2

a) Write a C program to find the roots of a quadratic equation.
b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.
b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.
b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.
c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

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a) Write a C program to interchange the largest and smallest numbers in the array.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

Exercise 6

a) Write a C Program to find both the largest and smallest number of an array of integers
b) Write a C Program to find transpose of a matrix.

Exercise 7

Write C programs that use both recursive and non-recursive functions for the following
a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

Exercise 8

Write a C Program for the following.
a) To find Fibonacci sequence
b) Write C programs illustrating call by value and call by reference concepts.

Exercise 9

Write C Programs for the following string operations without using the built in functions - to concatenate two strings
a) To append a string to another string
b) To compare two strings

Exercise 10

Write C Programs for the following string operations without using the built in functions
a) To find the length of a string
b) To find whether a given string is palindrome or not

Exercise 11

Write a C program that uses functions to perform the following operations:
a) To insert a sub-string in to given main string from a given position.
b) To delete n Characters from a given position in a given string.
c) To replace a character of string either from beginning or ending or at a specified location

a) Write a C program to implement a linear search.
b) Write a C program to implement binary search
c) Write a C program to implement sorting of an array of elements

Exercise 13

a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two arrays using pointers
c) Write a C program to swap two numbers using pointers

Exercise 14

Examples which explores the use of structures, union and other user defined variables

Exercise 15

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a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

Text Books:

1. Programming in C, Reema Thareja, OXFORD
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed.

Reference Books:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.
2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Power Generation and Economic Aspects							

Course objectives:

- To study the principle of operation of different components of a thermal power stations.
- To study the principle of operation of different components of a Nuclear power stations.
- To study the concepts of DC/AC distribution systems and voltage drop calculations.
- To study the constructional and operation of different components of an Air and Gas Insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

Course Outcomes:

The student should be able to

- Identify the different components of thermal power plants.
- Identify the different components of nuclear Power plants.
- Distinguish between AC/DC distribution systems and also estimate voltage drops of distribution systems.
- Identify the different components of air and gas insulated substations.
- Identify single core and three core cables with different insulating materials.
- Analyse the different economic factors of power generation and tariffs

UNIT-I Thermal Power Stations

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: boilers, super heaters, economizers, electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT-II Nuclear Power Stations

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT-III Economic Aspects of Power Generation & Tariff

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, base and peak load plants.

Tariff Methods– costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

UNIT-IV Substations

Classification of substations:

Air Insulated Substations– indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and

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transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.

UNIT-V Underground Cables

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables: Grading of cables – capacitance grading and inter sheath grading.

UNIT-VI Distribution Systems

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases - radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution, comparison of DC and AC distribution.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New Age International (P) Limited, Publishers.

Reference Books:

1. Electrical Power Distribution Systems by V. Kamaraju, Tata Mc Graw Hill, New Delhi.
2. Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi.

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I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
			3	25	50	75	2

BASIC COMMUNICATION SKILLS LAB
(Common to All Branches)

Course Objectives:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication to enable them to interact with the people in various social situations.
- To enable the learners develop better pronunciation through emphasis on word accent, intonation and Rhythm.

Course Outcomes:

Learners should be able to

- Improve their basic communication skills to interact with peers and others in various social situations
- Speak English effortlessly with good pronunciation
- Take part in various conversations/discourses using the formal and informal expressions they have learned.

UNIT-1

a. Greeting, Introducing and Taking leave
b. Pure Vowels

UNIT-2

a. Giving information and Asking for information
b. Diphthongs

UNIT-3

a. Inviting, Accepting and Declining Invitations
b. Consonants

UNIT-4

a. Commands, Instructions and Requests
b. Accent and Rhythm

UNIT-5

a. Suggestions and Opinions
b. Intonation

Text Book:

1. Strengthen Your Communication Skills – Maruthi Publications, 2013.

Reference Books:

1. Personality Development and Soft Skills (Oxford University Press, New Delhi)
2. J.D.O Conner, Better English Pronunciation, Cambridge University Press 1980
3. T.Balasubramanian, A Text Book of English Phonetics for Indian Students, Macmillan, 1981
4. Sanjay Kumar, Pusph Latha, Communication skills, Oxford University Press 2005

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			3	25	50	75	2
ENGINEERING CHEMISTRY LAB (Common to All Branches)							

Course Objectives:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

Course Outcomes:

- On completion of this course, students will have the knowledge in, Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results, and
- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

LIST OF EXPERIMENTS

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

VOLUMETRIC ANALYSIS

1. Estimation of NaOH using standard HCl solution
2. Estimation of Mohr's salt using potassium dichromate ($K_2Cr_2O_7$) solution
3. Estimation of $CuSO_4$ using sodium thiosulphate ($Na_2S_2O_3$) solution.

WATER ANALYSIS

4. Determination of hardness of water sample by EDTA method
5. Determination of alkalinity of water sample
6. Determination of free chlorine in bleaching powder
7. Determination of turbidity of water sample

CONDUCTOMETRIC TITRATIONS

8. Conductometric titration between strong acid and strong base (HCl + NaOH)
9. Conductometric titration between mixture of acids and strong base (HCl and CH_3COOH + NaOH)

FOOD ANALYSIS

10. Estimation of Vitamin-C

PREPARATION OF POLYMERIC RESINS

11. Preparation of phenol formaldehyde resin
12. Preparation of urea formaldehyde resin

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Text Books:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications
4. Chemistry Practical Manual, Lorven Publications
5. Inorganic quantitative analysis, Vogel.

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			3	25	50	75	2
ENHANCING COMMUNICATION SKILLS LAB (Common to All Branches)							

Course Objectives:

1. To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
2. To make the students understand the importance of body language.
3. To develop positive attitude and soft skills to improve their employability quotient.
4. To expose the students to variety of a self-instructional, learner friendly, electronic media and stimulate intellectual faculties/resources

Course Outcomes:

Learners are able to

1. Give presentations and attend job interviews confidently.
2. Speak confidently in challenging situations.
3. Know the importance of Non-verbal communication and interpret nonverbal symbols
4. Face computer based competitive exams like GRE, TOFEL, and IELTS.
5. Unit-1: Body Language
6. Unit-2: Dialogues
7. Unit-3: Presentation Skills
8. Unit-4: Group Discussion
9. Unit-5: Interviews and Telephonic Interviews
10. Unit-6: Debates

Text Book:

Strengthen your Communication Skills by Maruthi Publications, 2013

Reference Books:

1. *Personality Development and Soft Skills* (Oxford University Press, New Delhi)
2. M Ashraf Rizvi, *Effective Technical Communication skills*, McGraw-Hill, 2005
3. Barun K Mitra, *Personality Development and Soft Skills,* Oxford University Press, 2011
4. Konar N, *Communication Skills for Professionals,* PHI Learning Private Limited, 2011

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	0	0	3	25	50	75	2
ELECTRICAL AND IT WORKSHOP LAB							

ELECTRICAL WORK SHOP LABORATORY

Course Objectives:

- Know various wiring connections.
- Know how to make circuit boards
- Practice Lamp Circuits.

Course Outcomes:

- Getting knowledge on wiring connections.
- Getting knowledge on various lamp circuit connections.
- Getting knowledge on soldering of devices.

LIST OF EXPERIMENTS

1. One lamp controlled by one switch.
2. Two lamps controlled by two independent switches.
3. One lamp controlled by one switch and provision of 2/3 plug socket with switch control.
4. Stair case wiring.
5. Godown wiring.
6. Soldering and de soldering of simple electrical devices.
7. Practicing of resistance measurement.
8. House wiring (wiring of energy meter, main switch board and one sub circuit).
9. Wiring of fluorescent lamp.
10. Two lamps controlled by one switch.
11. Wiring of mercury vapour lamp.
12. Series and parallel connection of lamps (DIM&BRIGHT).

IT WORKSHOP LAB

Course Objectives:

- Enabling the student to understand basic hardware and software tools through practical exposure.

Course Outcomes:

After completion of this course, the students gain

- Knowledge on computer system such as system unit, input devices, output devices connected to the computer.
- Knowledge to understand the booting process and loading of the operating system, and getting it ready for use.
- Knowledge to understand the working of the internet that includes the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.
- Knowledge to familiarize with parts of Word window, Excel window and PowerPoint.

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SYLLABUS:

1. PC Hardware:
Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Troubleshooting Hardware and Software some tips and tricks.

2. Internet & World Wide Web:
Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber-attacks.

3. Productivity tools: Crafting professional word documents; excel spread sheets, power point presentations and personal websites using the Microsoft suite of office tools.
(Note: Student should be thoroughly exposed to minimum of 12 Tasks)

4. PC Hardware
Task a: Identification of the peripherals of a computer.
To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.
Task b: (Optional): A Practice on disassembling the components of a PC and assembling them to back to working condition.
Task c: Examples of Operating Systems- DOS, MS Windows, Installation of MS windows on a PC
Task d: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

Task e:
Hardware Troubleshooting (Demonstration): Identification of a problem and fixing a defective PC (improper assembly or defective peripherals).
Software Troubleshooting (Demonstration): Identification of problem and fixing the PC for any software issues.

5. Internet & Networking Infrastructure
Task: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.

6. Orientation & Connectivity Boot Camp and Web Browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task: Search Engines & Netiquette:
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.
Task: Cyber Hygiene (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced.

7. Word
Task a: MS Word Orientation:

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Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

Task b : Creating Project : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

8. Excel

Task a: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.

Task b: Creating Scheduler - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task c: LOOKUP/VLOOKUP

Task d: Performance Analysis: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

9. Power Point

Task a: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Task b: Focusing on the power and potential of Microsoft power point Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

10. UNIX Commands

11. Algorithms

12. Flowcharts

Text Books:

1. Computer Fundamentals, Anita Goel, Pearson
2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller QUE, Pearson, 2008
3. Information Technology Workshop, 3e, G Praveen Babu, M V Narayana BS Publications.
4. Comdex Information Technology, Vikas Gupta, dreamtech

Reference Books:

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Venkateswarlu.
2. How to solve it by Computer, R.G. Dromey, PHI.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electrical Circuit Analysis - II							

Course Objectives:

- To study the concepts of balanced &unbalanced three-phase circuits
- To study the transient behavior of electrical networks with DC and AC excitations.
- To study the performance of a network based on input and output excitation/response.
- To study the basic concepts of different types of filters.
- To understand the application of Fourier series and Fourier transforms for analysis of electrical circuits.

Course Outcomes:

Students are able to

- Solve three- phase circuits under balanced & unbalanced condition.
- Find out transient response of electrical networks with different types of excitations.
- Estimate the different types of two port network parameters.
- Design k and m filters.
- Extract different harmonics components from the response of electrical network.

UNIT-I: Balanced three phase circuits

Poly phase system - Advantages of a three phase system - Generation of three phase voltages- Phase sequence - star and delta connection - Relation between line and phase voltages and currents in balanced systems - Analysis of balanced three phase circuits - Three phase four wire supply connected to balanced star connected load - Three phase three wire supply connected to balanced star connected load - Three phase three wire supply connected to balanced delta connected load - Measurement of active and reactive power in balanced three phase systems.

UNIT-II: Unbalanced Three phase circuits

Analysis of three phase unbalanced circuits: Three phase four wire supply connected to unbalanced star connected load - Three phase three wire supply connected to unbalanced star connected load- Loop method - Star-Delta transformation technique -Three phase three wire supply connected to unbalanced delta connected load - Three wattmeter method and Two wattmeter methods for measurement of three phase power - Power factor by Two wattmeter method.

UNIT-III: Transient Analysis in DC and AC circuits

Steady state and transient response of a circuit - Transient response of R-L, R-C, R-L-C circuits for DC and AC excitations - Solution using differential equations and Laplace transforms.

UNIT-IV: Two Port Networks

Two Port network - Z parameters - Y parameters - Transmission line parameters - h- parameters - Inverse h parameters - Inverse Transmission line parameters - Relationship between parameter sets - T and π representation - series connection of two port networks - Parallel connection of two port networks - Cascading of two port networks - Lattice Network.

UNIT-V: Filters

Classification of Filters - Low pass filter - High pass filter - Band pass filter - Band elimination filter - Filter networks - Equations of Filter networks - T network-Propagation constant of T network - π network - Propagation constant of π network - Classification of Pass band and stop

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band - characteristic Impedance in the Pass and Stop bands - Constant-K Low pass Filter - Constant-K high pass Filter - m Derived T-section - m Derived low pass filter - m Derived high pass filter - Band pass filter - Band elimination Filter.

UNIT-VI: Fourier analysis and Transforms

Fourier theorem -Trigonometric form and exponential form of Fourier series-Conditions of symmetry- line spectra and phase angle spectra, Analysis of electrical circuits to non- sinusoidal periodic waveforms - Fourier integrals and Fourier transforms - properties of Fourier transforms and application to electrical circuits.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw HillCompany,6th edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.
3. Electric Circuit Analysis-II by A Sudhakar and Shyammohan S Palli, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Introduction to circuit analysis and design by TildonGlisson. Jr,Springer Publications.
2. Circuits by A.Bruce Carlson, Cengage Learning Publications.
3. Network Theory by N.C.Jagan & C.Lakshminarayana, Anshan publications.
4. Networks and Systems by D. Roy Choudhury, New Age International publishers.
5. Electric Circuits by David A. Bell, Oxford publications.
6. Circuit Theory (Analysis and Synthesis) by A.chakrabarthi, DhanpatRai&co.

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	3	1	0	40	60	100	3
Fluid Mechanics and Prime Movers							

Course Outcomes:

At the end of this course student will be ability to

- Learn the concept of fluid and its properties, the basic laws of fluids
- Get the knowledge of fluid kinematics and dynamics to solve the problems.
- Understand the concept of flow through pipes.
- Understand the working of different kinds of pumps.
- Understand the working of different kinds of turbines.
- Understand the concepts of hydro power generation.

UNIT I: Fluid Statics

Dimensions and units: physical properties of fluids- specific gravity, viscosity, surface tension, vapour pressure and their influence on fluid motion- measurement of pressure- Piezometer, manometry.

UNIT II: Fluid Kinematics & Fluid Dynamics

FLUID KINEMATICS: stream line, path line and streak lines and stream tube, classification of flows – steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, and irrational flows. Equation of continuity for one dimensional flow;

FLUID DYNAMICS: Surface and body forces, Euler's and Bernoulli's equations for flow along a stream line, applications.

UNIT III: Closed Conduit Flow

Reynolds's experiment, Minor losses in pipes, pipes in series and pipes in parallel, Measurement of flow: Pitot tube, venturimeter and orifice meter.

UNIT IV: Impact of Jets and Pumps

Impact of jets: Impulse momentum equation, Impact of Jet on stationary and moving vanes both flat and curved.

Pumps: Types of pumps, Centrifugal pump: components, working principle, Multi staging.

UNIT V: Hydraulic Turbines

Classification of turbines; Working principle, Efficiency calculation and Design principles for Pelton Wheel, Francis and for Kaplan turbines

UNIT VI: Hydro Power

Components of Hydroelectric power plant: pumped storage systems, load curve, load factor, capacity factor, utilization factor, diversity factor, load duration curve.

Text Books:

1. Hydraulics & Fluid Mechanics by P.N. Modi and S.M. Seth, Standard Book House, New Delhi.
2. Fluid Mechanics & Hydraulic Machinery by R.K.Bansal, Lakshmi Publications.
3. Fluid Mechanics & Hydraulic Machinery by A.K.Jain, Khanna Publishers, Delhi.

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Reference Books:

1. Fluid Mechanics, by Victor. L. Streeter, TMH Publishers.
2. Introduction to Fluid Mechanics by Edward .J. &Shaughnessy Jr., Oxford University Press, 2005.
3. Fluid Mechanics & Fluid power Engineering by Dr D.S. Kumar, Sk.Kataria and Sons Publishers.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electronic Devices and Circuits							

Course Objectives:

Students undergoing this course are expected to

- Know the properties of semiconductor materials.
- Understand the operation and principles of P-N diode and special diodes.
- Understand various types of rectifiers and filters.
- Know the working of BJT and need for transistor biasing and stabilization.
- Know the working of FET and other Transistors.

Course Outcomes:

After completion of the course, students will be able to

- Explore the semiconductors.
- Use P-N diodes and special diodes in electronic circuits.
- Analyze BJT and its thermal stability.
- Explore the operation of FET, other transistors and their applications.

UNIT-I: Overview of Semiconductors

Insulators, Semiconductors and Metals – Classification using Energy gap, Intrinsic and Extrinsic Semiconductors – Electrons and Holes, Conductivity, Mobility, Drift and Diffusion Currents, Transportation of Charge Carriers - Generation and Recombination of Carriers, Charge Densities in Semiconductors, Hall Effect - Quantitative Analysis and Applications, Continuity Equation, Mass Action Law, Einstein's Equation, Fermi level in intrinsic and extrinsic semiconductors.

UNIT- II: Junction Diode Characteristics

P-N Junction Diode - Formation of P-N Junction, Open Circuited P-N Junction, Biased P-N Junction-Forward Bias, Reverse Bias, Current Components in PN Junction Diode, Law of Junction, Diode Current Equation-Quantitative Analysis, V-I Characteristics of Diode- Forward Bias, Reverse Bias, Breakdown in P-N Junction Diode, Temperature Dependence on V-I Characteristics, Diode Resistance-Static Resistance, Dynamic Resistance, Reverse Resistance, Diode Capacitance-Transition Capacitance, Diffusion Capacitance, Energy Band Diagram of PN Junction Diode.

UNIT- III: Special Diodes and Rectifiers

Zener Diode-V-I Characteristics, Applications, Breakdown Mechanisms - Zener Breakdown and Avalanche Breakdown, Construction, Operation, Characteristics and applications of LED, LCD, Photodiode, Varactor Diode and Tunnel diode. Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, L– Section and π- Section, Derive and compare rectifier parameters with and without filter.

UNIT- IV: Bipolar Junction Transistor (BJT)

Bipolar Junction Transistor – Types, Symbols and Operation, Transistor Current Components, Transistor Equation - Relation among I_C, I_B, I_{CBO}, Transistor Configurations - CB, CE and CC, Transistor as a switch, Transistor switching times, Transistor as an Amplifier, Characteristics of Transistor in Common Base Configuration, Common Emitter and Common Collector Configurations - Input and output characteristics, Early effect, Transistor parameters, Current amplification factor, Relation among α, β, and γ, Comparison of CB, CE and CC Configurations, Punch Through/ Reach through, Typical transistor junction voltage values, Photo Transistor.

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UNIT- V: BJT Biasing

Need For Biasing, Operating Point, Load Line Analysis-D.C. Load Line, A.C. Load Line, Biasing - Methods, Basic Stability, Fixed Bias, Collector-to-base Bias and Self Bias.

UNIT- VI: FET& other Transistors

FET Types and Symbols - JFET and MOSFET/IGFET, JFET: N-Channel and P-Channel Construction, Operation, Characteristics - Drain and Transfer, Parameters-Drain Resistance, Amplification factor, Transconductance, Pinch- offvoltage, MOSFET - Types-Depletion MOSFET - N Channel and P Channel, Enhancement MOSFET- N-Channel and P-Channel, Construction, Operation, Characteristics - Transfer and Drain Characteristics for Depletion and Enhancement Modes , Comparison between JFET and MOSFET. SCR- Symbol, Two- Transistor version, UJT-Negative Resistance Property and Applications.

Text Books:

1. Electronic Devices and Circuits – J. Millman, C. Halkias, Tata McGraw-Hill, Third Edition, 2010.
2. Electronic Devices and Circuits – Allen Mottershed, PHI, 2011.
3. Electronic Devices and Circuits–Salivahanan, N. Suresh Kumar, A. Vallavaraj, Tata McGraw-Hill, Second Edition, 2008.

References Books:

1. Integrated Electronics– Jacob Millman, C. Halkies, C.D. Parikh, SatyabrataJit, Tata McGraw-Hill, Second Edition, 2011.
2. Electronic Devices and Circuit Theory– R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
3. Electronic Devices and Circuits – A.P. Godse and U.A. Bakshi, Technical Publications, First Edition, 2009.

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	3	1	0	40	60	100	3
Complex Variables and Statistical Methods							

Course Objectives:

The emphasis will be on gaining a geometric understanding of complex analytic functions as well as developing computational skills in employing the powerful tools of complex analysis for solving theoretical and applied problems. The fundamental concepts of probability and statistics to develop and understanding the role of statistics in engineering.

Course Outcomes:

Upon successful completion of the course, the students should be able to

- Apply mathematical reasoning and the theory of complex variables to solve theoretical and applied problems.
- Calculate fundamental concepts such as the cumulative distribution function, expectations, and distributions of random variables.
- Apply this knowledge to identify, maximum error and determination of sample size, Interval Estimation (Large sample and small sample), Bayesian Estimation, Tests of Hypothesis.

UNIT-I: Functions of a complex variable:

Complex function , Real and Imaginary parts of Complex function, Limit, Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function, equations in polar form, Harmonic functions, Milne-Thomson method, Simple applications to flow problems.

UNIT-II: Integration and Series expansions:

Line integral of a complex function, Cauchy's theorem (only statement), Cauchy's Integral formula. Absolutely convergent and uniformly convergent of series of complex terms, Radius of convergence, Taylor' series, Maclaurin's series expansion, Laurent's series.

UNIT-III: Integration using Residues:

Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m, Evaluation of real definite integrals: Integration around the unit circle, Integration around semi-circle, Indenting the contours having poles on the real axis.

UNIT-IV: Probability, Random Variables, Discrete Distributions:

Review of basic concepts in Probability and Discrete Random variables, Continuous Random variables - Probability density, Distribution. Calculating probabilities from probability density, Binomial Distribution and Poission Distribution, Determining Mean and Variance of BD and PD.

UNIT-V: Continuous Distributions:

Normal Distribution- Properties. Calculating Normal Probabilities, Normal Approximation to Binomial Distribution, Uniform Distribution. The Exponential Distribution, Gamma Distribution, Beta Distribution and Weibul Distribution.

UNIT-VI: Sampling Distributions:

Population and sample, Sampling distribution of the mean(s known), Central Limit theorem (without Proof) and Problems, Sampling distribution of the mean(s unknown), Point Estimation, Maximum error and determination of sample size, Interval Estimation (Large sample and small sample),Sampling distribution of sums and differences.

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Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers,2012.
2. Miller and John E.Freund, "Probability and Statistics for Engineers", Seventh edition, Pearson education, Prentice Hall of India,2005.

References Books:

1. Kreyszig E, "Advanced Engineering Mathematics", 8th Edition. John Wiley, Singapore, 2001.
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd edition, Pearson, 2004.
3. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Ninth Revised Edition, Sultan Chand & Sons Educational Publishers, 2007.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electro Magnetic Fields							

Course Objectives:

- To study the properties of materials, production of electric field and potentials due to different configurations of static charges and capacitance.
- To study the magnetic fields produced by currents in various configurations, application of ampere's law and Maxwell's 2nd and 3rd equations.
- To study the magnetic force and torque through Lorentz's force equation in magnetic field environment.
- To study the self and mutual inductances and the stored energy and study the time varying and Maxwell's equations in different forms.

Course Outcomes:

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

- Summarize the laws of Electrostatics and apply them in electrostatic field.
- Summarize the laws of Magneto statics and apply them in static magnetic field.
- Compute the force experienced by charged bodies in magnetic field and identify magnetic potential and its properties.
- Identify the time varying field and understand Faraday's Laws of Electromagnetic Induction.

UNIT-I: Electrostatics-I

A review of Co-Ordinate Systems-Electrostatic Fields - Coulomb's Law - Electric Field Intensity (EFI) - EFI due to a line, a Surface Charge and a circular loop - Work done in moving a Point charge in an electrostatic field - Electric Potential - Properties of Potential Function – Potential Gradient - Gauss's Law, Application of Gauss's Law- EFI due to a line, a Surface Charge and a circular loop. Maxwell's first equation div (D) = ρv, div(E)=ρ/εo Laplace's and Poisson's Equations - Solution of Laplace's Equation in one variable, simple cases only.

UNIT-II: Electrostatics-II

Electric dipole - Dipole Moment - Potential and EFI due to an electric dipole - Behaviour of conductors in an electric field - Conductors and Insulators. Electric field inside dielectric material – Polarization-Dielectric - Conductor and Dielectric - Dielectric Boundary Conditions, Capacitance - Capacitance of Parallel Plate, Spherical and co axial capacitors with composite dielectrics -Energy Stored and Energy Density in a Static Electric field - Current Density - Conduction and Convection Current densities - Ohm's law in point form - Equation of Continuity.

UNIT-III: Magnetostatics

Static Magnetic fields Biot-Savart Law - Magnetic Field Intensity (MFI) - MFI due to circular and solenoid current carrying wire - Relation between magnetic flux, magnetic flux density and MFI - Maxwell's 2ndEquation div(B)=0 Ampere's Circuital Law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament - Field due to circular loop of wire-Point form of Ampere's Circuital Law - Maxwell's third Equation Curl(H) = J

UNIT-IV: Magnetic Potential

Scalar Magnetic Potential and its limitations - vector magnetic potential and its properties - vector magnetic potential due to simple configurations - Vector Poisson's equations. Self and Mutual Inductances - Mutual inductance between a straight long wire and square loop wire in the same plane - Energy stored and Energy Density in a magnetic field.

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UNIT-V: Force in Magnetic Fields

Magnetic Force - Moving charges in Magnetic Field - Lorentz force Equation - Force on a current element in Magnetic field - Force on a straight and a long current carrying conductor in magnetic field - Force between two straight long and parallel current carrying conductors - Magnetic Dipole and Dipole Moment - a differential current loop as a magnetic dipole - Torque on a current loop placed in a magnetic field.

UNIT-VI: Time Varying Fields

Time Varying Fields - Faraday's Laws of Electromagnetic Induction - Its integral and Point Forms - Maxwell's 4thEquation curl(H)=-$\partial B/\partial t$- Statically and Dynamically Induced EMF's - Simple problems. Modification of Maxwell's equations for time varying fields – Displacement Current - Poynting Theorem

Text Books:

1. William H. Hayt& John. A.Buck, "Engineering Electromagnetics" 7th Edition 2006.Mc.Graw - Hill Companies.
2. Sadiku, "Electro Magnetic Fields", 4th Edition, Oxford Publications, 2009.

Reference Books:

1. D J Griffiths, "Introduction to Electro Dynamics", 2nd Edition, Prentice - Hall of India pvt. Ltd.
2. J.D. Kraus, "Electromagnetics", 4th Edition, Mc Graw-Hill Inc, 1992.
3. N.Narayana Rao, "Elements of Engineering Electromagnetic", Prentice - Hall of India Pvt. Ltd.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electrical Machines-I							

Course Objectives:

- To understand the principle of operation and constructional features of DC generators.
- To study the characteristics and performance of DC generators.
- To learn the performance and starting methods of DC motors.
- To impart knowledge on testing methods of DC machines.
- To study the concept of operation and performance of single phase transformers.

Course Outcomes:

Upon successful completion of the course, the students should be able to

- Understand the unifying principles of electromagnetic energy conversion.
- Understand the construction, principle of operation and performance of DC machines.
- Learn the characteristics, performance, methods of speed control and testing methods of DC motors.
- To predetermine the performance of single phase transformers with equivalent circuit models.
- Understand the methods of testing of single-phase transformer.
- Analyze the three phase transformers and achieve three phase to two phase conversion.

UNIT - I: D.C. Generators - I

Principles of electromechanical energy conversion, singly excited and multi excited system - Principle of operation of DC Generator - E.M.F equation- armature windings - Constructional Features – armature reaction - cross magnetizing and de-magnetizing AT/pole – commutation process - methods of improving commutation: Resistance commutation, Voltage commutation and Compensating windings- Types of generators - self excited and separately excited: Shunt, Series and Compound.

UNIT - II: D.C. Generators - II

Open circuit characteristics - critical field resistance - critical speed - causes for failure to self-excitation - remedial measures - Internal and external characteristics of separately excited, shunt, series & compound generators-applications, losses and efficiency. Need for parallel operation - Parallel operation of DC Shunt and Compound generators.

UNIT - III: DC Motors

Principle of operation - back E.M.F - torque equation - types of motors - losses and efficiency-speed-torque characteristics - applications of dc motors. Starting of motors by 3 point and 4 point starters - Speed control methods - Testing of DC machines - Brake test, Swinburne's test - principle of regenerative or Hopkinson's test - Retardation test.

UNIT-IV: Transformers - I

Constructional details of core and shell type transformers - principle of operation - emf equation - operation on no load and on load - phasor diagrams of transformers at Lagging, Leading & Unity power factors - voltage regulation - losses and efficiency - effect of variation of frequency and supply voltage on losses - All day efficiency.

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UNIT-V: Transformers - II

Testing on transformers: Polarity test - open circuit and short circuit tests - equivalent circuit

- Sumpner's test - Parallel operation with equal voltage ratios - auto transformer - comparison of three winding transformers with two winding transformers.

UNIT-VI: Transformers - III

Constructional details of three phase transformer - Polyphase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ and Scott connection - Third harmonics in phase voltages - determination of Z_p, Z_s and Z_t in three winding transformer - off load and on load tap changers.

Text Books:

1. Electrical Machines - P.S. Bhimbra, Khanna Publishers.
2. Electrical Machines by D P.Kothari, I .J .Nagarth, Mc GrawHill Publications, 4th edition.

Reference Books:

1. Electrical Machines by R.K. Rajput, Lakshmi publications, 5th edition.
2. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria & Sons.

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I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ENVIRONMENTAL STUDIES (Common to All Branches)							

Course Objectives:

- To make the students aware about the environment and it's inter–disciplinary, Basic understanding of the ecosystem and its diversity.
- Human development and societal development is inevitable. This development is entirely depends on science and Technological advancement through using resource assets of nature. In order to reduce the impacts of the technological development, the environmental studies creating awareness among the engineering graduates. So that we can have a healthy environment present and future.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- The course covers the aspects like general awareness, Resources, Utilization and conservation, Healthy sustenance of life, pollution control, social aspects, etc. All these areas will provide and habituate the students towards conservation and sustainable development.
- Overall understanding of the natural resources.

Course Outcomes:

- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.
- The knowledge about environmental studies is applicable as and when required like implementing any developmental activity can overcome the hurdles? In relation to environmental aspects.
- Students can develop eco-friendly technologies for a healthy growth, and development of anation which can prevent the environmental hazards by appropriate decisions and alternate remedies.
- To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
- The biodiversity of India and the threats to biodiversity and conservation practices to protect the biodiversity.
- About environmental assessment and the stages involved in EIA and the environmental audit.

UNIT–I: Multidisciplinary Nature of Environmental Studies

Definition, Scope and importance–Need for public awareness–Institutions and people in environment.

Ecosystems: Definitions and concepts–Characteristics of ecosystem–Structural and functional features–Producers, consumers, decomposers and food webs–Types of ecosystems–Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems– Energy flow in the ecosystem–Ecological pyramids–Ecological successions.

UNIT–II: Natural Resources

Forest resources: Use and over–exploitation–Deforestation–Water resources–Use and over utilization of surface and natural resourced ground water–Floods and droughts–Conflicts over water–Dams, benefits and problems on tribal population & Environment.

Mineral resources: Use and exploitation–Environmental effects of extracting and using mineral

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resources.

Food resources: World food problems–Changes caused by agriculture and overgrazing– Effects of modern agriculture–Fertilizer and pesticide problems–Water logging, salinity– Concept of sustainable agricultural methods.

Land resources: Land as a resource–Land degradation, man induced landslides–Soil erosion and desertification.

UNIT–III: Biodiversity and its Conservation

Levels and Values of biodiversity–India as a mega diversity nation–Hotspots–Threat and conservation of biodiversity–Assessment of biodiversity and its impact on Environment.

UNIT–IV: Environmental Pollution and Control

Definition, Cause, effects and control measures of

a. Air pollution
b. Water pollution
c. Soil pollution
d. Noise pollution.

UNIT–V: Global Environmental Problems and Global Efforts

Climate change–Global warming–Acid rain–Ozone layer depletion–Nuclear accidents and holocaust–Rain water harvesting–Traditional and modern techniques–Environmental legislation–Wasteland reclamation–Consumerism and waste products.

UNIT–VI: Environmental Management

Impact Assessment and its significance–various stages of EIA–Preparation of EMP and EIS–Environmental audit–Ecotourism. The student should submit a report individually on any issues related to environmental studies course and make a power point presentation.

Text Books:

1. An Introduction to Environmental Studies by B. Sudhakara Reddy, T. Sivaji Rao, U. Tataji & K. Purushottam Reddy, Maruti Publications.
2. Anubha Kaushik & C.P. Kaushik. 2014, Environmental Studies, Fourth edition, New Age International (P) Ltd., New Delhi.

Reference Books:

1. Text Book of Environmental Studies by Deekshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada.
3. Text Book of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.
4. Bharucha, E. **2005**, Text book of Environmental Studies, First edition, Universities Press (India) Pvt., Ltd., Hyderabad.
5. Dr. S. Keerthinarayana & Dr. C. Daniel Yesudian. **2004**, *Principles of Environmental Scienceand Engineering, First edition*, Anuradha Publications (P) Ltd., Kumbakonam.
6. P. Anandan & R. Kumaravelan. **2010**, *Environmental Science & Engineering, Sixth reprint*, Scitech Publications (India) (P) Ltd., Chennai.
7. Dr. Surinder Deswal & Dr. Anupama Deswal. **2008-09**, A *Basic Course in Environmental Studies, Second revised edition*, Dhanpat Rai & Co (P) Ltd., New Delhi.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Digital Electronics							

Course Objectives:

- To study various number systems, error detecting and correcting binary codes, representation of switching functions using Boolean expressions and their minimization techniques.
- To study the combinational logic design and their realization.
- To study programmable logic devices and realization of switching functions.
- To study the sequential logic circuits design and their realization and also study the different digital logic families.

Course Outcomes:

After the completion of this course the student will be able to

- Aware of Boolean algebra & the underlying features of various number systems.
- Design various combinational logic circuits.
- Design and realize Boolean functions using PLDs.
- Analyze and design various sequential circuits and illustrate basic gates with TTL, ECL, MOS logic family.

UNIT – I: Number Systems and Logic Gates

Number systems, Complements, Signed binary numbers, Binary Arithmetic, Binary codes – BCD, Excess-3 code, Gray code, Error detecting and correcting code – Hamming code, Conversion. AND, OR, NOT, NAND, NOR, Exclusive –OR and Exclusive – NOR logic gates, NAND-NAND and NOR-NOR realizations, Realization of Boolean Functions using logic gates.

UNIT – II: Boolean Algebra

Boolean postulates – De-Morgan's Theorems, Principle of Duality, Minimization of Boolean expressions – Sum of Products (SOP) and Product of Sums (POS) - Minterm and Maxterm, Canonical forms – Conversion into canonical form –Karnaugh map Minimization (up to 5 variables) - Don't care conditions.

UNIT – III: Combinational Logic Circuits

Design procedure, Adders and Subtractors – Serial adder/Subtractor, Parallel adder/Subtractor-Carry look ahead adder, BCD adder, Comparator, Decoder, Encoder, Multiplexer, Demultiplexer, Parity Checker, Code converters.

UNIT – IV: Programmable Logic Device

PROM, PLA, PAL, Realization of switching functions using PROM, PLA and PAL, Comparison of PROM, PLA, and PAL, Programming tables of PROM, PLA and PAL.

UNIT – V: Sequential Logic Circuits

Latches, Flip flops - SR, JK, T, D and Master Slave, JK – Characteristic equations and Excitation tables, Modes of triggering – Edge and Level Triggering, Realization of one flip flop using other flip flops.

UNIT-VI: Registers & Counters

Registers and their operation, Synchronous and Asynchronous Counters, Modulo–N Counters.

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Text Books:

1. Switching Theory and Logic Design – A. Anand Kumar, Prentice-Hall of India Pvt.Ltd, Second Edition, 2014.
2. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. PrakashRao, Tata McGraw-Hill, Second Edition, 2008.
3. Digital Design – M. Morris Mano, PHI, Fourth Edition, 2008.

Reference Books:

1. Modern Digital Electronics - R.P. Jain, TMH, Fourth Edition, 2009.
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, Second Edition, 2005.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Analog Electronics							

Course Objectives:

- Design and understand the operation of analog electronics circuits such as feedback amplifiers, Operational Amplifiers and its applications.
- Understand the operation of Linear, Non-Linear wave shaping circuits and its applications
- Compare the working of multivibrators using op-amp, IC 555and the operation of different oscillators.
- Understand the operation of the most commonly used D/A and A/D converters.

Course Outcomes:

After completion of this course, the students will be able to

- Understand and design the operation of feedback amplifiers.
- Understand different wave shaping circuits and design basic op-amp circuits.
- Design different multivibrators using op-amp and 555 timers, different oscillators.
- Know about different D/A and A/D converters.

UNIT - I: Feedback Amplifiers

Feedback principle and concept, Types of feedback, Classification of amplifiers- Voltage amplifier, Current amplifier, Trans conductance amplifier, Trans resistance amplifier, Feedback topologies, Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers, Analysis feedback amplifier- Voltage series feedback, Current shunt feedback.

UNIT - II: Linear and Non-Linear Wave Shaping

Linear Wave Shaping: The high pass and low pass RC circuits: Sinusoidal input, Step input, Pulse input, Square and Ramp input, RC network as a differentiator and an integrator.

Non-Linear Wave Shaping: Diode and its characteristics, Diode series clippers, Diode parallel clippers, Two level clipping circuits and Emitter coupled clipper, Clamping operation, Clamping circuits using diode with different inputs.

UNIT - III: Operational Amplifier and its Applications

Different stages of Operational Amplifier: Differential Amplifier, Ideal and practical Op- Amp. Characteristics of OP-Amps, DC and AC characteristics, Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, V to I and I to V converters, Comparators, Log and Anti log amplifiers.

UNIT - IV: Multivibrators, Timers and Oscillators

Multivibrators: Monostable, (Bistable), Astable multivibrators using Op-amp.

Timers: Introduction to 555 timer, Functional diagram, Monostable and Astable operation using 555 timer and its applications.

Oscillators: RC phase shift oscillator and Wien bridge oscillator using Op-amp.

UNIT - V: Active Filters

Introduction– Merits and demerits of active filters over passive filters– 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and All pass filters.

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UNIT - VI: D/A And A/D Converters

Introduction, Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, Inverted R- 2R DAC, Different types of ADCs - Parallel comparator type ADC, Counter type ADC, Successive approximation ADC and Dual slope ADC.

Text Books:

1. Integrated Electronics- Jacob Millman, C. Halkies, C.D. Parikh, SatyabrataJit, Tata McGraw-Hill, Second Edition, 2011.
2. Linear Integrated Circuits - D. Roy Chowdhury, New Age International Pvt Ltd, Second Edition,2003.
3. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. Prakash Rao, Tata McGraw-Hill, Second Edition, 2008.

Reference Books:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, Pearson Education, Fourth Edition, 2015.
2. Electronic Devices and Circuit Theory– R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
3. Operational Amplifiers with Linear Integrated Circuits–William D. Stanley, Pearson Education India, Fourth Edition, 2002.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Electrical Machines-II							

Course Objectives:

- To familiarize the students with the constructional details, working principles, operating characteristics of poly phase induction machines.
- To let the students to know the constructional details, working principles, operation of synchronous generators and synchronous motors.
- To study the operation of single phase induction motor, reasons for it's no self-starting character and applications.

Course Outcomes:

Upon completion of the course the student can able to know

- Working of induction motors and its characteristics.
- Performance test on the induction motor to find the losses, efficiency.
- Speed control techniques of induction motors for industry requirements.
- Working of synchronous generator, Calculation of voltage regulation and how to synchronize it with grid.
- Applications of synchronous motors and differences between the induction motor and synchronous motor.

UNIT-I: Three phase induction motor – I

Construction details and principle of operation induction motors – slip – rotor emf & rotor frequency- equivalent circuit - phasor diagram – relation between rotor input, rotor losses and mechanical power developed - torque-slip characteristics – losses and efficiency - no load and blocked rotor test - circle diagram

UNIT- II: Three phase induction motor – II

Starting of Induction motors – types of starters – DOL starter, rotor resistance, star-delta starter & auto transformer – speed control – voltage control, frequency control – cogging and crawling – double cage induction motors – Induction generator.

UNIT-III: Synchronous Generators - I

Constructional features of non-salient and salient pole type synchronous machines- Armature windings – winding factors - EMF equation – Phasor diagram –Single phase Armature reaction – Rotating magnetic fields - synchronous reactance - load characteristics.

UNIT-IV: Synchronous Generators - II

Voltage regulation - predetermination of regulation by synchronous impedance method (EMF) Ampere turns method (MMF) and Potier triangle method (ZPF) - Two reaction theory of salient pole machines – determination of Xd and Xq- Parallel operation- load sharing– effect of change of excitation and numerical problems.

UNIT-V: Synchronous motors

Principle of operation of Synchronous motor – Phasor diagram- Operation of Synchronous motor on infinite bus bar – 'V' and inverted 'V' curves – Equations for power developed and power input – starting methods – Hunting of Synchronous motors and its suppression - synchronous condenser.

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UNIT-VI: Single phase induction motors

Constructional details of Single phase induction motor-Double revolving field theory and operation–Equivalent circuit - performance analysis – Starting methods.

Text books:

1. D.P.Kothariand I.J.Nagrath,"Electric Machines", Tata McGraw-Hill Publications 4th edition
2. Electrical Machinery - P.S. Bhimbra, Khanna Publishers, 2003.

Reference books:

1. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons.
2. Electrical Machine Design by A.K. Sawhney, Dhanpat Rai & Sons publications.
3. Alexander S.Langsdorf,"Theory of Alternating current machinery", Tata McGraw Hill
4. Theory of Alternating Current Machinery- Langsdorf, Tata McGraw-Hill

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Control Systems							

Course Objectives:

- To Describe feedback control and basic components of control systems
- To understand the various time domain and frequency domain tools for analysis and design of linear control systems
- To study the methods to analyze the stability of systems from transfer function forms
- To describe the methods of designing

Course Outcomes:

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

- Develop a mathematical model of electrical and physical system.
- Analyze the electrical and mechanical analysis in time and frequency domains.
- Examine stability analysis techniques with appropriate compensators.

UNIT - I: Mathematical Modeling of Control Systems

Open Loop and closed loop control systems and their differences, Classification of control systems, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor and AC servo motor - Synchro-transmitter and Receiver, Block diagram algebra - Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II: Time Response Analysis

Standard test signals - Time response of first order systems -Time response of second order systems - Time domain specifications - Steady state error and error constants - Effects of proportional derivative, proportional integral systems & proportional integral and derivative systems

UNIT - III: Stability and Root locus Technique

The concept of stability -Routh's stability criterion - limitations of Routh's stability - The root locus concept - construction of root loci (Simple problems), Effect of Addition of poles and Zeros on Root locus

UNIT - IV: Frequency Response Analysis

Introduction, Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, and Nyquist Stability criterion.

UNIT - V: Classical Control Design Techniques

Lag, Lead, Lag-Lead compensators, design of compensators -using Bode plots.

UNIT - VI: State Space Analysis of Continuous Systems

Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties - Concepts of Controllability and Observability.

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Text Books:

1. Control Systems Engineering by I.J.Nagarath and M.Gopal, New Age InternationalPublishers.
2. Automatic control systems, Benjamin C. Kuo, Prentice Hall of India,2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems principles and design, M.Gopal, Tata Mc Graw Hill education Pvt Ltd.,4th Edition.
3. Control Systems Engineering, S. Palani, Tata Mc Graw Hill Publications.
4. Control Systems, ManikDhanesh N, Cengage publications.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
Business Management Concepts for Engineers							

Course Objective:
To equip the student with the fundamental knowledge relating to economic principles, management concepts fundamentals of the accounting.

Course Outcome:

- The outcome of this program is that the student learns necessary skills relating tothe economics, management and accountancy which are useful for decision making.
- This course helps the student to equip themselves with the basic principles of accounting which will be of help to them to know the fundamentals of accounting.
- The student will also acquire necessary skills relating to various functional aspects of management viz., Human Resource Management, Marketing Management etc.
- This course will also help the student to acquaint with the latest management concepts and practices which are used in the industry.

UNIT-I Introduction to Managerial Economics
Definitions, - Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants- Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Demand Forecasting Techniques.

UNIT-II Theory of Production and Cost Analysis:
Production Function- Law of Variable Proportions- Economies of Scale- Cost Concepts- CVP Analysis (With Simple Problems)- Significance- Limitations- Introduction to Markets – Features of various markets-Perfect competition, Monopoly and Oligopoly.

UNIT-III Introduction to Financial Accounting
Definition-GAAP principles- types of accounting- Double Entry System- Journal Entries – Ledger- Trial Balance- Income statement-Balance sheet-Final Accounts with Simple Adjustments.

UNIT-IV Introduction to Management
Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management - F.W.Taylors Scientific Management- Douglas Mc Gregors Theory X and Y- Challenges of Management.

UNIT-V Functional Areas of Management (1)
Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing Manager-Production Management-Functions of Production Management – Methods of Production - Job Production, Batch Production and Mass Production – Method Study-Inventory Management- ABC Analysis – EOQ Analysis

UNIT-VI Functional Areas of Management (2):
Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis- Financial Management- Concepts of Capital –Working Capital- Capital Budgeting- Functions of Financial Management.

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Text Books:

1. Dr.N.APPARAO Dr. P. Vijay Kumar: "Managerial economics and financial analysis" Cengagepublication's, New Delhi-2011.
2. Dr. A.R.Aryasri- Managerial Economics and Financial Analysis, TMH2011.
3. Dr. P. Vijaya Kumar & Dr. N.Appa Rao," Managerial Science" cengage. Delhi,2012.

References Books:

1. V. Maheswari: Managerial Economies, Sultan Chand.
2. Suma Damodaran: Managerial Economics, Oxford 2011.
3. Koontz &Weihrich: Essentials of Management" TMH 2011.
4. Hitt and Vijaya Kumar: Strategic Management, cengage learning.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
Analog & Digital Circuits Lab							

Course Objective:

This lab course is intended to know the use and design of Logical gates, Flip-Flops, Op-Amp, power amplifiers, multivibrator circuits using IC 555 and voltage regulators.

Course Outcomes:

After completion of this course, the students will be able to

- Understand the realization of logic gates and Flip-Flops.
- Design and analyze clippers, Clampers and also implement the applications using op-amps.
- Design of multivibrator using 555 IC timers and Schmitt trigger circuit using op-amp.

List of Experiments:

1. Realization of logic gates.
2. Representation of logic gates with universal gates.
3. Verification of SR and JK Flip Flops operation.
4. Linear wave shaping-low pass and high pass circuits.
5. Nonlinear wave shaping-clippers and clampers circuits.
6. Realization of adder, subtractor, and comparator circuits using Op-amp.
7. Designing LPF, HPF (first order) using Op-amp.
8. Designing Differentiator and Integrator using Op-amp.
9. Designing Monostable and Astable operation circuits using IC 555 timer.
10. Designing RC Phase shift oscillator using Op-amp.
11. Design of half adder, full adder and half subtractor.
12. Design of Schmitt trigger using Op-amp.

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	-	-	3	25	50	75	2
Electrical Circuits Lab							

Course Objectives:

- To learn the methods used for verification of circuit theorems.
- To study the concepts of resonance in series and parallel circuits.
- To understand the measurement of active and reactive power in a three-phase system
- To conduct experiment to calculate network parameters
- To learn the measurement of inductance of a mutually coupled coil.

Course Outcomes:

Upon successful completion of the course, the students should able to

- Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit.
- Become familiar with basic electrical measurement instruments and know how to use them to make different types of measurements.
- Verify the laws and principles of electrical circuits, understand the relationships and differences between theory and practice.
- Gain practical experience related to electrical circuits, stimulate more interest and motivation for further studies of electrical circuits.

Any 10 of the following experiments to be conducted:

1. Verification of Kirchhoff's laws.
2. Verification of Thevenin's and Norton's Theorems.
3. Verification of Superposition theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Verification of Reciprocity Theorem.
6. Verification of Millmann's Theorem.
7. Verification of Compensation Theorem.
8. Verification of Telligen's Theorem.
9. Series and Parallel Resonance of a RLC circuit.
10. Determination of Self, Mutual Inductances and Coefficient of coupling.
11. Z and Y Parameters of a Two-Port Network.
12. Transmission and hybrid parameters of a Two-Port Network.
13. Measurement of Active Power for Star and Delta connected balanced loads.
14. Measurement of Reactive Power for Star and Delta connected balanced loads.
15. Measurement of 3-phase Power by two wattmeter method for unbalanced loads.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
Electrical Machines-I Lab							

Course Objective:

- To obtain the characteristics of DC motors and generators by performing brake tests and load tests respectively.
- To determine the losses and efficiencies of a DC Machine
- To know the performance and speed control of DC Machines

Course Outcomes:

After completion of this course student can able to

- Calculate the critical field resistance and critical speed of DC Generator
- Predetermine the efficiency of a given DC Shunt machine working as Motor and Generator.
- Analyse the characteristics of DC Motors and Generators.
- Evaluate efficiencies of DC Series and Shunt generators

Any 10 of the following experiments are to be conducted:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics
4. Load test on DC compound generator. Determination of characteristics.
5. Brake test on DC compound motor. Determination of performance curves.
6. Brake test on DC shunt motor. Determination of performance curves.
7. Speed control of DC shunt motor by armature and field control methods.
8. Hopkinson's test on DC shunts machines. Predetermination of efficiency.
9. Fields test on DC series machines. Determination of efficiency.
10. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
11. Retardation test on DC shunt motor. Determination of losses at rated speed.
12. Separation of losses in DC shunts motor.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
Electronic Devices and Circuits Lab							

Course Objective:
This lab course is intended to know the usage of electrical and electronics equipment, understand the characteristics of PN junction diode, transistor, and amplifiers.

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

- Understand and analyze the behavior of electronic circuits.
- Understand the characteristics of various semiconductor devices like BJT, FET, UJT.
- Design transistor & FET amplifier circuits.

LIST OF EXPERIMENTS:
(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias) Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter) Part A: Half-wave Rectifier Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration) Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics (CS Configuration) Part A: Drain Characteristics
   Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required for Laboratory

1. Breadboard Trainers.
2. Ammeters (Analog or Digital).
3. Voltmeters (Analog or Digital).
4. Regulated Power Supplies.
5. Analog/Digital Storage Oscilloscopes.
6. Analog/Digital Function Generators.
7. Digital Multimeters.

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8. Decade Résistance Boxes/Rheostats.
9. Decade Capacitance Boxes.
10. Cathode Ray Oscilloscopes.

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II B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	-
Verbal Ability							

Course Objectives:

- To make students understand the usage of words, relationships; the alternatives and their meanings
- To give fair idea about understanding and comprehension skills
- To make students analyze arguments and draw logical conclusions
- To help students overcome the problems in using English through remedial grammar

Course Outcomes:

At the end of the course Students will be able to

- Use appropriate words effectively in their communication
- Identify and correct Grammar and vocabulary related errors
- Construct the sentences effectively using appropriate verbal reasoning abilities
- Demonstrate understanding and comprehensive skills
- To clear written test in campus placements as well as various competitive exams.

Teaching Methodology:

The methodology of teaching will be chalk & talk, Ppt., Audio-Visual and activity based.

No. of Periods per Unit	8	No. of tutorial periods	1

Unit-I: Vocabulary Building
(Direct links to content used from the web page:

a. http://grammar.ccc.commnet.edu/grammar/vocabulary.htm
b. http://www.enhancemyvocabulary.com/
c. http://celi.olemiss.edu/wp-content/uploads/sites/7/2014/01/StrategiesVocabulary- 80808.pdf

Unit-II: Sentence construction
(Direct links to content used from the web page:

a. http://www.learnenglish.de/grammar/sentencetext.html
b. http://www.bbc.co.uk/skillswise/factsheet/en30stru-l1-f-rules-and-egs-to-help-you- make-a-sentence
c. http://www.dummies.com/how-to/education-languages/language-arts/Grammar- usage/Sentence-Construction.html
d. https://www.liberty.edu/media/2030/Sentence_Construction.pdf
e. http://www2.isu.edu/success/writing/handouts/sent-structure.pdf

Unit-III: English Usage and Remedial Grammar (Direct links to content used from the web page:

a. http://ihecs-langues.be/remedial/grammar.htm
b. http://mdudde.net/books/BA/BA%20I%20year/English/ba-1st-engish-paperB.pdf
c. http://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/English GRAMMAR.pdf

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Books with page numbers:

1. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007; Pg.No.2.233-2.236.
2. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No : 630 – 662.)

Unit-IV: Analogies and Reverse Analogies (Direct links to content used from the web page:

a. http://www.jagranjosh.com/articles/verbal-ability-analogies-and-reverse-analogies- questions-for-cat-1335522802-1
b. http://www.testprepreview.com/modules/analogies1.htm
c. http://www.gmat-pacer.com/gre-guidetc.html

Books with page numbers:

1. A Modern Approach to Verbal & Non – Verbal Reasoning by Dr. R.S. Aggarwal, 1994, S.Chand & Co, Pg. Nos 35-142.
2. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No's 2.95-2.103)

Unit-V: Reading Comprehension, Close Passage & Fill in the Blanks (Direct links to content used from the web page:

a. http://www.majortests.com/sat/reading-comprehension.php
b. http://cat.wordpandit.com/rc-passage-36/
c. http://www.mycatprep.com/FreepracticeQuestionsEnglish.html
d. http://www.lofoya.com/Verbal-Test-Questions-and-Answers/Reading-Comprehension/intro
e. http://mba.hitbullseye.com/free_mock_cat/Reading-Comprehension-CAT.php

Books with page numbers:

1. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No 1.11-1.99
2. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No's: 340-462.)

Unit-VI: Facts, Inferences & Judgments Books with page numbers:

1. A Modern Approach to Verbal & Non – Verbal Reasoning by Dr. R.S. Aggarwal, 1994, S.Chand & Co, Section-II Pg. No's: 1-224
2. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No's: 3.5 – 3.27; 3.63 – 3.64
3. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No 464-506.

No. of Periods for assessments for all units	2

References:

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

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Books

1. 30 Days to a More Powerful Vocabulary by Funk.
2. Practical English Usage by Michael Swan
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman
4. Kaplan MCAT Verbal Reasoning and Writing Review
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon
6. Understanding and Using English Grammar by Betty Schrampfer Azar.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	-	-	-	-
Quantitative Aptitude and Reasoning - I							

Course Objectives:

- To train students in analysing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements

Course Outcomes:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

- Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements
- Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.
- Will be able to demonstrate various principles involved in solving mathematical
- Problems and thereby reducing the time taken for performing job functions.

Unit I: Simple equations, Ratio, Proportion, Variation, Percentages

1. **Simple equations**
   a. Definition of Linear Equations
   b. Formation of simple equations
   c. Problems on Ages, Fractions and Digits
   d. Indeterminate system of equations
   e. Special cases in indeterminate system of equations
2. **Ratio and proportion**
   a. Definition of Ratio
   b. Properties of Ratios
   c. Comparison of Ratios
   d. Problems on Ratios
   e. Compound Ratio
   f. Problems on Proportion, Mean proportional and Continued Proportion.
3. **Variation**
   a. Direct variation
   b. Inverse variation
   c. Joint variation
   d. Problems on Variations

Unit II: Percentages, Profit and loss, Partnership, Simple interest and Compound Interest, Quadratic equations, Progressions

1. **Percentages**
   a. Introduction
   b. Converting a percentage into decimals
   c. Converting a Decimal into a percentage
   d. Percentage equivalent of fractions
   e. Problems on percentages
2. **Profit And Loss**
   a. Problems on Profit and Loss percentage
   b. Relation between Cost Price and Selling price
   c. Discount and Marked Price

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d. Two different articles sold at same Cost Price
e. Two different articles sold at same Selling Price
f. Gain% / Loss% on Selling Price

3. **Partnership**
   a. Introduction
   b. Relation between capitals, Period of investments and Shares
4. **Simple Interest**
   a. Definitions
   b. Problems on interest and amount
   c. Problems when rate of interest and time period are numerically equal.
5. **Compound Interest**
   a. Definition and formula for amount in compound interest
   b. Difference between simple interest and compound interest for 2 years on the same principle and time period.
6. **Quadratic equations**
   a. General form of Quadratic equations
   b. Finding the roots of Quadratic equations
   c. Nature of the roots
   d. Relation between the roots
   e. Maximum and minimum value of Quadratic Expression
7. **Progressions**
   a. Arithmetic Progression
   b. Geometric Progression
   c. Harmonic Progression
   d. Arithmetic Mean, Geometric Mean and Harmonic Mean and their relation.

UNIT III: Deductions & Connectives

1. **Deductions**
   a. Finding the conclusions using Venn diagram method
   b. Finding the conclusions using syllogism method
2. **Connectives**
   a. Definition of a simple statement
   b. Definition of compound statement
   c. Finding the Implications for compound statements
   d. Finding the Negations for compound statements

UNIT IV: Analytical Reasoning puzzles

a. Problems on Linear arrangement
b. Problems on Circular arrangement
c. Problems on Double line-up
d. Problems on Selections
e. Problems on Comparisons

UNIT IV: Clocks, Calendars & Blood relations

1. **Clocks**
   a. Finding the angle when the time is given
   b. Finding the time when the angle is known
   c. Relation between Angle, Minutes and Hours
   d. Exceptional cases in clocks
2. **Calendars**
   a. Definition of a Leap Year
   b. Finding the number of Odd days
   c. Framing the year code for centuries

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d. Finding the day of any random calendar date

3. **Blood relations**
   a. Defining the various relations among the members of a family
   b. Solving Blood Relation puzzles
   c. Solving the problems on Blood Relations using symbols and notations

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - AbhijitGuha Mc Graw Hills

References:

1. www.careerbless.com/aptitude/qa/home.php
2. www.affairscloud.com/quantitative-aptitude-questions
3. www.careerafter.com/rs-aggarwal-quantitative-aptitude-pdf/
4. www.amazon.in/Quantitative-Aptitude-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practiceaptitudetests.com/numerical-reasoning-tests

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III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
ELECTRICAL MEASUREMENTS							

Course Objectives:

1. To understand different electrical measurements and instruments.
2. To learn the usage of bridges for the measurement of resistance, inductance and capacitance
3. To learn the usage of digital meters and types of transducers

Course Outcomes:

After completion of this course, Students will be able to

1. Understand and describe construction, principle of construction operation, errors, and compensations
2. Understand the extension of ranges of different electrical measurement instruments and understanding of error analysis.
3. Able to perform test on CTs and calculate Ratio and phase angle errors and calibrate the PF meters. To be acquainted with the knowledge of instruments that is useful for the measurement of power and energy.
4. Describe and demonstrate the usage of DC and AC bridges for the measurement of resistance, inductance and capacitance and able to calibrate different measuring instruments using potentiometers.
5. Determination of magnetic measurements including B-H curve, hysteresis loop.
6. Understand usage of different digital meters for the measurement of voltage frequency and speed.

UNIT–I: Measuring Instruments

Classification – Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer and electrostatic instruments – Expression for the deflecting torque and control torque – Errors and compensations– Extension of range using shunts and series resistance – CT and PT: Ratio and phase angle errors – Design considerations.

UNIT –II: Measurement of Power and Energy

Single phase and three phase dynamometer wattmeter – LPF and UPF – Expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems – Type of P.F. Meters – Single phase and three phase dynamometer and moving iron type Single phase induction type energy meter – Driving and braking. torques – errors and compensations – Testing by phantom loading using R.S.S. meter– Three phase energy meter – Tri vector meter – Maximum demand meters– Electrical resonance type frequency meter and Weston type synchroscope.

UNIT – III: Potentiometers

Principle and operation of D.C. Crompton's potentiometer – Standardization – Measurement of unknown resistance – Current – Voltage – AC Potentiometers: polar and coordinate types –Standardization –applications.

UNIT – IV: Measurements of Parameters

Method of measuring low, medium and high resistance – Sensitivity of Wheat stone's bridge – Carey Foster's bridge– Kelvin's double bridge for measuring low resistance– Loss of charge method for measurement of high resistance – Megger– Measurement of earth

resistance – Measurement of inductance – Quality Factor – Maxwell's bridge–Hay's bridge – Anderson's bridge–Measurement of capacitance and loss angle –Desauty bridge – Schering Bridge–Wagner's earthing device–Wien's bridge.

UNIT – V: Magnetic Measurements

Ballistic galvanometer – Equation of motion – Flux meter – Constructional details– Determination of B–H Loop methods of reversals six point method – AC testing – Iron loss of bar samples– Core loss measurements by bridges andpotentiometers.

UNIT – VI: Digital Meters

Digital Voltmeter–Successive approximation – Measurement of phase difference – Frequency – Hysteresis loop using lissajious patterns in CRO – Ramp and integrating type– Digital frequency meter–Digital multimeter– Digital Tachometer.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.
2. Electrical Measurements – by Buckingham and Price, Prentice –Hall
3. Electrical Measurements by Forest K. Harris. John Wiley and Sons
4. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.
5. Electrical and Electronic Measurements –by G.K.Banerjee, PHI Learning Private Ltd.,New Delhi–2012.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SYSTEM TRANSMISSION LINES							

Course Objectives:

1. To introduce the transmission line parameters and methods for calculation of line parameters for the single phase and three phase circuits.
2. To study performance of short, medium and long transmission lines
3. To study power system transients and various factors governing the transmission lines
4. To study mechanical design of transmission lines and overhead insulators

Course Outcomes:

After completion of this course, Students will be able to

1. Apply the knowledge of mathematics for deriving the inductance and capacitance for various conductor configurations and to find ABCD constants for different transmission lines.
2. Find efficiency and regulation of different transmission lines.
3. Analyze the factors affecting the power loss due to corona and suggest methods to minimize the corona loss.
4. Classify the insulators used in power transmission and distribution system.
5. Analyze the different waves and transients in power systems.
6. Calculate Sag and Tension in Transmission lines.

UNIT-I: Transmission Line Parameters

Introduction-Types of conductors-Bundled conductors - Skin and Proximity effects - Description and effect on Resistance of Solid Conductors- inductance of single phase two- wire system with composite conductors - inductance of three-phase lines: Equivalent(Symmetrical) Spacing, Unsymmetrical Spacing (Untransposed & Transposed), Inductance of three-phase double circuit line, Numerical Problems, Capacitance of a Single phase line &Three-phase lines, Capacitance of a Three-Phase double circuit line, Numerical Problems, Effect of Earth on Transmission line Capacitance.

UNIT-II: Performance of Short and Medium Transmission Lines

Introduction, Classification of Transmission Lines –Short Transmission line: A, B, C, D constants-efficiency and regulation – Medium Transmission line: Load End Capacitance Method, Nominal-T, And Nominal-π, A, B, C, D Constants- efficiency and regulation-Numerical Problems.

UNIT-III: Performance of Long Transmission Lines

Introduction - Rigorous Solution- Interpretation of the Long Line equations - Evaluation of A, B, C, D constants-Ferranti effect – Charging Current – Efficiency & Regulation- Equivalent-T and Equivalent π network models. Surge Impedance and SIL of Long Lines- Numerical Problems.

UNIT-IV: Power System Transients

Introduction, Transients in simple circuits – Travelling waves on transmission lines – Open Circuited Line–Short Circuited Line – Line terminated through a resistance- Line connected to a cable- Reflection and Refraction at T-Junction– Line terminated through a capacitance-Attenuation of Travelling waves-Numerical Problems.

UNIT-V: Various Factors Governing the Performance of Transmission line

Power factor Improvement- causes , effects of low power factor-Advantages-Methods of power factor Improvement-Shunt Capacitor, Synchronous Condenser – Voltage control – Concepts of voltage control Methods –Corona – Description of the phenomenon–Factors affecting corona– Methods to decrease corona loss –Radio Interference-Numerical Problems.

UNIT -VI: Mechanical design of transmission lines & Overhead Line Insulators

Introduction- Sag and Tension calculations with equal and unequal heights of towers- effect of Wind and Ice loading- numerical Problems - Stringing chart and sag template. Types of Insulators-Potential distribution over a string of suspension insulators-calculation of string efficiency- Methods of equalizing the potential- Numerical Problems.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, DhanpatRai& Co Pvt.Ltd.
2. Electrical power systems by C.L.Wadhwa, New Age International (P) Limited, Publishers.
3. Power System Analysis by John J Grainger and William D Stevenson Jr. McGrawHill

Reference Books:

1. Electric Power Transmission and Distribution by S.Sivanagaraju&S.Satyanarayana.
2. A course in Electrical Power systems by J.B. Gupta, KatariaPublications
3. Electrical power systems by Dr.S.L.Uppal, Khannapublishers.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER ELECTRONICS							

Course Objectives:

1. To study the characteristics of various power semiconductor devices like BJT, MOSFET, and IGBT &SCR.
2. To study the operation of 1-Ø &3-Ø AC-DC Converters and their analysis.
3. To study the operation of AC-AC and DC-DC Converters like AC Voltage regulators, Cyclo converters &Choppers
4. To understand the working of inverters and application of PWM techniques for voltage control and harmonic mitigation.

Course Outcomes:

After completion of this course, Students will be able to

1. Explain the characteristics of various power semiconductor devices like BJT, MOSFET, and IGBT &SCR.
2. Identify the operation of Half–wave & full–wave converters and their comparisons.
3. Identify the operation of three phase full–wave converters and dual converter.
4. Demonstrate the operation of single phase AC Voltage converters & Cyclo converters and their comparisons.
5. Summarize the various DC-DC converters and four-quadrant operation of chopper clearly.
6. Explain the working of inverters and make use of PWM techniques for voltage control and harmonic mitigation.

UNIT–I: Power Semi-Conductor Devices

Thyristors–Silicon controlled rectifiers (SCR's) - Characteristics of power BJT, MOSFET and IGBT - Basic theory of operation of SCR - Firing circuits - Static characteristics - Turn on and turn off methods - Dynamic characteristics of SCR - Snubber circuit - Series & Parallel connections of Thyristors-Numerical problems.

UNIT–II: AC-DC Converters (Single-Phase)

Half wave converters with R, RL, and RLE loads– Derivation of average load voltage and current–Effect of freewheeling diode for RL load. Semi Converters (Half Controlled): Operation with R, RL loads –Applications. Full Converters: Operation with R, RL and RLE loads–Derivation of average voltage and current – Effect of source Inductance- Numerical problem-Dual Converter.

UNIT–III: AC–DC Converters (Three-Phase)

Full converter with R and RL loads–Semi converter (Half Controlled) with R and RL loads–Derivation of load voltage–Line commutated Inverter operation–Dual converters with non–circulating and circulating modes of currents. Effect of Source of inductance on Three-Phase Converter - Numerical problems.

UNIT - IV: AC–AC Converters

AC Voltage Controllers: Phase Control-Single phase AC voltage controller with R and RL loads-Derivation of R.M.S & Load Voltages-Applications-Numerical Problems.
Cyclo converters: Introduction-Single phase Bridge type & Mid-Point type cyclo converters with R and RL load (Principle of operation)

UNIT - V: DC - DC Converters

Introduction-Basic chopper operation- Time ratio and current limit control strategies– Chopper classification-Buck, Boost and Buck-Boost converters operation–Voltage and current waveforms–Derivation of output voltage–Two-quadrant & Four-Quadrant operation of choppers-Applications-Numerical problems.

UNIT - VI: DC - AC Inverters

Single phase inverters–Unipolar and bipolar switching(Half & Full Bridge) – Series and Parallel Inverters-Voltage control of Single-Phase Inverters-PWM techniques– Single pulse, Multiple pulse &Sinusoidal PWM techniques-Three phase Inverters (120^0 and 180^0 modes of operation)

Text Books:

1. Power Electronics: by M.D.Singh, K B Khanchandani. Tata Mcgraw-Hill 2nd Edition.
2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

Reference Books:

1. Elements of Power Electronics–PhilipT.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Power Electronics handbook by Muhammad H. Rashid, Elsevier.

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III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
MICROPROCESSORS & MICROCONTROLLERS							

Course Objectives:

1. To understand the organization and architecture of Micro Processor
2. To explain the addressing modes to access memory
3. Explore how to interface microprocessor with I/O as well as other devices.
4. To familiarize 8051 micro controller architecture
5. To know the programming principles for 8086 and 8051
6. To understand how to develop cyber physical systems

Course Outcomes:

After completion of the course, Students will be able to

1. Recall the basic concepts, elements & operations of digital computer system.
2. Demonstrate memory organization and I/O processing for microprocessor and microcontroller.
3. Make use of Instruction set to develop Assembly Language Programming for computational operations.
4. Model a microprocessor based system by interfacing different electronic devices.
5. Illustrate the instruction set present in a microcontroller for different operations.
6. Develop cyber physical systems.

UNIT-I: Introduction to 8086 Microprocessor

Introduction and evolution of Microprocessors, Architecture of 8086, Register Organization of 8086, Physical memory organization of 8086, General bus operation of 8086, Introduction to 80286–80386 and 80486 and Pentium.

UNIT-II: Minimum and Maximum Mode Operations

Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing diagrams, Instruction set, Addressing modes.

UNIT-III: Assembly Language Programming

Assembler Directives, Macro's, Algorithms for Implementation of FOR Loop–WHILE–REPEAT and IF-THEN-ELSE. Addressing modes and Instruction set of 8051, Assembly language programming of 8051, Development systems and tools.

UNIT-IV: 8086 Interfacing

8255 PPI– Architecture of 8255&Modes of operation, Interfacing I/O devices to 8086 using 8255, Interfacing A to D converters & Interfacing D to A converters, Stepper motor interfacing, Static memory interfacing with 8086, DMA controller (8257)–Architecture & Interfacing 8257 DMA controller, Programmable Interrupt Controller (8259)–Command words, operating modes & Interfacing of 8259, Keyboard/display controller (8279)–Architecture, Modes of operation, Command words & Interfacing of 8279.

UNIT-V: Introduction to 8051 Micro Controller

8051 Microcontroller Architecture, Register set of 8051, I/O ports and Memory Organization, Modes of timer operation, Serial port operation, Interrupt structure of 8051.

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UNIT-VI: Industrial Applications of 8051

Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing.

Text Books:

1. A.K.Ray, K.M.Bhurchandi,"Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.
2. Douglas V Hall "Microprocessors and Interfacing" 2nd Edition, Mc–Graw Hill,.
3. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", 2nd Edition Thomson Publishers,.

Reference Books:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V Deshmukh, "Microcontrollers", TATA McGraw Hill publications, 2012.
3. Krishna Kant, "Microprocessors and Microcontrollers", PHI Publications, 2010.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SYSTEM ANALYSIS							

Course Objectives:

1. To study the development of impedance diagram (p.u) and formation of Y_{bus} and the Gauss Seidel, Newton raphson, decoupled and fast decoupled load flow methods.
2. To study the concept of the Z_{bus} building algorithm. And short circuit calculation for symmetrical faults
3. To study the effect of unsymmetrical faults.
4. To study the rotor angle stability analysis of power systems

Course Outcomes:

After completion of this course, Students will be able to

1. Draw an impedance diagram for a power system network.
2. Form a Y_{bus} matrix for a power system network with or without mutual couplings.
3. Find out the load flow solution of a power system network using different types of load flow methods.
4. Formulate the Z_{bus} for a power system network.
5. Find out the fault currents for all types faults with a view to provide data for the design of protective devices.
6. Find out the sequence components of currents for any unbalanced power system network.

UNIT –I: Per Unit Representation & Topology

Per Unit Quantities–Single line diagram– Impedance diagram of a power system – Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods.

UNIT –II: Power Flow Studies

Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods (Algorithmic approach) – Problems on 3–bus system only.

UNIT –III: Z–Bus formulation

Formation of Z–Bus: Partial network– Algorithm for the Modification of Z_{bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).– Modification of Z_{bus} for the changes in network(Problems).

UNIT – IV: Symmetrical Fault Analysis

3–Phase short circuit currents and reactance's of synchronous machine–Short circuit MVA calculations.

UNIT –V: Symmetrical Components & Fault analysis

Synthesis of unsymmetrical phasor from their symmetrical components– Symmetrical components of unsymmetrical phasor–Phase - shift of symmetrical components in Y-Δ transformers- Power in terms of symmetrical components – Sequence networks – Positive, negative and zero sequence networks of unloaded generator and transmission lines– Various types of faults: LG, LL, LLG and LLL on unloaded alternator.

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UNIT – VI: Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance– Synchronizing Power Coefficient – Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Application of Equal Area Criterion–Methods to improve steady state and transient stability.

Text Books:

1. Power System Analysis by Grainger and Stevenson, Tata Mc Graw Hill.
2. Electrical Power Systems by P.S.R.Murthy, B.S.Publications
3. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata Mc Graw–Hill Publishing Company, 2ndedition.
4. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye – CengageLearningpublications.

Reference Books:

1. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
2. Power System Analysis by HadiSaadat – TMH Edition.
3. Power System Analysis by B.R.Gupta, Wheeler Publications.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
POWER SEMICONDUCTOR DRIVES							

Course Objectives:

1. To learn the fundamentals of electric drive and different electric braking methods.
2. To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3. To discuss the converter control of dc motors in various quadrants
4. To learn the principles of static rotor resistance control and various slip power recovery schemes

Course Outcomes:

After completion of this course, Students will be able to

1. Understand the fundamentals of electric drive and different electric braking methods.
2. Analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3. Discuss the converter control of dc motors in various quadrants.
4. Understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. Analyze the principles of static rotor resistance control and various slip power recovery schemes.
6. Understand the speed control mechanism of synchronous motors

UNIT-I: Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.

UNIT-II: Three phase converter controlled DC motors

Revision of speed control techniques – Separately excited and series motors controlled by full converters – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Numerical problems – Four quadrant operation using dual converters

UNIT-III: Control of DC motors by DC–DC converters

Single quadrant – Two quadrant and four quadrant chopper fed separately excited and series excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operations – Closed loop operation (Block diagrams only).

UNIT-IV: Induction motor control – Stator side

Variable voltage characteristics– Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by voltage source inverter –PWM control – Closed loop operation of induction motor drives (Block Diagram Only).

UNIT–V: Control of Induction motor – Rotor side

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

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UNIT–VI: Control of Synchronous Motors

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (Block Diagram Only) –Variable frequency control–Pulse width modulation

Text Books:

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Semiconductor Drives, by S.B. Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

Reference Books:

1. Electric Motors and Drives Fundamentals, Types and Aplications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3

RENEWABLE ENERGY SOURCES
(Professional Elective-I)

Course Objectives:

1. To study the solar radiation data and radiation on earth's surface.
2. To study solar photo voltaic energy conversion and solar pond.
3. To study wind energy conversion and Bio-mass.
4. To study basic principle and working of Geothermal, Tidal, thermal and MHD Generators.

Course Outcomes:

After completion of this course, Students will be able to

1. Analyze the significance of renewable energy.
2. Understand the principles of solar radiation and design the solar collectors.
3. Know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
4. Understand the working principles of geothermal, ocean, tidal and wave energy techniques.
5. Know the functioning of direct energy conversion techniques.
6. Understand the MHD power generation and its future prospects

UNIT – I: Principles of Solar Radiation

Introduction to Energy Sources and their availability- renewable sources-The solar constant-Solar Radiation at the Earth's surface- solar radiation Geometry- instruments for measuring solar radiation and sun shine- solar radiation data- solar radiation on titled surfaces with numerical problems.

UNIT – II: Solar Energy Storage and Applications

Different methods- Sensible, latent heat and solar ponds-Applications of Solar ponds- solar heating-Photovoltaic energy conversion.

UNIT – III: Wind Energy and Bio-Mass

Principles of wind energy conversion, Components of WECS- horizontal and vertical axis windmills- performance characteristics. Bio fuels- Methods for obtaining energy from Biomass-Thermal gasification of Biomass.

UNIT – IV: Geothermal Energy, Ocean Energy, Tidal and Wave Energy

Introduction of Geothermal Energy- Nature of Geothermal fields- Geothermal Sources-Potential of Geothermal resources in India- OTEC- Methods of ocean thermal electric power generation- Open cycle and closed cycle- Principle of Tidal power- Components of Tidal power plants- Advantages and Disadvantages of Wave energy- Energy and power from the Waves.

UNIT – V: Thermal Electric Power

Introduction- Thermo electric power generation- See-beck, Peltier, Thomson effects- Thermo electric power generation- Thermo electric materials- Selection of materials.

UNIT – VI: MHD Power Generation

Introduction- Principle of MHD power generation- MHD Systems- Open cycle and closed cycle.

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Systems- Advantages of MHD Systems- International Status of MHD power generation and its future prospects.

Text Books:

1. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons
2. Tiwari and Ghosal, "Renewable energy resources",Narosa.

Reference Books:

1. Twidell& Weir, "Renewable Energy Sources"
2. Sukhatme, "Solar Energy", Tata McGraw-HillEducation.
3. B.S Magal Frank Kreith& J.F Kreith, "Solar Power Engineering"
4. Frank Krieth& John F Kreider, "Principles of SolarEnergy"

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III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SIGNALS AND SYSTEMS							

Course Objectives:

1. To get an in-depth knowledge about signals and analysis of the same using various transforms.
2. Able to know different types of signals and their frequency domain analysis.
3. Understand the principle, filter characteristics and bandwidth of a linear system.
4. Understand the concepts of auto correlation, cross correlation and power density.

Course Outcomes:

After completion of this course, Students would be able to

1. Remember basic signals and its operations.
2. Understand Fourier series representation of different signals.
3. Translate signals from time-domain to frequency-domain and vice versa.
4. Understand the LTI system and responses for different inputs.
5. Understand different properties of Convolution methods.
6. Understand Sampling theorem, Correlation and their applications.

UNIT-I: Signal Analysis

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition. Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function. Signal approximation using orthogonal functions, Mean square error.

UNIT-II: Fourier Series

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Conversion of Exponential Fourier Series from Trigonometric Fourier series & vice versa.

UNIT-III: Fourier Transforms

Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of periodic signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function.

UNIT-IV: Signal Transmission through Linear Systems

System and its types: Linear & Non-Linear, Time Variant & Time Invariant, Causal & Non Causal, Static & Dynamic, Stable & Unstable. Impulse response of a linear time invariant (LTI) system and linear time variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF and its characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT-V: Sampling

Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

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UNIT-VI: Convolution, Correlation and PSD of Signals

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms, Cross correlation and auto correlation functions, Properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function, Relation between convolution and correlation.

Text Books:

1. B.P. Lathi "Signals, Systems and Communications" –BS Publications, 2008.
2. Simon Haykin and Van Veen, Wiley "Signals and Systems"2nd Edition, 2003.

Reference Books:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab "Signals and Systems" 2nd Edition, PHI, 2013.
2. P. Ramesh Babu, "Signals and Systems", 3rd Edition, SciTech Publications, 2011.
3. A.Anand Kumar, "Signals and Systems", 3rd Edition, PHI Publications, 2013.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
DATA STRUCTURES							

Course Objectives:

1. Comprehensive knowledge of data structures and exposure to recursive algorithms, searching and sorting techniques
2. Apply stack and queue data structures for logical operations
3. Understand Linked-list representation models in various types of applications
4. Implementation of trees in various forms, orientation on graphs, representation of graphs, graph traversals

Course Outcomes:

After completion of this course, Students will be able to

1. Analyze sorting and searching algorithms.
2. Summarize elementary data structures such as stacks, queues and linked lists.
3. Compare and contrast various forms of trees.
4. Outline graph data structures and various graph traversal techniques.

UNIT - I: Introduction to Data Structures and Algorithms

Basic Terminology, Elementary Data Structure Organization, Classification of Data structures, Operations on Data structures, Abstract Data Type.

Recursion: Pseudo code, Recursive examples, Factorial, GCD implementation, Fibonacci numbers.

UNIT - II: Searching and Sorting

Introduction to Searching, Linear Search, Binary Search, Introduction to Sorting, Internal Sorting, External Sorting, Insertion sort, Merge sort.

UNIT - III: Stacks

Introduction to stacks, Array Representation of stacks, Operations on stack, push operation, pop operation, peek operation, Linked representation of stacks, operations on a linked stack, push operation, pop operation, applications of stacks, evaluation of a postfix expression, conversion of infix expression into a prefix expression.

Queues: Introduction, Array Representation of Queues, Linked representation of Queues, Circular Queues, Applications of queues.

UNIT - IV : Linked Lists

Introduction, Basic terminologies, Linked lists versus Arrays, Memory allocation and De-allocation for a linked list, single linked list, Traversing a Linked List, Searching a value in a linked list, inserting a new node in a linked list, Deleting a node from a linked list, Circular linked list, inserting a new node in a Circular linked list, Deleting a node from a Circular linked list, Doubly linked list, inserting a new node in a Doubly linked list, Deleting a node from a Doubly linked list.

UNIT - V: Trees

Introduction, Basic Terminology, Types of Trees, General Trees, Forests, Binary Trees,, Expression Trees, Traversing a Binary Tree, Pre-order Traversal, In-order Traversal, Post-order traversal, Level order traversal, (recursive & non-recursive), Constructing a Binary Tree from Traversals, Binary Search Trees, operations on Binary Search Trees, Searching for a node in

Binary Search Tree, inserting a new node in Binary Search Tree, Deleting a node from a Binary Search Tree.

UNIT – VI: Graphs

Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Graph Traversal algorithms, Breadth- First Search Algorithm, Depth-First-Search Algorithm.

Text Books:

1. Data Structures using C, Reema Thareja, Oxford, Second Edition, 2014 (UNITS: I, II, III, IV, V & VI)
2. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage (UNIT: I)

Reference Books:

1. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
2. Data Structure with C, Seymour Lipschutz, TMH
3. Data structures and algorithm analysis in C, 2/e, Mark Allen Weiss

Additional Resources:

1. nptel.ac.in/courses/106102064/1
2. nptel.ac.in/courses/106103069

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ELECTRICAL MACHINES - II LABORATORY							

Course objectives:

1. To predetermine the efficiency and regulation of transformers and assess their performance.
2. To predetermine the regulation of three–phase alternator by various methods.
3. To find X_d/X_q ratio of alternator and asses the performance of three–phase synchronous motor.
4. To perform various tests on Induction motor for assessing its performance.

Course Outcomes:

After completion of this course, Students will be able to

1. Conduct open circuit/ short circuit test on transformer
2. Perform test on synchronous Machine to find Direct and quadrature axis reactance
3. Conduct No Load and Full load tests on transformers/Induction Motor
4. Calculate torque and speed of given Machine.

LIST OF EXPERIMENTS

Any 10 of the following experiments are to be conducted:

1. O.C. & S.C. Tests on Single phase Transformer.
2. Parallel operation of Single phase Transformers.
3. Sumpner's test on single phase transformers.
4. Scott connection of transformers.
5. Brake test on three-phase induction motor.
6. No-load & blocked rotor tests on three- phase induction motor and circle diagram.
7. Determination of equivalent circuit parameters of a single phase induction motor.
8. Regulation of a three-phase alternator by synchronous impedance, M.M.F. Methods.
9. Determination of X_d and X_q of a salient pole synchronous generator.
10. V and inverted-V curves of a three-phase synchronous motor.
11. Measurement of sequence impedance of a three-phase alternator.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
CONTROL SYSTEMS AND MEASUREMENTS LABORATORY							

Course Objectives:

1. To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy.
2. To understand testing of transformer oil & measure the parameters of choke coil.
3. To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, DC servo motors, AC Servo motors, stepper motor and potentiometer.

Course Outcomes:

After completion of this course, Students will be able to

1. Measure accurately the electrical parameters voltage, current, power, energy.
2. To test transformer oil for its effectiveness and measure the parameters of Chokecoil.
3. Analyze the performance and working Magnetic amplifier, D.C. servo motors, A.C. Servo motors.
4. Design P, PI, PD and PID controllers and lag, lead and lag–leadcompensators.

LIST OF EXPERIMENTS

Any Ten experiments from the following list are required to be conducted.

1. Transfer function of DC generator.
2. Characteristics of AC servomotor.
3. Lag and lead compensation – Magnitude and phase plot.
4. Characteristics of DC Servomotor.
5. Characteristics of Magnetic amplifier.
6. Time response of a second order system.
7. Effect of P, PD, PI, PID Controller on a second order system.
8. Kelvin's double Bridge - Measurement of resistance.
9. Capacitance measurement using Anderson Bridge.
10. Calibration and testing of single phase energy meter
11. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
12. Crompton DC potentiometer- Calibration of PMMC Ammeter and PMMC Voltmeter.
13. C.T Testing using mutual inductor- measurement of % ratio error and phase angle error of given C.T by Null method.
14. LVDT and Capacitance pickup – Characteristics and Calibration.
15. Dielectric Oil Testing of Transformer Oil.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
POWER ELECTRONICS LAB							

Course Objectives:

1. To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2. To analyze the performance of single–phase and three–phase full wave bridge converters, single–phase dual converter with both resistive and inductive loads.
3. To understand the operation of AC voltage controller and cyclo converter with resistive and inductive loads.
4. And the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

Course Outcomes:

After completion of this course, Students will be able to

1. Study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2. Analyze the performance of single–phase and half wave and Full wave bridge converters, single–phase dual converter with both resistive and inductive loads.
3. Understand the operation of AC voltage controller and cyclo converter with resistive and inductive loads.
4. Understand the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

Any 10 of the Following Experiments are to be conducted

1. Study of Characteristics of SCR, MOSFET &IGBT
2. Study of Gate firing circuits for SCR's
3. Forced commutation circuits(Class A, Class B, Class C, Class D)
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Controller with R and RL Loads
7. Single -Phase Cyclo–converter with R and RL loads
8. Single -Phase Bridge Inverter with R and RL Loads
9. Single -Phase dual converter with R and RL Loads
10. Single -Phase parallel inverter with R and RL Loads
11. Three -Phase half controlled bridge converter with RL load.
12. Three- Phase full converter with RL–load.
13. Single -phase PWM inverter.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
DATA STRUCTURES LAB							

Course Outcomes:

After completion of this course, Students will be able to

1. Develop various algorithms using recursive and non-recursive functions.
2. Experiment with linear data structures.
3. Apply Tree traversal techniques in various applications.

Week – 1

a) Write a recursive C program which computes the nth Fibonacci number, for appropriate values of n.

b) Write recursive C programs for the following
   i) Factorial of a given number
   ii) GCD Computation
   iii) Towers of Hanoi

Week – 2

a) Write a C program that use both recursive and non-recursive functions to perform linear search.

b) Write a C program that use both recursive and non-recursive functions to perform binary search.

Week -- 3

a) Write a C program to implement Bubble sort.
b) Write a C program to implement Insertion sort.
c) Write a C program to implement Selection sort.

Week -- 4

a) Write a C program to implement Quick sort.
b) Write a C program to implement Merge sort.
c) Write a C program to implement heap sort.

Week -- 5

a) Write a C program to implement Stack operations using arrays
b) Write a C program to implement Queue operation using arrays.
c) Write a C program to convert infix expression into postfix expression using stack.

Week -- 6

a) Write a C program to implement Stack operation using Linked list.
b) Write a C program to implement Queue operations using Linked lists.

Week – 7

a) Write a C program to implement the following operations on a singly Linked using functions
   i) Insertion
   ii) Deletion
   iii) Displaying
   iv) Reversing

Week - 8

a) Write a C program to implement following Operations on a Binary Tree
   i) Create
   ii) In-order traversal
   iii) Pre-order traversal

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iv) Post-order traversal

b) Write a C program to implement following Operations a Binary Search Tree
   i) Create
   ii) Insert
   iii) Delete

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III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2

MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Objectives:

1. To study programming based on 8086 microprocessor and 8051 microcontroller.
2. To learn 8086 microprocessor based ALP using arithmetic, logical and shift operations.
3. To understand modular and Dos/Bios programming using 8086 microprocessor.
4. Familiarize to interface 8086 with I/O and other devices.

Course Outcomes:

After completion of this course, Students will be able to

1. Build Up the assembly language programs on arithmetic, logical and string operations.
2. Construct an 8086 system by interfacing I/O and other devices.
3. Make Use of Instruction set of 8086 for modular programming and Dos/Bios programming.
4. Model the 8051 based embedded systems for various applications.

I. Microprocessor 8086:

Any 8 of the following experiments are to be conducted:

1. Introduction to MASM/TASM.
2. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison.
5. Modular Program: Procedure, Near and Far implementation, Recursion.
6. Dos/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.
7. Interfacing 8255–PPI
8. Programs using special instructions like swap, bit/byte, set/reset etc.
9. Programs based on short, page, absolute addressing.
10. Interfacing 8259 – Interrupt Controller.
11. Interfacing 8279 – Keyboard Display.
12. Stepper motor control using 8253/8255.

II. Microcontroller 8051

Any 2 of the following experiments are to be conducted:

13. Reading and Writing on a parallel port.
14. Timer in different modes.
15. Serial communication implementation.
16. Understanding three memory areas of 00 – FF (Programs using above areas) using external Interrupts.

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EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software.
2. 8086 Microprocessor.

Kits

1. 8051 Micro Controller kits.
2. Interfaces/peripheral subsystems.
   i) 8259 PIC
   ii) 8279-KB/Display
   iii) 8255 PPI
   iv) 8251 USART
   4. A/D and D/AC Interface.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3

ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-II)

Course Objectives:

1. To study different factors of Distribution system and the substations design.
2. To study the concepts of voltage drop and power loss.
3. To study the distribution system protection and its coordination.
4. To study the effect of compensation for power factor improvement & effect of voltage control on distribution system.

Course Outcomes:

After completion of this course, Students will be

1. Able to understand various factors of distribution system.
2. Able to design the substation and feeders.
3. Able to determine the voltage drop and power loss
4. Able to understand the protection and its coordination.
5. Able to understand the effect of compensation for power factor improvement.
6. Able to understand the effect of voltage control.

UNIT – I: General Concepts

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial).

UNIT – II: Substations and Feeders

Location of substations: Rating of distribution substation –Service area with 'n' primary feeders –benefits and methods of optimal location of substations.

Distribution Feeders: Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading-Basic design practice of the secondary distribution system.

UNIT – III: System Analysis

Voltage drop and power–loss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads, non-uniformly distributed loads and Non 3-Φ loads– Numerical problems - Three phase balanced primary lines.

UNIT – IV: Protection & Coordination

Protection: Objectives of distribution system protection –Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

Coordination: General coordination procedure –Various types of coordinated operation of protective devices - Residual Current Circuit Breaker.

UNIT – V: Compensation for Power Factor Improvement

Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor

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correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

UNIT – VI: Voltage Control

Voltage Control: Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Text Book:

1. "Electric Power Distribution system, Engineering" – by Turan Gonen, McGraw–hill Book Company.

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997. 3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
SPECIALMACHINES (Professional Elective-II)							

Course Objectives:

1. To study theory of operation and control of single phase motors like universal motor, servo motors etc.
2. To understand theory of operation and control of switched reluctance motor.
3. To explain the performance and control of stepper motors, and their applications.
4. To describe the operation and characteristics of permanent magnet dc motor.
5. To distinguish between brush dc motor and brush less dc motor.
6. To study the theory of travelling magnetic in linear motors and the significance of electrical motors for traction drives

Course Outcomes:

After completion of this course, Students will be able to

1. Explain theory of operation and control different types of single phase motors like Universal motor & Servo motors etc.
2. Explain theory of operation and control of switched reluctance motor.
3. Contrast the performance and control of stepper motors, and their applications.
4. Classify different types of permanent magnet materials & explain PMDC motor operation.
5. Compare brush dc motor and brush less dc motor.
6. Explain the theory of travelling magnetic field in linear motors & summarize the AC&DC Traction systems.

UNIT I: Single phase Special Electrical Machines

Introduction- Single phase Induction Motor types-Comparison between 1-Φ & 3-Φ Induction motors-AC series Motor (Universal Motor)
Servo Motor- Types –construction- operating principle and application

UNIT II: Switched Reluctance Motor

Construction- -Principle of operation – Rotor Sensing mechanism- Torque & Voltage Equations– Various Power converters for switched reluctance motor – Control of switched reluctance motor-Applications.

UNIT III: Stepper Motors

Basic terms used in Stepper Motors-Theory of Torque Production–Types of Stepper Motors Construction–Principle of operation–Permanent Magnet Stepping Motor- Variable reluctance stepping motor – Hybrid stepping motor- Applications-Numerical Problems.

UNIT IV: Permanent Magnet DC Motors

Introduction-Permanent magnet materials-Construction – Principle of working – Torque equation and equivalent circuits – Performance characteristics – Moving coil motors-Applications.

UNIT V: Permanent Magnet Brushless DC Motor

Introduction –Construction –Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation – Power controllers – Motor characteristics and control-Applications.

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UNIT VI: Electric Motors for traction drives

Introduction-Linear Induction motors-Characteristics of Traction motor – Single sided & Double sided linear induction motor for traction drives – Comparison of AC and DC traction systems.

Text Books:

1. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.
2. Special electrical Machines , Simmi P.Bumran Katson books S.K.Kataria & Sons

Reference Books:

1. Electrical machines, Rajput Laxmi Publications.
2. Electrical machines, by Ashfaq Hussain, Dhanpat Rai Publications.

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III B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
DIGITAL SIGNAL PROCESSING **(Professional Elective-II)**							

Course Objectives:

1. Enhance the analytical ability of the students in facing the challenges posed by growing trends in communication, control and signal processing areas.
2. Develop ability among students for problem formulation, system design and solving skills
3. Demonstrate basic knowledge of Digital Signal Processing by understanding various Transformations.
4. Understand Various Discrete-time signals and class of linear shift-invariant systems will be studied using the convolution sum, and the frequency domain, using transformations.
5. Design system with digital network composed of adders, delay elements, and coefficient multipliers.

Course Outcomes:

After completion of the course, Students will be able to

1. Analyze the signals and system in Time and Frequency domain through its respective tools.
2. Find DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm.
3. Explain the significance of various filter structures and effects of roundoff errors.
4. Demonstrate knowledge of complex number, Fourier series and ability to design electrical and electronics systems.
5. Construct the digital filter circuits for generating desired signal wave shapes (non-sinusoidal) for different applications like computers, control systems and counting and timing systems.
6. Develop the digital computer or digital hardware for quantizing amplitudes of signals.

UNIT-I: Introduction

Review of Discrete Time Signals: Some Elementary Discrete-Time Signals, Classification of Discrete–Time Signals, Simple Manipulations of Discrete–Time Signals, Discrete Time Systems: Input-Output Description of Systems, Block Diagram Representation of Discrete-Time Systems, Classification of Discrete-Time Systems Interconnection of Discrete-Time Systems. Frequency domain representation of Discrete Time Signals and Systems, Discrete-Time Fourier Transform (DTFT): Existence of DTFT, properties of DTFT.

Discrete Fourier Series: Properties of Discrete Fourier Series, DFS representation of periodic sequences.

UNIT-II: Discrete Fourier Transforms

Properties of DFT, Circular & Linear Convolution of Sequences using DFT, and Computation of DFT: Direct evaluation of the DFT.

FAST FOURIER TRANSFORMS: Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT, and Inverse FFT: IDFT-FFT.

UNIT-III: Realization of IIR Filters

Review of Z-Transforms: z-transform and ROC of finite and infinite sequence, properties of z-transform, relationship between the Fourier transform and z-transform, inverse z-transform. Solution of Difference Equations of Digital Filters, Block Diagram Representation of Linear Constant Coefficient Difference Equations, Basic structures of IIR systems: Direct form-I

realization, Direct form-II realization, transposed, cascade form, parallel form. Lattice structures of IIR systems, Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure, Lattice-ladder structure.

UNIT-IV: Realization of FIR Filters

Basic structures of FIR systems: Transversal structure, Linear phase, Lattice structure, Polyphase Lattice structures of FIR systems, Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure, Lattice-ladder structure.

UNIT-V: IIR Digital Filters

Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter. Frequency Transformations in digital domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter.

UNIT-VI: FIR Digital Filters

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques: Rectangular Window, Triangular or Bartlett Window, Raised Cosine Window Hanning Window, Blackman Window, Kaiser Window, Frequency Sampling Technique: Frequency Sampling Realization, Frequency Response, Design, Comparison of IIR and FIR filter, Illustrative Problems.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications" Pearson Education/PHI, 4th Edition, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing" 2nd Edition, PHI.

Reference Books:

1. Digital Signal Processing by Ramesh Babu.
2. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
3. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publishing House Pvt. Ltd.
4. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
ELECTRICAL MACHINE DESIGN (Professional Elective-1)							

Course Objectives:

1. To develop knowledge on principles of design of static and rotating machines.
2. To find out the dimension of various parts of the machine.
3. To examine various loadings in the machines.
4. To Study manufacturing and heating cooling techniques of materials

Course Outcomes:

After completion of this course, Students will be able to

1. Understand Material Selection, Heating & Cooling Techniques.
2. Understand the design of various types of windings.
3. Understand the design of various parts of DC machines and solve the problems of design
4. Understand the design concepts of transformers and know about how to design the parts.
5. Understand the design concepts of synchronous machines and solve the problems related to design.
6. Understand the importance of design of machines based on their applications.

UNIT-I: Introduction to Electrical Machine Design

Design concepts- factors- Material Selection- Manufacturing techniques- Review of basic Principles- Heating & Cooling Techniques.

UNIT-II: Armature Windings (AC & DC)

Single layer winding- two layer winding- lap and wave windings- concept of pole pitch- emf generation -full pitch coil, fractional pitch coil and concentrated winding.

UNIT-III: DC Machines

Constructional details – Output equation - Choice of specific electric and magnetic loadings - Separation of D and L for rotating machines. Estimation of number of conductors/turns - Coils - armature Slots - Conductor dimension - Slot dimension. Choice of number of poles - Length of air gap - Design of field system- Interpoles- Commutator and Brushes.

UNIT-IV: Transformers

Construction-Comparison of Core and Shell type, Single and Three phase transformer comparison-Core and Yoke Design – cross section- cooling of transformers- Number of tubes- Transformer windings-Coil design- Output equation- determination of number of turns and length of mean turn of winding- Resistance- Leakage reactance.

UNIT-V: Induction Motors

Choice of specific electric and magnetic loadings- Stator Design (Frames)- output equation- choice of conductor rating- stator winding- and stator slots- Squirrel cage rotor design - air gap length- rotor slots and rotor bars- Design of wound rotor - rotor slots-windings.

UNIT –VI: Synchronous Machines

Constructional features - short circuit ratio - Output equation - Specific loadings - Main dimensions - Stator design - Design of Salient Pole field coil.

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Text Book:

1. "Electrical Machine Design", Sawhney, Dhanpath Rai &Co

Reference Books:

1. "Performance and Design of DC Machines", Clayton & Hancock,ELBS.
2. "Performance and Design of AC Machines", M.G.Say; Pitman,ELBS.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
MICRO ELECTRO MECHANICAL SYSTEMS (Professional Elective-I)							

Course Objectives:

1. To learn basics of Micro Electro Mechanical Systems (MEMS).
2. To learn about various sensors and actuators used in MEMS.
3. To learn the principle and various devices of MOEMS, Fluidic.
4. To learn the concepts of bio and chemical systems and devices.

Course Outcomes:

After completion of this course, Students will be able to

1. Learn basics of Micro Electro Mechanical Systems (MEMS) & essential material properties.
2. Learn the principle and various devices of MOEMS, Micro Fluidic systems.
3. Study the Chemical and Bio Medical Micro Systems.
4. Know machining process of MEMS.
5. Know about the optical MEMS.
6. Understand the operational theory of common MEMS sensors and MEMS actuators.

UNIT-I: Introduction

Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods. Principles of sensing and actuation: piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator.

UNIT-II: Thermal Sensors and Actuators

Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, pettier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT-III: Micro-Opto-Electro Mechanical Systems

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT-IV: Magnetic Sensors and Actuators

Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on Hall Effect, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, bidirectional micro actuator, and feedback circuit integrated magnetic actuator.

UNIT-V: Micro Fluidic Systems

Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow. Radio Frequency MEMS: RF - based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

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UNIT-VI: Chemical and Bio Medical Micro Systems

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemo resistors, chemo capacitors, chemo transistors, electronic nose(E-nose), mass sensitive chemo sensors, fluorescence detection, calorimetric.

Text Books:

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

Reference Books:

1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
2. MEMS and NEMS, Sergey Edwrd Lyshevski, CRC Press, Indian Edition.
3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
4. Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.

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III B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
INDUSTRIAL INSTRUMENTATION (Professional Elective-I)							

Course Objectives:

1. To study various types of signals and their representation, various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.
2. To study and measure the various types of Non–electrical quantities.
3. To study various types of digital voltmeters and the working principles of various types of oscilloscopes and their applications.
4. To study various types of signal analysers.

Course Outcomes:

After completion of this course, Students will be able to

1. To understand various types of signals and their representation.
2. To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.
3. To analyze the measurement of the various types of Non–electrical quantities.
4. To study various types of digital voltmeters
5. To study the working principles of various types of oscilloscopes and their applications.
6. To study various types of signal analyzers.

UNIT-I: Signals and their representation

Measuring Systems, Performance Characteristics, - Static characteristics - Dynamic Characteristics - Errors in Measurement - Gross Errors - Systematic Errors -Statistical analysis of random errors – Signal and their representation – Standard test, periodic, aperiodic, modulated signal –Sampled data pulse modulation and pulse code modulation.

UNIT-II: Transducers

Definition of transducers – Classification of transducers – Advantages of Electrical transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, inductive and capacitor transducers – LVDT Applications – Strain gauge and its principle of operation – Gauge factor

UNIT-III: Measurement of Non–Electrical Quantities

Measurement of strain – Gauge Sensitivity – Displacement – Velocity –Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

UNIT-IV: Digital Voltmeters

Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type – DVM digital frequency meter – Digital phase angle meter.

UNIT-V: Oscilloscope

Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns –Sampling oscilloscope

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UNIT-VI: Signal Analyzers

Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion –Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters.

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition,1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat rai & Co.

Reference Books:

1. Measurement and Instrumentation theory and application, AlanS. Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D ODoeblin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson / Prentice Hall of India
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D. Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

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	3	1	-	40	60	100	3

ENERGY AUDIT, CONSERVATION & MANAGEMENT
(Professional Elective-II)

Course Objectives:

1. To understand energy efficiency, scope, conservation and technologies and design energy efficient lighting systems.
2. To estimate/calculate power factor of systems and propose suitable compensation techniques.
3. To understand energy conservation in HVAC systems.
4. To calculate life cycle costing analysis and return on investment on energy efficient technologies

Course Outcomes:

After completion of this course, Students will be able to

1. Explain energy efficiency, conservation and various technologies.
2. Design energy efficient lighting systems.
3. Calculate power factor of systems and propose suitable compensation techniques.
4. Explain energy conservation in HVAC systems.
5. Calculate life cycle costing analysis and return on investment on energy efficient technologies.
6. Understand economic aspects and analysis.

UNIT–I: Basic Principles of Energy Audit and management Energy audit

Basic Principles of Energy Audit and management Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management –Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

UNIT–II: Lighting

Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT–III: Power Factor and energy instruments

Power factor – Methods of improvement – Location of capacitors – Power factor with nonlinear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

UNIT–IV: Space Heating and Ventilation

Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning – Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

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UNIT–V: Economic Aspects and Analysis

Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts).

UNIT–VI: Computation of Economic Aspects

Calculation of simple payback method – Net present worth method – Power factor correction -Lighting – Applications of life cycle costing analysis – Return on investment.

Text Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications.2012
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and p venkataseshaiah-I K International Publishing House pvt.ltd,2011.

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III B.TECH II -SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
QUANTITATIVE APTITUDE AND REASONING – II							

Course Objectives:

1. To train students in analyzing real life scenarios considering all factors
2. To educate the students on principles of mathematical problems and problem solving methods
3. To train students for campus placements

Course Outcomes:

After completion of this course, Students will be able to

1. Prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements.
2. Evaluate various real life situations by resorting to Analysis. of key issues and factors.
3. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

UNIT I: Numbers, Time and Distance, Time and work,Averages, Mixtures and Allegations

1. Numbers

a) Classification of numbers
b) Divisibility rules
c) Finding the units digit
d) Finding remainders in divisions involving higher powers
e) LCM and HCF Models

2. Time and Distance

a) Relation between speed, distance and time
b) Converting km/h into m/s and vice versa
c) Problems on average speed
d) Problems on relative speed
e) Problems on trains
f) Problems on boats and streams
g) Problems on circular tracks
h) Problems on races

3. Time and Work

a) Problems on Unitary method
b) Relation between Men, Days, Hours and Work
c) Problems on Man-Day-Hours method
d) Problems on alternate days
e) Problems on Pipes and Cisterns

4. Averages, Mixtures and Allegations

a) Definition of Average
b) Rules of Average
c) Problems on Average Problems on Weighted Average
d) Finding average using assumed mean method

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e) Problems on mixtures
f) Allegation rule
g) Problems on Allegation

UNIT II: Data Interpretation, Data Sufficiency, Mensuration, Permutation and Combinations, Probability

1. Data Interpretation

a) Problems on tabular form
b) Problems on Line Graphs
c) Problems on Bar Graphs
d) Problems on Pie Charts

2. Data Sufficiency

a) Different models in Data Sufficiency
b) Problems on data redundancy

3. Mensuration

a) Formulas for Areas
b) Formulas for Volumes of different solids
c) Problems on Areas
d) Problems on Volumes
e) Problems on Surface Areas

4. Permutation and Combinations

a) Definition of permutation
b) Problems on Permutations
c) Definition of Combinations
d) Problems on Combinations

a) **Probability** Definition of Probability
b) Problems on coins
c) Problems on dice
d) Problems on Deck of cards
e) Problems on Years

SYLLABUS FOR REASONING

UNIT III: Cubes, Venn diagrams, Binary Logic

a) **Cubes**
b) Basics of a cube
c) Formulae for finding volume and surface area of a cube
d) Finding the minimum number of cuts when the number of identical pieces are given
e) Finding the maximum number of pieces when cuts are given
f) Problems on painted cubes of same and different colors
g) Problems on cuboids
h) Problems on painted cuboids
i) Problems on diagonal cuts

Venn diagrams

a) Representing the given data in the form of a Venn diagram

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b) Problems on Venn diagrams with two sets
c) Problems on Venn diagrams with three sets
d) Problems on Venn diagrams with four sets

a) **Binary Logic**
b) Definition of a truth-teller
c) Definition of a liar
d) Definition of an alternator
e) Solving problems using method of assumptions
f) Solving analytical puzzles using binary logic

UNIT IV: Number and letter series, Number and letter Analogies, Odd man out

1. Number and letter series

a) Difference series
b) Product series
c) Squares series
d) Cubes series
e) Alternate series
f) Combination series
g) Miscellaneous series
h) Place values of letters

a) **Number and Letter Analogies**
b) Definition of Analogy
c) Problems on number analogy
d) Problems on letter analogy
e) Problems on verbal analogy

2. Odd man out

a) Problems on number Odd man out
b) Problems on letter Odd man out
c) Problems on verbal Odd man out

UNIT V: Coding and decoding, Direction sense, Critical Reasoning, Lateral reasoning puzzle

a) **Coding and decoding**
b) Coding using same set of letters
c) Coding using different set of letters
d) Coding into a number

1. Problems on R-model

a) **Direction sense**
b) Solving problems by drawing the paths
c) Finding the net distance travelled
d) Finding the direction
e) Problems on clocks
f) Problems on shadows
g) Problems on damaged compass
h) Problems on direction sense using symbols and notations

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2. Critical Reasoning

a) Problems on assumption
b) Problems on conclusions
c) Problems on inferences
d) Problems on strengthening and weakening of arguments
e) Problems on principle
f) Problems on paradox

3. Lateral reasoning puzzle

a) Problems on common balance
b) Problems on digital balance
c) Problems on coins
d) Problems on lockers
e) Problems on heights
f) Digit puzzles using basic arithmetic operations

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude – Abhijit Guha Mc Graw Hills

References:

1. www.affairscloud.com/**quantitative-aptitude**-questions
2. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
3. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
4. www.indiabix.com
5. www.practice**aptitude**tests.com/numerical-**reasoning**-test.

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IV Year – I SEMESTER

T	P	C
3+1	0	3

HVAC & DC TRANSMISSION

Preamble:

With the increasing power generation in the country and long distance power transmission, it is necessary that power should be transmitted at extra and ultra high voltage. The topics dealt in this subject relate to phenomena associated with transmission line at higher voltages, equipments generating high voltage and power control strategy.

Learning Objectives:

- To understand the phenomena associated with transmission line, operating at extra high voltages. The unit gives detail analysis of several phenomena viz. electrostatic field, charges, voltage gradient and conductor configuration.
- The objective is to discuss phenomena of corona, losses, audible noise, radio interference and measurement of these quantities.
- To understand the phenomena of HVDC, HVDC equipment comparison with AC and the latest state of art in HVDC transmission.
- To understand method of conversion of AC to DC, performance of various level of pulse conversion and control characteristics of conversion. It also provides knowledge of effect of source inductance as well as method of power control.
- To understand the requirements of reactive power control and filtering technique in HVDC system.
- To understand the harmonics in AC side of power line in a HVDC system and design of filters for various levels of pulse conversion.

UNIT – I:

Introduction of EHV AC transmission

Necessity of EHV AC transmission – Advantages and problems – Power handling capacity and line losses – Mechanical considerations – Resistance of conductors –Electrostatics – Field of sphere gap – Field of line charges and properties – Charge ~ potential relations for multi–conductors – Surface voltage gradient on conductors – Bundle spacing and bundle radius –

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Examples – Distribution of voltage gradient on sub conductors of bundle – Examples.

UNIT – II:

Corona effects

Power loss and audible noise (AN) – Corona loss formulae – Charge voltage diagram – Generation – Characteristics – Limits and measurements of AN – Relation between 1–phase and 3–phase AN levels – Examples – Radio interference (RI) – Corona pulses generation – Properties and limits – Frequency spectrum – Modes of propagation – Excitation function – Measurement of RI, RIV and excitation functions – Examples.

UNIT – III:

Basic Concepts of DC Transmission

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC transmission – Application of DC Transmission System – Planning & Modern trends in DC transmission.

UNIT – IV:

Analysis of HVDC Converters and System Control

Choice of Converter configuration – Analysis of Graetz – Characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star – Star mode and their performance – Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system – Starting and stopping of DC link – Power Control.

UNIT–V:

Reactive Power Control in HVDC

Reactive Power Requirements in steady state – Conventional control strategies –Alternate control strategies sources of reactive power – AC Filters – Shunt capacitors – Synchronous condensers.

UNIT – VI:

Harmonics and Filters

Generation of Harmonics – Characteristics harmonics – Calculation of AC Harmonics – Non–Characteristics harmonics – Adverse effects of harmonics – Calculation of voltage & current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single tuned filters – Design of High pass filters.

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Learning Outcomes:

- To be able to acquaint with HV transmission system with regard to power handling capacity, losses, conductor resistance and electrostatic field associate with HV. Further knowledge is gained in area of bundle conductor system to improve electrical and mechanical performance.
- To develop ability for determining corona, radio interference, audible noise generation and frequency spectrum for single and three phase transmission lines.
- To be able to acquire knowledge in transmission of HVDC power with regard to terminal equipments, type of HVDC connectivity and planning of HVDC system.
- To be able to develop knowledge with regard to choice of pulse conversion, control characteristic, firing angle control and effect of source impedance.
- To develop knowledge of reactive power requirements of conventional control, filters and reactive power compensation in AC. side of HVDC system.
- Able to calculate voltage and current harmonics, and design of filters for six and twelve pulse conversion.

Text Books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
3. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (P) Ltd.

Reference Books:

1. EHVAC and HVDC Transmission Engineering and Practice – S.Rao.
2. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications
3. HVDC Transmission – J. Arrillaga.

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IV Year – I SEMESTER

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POWER SYSTEM OPERATION AND CONTROL

Preamble:

This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.

Learning Objectives:

- To understand optimal dispatch of generation with and without losses.
- To study the optimal scheduling of hydro thermal systems.
- To study the optimal unit commitment problem.
- To study the load frequency control for single area system
- To study the PID controllers for single area system and two area system.
- To understand the reactive power control and compensation of transmission lines.

UNIT–I:

Economic Operation of Power Systems

Optimal operation of Generators in Thermal power stations, – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT–II:

Hydrothermal Scheduling

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models – Scheduling problems – Short term Hydrothermal scheduling problem.

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UNIT–III:

Unit Commitment

Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT–IV:

Load Frequency Control

Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Modeling of Hydro turbine – Necessity of keeping frequency constant – Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case – Load frequency control of two area system – Uncontrolled case and controlled case – Tie–line bias control.

UNIT–V:

Load Frequency Controllers

Proportional plus Integral control of single area and its block diagram representation – Steady state response – Load Frequency Control and Economic dispatch control.

UNIT–VI:

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – Uncompensated and compensated transmission lines: Shunt and series compensation – Need for FACTS controllers.

Learning Outcomes:

- Able to compute optimal scheduling of Generators.
- Able to understand hydrothermal scheduling.
- Understand the unit commitment problem.
- Able to understand importance of the frequency.
- Understand importance of PID controllers in single area and two area systems.
- Will understand reactive power control and line power compensation.

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Text Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Power System stability & control, Prabha Kundur,TMH
3. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata Mc Graw – Hill Publishing Company Ltd, 2nd edition.

Reference Books:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma, THOMPSON, 3rd Edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by Hadi Saadat – TMH Edition.

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IV Year – I SEMESTER

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POWER SYSTEMS LAB

Learning Objectives:

To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

Any 10 of the Following experiments are to be conducted:

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Fault Analysis.
3. Sequence impedances of 3 phase Alternator by Direct method.
4. ABCD parameters of Transmission network.
5. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
6. Dielectric strength of Transformer oil.
7. Calibration of Tong Tester.

8&9. Load flow studies any two methods.

10. Transient Stability Analysis
11. Load frequency control without control
12. Load frequency control with control
13. Economic load dispatch without losses
14. Economic load dispatch with losses.

Learning Outcomes:

The student is able to determine the parameters of various power system components which are frequently occur in power system studies and he can execute energy management systems functions at load dispatch centre.

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OPTIMIZATION TECHNIQUES

(Open Elective)

Preamble:

Optimization techniques have gained importance to solve many engineering design problems by developing linear and nonlinear mathematical models. The aim of this course is to educate the student to develop a mathematical model by defining an objective function and constraints in terms of design variables and then apply a particular mathematical programming technique. This course covers classical optimization techniques, linear programming, nonlinear programming and dynamic programming techniques.

Learning Objectives:

1. To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
2. To state single variable and multi variable optimization problems, without and with constraints.
3. To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
4. To state transportation and assignment problem as a linear programming problem to determine optimality conditions by using Simplex method.
5. To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.
6. To explain Dynamic programming technique as a powerful tool for making a sequence of interrelated decisions.

UNIT – I:

Introduction and Classical Optimization Techniques:

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

UNIT – II:

Classical Optimization Techniques

Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of

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Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – III:

Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm - Duality in Linear Programming – Dual Simplex method.

UNIT – IV:

Transportation Problem

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems – Special cases in transportation problem.

UNIT – V:

Nonlinear Programming:

Unconstrained cases - One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method - Univariate method, Powell's method and steepest descent method.

Constrained cases - Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – VI:

Dynamic Programming:

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Learning Outcomes:

The student should be able to:

1. State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.

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2. Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
3. Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
4. Solve transportation and assignment problem by using Linear programming Simplex method.
5. Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.
6. Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

Text Books:

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research" by H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis" – by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research – by Dr. S.D.Sharma, Kedarnath, Ramnath & Co
3. "Operations Research: An Introduction" – by H.A.Taha, PHI Pvt. Ltd., 6th edition
4. Linear Programming–by G.Hadley.

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Note : This Elective can be offered to Students of All Branches except EEE.

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HIGH VOLTAGE ENGINEERING
(ELECTIVE – II)

Preamble:

With the growth of power, HV power transmission has become an important subject. The performance of generating equipment requires knowledge of different phenomena occurring at higher voltage. Thus evaluations of various insulating materials are required for protection of HV equipments. Keeping this in view the course is designed to understand various phenomena related to breakdown study and withstand characteristics of insulating materials. The course also describes the generation and measurement of DC, AC and Impulse voltages as well various testing techniques.

Learning Objectives:

- To understand electric field distribution and computation in different configuration of electrode systems.
- To understand HV breakdown phenomena in gases, liquids and solids dielectric materials.
- To acquaint with the generating principle of operation and design of HVDC, AC and Impulse voltages and impulse currents.
- To understand various techniques of AC, DC and Impulse measurement of high voltages and currents.
- To understand the insulating characteristics of dielectric materials.
- To understand the various testing techniques of HV equipments.

UNIT–I:

Introduction to High Voltage Technology

Electric Field Stresses – Uniform and non–uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

UNIT–II:

Break down phenomenon in gaseous, liquid and solid insulation

Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law – Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of solid dielectrics in practice – Breakdown in composite dielectrics used in practice.

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UNIT–III:

Generation of High voltages and High currents

Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages – Generation of impulse currents – Tripping and control of impulse generators.

UNIT–IV:

Measurement of high voltages and High currents

Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

UNIT–V:

Non–destructive testing of material and electrical apparatus

Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial discharge measurements.

UNIT–VI:

High voltage testing of electrical apparatus

Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

Learning Outcomes:

- To be acquainted with the performance of high voltages with regard to different configurations of electrode systems.
- To be able to understand theory of breakdown and withstand phenomena of all types of dielectric materials.
- To acquaint with the techniques of generation of AC,DC and Impulse voltages.
- To be able to apply knowledge for measurement of high voltage and high current AC,DC and Impulse.
- To be in a position to measure dielectric property of material used for HV equipment.
- To know the techniques of testing various equipment's used in HV engineering.

Text Books:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.

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2. High Voltage Engineering : Fundamentals by E.Kuffel, W.S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.
3. High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New.

   Age International (P) Limited, 1995.

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IV Year – II SEMESTER

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ELECTIVE – III

ELECTRIC POWER QUALITY

Preamble:

Power quality is a major problem for utilities and customers. Customers using sensitive critical loads need quality power for proper operation of the electrical equipment. It is important for the student to learn the power quality issues and improvement measures provided by the utility companies. This course covers the topics on voltage and current imperfections, harmonics, voltage regulation, power factor improvement, distributed generation, power quality monitoring and measurement equipment.

Learning Objectives:

- To learn different types of power quality phenomena.
- To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
- To describe power quality terms and study power quality standards.
- To learn the principle of voltage regulation and power factor improvement methods.
- To explain the relationship between distributed generation and power quality.
- To understand the power quality monitoring concepts and the usage of measuring instruments.

UNIT–I:

Introduction

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

UNIT–II:

Voltage imperfections in power systems

Power quality terms – Voltage sags – Voltage swells and interruptions –

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Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

UNIT–III

Voltage Regulation and power factor improvement:

Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

UNIT– IV

Harmonic distortion and solutions

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

UNIT–V

Distributed Generation and Power Quality

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

UNIT–VI

Monitoring and Instrumentation

Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Learning Outcomes:

At the end of this course the student should be able to

- Differentiate between different types of power quality problems.
- Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
- Analyze power quality terms and power quality standards.

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- Explain the principle of voltage regulation and power factor improvement methods.
- Demonstrate the relationship between distributed generation and power quality.
- Explain the power quality monitoring concepts and the usage of measuring instruments.

Textbooks:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J. Bollen IEEE series-Wiley india publications, 2011.
3. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.

Reference Books:

1. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines–EwaldF. fuchs, Mohammad A.S. Masoum–Elsevier.

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FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS (FACTS)

(Elective – III)

Preamble:

Flexible Alternating Current Transmission System controllers have become a part of modern power system. It is important for the student to understand the principle of operation of series and shunt compensators by using power electronics. As the heart of many power electronic controllers is a voltage source converter (VSC), the student should be acquainted with the operation and control of VSC. Two modern power electronic controllers are also introduced.

Learning Objectives:

- To learn the basics of power flow control in transmission lines by using FACTS controllers
- To explain the operation and control of voltage source converter.
- To discuss compensation methods to improve stability and reduce power oscillations in the transmission lines.
- To learn the method of shunt compensation by using static VAR compensators.
- To learn the methods of compensation by using series compensators
- To explain the operation of two modern power electronic controllers (Unified Power Quality Conditioner and Interline Power Flow Controller).

UNIT–I:

Introduction to FACTS

Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

UNIT–II:

Voltage source and Current source converters

Concept of voltage source converter(VSC) – Single phase bridge converter – Square–wave voltage harmonics for a single–phase bridge converter – Three–phase full wave bridge converte r– Three–phase current source

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converter – Comparison of current source converter with voltage source converter.

UNIT–III:

Shunt Compensators–1

Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

Methods of controllable VAR generation

Variable impedance type static VAR generators – Thyristor Controlled Reactor (TCR) and Thyristor Switched Reactor (TSR).

UNIT–IV:

Shunt Compensators–2

Thyristor Switched Capacitor(TSC)– Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator(SVC) and Static Compensator(STATCOM): The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

UNIT V:

Series Compensators

Static series compensators: Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

UNIT–VI:

Combined Controllers

Schematic and basic operating principles of unified power flow controller(UPFC) and Interline power flow controller(IPFC) – Application of these controllers on transmission lines.

Learning Outcomes:

The student should be able to

- Determine power flow control in transmission lines by using FACTS controllers.
- Explain operation and control of voltage source converter.

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- Discuss compensation methods to improve stability and reduce power oscillations in the transmission lines.
- Explain the method of shunt compensation by using static VAR compensators.
- Appreciate the methods of compensations by using series compensators.
- Explain the operation of modern power electronic controllers (Unified Power Quality Conditioner and Interline Power Flow Controller).

Text Books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:—Standard Publications, 2001.
2. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
3. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.Mohan Mathur and Rajiv K.Varma, Wiley.

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AI TECHNIQUES

(Elective IV)

Preamble:

The aim of this course is to study the AI techniques such as neural networks and fuzzy systems. The course focuses on the application of AI techniques to electrical engineering.

Learning Objectives:

- To study various methods of AI
- To study the models and architecture of artificial neural networks.
- To study the ANN paradigms.
- To study the fuzzy sets and operations.
- To study the fuzzy logic systems.
- To study the applications of AI.

UNIT–I:

Introduction to AI techniques

Introduction to artificial intelligence systems– Humans and Computers – Knowledge representation – Learning process – Learning tasks – Methods of AI techniques.

UNIT–II:

Neural Networks

Organization of the Brain – Biological Neuron – Biological and Artificial neuron Models, MC Culloch-pitts neuron model, Activation functions, Learning rules, neural network architectures- Single-layer feed-forward networks: – Perceptron, Learning algorithm for perceptron- limitations of Perceptron model

UNIT–III:

ANN paradigm

Multi-layer feed-forward network (based on Back propagation algorithm)– Radial-basisn function networks- Recurrent networks (Hopfield networks).

UNIT – IV:

Classical and Fuzzy Sets

Introduction to classical sets – properties – Operations and relations – Fuzzy sets – Membership – Uncertainty – Operations – Properties – Fuzzy relations – Cardinalities – Membership functions.

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UNIT–V:

Fuzzy Logic System Components

Fuzzification – Membership value assignmen – Development of rule base and decision making system – Defuzzification to crisp sets – Defuzzification methods – Basic hybrid system.

UNIT–VI:

Application of AI techniques

Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Reactive power control – Speed control of dc and ac motors.

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by S.Rajasekaran and G.A. Vijayalakshmi Pai – PHI Publication.
2. Fuzzy logic with fuzzy applications- by T.J. Ross, TMH.

Reference Books:

1. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fundamentals of Neural Networks Architectures, Algorithms and Applications - by laurene Fausett, Pearson.
3. Neural Networks, Algorithms, Applications and programming Techniques by James A. Freeman, David M. Skapura.
4. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam, S Sumathi, S N Deepa TMGH

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IV Year – I SEMESTER	T	P	C
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Open Elective

ENERGY AUDIT, CONSERVATION & MANAGEMENT

Preamble:

This is an open elective course developed to cater current needs of the industry. This course covers topics such as energy conservation act and energy conservation. It also covers energy efficient lighting design, student will learn power factor improvement techniques, energy efficiency in HVAC systems. In addition, economic aspects such as payback period calculations, life cycle costing analysis is covered in this course.

Learning Objectives:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Unit–I:

Basic Principles of Energy Audit and management

Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

Unit–II:

Lighting

Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam

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– Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

Unit–III:

Power Factor and energy instruments

Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

Unit–IV:

Space Heating and Ventilation

Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning – Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

Unit–V

Economic Aspects and Analysis

Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts).

Unit–VI:

Computation of Economic Aspects

Calculation of simple payback method – Net present worth method – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment.

Learning Outcomes:

Student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

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Text Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and pvenkata seshaiah-I K International Publishing House pvt.ltd,2011.
5. http://www.energymanagertraining.com/download/Gazette_of_IndiaPartIISecI-37_25-08-2010.pdf

Note : This Elective can be offered to Students of All Branches including EEE.

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	-	-	3	25	50	75	2

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

COURSE OUTCOMES:

Upon completion of this subject student can able to

- Calculate the efficiency of a Machines and Transformers and draw the performance curves of each.
- Draw the no-load curve of a dc generator and calculate critical speed and critical resistance.
- Plot the diode and amplifier characteristics, Rectifier output waveforms.

Any five experiments are to be conducted from each part

SECTION A:

ELECTRICAL ENGINEERING:

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performance characteristics).
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. Shunt Motor.

SECTION B:

ELECTRONICS ENGINEERING:

1. PN junction Diode characteristics
   A. Forward bias B. Reverse bias. (Cut in voltage & Resistance calculations)
2. Transistor CE Characteristics (Input and Output).
3. Full wave Rectifier with and without filters.
4. CE Amplifiers.
5. RC Phase Shift Oscillator.
6. Class A Power Amplifier.

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	-	-	3	25	50	75	2
MECHANICS OF SOLIDS & METALLURGY LAB							

COURSE OUTCOMES:

1. Experiment with different materials for the evaluation of material properties through various destructive testing procedures.
2. Examine the microstructures of different materials and also identify the hardness values.

NOTE: Any 6 experiments from each section A and B.

(A) MECHNICS OF SOLIDS LAB:

1. Direct tension test-brittle and ductile materials
2. Fatigue Test
3. 3-point bend test
4. Unsymmetrical bend test
5. Specimen preparation and characterization
6. Torsion test
7. Vickers hardness Test
8. Test on springs
9. Compression test on cube
10. Impact test
11. Punch shear test
12. Brinell's and Rockwell's hardness test
13. Simply Supported beam

(B) METALLURGY LAB:

I. Preparation and study of the Micro Structure of Ferrous materials-

a) Cast Iron

1. Grey cast iron
2. Nodular cast iron
3. White cast iron

b) Steel

4. Mild steel
5. Low carbon steel
6. High carbon Steel

II. Preparation and study of the Micro Structure of Non-Ferrous materials-

7. Brass 8. Aluminium 9. Copper

10. Hardeneability of steels by Jominy End Quench Test.
11. Die penetration Test

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VERBAL ABILITY

COURSE OUTCOMES:

At the end of the course Students will be able to

1. Use appropriate words effectively in their communication
2. Identify and correct Grammar and vocabulary related errors
3. Construct the sentences effectively using appropriate verbal reasoning abilities
4. Demonstrate understanding and comprehensive skills

UNIT - I:

Synonyms1, Synonyms2, Antonyms1, Antonyms2, One-Word Substitution, Phrasal Verbs, Idioms & Phrases, Word Family Operation, Commonly Confused words, Odd man out

UNIT – II:

Tenses, Voice, Parts of speech, Direct & Indirect Speech, Sentence Completion & Correction, Reconstruction of Sentences, Sentence Improvement, Choosing the Incorrect Sentences, Transformation

UNIT - III:

Common Errors1, Common Errors2, Common Errors3, Common Errors4, Common Errors5, Indianisms1, Indianisms2

UNIT - IV:

Direct / simple Analogy, Completing the analogous pair, choosing the Analogous pair, Double Analogy, Choosing a similar word, Detecting Analogies, Multiple-word Analogy

UNIT - V:

Reading Comprehension1, Reading Comprehension2, Reading Comprehension3, Reading Comprehension4, Cloze Passage1, Cloze Passage2, Cloze Passage3, Cloze Passage4

UNIT - VI:

Hidden Assumptions, Fallacies, Induction & Deduction Methods, Arguments, Truth, Validity, Soundness

TEXT BOOKS:

1. 30 Days to a More Powerful Vocabulary by Funk.
2. Practical English Usage by Michael Swan
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman
4. Kaplan MCAT Verbal Reasoning and Writing Review
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon
6. Understanding and Using English Grammar by Betty SchrampferAzar

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REFERENCES:

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

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	3	1	-	40	60	100	3

THEORY OF MACHINES

COURSE OUTCOMES:

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

- Know the purpose of kinematics, kinematic joint & mechanism.
- Learn the velocity and acceleration diagrams and the theories involved in cams and their working principles.
- Understand the cams and followers.
- Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.
- Understand governors and their working principles
- Understand balancing of reciprocating and rotary masses.

UNIT – I:

MECHANISMS: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Gubralrs criteria, Grashoff's law, Degrees of freedom, Kutzbach criterian for planar mechanisms, Mechanism and machines –Classification of machines – kinematic chain – inversion of mechanism –inversion of mechanism – inversions of quadric cycle, chain – single anddouble slider crank chains.

UNIT – II:

KINEMATICS: Velocity and acceleration – Motion of a link in machine –Determination of Velocity and acceleration diagrams – Graphical method –Application of relative velocity method four bar chain. Velocity and acceleration analysis of a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration. Plane motion of body: Instantaneous center of rotation, centroids and axodes– relative motion between two bodies – Three centres in line theorem –Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – III:

CAMS: Definitions of cam and followers – their uses – Types of followers and cams– Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases. Analysis of motion of followers: Roller follower – circular cam with straight.

UNIT – IV:

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships, static and dynamic force analysis of planar mechanisms.

UNIT - V:

GOVERNERS AND FLY WHEELS: Watt, porter and proell governors, spring loaded governors– Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms andhunting. Turning moment diagram , fly wheels and their design.

UNIT – VI:

GEAR: Higher pairs, friction wheels and toothed gears–types – law ofgearing, condition for

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constant velocity ratio for transmission of motion,velocity of sliding –phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact.

GEAR TRAINS: Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio –Epicyclic gear trains.

TEXT BOOKS:

1. Theory of Machines by S.S.Ratan, Mc. Graw Hill Publ.
2. Theory of machines by Khurmi ,S.Chand publications

REFERENCES:

1. Theory of Machines by Sadhu Singh Pearsons Education
2. Theory of Machines by Thomas Bevan/ CBS
3. Mechanism and machine theory by Ashok G. Ambedkar, PHI Publications.

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	3	1	-	40	60	100	3

APPLIED THERMODYNAMICS

COURSE OUTCOMES:

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

- To make the student learn and understand the reasons and affects of various losses that occurs in the actual engine operation.
- To familiarize the student with the various engine systems along with their function and necessity.
- To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.
- To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.
- To make students learn about different types of compressors and to calculate power and efficiency of reciprocating compressors and rotary compressors.

UNIT - I:

ACTUAL CYCLES AND THEIR ANALYSIS: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT - II:

WORKING OF I.C ENGINES: Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems -Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of Wankle engine, principles of supercharging and turbocharging

UNIT - III:

COMBUSTION IN S.I. ENGINES: Normal Combustion and abnormal combustion - Importance of flame speed and effect of engine variables - Type of Abnormal combustion, pre-ignition and knocking - Fuel requirements and fuel rating, anti knock additives -combustion chamber- requirements, types.

COMBUSTION IN C.I. ENGINES: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT - IV:

MEASUREMENT, TESTING AND PERFORMANCE: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power - Performance test – Heat balance Sheet

UNIT - V:

COMPRESSORS: Classification - positive displacement and roto dynamic machinery - power producing and power absorbing machines, fan, blower and compressor-positive displacement and dynamic types-reciprocating and rotary types.

Rotary (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor - mechanical details and principle of working - efficiency considerations.

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UNIT-VI:

ROTARY COMPRESSORS: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation –velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency-pressure rise calculations – Polytrophic efficiency.

TEXT BOOKS:

1. Internal Combustion Engines by V.Ganesan, Tata McGraw Hills Publications
2. A treatise on heat power engineering by Vasandani & D.S.Kumar, Metropolitan Book Co. Ltd.

REFERENCES:

1. Internal Combustion Engine by M.L.Mathur and R.P.Sharma, DhanpatRai Publications
2. Thermal Engineering by R.S.Khurmi and J.K.Guptha, S.Chand Publicationss

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	3	1	-	40	60	100	3

HYDRAULIC MACHINERY AND PNEUMATIC SYSTEMS

COURSE OUTCOMES:

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

- Understand about the force required to move the vane using by Jet
- Know the turbines and its functions
- Operating conditions of Centrifugal and Reciprocating pumps
- Understand about the Hydraulic Valves and Hydraulic System Accessories
- Know the Pneumatic systems and control valves
- Understand about the Pneumatic circuits

UNIT - I:

BASICS OF TURBO MACHINERY: Hydrodynamic force or jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes

UNIT - II:

HYDRAULIC TURBINES: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine – working proportions, work done, efficiencies, hydraulic design-draft tube-theory-functions and efficiency.

UNIT - III:

CENTRIFUGAL PUMPS: Classification, working, work done - manometric head losses and efficiencies, specific speed- pumps in series and parallel-performance characteristic curves, NSPH; Reciprocating pumps: Working, Discharge, Slip, Indicator diagrams

UNIT - IV:

HYDRAULIC VALVES AND HYDRAULIC SYSTEM ACCESSORIES: Basic principles of hydraulics, Direction control valves, Pressure control valves, Flow control valves, Non-return valves, Reservoirs, Accumulators, Heating & cooling devices, Hoses. Selection of valves for circuits.

UNIT - V:

INTRODUCTION TO PNEUMATIC SYSTEMS: Basic requirements for pneumatics systems, Applications, Pneumatic fundamentals, Construction, Working principle and operation of pneumatic power transmission system components, FRL unit, Actuators and control valves - DCV, FCV, PCV, time delay, quick exhaust, twin pressure, shuttle

UNIT - VI:

PNEUMATIC CIRCUITS: Basic pneumatic circuits, Development of single Actuator Circuits, Development of multiple Actuator Circuits, Cascade method for sequencing, introduction to piping and its software's.

TEXTBOOKS:

1. Hydraulics, Fluid Mechanics and Hydraulic Machinery by P.N. Modi, S.M. Seth, Standard Book House.

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2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput, S. Chand *Publishing*
3. Industrial Hydraulics by John Pippenger and Tyler Hicks, McGraw Hill.
4. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar, McGraw Hill.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S.Kumar, SK Kataria and Sons.
2. Fluid Power with Applications by Anthony Esposito, Pearson.
3. Hydraulic and Pneumatic Controls: Understanding made Easy by K.Shanmuga Sundaram, S.Chand, New Delhi, 2006.

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	4	-	-	40	60	100	3

MANUFACTURING TECHNOLOGY

COURSE OUTCOMES:

At the end of this course student will acquire ability to

- Understand different manufacturing processes and fundamentals of casting.
- Distinguish different types of furnaces and design gating system for preparation of a casting.
- Identify and Recommend appropriate type of welding process for fabrication of metals.
- Distinguish process details of advanced welding processes.
- Demonstrate the characteristics of cold and hot working processes.
- Explain principles of sheet metal working, plastic injection and blow moulding processes.

UNIT - I:
Introduction to Manufacturing Processes, Difference between Production and Manufacturing.
FOUNDRY: Introduction to casting process, steps involved in making a casting, Advantages of casting and its applications, Types of patterns, Materials used for patterns, Pattern allowances, sand moulding procedure, Moulding materials, Importance of constituents, Cores, Types of Sand moulding-CO_2 Moulding and Shell Moulding.

UNIT - II:
GATING SYSTEM: Elements of gating system, Gating system design, Calculation of gating system dimensions for simple objects, riser design and its function, Solidification of casting.
SPECIAL CASTING METHODS: Permanent Mould Casting, Die Casting, Centrifugal Casting, Investment Casting, Continuous Casting, Fettling of Castings, Casting Defects: causes and remedies.

UNIT - III:
WELDING: Classification of welding processes, Types of welds and types of joints.
GAS WELDING: Equipment, Oxy-Acetylene flame, types, Gas welding procedure, Gas cutting.
ARC WELDING: Principle of Arc welding, Equipment, Electrodes, Electrode coatings, AC and DC Welding, Arc Blow, Arc Length Characteristics, Related Simple Problems. Welding defects-Causes and Remedies.

UNIT - IV:
RESISTANCE WELDING: Principle, Butt welding, spot welding and seam welding. Simple problems on resistance welding.
OTHER WELDING PROCESSES: Thermit welding, Inert gas welding - TIG and MIG welding, submerged arc welding, plasma arc welding, soldering and brazing.

UNIT - V:
FORMING AND FORGING: Fundamentals, Introduction to metal working process, Hot working, Cold working.
ROLLING: Rolling fundamentals, Analysis of rolling process- Derivation of Length of deformation zone, Angle of bite, Maximum reduction possible for one pass, Rolling stand arrangements.

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UNIT - VI:

EXTRUSION & DRAWING: Extrusion fundamentals, Classification of Extrusion- Forward Extrusion, Backward Extrusion, Impact extrusion, Hydrostatic extrusion. Types of drawing: Wire drawing, Tube drawing.

TEXT BOOKS:

1. Manufacturing Technology Vol-I by P.N. Rao, Tata McGraw Hill Publications.
2. Production Technology by P. C. Sharma, S. Chand Publications.

REFERENCES:

1. Welding Technology by Little by Tata McGraw Hill Publications.
2. Manufacturing Engineering and Technology by Kalpak Jain, Pearson Education/PHI.

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	-	-	3	25	50	75	2

APPLIED THERMODYNAMICS LAB

COURSE OUT COMES:

- The student will be able to estimate the performance and efficiency of IC engines at various horse powers and also for compressors.

LIST OF EXPERIMENTS:

1. Determination of flash point, fire point.
2. Determination of calorific value of fuel using Bomb Calorimeter.
3. Determination of viscosity of fluid.
4. I.C. Engine Valve Timing Diagram
5. I.C. Engine Port Timing Diagram
6. I.C. Engine Performance Test on Single Cylinder 4 Stroke Diesel Engine
7. Evaluation of Engine Friction by Conducting Morse Test on 4 - Stroke Petrol Engine.
8. Evaluation of Engine Friction by Conducting Motoring/Retardation Test on Single Cylinder 4 Stroke Diesel Engine
9. Heat Balance Test on Single Cylinder 4 Stroke Diesel Engine
10. Performance Test on Variable Compression Ratio
11. Volumetric Efficiency of a Reciprocating Air Compressor
12. Disassembly/Assembly of I.C. Engine

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II B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2

MANUFACTURING TECHNOLOGY LAB

COURSE OUTCOMES:

- Prepare green sand mold for single-piece and multi-piece patterns.
- Create joints using electric arc, spot, and gas welding techniques.
- Form plastic parts using injection and blow molding.
- Fabricate a pipe bend and a washer using hydraulic press.
- Fabricate alloy or composite using Stir Casting Machine

LIST OF EXPERIMENTS:

I. MOLDING PRACTICE:

1. Preparation of a green sand mould using single piece pattern.
2. Preparation of a green sand mould using multi piece pattern.
3. Sand testing: green strength, dry strength, grain fineness number, permeability etc.

II. WELDING PRACTICE:

1. Preparation of a T joint using electric arc welding.
2. Preparation of a Butt Joint using gas welding.
3. Preparation of a lap joint using spot welding.

III. PLASTIC MOLDING:

INJECTION MOLDING:

4. Preparation of a key chain by using two plate mold.

BLOW MOLDING:

5. Preparation of a bottle by using blow molding technique.

IV. MECHANICAL PRESSES:

6. Preparation of a rod bends using hydraulic press.
7. Preparation of a washer using hydraulic press.

V. DEMONSTRATION OF STIR CASTING MACHINE:

8. Preparation of Aluminum casting with stir casting machine

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	-	-	3	25	50	75	2

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

COURSE OUTCOME:

1. Experiment with different turbines & pumps to determine the efficiency
2. Determine the pipe losses.

LIST OF EXPERIMENTS:

1. Impact of jet on Vane.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head in a pipe flow
12. Pneumatic trainer.

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	4	-	-	40	60	100	3
METAL CUTTING & MACHINE TOOLS							

CO1: Define and explain theory and fundamentals of metal cutting.
CO2: Illustrate the working of lathe machines and apply machining economics.
CO3: Explain the working of Shaping, slotting, planning, drilling, boring machines and apply machining economics.
CO4: Illustrate the working of milling machines and apply machining economics.
CO5: Illustrate the working of grinding, lapping, honing and broaching processes.
CO6: Explain working of jigs and fixtures.

UNIT – I:
FUNDAMENTALS OF MACHINING: Elementary treatment of metal cutting theory -element of cutting process – geometry of single point tool angles, chip formation and types of chips – built-up edge and its effects chip breakers, mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials.

UNIT–II:
LATHE MACHINES: Engine lathe – principle of working, specification of lathe – types of lathe, taper turning and methods, thread turning, constructional features of speed gear box and feed gear box. Turret and capstan lathes, work holders, tool holding devices. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes, lathe attachments, Machining time calculations.

UNIT–III:
SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working–principal parts – specifications, operations performed, machining time calculations.
DRILLING & BORING MACHINES: Twist drill and its geometry, principles of working, specifications, types, operations performed, Boring Machines – fine Boring Machines – jig boring machine, Deep hole drilling Machine, machining time calculations.

UNIT –IV:
MILLINGMACHINES: Principles of working – specifications – classification of Milling Machines – Principle features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, methods of indexing, machining time calculations.

UNIT–V:
FINISHING PROCESSES: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations.

UNIT–VI:
JIGS & FIXTURES: Principles of jigs and fixtures, uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, drill jigs and milling and boring fixtures.

TEXT BOOKS:
1. Manufacturing technology II, P.N Rao, Tata Mcgraw hill publishers
2. Workshop Technology, B.S.RaghuVamshi–Vol II, DhanpatRai& Co

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	3	1	-	40	60	100	3
HEAT POWER ENGINEERING (Use of steam tables and Mollier chart is allowed)							

COURSE OUTCOMES:

CO1: Interpret the steam power plant cycles
CO2: Demonstrate the basics of combustion
CO3: Identify different types of nozzles used in steam turbines
CO4: Classify different turbines based on utility and applications
CO5: List different types of steam condensers
CO6: Report different features of gas turbines and jet engines

UNIT – I:

RANKINE CYCLE: Schematic layout, thermodynamic analysis, methods to improve cycle performance, regeneration & reheating.
COMBUSTION: Fuels and combustion, concepts of heat reaction, adiabatic flame temperature, flue gas analysis.

UNIT - II:

BOILERS: Classification, working principles of L.P & H.P boilers, mountings and accessories, working principles, boiler horsepower, equivalent evaporation, efficiency.
DRAUGHT: Classification, Natural and Artificial draught, induced and forced draught, height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney.

UNIT – III:

STEAM NOZZLES: Function of a nozzle, applications, types, flow through nozzles, thermodynamic analysis, assumptions, velocity of fluid at nozzle exit, Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, nozzle design, Super saturated flow, its effects, degree of super saturation and degree of under cooling, Wilson line.

UNIT - IV:

STEAM TURBINES: Construction & working of steam turbines, Impulse & reaction principles, inlet & outlet velocity diagrams. Work output & efficiencies. Pressure & velocity compounding, regenerative feed water heating, reheat cycles, reheat factor, governing of turbine, back pressure & pass out turbine.

UNIT - V:

STEAM INSTRUMENTATION AND CONTROLS: Steam flow measurement, water and steam pressure measurements, superheated steam temperature control, steam pressure control, smoke detectors, and pollution monitoring instruments.
STEAM CONDENSERS: Types, cooling water requirement, air leakage and air pump capacity, vacuum and condenser efficiencies, steam ejectors, spray pond, cooling tower.

UNIT – VI:

GAS TURBINES: Simple gas turbine plant, ideal cycle, essential components, parameters of performance, actual cycle, regeneration, inter-cooling and reheating, closed and semi-closed cycles, merits and demerits and types of combustion chambers.
JET PROPULSION: Working principle, thrust power, propulsive force and efficiency.
ROCKET ENGINE: Theory of operation and its applications, propellant and types.

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REFERENCES:

1. Production Technology by H.M.T., Tata McGraw-Hill Education
2. Production Engineering, K.C Jain & A.K Chitaley, PHI Publishers
3. Production Technology, R.K. Jain and S.C. Gupta, Khanna Publisher

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TEXT BOOKS:

1. Thermodynamics and Heat Engines, Volume 2, R.Yadav, Centralbook depot.
2. Heat Engineering, V.P Vasandani and D.S Kumar, MetropolitanBook Company, New Delhi

REFERENCES:

1. Gas Turbines and Propulsive Systems, P.Khajuria & S.P.Dubey, Dhanpatrai
2. Gas Turbines, Cohen, Rogers and SaravanaMuttoo, Addison Wesley, Longman, John wiley& sons
3. Thermal Engineering, R.S Khurmi, JS Gupta, S.Chand, Mechanical Engineering

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	3	1	-	40	60	100	3

MACHINE DYNAMICS AND VIBRATIONS

COURSE OUTCOMES:

CO1: Apply friction principles to clutches & brakes.
CO2: Understand and study the types of brakes and dynamometers.
CO3: Understand the state of balance of multi-cylinder engines.
CO4: Analyse the response of single degree freedom systems under harmonic excitations.
CO5: Identify the response of two degree freedom systems under free and forced vibrations.
CO6: Summarize the frequencies of damped, transverse and torsional vibrations.

UNIT - I:

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction, and film lubrication.

UNIT – II:

FRICTION CLUTCHES: Basics, Inclined planes, Screw thread forms (Square, V), Screw jack, Rolling friction, Journal friction. Friction axis of a link, four-bar mechanism, film friction.Pivots and collars, uniform pressure, uniform wear. Types of clutches –disc, multi plate, cone and centrifugal

UNIT – III:

BRAKES AND DYNAMOMETERS: Types of brakes – Block brake, band brake, disc brake, and block brake, internal expanding shoe brake, effect of brake. Types of dynamometer-Prony, rope brake

UNIT – IV:

BALANCING: Introduction, Static balancing, dynamic balancing, balancing of several masses in same planes, balancing of several masses in different planes, Balancing of Reciprocating masses, balancing of locomotives, balancing of inline engines, balancing of V-engines.

UNIT – V:

MECHANICAL VIBRATIONS: Introduction, Definitions, types, basic features, degrees of freedom. Types of vibrations- Natural frequencies of free longitudinal vibrations of systems having single degree of freedom Free longitudinal vibration – equilibrium method, energy method, Rayleigh's method, Displacement, velocity, acceleration, effect of mass of spring, damped vibration, logarithmic decrement. Forced longitudinal vibrations- harmonic excitation, magnification factor, vibration isolation and transmissibility, rotating imbalance, support excitation

UNIT – VI:

TRANSVERSE AND TORSIONAL VIBRATIONS: Transverse vibrations, single concentrated load, uniformly distributed load, several loads, Dunkerley's method, energy method, whirling of shafts. Torsional vibrations -single rotor, two-rotor, three-rotor systems, torsionally equivalent shaft, geared system. Frequency of damped vibration with damping-magnification factor or dynamic magnifier.

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TEXT BOOKS:

1. Theory of machines, SS Rattan, Tata McGraw Hill publications.
2. Mechanical Vibrations, G.K.Groover, Nem Chand and bros.

REFERENCES:

1. Theory of Machines, Thomas Bevan, Pearson education publications.
2. Theory of Machines, W.G.Green, Blackie publications.
3. Theory of Machines, R.S. Khurmi&J.K.Gupta, S. Chand Publications.

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PRINCIPLES OF MACHINE DESIGN
(Design Data Hand Book Is Not Allowed)

COURSE OUTCOMES:

CO1: Define and understand the design considerations and stresses in machine members.
CO2: Explain and solve the problems related to strength of machine elements.
CO3: Apply the engineering principles for the design of simple engineering machine members such as riveted joints, welded joints,
CO4: Apply the engineering principles for the design of keys, cotters, knuckle joints and power transmission of joints.
CO5: Understand and solve the problems related to shaft coupling.
CO6: Explain and apply the knowledge for designing the different springs.

UNIT – I:

INTRODUCTION: General considerations in the design of Engineering Materials and their properties selection –Manufacturing consideration in design, tolerances and fits –BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses combined stresses, torsional and bending stresses, impact stresses, stress strain relation, various theories of failure, factor of safety, design for strength and rigidity, preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations, static strength design based on fracture toughness.

UNIT – II:

STRENGTH OF MACHINE ELEMENTS:

Stress concentration, theoretical stress concentration factor, fatigue stress concentration factor notch sensitivity, design for fluctuating stresses, endurance limit, estimation of endurance strength, Soderberg's line, Goodman's line, modified Goodman's line.

UNIT – III:

RIVETED AND WELDED JOINTS: Riveted joints- types, failure of joints, and efficiency of joint. Welded joints-types of welded joints, strength of butt, parallel fillet and transverse fillet welded joints Stresses, joints subjected to bending and twisting moments.

UNIT – IV:

KEYS, COTTERS AND KNUCKLE JOINTS: Types of keys, force acting on keys, Design of Keys. Types of Cotter joint-Socket & Spigot joint, Sleeve & Cotter joint, Knuckle Joint.

POWER TRANSMISSION SHAFTS: Design of shafts. Shafts subjected to bending, torsion and axial loading. Shafts subjected to Fluctuating loads.

UNIT – V:

SHAFT COUPLING: Rigid couplings-muff, split muff and flange couplings, flexible couplings-flange coupling (modified).

UNIT – VI:

MECHANICAL SPRINGS: Stresses and deflections of helical springs, extension and compression of springs, springs for fatigue loading, energy storage capacity, helical torsion springs, co-axial springs, leaf springs.

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TEXT BOOKS:

1. Design of Machine Elements,V.B.Bhandari, TMH Publishing Co. Ltd., New Delhi.
2. Mechanical Engineering Design,J.E.Shigley, TMH Publishing Co. Ltd., New Delhi.

REFERENCES:

1. Machine Design, Pandyah and Shah, TMH Publishing Co. Ltd., New Delhi.
2. Design Data hand book. Mahadevan, CBS Publishers.
3. Machine Design, R.S. Khurmi & J.K.Gupta, S. Chand Publications.

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OPERATIONS RESEARCH

COURSE OUTCOMES:

CO1: Understand and solve linear programming problems.
CO2: Solve transportation, assignment problems.
CO3: Solve sequencing and networking problems.
CO4: Solve waiting line theory problems.
CO5: Solve game theory problems.
CO6: Solve replacement and simulation problems.

UNIT – I:

Development-definition, characteristics and phases, types of operation research models, applications.

LINEAR PROGRAMMING PROBLEM: Formulation, graphical solution, simplex method, artificial variables techniques, two–phase method, big-M method, duality principle.

UNIT – II:

TRANSPORTATION PROBLEM: Formulation, types of initial basic feasible solution using different methods, optimal solution, unbalanced transportation problem, degeneracy.

ASSIGNMENT PROBLEM: Formulation, optimal solution, variants of assignment problem, travelling salesman problem.

UNIT – III:

SEQUENCING: Introduction, flow, shop sequencing, *n* jobs through two machines, *n* jobs through three machines, job shop sequencing, and two jobs through 'm' machines.

NETWORKING MODELS: Earliest Completion time of a project and Critical path, Programme Evaluation Review Technique, Total Slack, Free Slack, Probability of achieving completion date, Cost Analysis, Crashing the network, Resource Scheduling-Advantages, Limitations, Cost Analysis, Distinction between PERT and CPM, LPP Formulation

UNIT – IV:

WAITING LINES: Introduction – single channel – poison arrivals –exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

UNIT – V:

THEORY OF GAMES: Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games – dominance principle – m x 2 &2 x n games -graphical method.

UNIT – VI:

REPLACEMENT: Replacement Model, Replacement of items that deteriorate, Gradually, Fail suddenly, group Replacement policy analysis, Problems.

SIMULATION: Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages.

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TEXT BOOKS:

1. Operations Research, S.D.Sharma, KedarNath Ram Nath Publishers.
2. Operations Research, A.M.Natarajan, P.Balasubramani and A. Tamilarasi, Pearson Education.

REFERENCES:

1. Introduction to O.R, Hiller & LibermannTata McGraw Hill
2. Operations Research, R.Pannerselvam,PHI Publications.
3. Operations Research, Wagner, PHI Publications.

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	-	-	3	25	50	75	2
HEAT POWER ENGINEERING LAB							

COURSE OUTCOMES:

CO1: Demonstrate the various horse powers, Calorific values, emissions of IC engines.
CO2: Determine the various efficiencies and energy balance for several types of Internal Combustions Engines and compressors.
CO3: Classify different types of boilers.
CO4: List various types of solar flat plate collectors.

LIST OF EXPERIMENTS:

1. Determination of Calorific Value of gaseous Fuel by Junker's Calorimeter.
2. Performance Analysis of Heat Pipe
3. Engine Performance with Turbo Charger & without Turbo Charger
4. Emission Studies of IC Engine.
5. Performance Analysis of Vapour Compression Test Rig
6. Economical Speed Test on Four Stroke Multi-cylinder Petrol Engine
7. Performance Test on Solar Flat Plate Collector Test Rig
8. Retardation Test on Single Cylinder Diesel Engine.
9. Study of Boilers.
10. Dryness fraction measurement by separating and throttling calorimeter.

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	-	-	3	25	50	75	2

MACHINE TOOLS AND MACHINE DYNAMICS LAB

COURSE OUTCOMES:

CO1: Understand the working of lathe, shaper, planer, drilling, milling and grinding machines.
CO2: Analyze natural frequencies, procedure of basic balancing and gyroscopic couple concept.

PART-A
MACHINE TOOLS LAB

LIST OF EXPERIMENTS:

1. Experiment on Plain turning and step turning operation.
2. Experiment on taper turning operation
3. Experiment on threading and Knurling operation
4. Experiment on surface grinding
5. Preparation of hexagonal nut on milling machine
6. Cutting a slot on shaper machine
7. Experiment on drilling machine
8. Force measurement using Lathe tool Dynamometer.

PART-B
MACHINE DYNAMICS LAB

LIST OF EXPERIMENTS:

1. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils.
2. Determination of steady state amplitude of forced vibratory system.
3. Static balancing using steel balls.
4. Determination of the magnitude and orientation of the balancing mass in dynamic balancing.
5. Determination of the magnitude of gyroscopic couple, angular velocity of precession, and representation of vectors.
6. An experiment on pin-on-disc apparatus.

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	3	1	-	40	60	100	3

DESIGN OF MECHANICAL COMPONENTS
(Design Data Hand Book Allowed)

COURSE OUTCOMES:

CO1: Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constrains of bearings.
CO2: Identify the loads and stresses while designing the connecting rod and crank shaft.
CO3: Analyze stresses on the piston and cylinder depending upon Design and proportions.
CO4: Identify the loads and machine members subjected and calculate static and dynamic stresses to ensure safe design.
CO5: Compare capacities of power transmission of Belt, Rope and Chain Drives.
CO6: Choose type of Power Screws and Gears for Static and Dynamic loads.

UNIT – I:

DESIGN OF BEARINGS: Types of Journal bearings, Lubrication, Bearing Modulus, Full and partial bearings, Clearance ratio, Heat dissipation of bearings, bearing materials, Journal bearing design, Ball and roller bearings, Static loading of ball & roller bearings, Bearing life.

UNIT – II:

DESIGN OF I.C ENGINE COMPONENTS: Connecting Rod, Thrust in connecting rod, Stress due to whipping action on connecting rod ends, Cranks and Crank shafts, strength and proportions of over hung and centre cranks, Crank pins, Crank shafts.

UNIT – III:

Pistons, Forces acting on piston, Construction, Design and proportions of piston, Cylinder. Cylinder liners.

UNIT – IV:

DESIGN OF CURVED BEAMS: introduction, stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section, C – clamps. Design of crane hook.

UNIT – V:

POWER TRANSMISSION SYSTEMS: Transmission of power by Belt and Rope drives, Transmission Efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives, Materials, Chain drives.

UNIT – VI:

DESIGN OF POWER SCREWS: Square, ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures. Spur& Helical gear drives: Spur gears- Helical gears – Load concentration factor – Dynamic load factor. Surface Compressive strength – Bending strength – Estimation of Centre distance, module and face width.

TEXT BOOKS:

1. Machine Design, V.B. Bandari, Tata McGraw Hill Publishers .
2. Machine Design, Pandya & Shaw, Charotar publishers.

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REFERENCES:

1. Machine Design, R.N. Norton, Pearson Publishers.
2. Design Data hand book. Mahadevan, CBS Publishers.
3. Mechanical Engineering Design, JE Shingly, Tata McGraw Hill Publishers.

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HEAT TRANSFER
(Heat transfer data book allowed)

COURSE OUTCOMES:

CO1: Apply basic principles of fluid mechanics, thermodynamics, heat transfer for designing heat and mass transfer systems.
CO2: Identify heat, mass and momentum transport systems to show predictive correlation.
CO3: Calculate various designs for heat and mass transfer and optimize the solution
CO4: Comprehend the terms of convection heat transfer
CO5: Use basic equations to device heat exchangers
CO6: Articulate basics of boiling, condensation and radiation heat transfer

UNIT – I:

INTRODUCTION: Modes and mechanisms of heat transfer, Basic laws of heat transfer, and applications of heat transfer. Conduction Heat Transfer, Fourier equation, general heat conduction equation in Cartesian, Cylindrical and Spherical coordinates simplification and forms of the field equation. Steady, unsteady, and periodic heat transfer, initial and boundary conditions.
ONE DIMENSIONAL STEADY STATE CONDUCTIONHEAT TRANSFER: Homogeneous slabs, hollow cylinders, and spheres, Composite systems, overall heat transfer coefficient, Electrical analogy, Critical radius of insulation.

UNIT – II:

ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: Variable Thermal conductivity, systems with heat sources or Heat generation. Extended surface (fins) Heat Transfer, Long Fin, Fin with insulated tip and Short Fin
ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER: Systems with negligible internal resistance, significance of Biot and Fourier Numbers, Infinite bodies, Chart solutions of transient conduction systems, Concept of Semi-infinite body.

UNIT – III:

CONVECTIVE HEAT TRANSFER: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow. Dimensional analysis as a tool for experimental investigation, Buckingham Π Theorem and method, application for developing semi-empirical non-dimensional correlation for convection heat, significance of non-dimensional numbers.
FORCED CONVECTION: External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer, Flat plates and Cylinders.

UNIT – IV:

INTERNAL FLOWS: Concepts about Hydrodynamic and Thermal Entry Lengths(TEL), Division of internal flow based on TEL, Use of empirical relations for Horizontal Pipe Flow and annulus flow.
FREE CONVECTION: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes. **HEAT EXCHANGERS:** Classification of heat exchangers, overall heat transfer Coefficient and fouling factor, LMTD and NTU methods, Problems on LMTD and NTU methods.

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UNIT – V:

HEAT TRANSFER WITH PHASE CHANGE: Boiling, Pool boiling, Regimes, Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

CONDENSATION: Film wise and drop wise condensation, Nusselt's Theory of Condensation on a vertical plate, Film condensation on vertical and horizontal cylinders using empirical correlations.

UNIT - VI:

RADIATION HEAT TRANSFER : Emission characteristics and laws of black-body radiation, Irradiation, total and monochromatic quantities, laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann, heat exchange between two black bodies, concepts of shape factor, Emissivity, heat exchange between grey bodies, radiation shields, electrical analogy for radiation networks.

TEXT BOOKS:

1. Fundamentals of Engineering Heat and Mass Transfer, R.C.Sachdeva, New Age International.
2. Heat Transfer, P.K.Nag, Tata McGraw Hill.

REFERENCE BOOKS:

1. Essential Heat Transfer, Christopher A Long, Pearson Publishers
2. Heat Transfer, J.P.Holman, Tata McGraw Hill
3. Principles of Heat Transfer, Frank Kreith, RM Manglik& MS Bohn, Cengage learning publishers.

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	4	-	-	40	60	100	3

AUTOMOBILE ENGINEERING

COURSE OUTCOMES:

CO1: Identify chassis models for different automobile applications
CO2: Contrast steering, braking and suspension systems
CO3: Estimate suitable conventional and automatic transmission system
CO4: Identify the usage of Electrical vehicles / Hybrid vehicles and power plants
CO5: Predict the formation of pollution and its control methods
CO6: Illustrate the techniques of engine maintenance and service

UNIT – I:

INTRODUCTION TO VEHICLE STRUCTURE AND ENGINE COMPONENTS: Vehicle construction, Chassis and body, Specifications, Engine Types-Construction, Location of engine, Cylinder arrangement , Construction details, Cylinder block, Cylinder head, Cylinder liners. Lubrication system, Types, Oil pumps, Filters, Cooling system, Types, Water pumps, Radiators, Thermostats, Anti-freezing compounds.

UNIT – II:

IGNITION, FUEL SUPPLY: Ignition system, Coil and Magneto, Spark plug, Distributor, Electronic ignition system, Fuel system, Carburettor, Fuel pumps, Fuel injection systems, Mono point and Multi point, Unit injector, Nozzle types, Electronic Fuel Injection system, MPFI, DTSI.

UNIT – III:

TRANSMISSION SYSTEM:
CLUTCHES- Function, Types, Single plate, multiple plate, Fluid coupling,
GEARBOX - Sliding, Constant, Synchromesh, Overdrive, Torque converter, automatic transmission system – Epicylic.
PROPELLER SHAFT - Hotchkiss drive, Final drive, Rear axle assembly
DIFFERENTIAL - Need, Construction.

UNIT – IV:

STEERING, SUSPENSION AND BRAKING SYSTEM:
STEERING - Principle of steering, Steering Geometry and wheel alignment, steering linkages, Steering gearboxes, Power steering
SUSPENSION - front axle Suspension system, Independent and Solid axle. Coil, leaf spring and air suspensions, torsion bar, shock absorbers
BRAKING SYSTEM needs Classification, Drum and Disc, Mechanical, Hydraulic and pneumatic, vacuum assist Retarders, Anti-lock Braking System.

UNIT – V:

AUTOMOBILE ELECTRICAL SYSTEMS, SAFETY AND ADVANCES: ELECTRICAL SYSTEMS- Battery, General electrical circuits, cut out relay, Dash board instrumentation, Passenger comfort, SAFETY- Seat belts, air bags, HVAC Systems, Automotive Electronics, Electronic Control Unit, Traction Control System ADVANCES: Hybrid Electric Vehicles.

UNIT – VI:

ENGINE EMISSION CONTROL: Introduction, types of pollutants, mechanism of formation, concentration measurement, methods of controlling, engine modification, exhaust gas treatment-

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thermal and catalytic converters-use of alternative fuels for emission control – National and International pollution standards

ENGINE SERVICE: Introduction, service details of engine cylinder head, valves and valve mechanism, piston-connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions.

LIGHT WEIGHT MATERIALS: Carbon fibre composites, glass fibre composites, aluminum and Al matrix composites, magnesium alloys, aluminum alloys, advanced high strength steel, applications.

TEXT BOOKS:

1. Automotive Mechanics, Vol. 1 & Vol. 2, Kirpal Sing, standard publishers.
2. Automobile Engineering- P.S Gill, S.K. Kataria & Sons, New Delhi.

REFERENCE BOOKS:

1. David A. Corolla, (2009), Automotive Engineering: Powertrain, Chassis System and
2. Automotive Engines Theory and Servicing, James D. Haldermanand Chase D. Mitchell Jr., Pearson education inc.
3. Automobile Engineering, William Crouse, Tata McGraw Hill Distributors.

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	4	-	-	40	60	100	3

ELECTIVE-I
GAS TURBINES AND JET PROPULSIONS

COURSE OUTCOMES:

CO1: Tabulate different kinds of jet engines and rocket engines.
CO2: Summarize the working of different components of jet engines.
CO3: Demonstrate the concept of fluid Flow.
CO4: Identify the functions and flow characteristics of nozzle and diffusers
CO5: List the components of Ramjet and it uses
CO6: Discover the concepts of rocket propulsion, propellants

UNIT – I:

FUNDAMENTALS OF GAS TURBINE ENGINES: Introduction and Basic review of thermodynamic concepts and Gas turbine cycle with regeneration, reheating and intercooling, various methods to improve efficiency and work output of gas turbine, Fundamentals of gas turbine engine use as aircraft power plant, turbojet, turbofan and turboprop engines.

UNIT – II:

GAS TURBINE COMBUSTION CHAMBER/BURNER: Introduction and types of burners, Can burner, Annular burner, Cannular burner, Relative advantages and disadvantages of different types of burners, zones of combustion chamber, requirements of combustion chamber, design criteria of combustion chamber, pressure losses, combustion intensity and combustion efficiency, flame stabilization and flame holder, Design parameters of combustion chamber, Materials for combustion chamber.

UNIT – III:

NOZZLE THEORY: Basic review of thermodynamics and one dimensional isentropic flow, Area –Mach relation and types of nozzle, Exhaust velocity of nozzle, Mass flow rate through nozzle and choking of nozzle, Area ratio of nozzle, Effect of back pressure, Optimum expansion, under expansion and over expansion nozzle, Various nozzle configurations, Different Types of Nozzle, Actual mass flow rate through nozzle and equilibrium conditions.

UNIT – IV:

DIFFUSERS / INLETS: Introduction to inlets, subsonic and supersonic inlets Inlet Types internal compression inlet, external compression inlet and mixed compression inlet, subsonic inlets design variables, inlet total pressure ratio, inlet sizing and inlet flow distortion, Nacelle and interference drag. Boundary layer separation and features of external flow near a subsonic inlet, internal flows and stalling in subsonic inlets, relation between minimum area ratio and internal deceleration ratio, Supersonic Inlets , design construction and working, numericals.

UNIT – V:

RAMJET PROPULSION: Introduction and operating principle, Advantages, disadvantages, limitations and comparison with jet engines, Subcritical, critical and super critical operation, Ramjet performance, Simple design calculation of ramjet engine, Introduction to scramjet and preliminary concepts in supersonic combustion.

UNIT – VI:

ROCKET PROPULSION: Introduction to rocket propulsion and operating principle,

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Classification of rocket propulsion system, Introduction to solid propellant rockets and liquid propellant rockets.

TEXT BOOKS:

1. Gas Turbines, V.Ganesan, Tata McGraw Hill Publishers.
2. Mechanics and Dynamics of Propulsion, Hill and Peterson, John Wiley & Sons.

REFERENCES:

1. Gas Turbine Theory, Cohen and Rogers, Pearson Publishers.
2. Gas Turbines & Propulsive Systems, Khajuria & Dubey, Dhanpat Rai & Sons.
3. Rocket Propulsion, Ramamurthi, MacMilan Publishers.

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	3	1	-	40	60	100	3

FRACTURE MECHANICS

COURSE OUTCOMES:

CO1: Understand the failure of the products manufactured through various processes and suggests remedial methods.
CO2: Identify the energy release rate (G), and fracture energy for the materials. Modify for the ductile materials.
CO3: Understand linear elastic fracture mechanism theories and apply them for fatigue studies.
CO4: Understand elastic plastic fracture mechanism theories and apply them for fatigue studies
CO5: Identify the reasons for failures in different production processes, Forging, Casting and welding
CO6: Find the Fatigue strength and Identify Fatigue limits Total life and damage tolerant approaches to life prediction.

UNIT – I:
INTRODUCTION: Prediction of mechanical failure. Macroscopic failure modes brittle and ductile behavior. Fracture in brittle and ductile materials-characteristics of fracture surfaces; inter-granular and intra-granular failure, cleavage and micro-ductility, growth of fatigue cracks, the ductile/brittle fracture transition temperature for notched and un-notched components. Fracture at elevated temperature.

UNIT – II:
GRIFFITH'S ANALYSIS: Concept of energy release rate (G), and fracture energy, R(Material Resistance to Crack Extension).Modification for ductile materials, loading conditions. Concept of Rcurves.

UNIT – III:
LINEAR ELASTIC FRACTURE MECHANICS (LEFM): Three loading modes and the state of stress ahead of the crack tip, stress concentration factor, stress intensity factor and the material parameter the critical stress intensity factor, crack tip plasticity, effect of thickness on fracture toughness.

UNIT – IV:
ELASTIC-PLASTIC FRACTURE MECHANICS (EPFM): The definition of alternative failure prediction parameters, Crack Tip Opening Displacement, and the J integral. Measurement of parameters and examples of use.

UNIT – V:
Failure Of Forging, Casting And Weldments Causes of Failure in Forging like material characteristics, Deficiencies in design, Improper Processing / Fabrication or Deterioration resulting from service conditions, Failure of Iron and Steel Castings, effect of Surface Discontinuities, Internal Discontinuities, Microstructure, Improper Composition, Improper Heat Treatment, Stress Concentration and Service Conditions. Failure of Weldments, Reasons for Failure procedure for Weld Failure Analysis.

UNIT – VI:
FATIGUE: Definition of terms used to describe fatigue cycles, High Cycle Fatigue, Low Cycle Fatigue, mean stress R ratio, strain and load control. S-N curves. Goodman's rule and Miners rule.

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Micro-mechanisms of fatigue damage, fatigue limits and initiation and propagation control, leading to a consideration of factors enhancing fatigue resistance. Total life and damage tolerant approaches to life prediction.

TEXT BOOKS:

1. Dislocations and Mechanical Behavior of Materials, M. N. Shetty, PHI Publications
2. Fracture Mechanics Fundamentals and Applications, T.L. Anderson, CRC press.

REFERENCES:

1. Fracture of Brittle Solids, B. Lawn, Cambridge Solid State Science Series
2. Fundamentals of Fracture Mechanics, J.F. Knott, Butterworths Publications
3. Material Science and Metallurgy, Dr V.D. Kodgire and S.V.Kogire, Everest Publishing house.

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	3	1	-	40	60	100	3

ELECTIVE-I
JIGS, FIXTURES & PRESS TOOL DESIGN

COURSE OUTCOMES:

CO1: Understand the locating and clamping principles.
CO2: Explain the functions and design principles of Jigs,
CO3: Explain the functions and design principles of Fixtures.
CO4: Define the functions and design principles of press tools.
CO5: Develop die design for different operations.
CO6: Explain different forming techniques.

UNIT – I:
LOCATING AND CLAMPING PRINCIPLES: Objectives of tool design- Function and advantages of Jigs and fixtures – Basic elements – principles of location – 3-2-1 principle - Locating methods and devices – Redundant Location – Principles of clamping – Mechanical actuation – pneumatic and hydraulic actuation Standard parts – Drill bushes and Jig buttons – Tolerances and materials used.

UNIT – II:
DESIGN OF JIGS: Principles of jigs and fixtures - Locating elements - Drill bushes - Different types of jigs - Plate, latch, channel, post, angle plate, turn over, and pot jigs - Automatic drill jigs, Design and development of jigs for given components.

UNIT – III:
DESIGN OF FIXTURES: Design principles of fixtures - Design of fixtures for milling, boring. Design of fixture for assembly, inspection and welding. Design and development of fixtures for given components.

UNIT – IV:
PRESS WORKING TERMINOLOGIES AND ELEMENTS OF DIES AND STRIP LAY OUT: Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements. Elements of progressive combination and compound dies: Die block-die shoe. Bolster plate-punch plate punch holder-guide pins and bushes – strippers –knockouts-stops –pilots-Selection of standard die sets strip layout-strip layout calculations

UNIT – V:
DESIGN AND DEVELOPMENT OF DIES: Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies. Design considerations in forging, extrusion dies.

UNIT – VI:
FORMING TECHINIQUES: Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, recent trends in tool design, computer Aids for sheet metal forming Analysis, basic introduction, tooling for numerically controlled machines- setup reduction for work holding.

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TEXT BOOKS:

1. Production engineering, P.C Sharma. S.Chand Publications.
2. Tool Design, Donaldson, Lecain and Goold, III rd Edition Tata McGraw Hill, 2000.

REFERENCE BOOKS:

1. Jigs and Fixtures – Non-standard clamping device, Hiram E. Grant, Tata McGraw Hill, New Delhi, 1971.
2. Press tool design and construction, 1st edition, Prakash H. Joshi, Wheeler Publishing, New Delhi, 2000.
3. An Introduction to Jig and tool design, 3rd edition, Kempster, M. H. A., ELBS, 1987.

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ELECTIVE –I

INDUSTRIAL ENGINEERING AND COST ESTIMATION.

COURSE OUTCOMES:

CO1: Explain fundamental knowledge and skill sets required in the Industrial Management and domain knowledge in Industrial engineering.
CO2: Illustrate the concepts of human resource management, job evaluation and merit rating.
CO3: Illustrate the concepts of wages and intensive systems.
CO4: Solve various problems related to estimating and costing of a product.
CO5: Make use of different techniques to estimate weights and volumes of materials.
CO6: Make use of different techniques to estimation of welding, forging and foundry cost.

UNIT – I:

INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management. Reliability: introduction, importance & definition, bath tub curve, system reliability.

UNIT – II:

RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, methods of merit rating, advantaged and disadvantages of merit rating.

UNIT – III:

WAGE & INTENSIVE SYSTEMS:

Wages – definition, types – wage differentials – reasons, methods of wage payments, types of incentives, standard wage plans – Halsey, Weir, Emerson's, Rowans Gantt's task and Bonus systems, - Taylor's piece rate systems, Merric's piece rate system – Numerical problems on the above plans, incentives to the supervisor and executives.

UNIT – IV:

FUNDAMENTALS OF ESTIMATION AND COSTING: Objectives and functions of estimation; Principal Constituents of the estimation; estimation procedure: Labour, materials, overheads, miscellaneous expenses; Objectives of cost accounting – elements of cost viz., material, labour and expenses – Calculate the selling price of a product; Depreciation-causes-calculation of depreciation charges by a few important methods (Straight line method, Sinking fund method, Reducing balance method, Sum of Years digits method).

UNIT – V:

ESTIMATION OF WEIGHTS AND VOLUMES OF MATERIALS: Principles of dividing the component drawing into simple and smaller geometrical configurations; Calculation of volumes and the weight of the material; Estimating the cost ; Exercises in the calculation of weight of material and cost.

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UNIT – VI:

ESTIMATION OF WELDING, FORGING AND FOUNDRY COST: Estimate the cost of fabrication by gas welding and arc welding; Estimation of Forging Cost: Estimation of stock weight, net weight, gross weight, losses in forging; Exercises in the estimation of length, net and gross weight and cost of forging for given components. Estimation of foundry cost: Process for finding the foundry cost, cost of metal, cost of metal melting, moulding, core cost, cleaning cost, grinding and tooling cost. Exercises in estimating the foundry cost.

TEXT BOOKS:

1. Industrial engineering by M.I Khan,New Age International,2004.
2. Industrial engineering and estimating and costing by M. Gopalaiah, Radiant publishing house.

REFERENCES:

1. Industrial Engineering and management by O.P Khanna, Khanna publishers.
2. Industrial Engineering & - Estimating & Costing- by M.ZakriaBaig. Radiant publishing house.
3. Industrial Engineering & Management Science. – by T.R.Banga, Khanna publishers.

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WORK STUDY

COURSE OUTCOMES:

CO1: Demonstrate the fundamental concepts of work systems and work study.
CO2: Analyse the movements of workers and materials at work place.
CO3: Explain work measurement and method study.
CO4: Apply various types of engineering work measurements such as direct time study, predetermined motion time systems (PMTs).
CO5: Explain work sampling and predetermined time standards.
CO6: Explain maynard operation sequence technique.

UNIT – I:

Work Study Fundamentals: Productivity and Work Study, Definitions, Scope, and History of Work Study, Tools of productivity, Productivity index, Kinds of productivity Measurements, Causes of low productivity and techniques of their elimination, technical Methods to improve productivity.

UNIT – II:

Movement of workers and material at workplace, string diagram, flow process charts: worker material and equipment type, multiple activity chart: Man, Machine, Machine-Machine chart, Travel charts for workplace. Principles of motion economy, Classification of movements, Two handed process chart, SIMO charts, Micro Motion study, Therbligs, Use of Therbligs in examining common industrial tasks.

UNIT – III:

WORK MEASUREMENT: Objectives, basic procedure, Techniques of work measurement
METHOD STUDY: Definition, objectives and basic procedure. Record, Examine, Develop, Evaluate, Define, Install and maintain methods, Process chart symbols, Outline and flow process charts, Flow diagrams, Critically Examine Techniques.

UNIT – IV:

TIME STUDY: Equipment and forms, selection of a job, steps in time study, breaking the job into elements, timing the elements; Rating in time study – standard rating and standard performance, factors affecting rate of working, standard time determination, use of time standards, allowances.

UNIT – V:

WORK SAMPLING: Need, procedure for work sampling, underlying statistical distribution, determining time standards by work sampling.
PREDETERMINED TIME STANDARDS (PTS) – definition, methods time measurement (MTM), standard data from PTS, applications of PTS in different industrial situations

UNIT – VI:

MAYNARD OPERATION SEQUENCE TECHNIQUE: Introduction, Methodology, Basic MOST, Mini MOST, Maxi MOST, Applications to industrial cases

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TEXT BOOKS:

1. Work Study, OP.Khanna, DhanpatRai Publications.
2. Industrial Engineering Handbook, Maynard, Tata McGraw Hill.

REFERENCES:

1. Time and Motion Study Design, Barnes, R.M., John Wiley Publications.
2. Work Study & Ergonomics, L.C. Jhamb, Everest Publications.
3. Introduction to Work Study, George Kanawaty, International Labor Office.

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	3	-	-	25	50	75	2
HEAT TRANSFER LAB(R16)							

COURSE OUTCOMES:

CO1: Evaluate the amount of heat exchange for plane, cylindrical & spherical geometries
CO2: compare the performance of extended surfaces and heat exchangers.

LIST OF EXPERIMENTS:

1. Determination of overall heat transfer co-efficient of a composite slab.
2. Determination of heat transfer rate through a lagged pipe.
3. Determination of heat transfer rate through a concentric sphere.
4. Determination of thermal conductivity of a metal rod.
5. Determination of efficiency of a pin-fin.
6. Determination of heat transfer coefficient in forced convection.
7. Determination of heat transfer coefficient in natural convection.
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzmann constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Study of two-phase flow.

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	3	-	-	25	50	75	2

METROLOGY & INSTRUMENTATION LAB

COURSE OUTCOMES:

CO1: Examine different instruments that are available for linear, angular and roughness measurements and select and use the appropriate measuring instrument according to a specific requirement.

CO2: Select proper measuring instrument and know the requirement of calibration, errors in measurement etc.

METROLOGY LAB:

1. Measurement of lengths, heights, diameters by Vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth Vernier caliper for tooth thickness inspection and flange micro meter for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe, drilling & milling machines.
5. Angle and taper measurements with bevel protractor, Sine bars, rollers and balls.
6. Use of spirit level in finding the straightness of a bed and flatness of a surface.
7. Thread inspection with two wires/ three wire method & tool maker's microscope.
8. Surface roughness measurement with roughness measuring instrument.

INSTRUMENTATION LAB:

1. Calibration of pressure gauge.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge.
5. Calibration of thermocouple.
6. Calibration of capacitive transducer.
7. Study and calibration of photo and magnetic speed pickups.
8. Calibration of resistance temperature detector.
9. Study and calibration of a Rota meter.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low-pressure

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	4	-	-	40	60	100	3
METAL CUTTING & MACHINE TOOLS							

CO1: Define and explain theory and fundamentals of metal cutting.
CO2: Illustrate the working of lathe machines and apply machining economics.
CO3: Explain the working of Shaping, slotting, planning, drilling, boring machines and apply machining economics.
CO4: Illustrate the working of milling machines and apply machining economics.
CO5: Illustrate the working of grinding, lapping, honing and broaching processes.
CO6: Explain working of jigs and fixtures.

UNIT – I:
FUNDAMENTALS OF MACHINING: Elementary treatment of metal cutting theory -element of cutting process – geometry of single point tool angles, chip formation and types of chips – built-up edge and its effects chip breakers, mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials.

UNIT–II:
LATHE MACHINES: Engine lathe – principle of working, specification of lathe – types of lathe, taper turning and methods, thread turning, constructional features of speed gear box and feed gear box. Turret and capstan lathes, work holders, tool holding devices. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes, lathe attachments, Machining time calculations.

UNIT–III:
SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working–principal parts – specifications, operations performed, machining time calculations.
DRILLING & BORING MACHINES: Twist drill and its geometry, principles of working, specifications, types, operations performed, Boring Machines – fine Boring Machines – jig boring machine, Deep hole drilling Machine, machining time calculations.

UNIT –IV:
MILLINGMACHINES: Principles of working – specifications – classification of Milling Machines – Principle features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, methods of indexing, machining time calculations.

UNIT–V:
FINISHING PROCESSES: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations.

UNIT–VI:
JIGS & FIXTURES: Principles of jigs and fixtures, uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, drill jigs and milling and boring fixtures.

TEXT BOOKS:
1. Manufacturing technology II, P.N Rao, Tata Mcgraw hill publishers
2. Workshop Technology, B.S.RaghuVamshi–Vol II, DhanpatRai& Co

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REFERENCES:

1. Production Technology by H.M.T., Tata McGraw-Hill Education
2. Production Engineering, K.C Jain & A.K Chitaley, PHI Publishers
3. Production Technology, R.K. Jain and S.C. Gupta, Khanna Publisher

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	3	1	-	40	60	100	3

FINITE ELEMENT METHODS

COURSE OUTCOMES:

CO1: Derive displacement, stress, strain relations and apply vibrational and weighted residual methods to solve differential equations.
CO2: Determine the elongation, stresses and strains in one dimensional bar problems.
CO3: Determine the displacement in Truss and deflections in beams
CO4: compute stress and strains in two dimensional problems using constant strain triangle and also parametric elements.
CO5: Evaluate the rate of heat transfer and temperature distribution in thin plates and fin.
CO6: Determine natural frequencies of free vibration problems.

UNIT – I:

INTRODUCTION: Stress and equilibrium, strain, displacement relations, stress, strain relations, plane stress and plane strain conditions, vibrational and weighted residual methods
FINITE ELEMENT METHOD: Discretization, Types of elements, band width, node numbering, and interpolation functions, local and global coordinates, convergence requirements, Types of boundary conditions, Steps in Finite Element Method, Applications of Finite Element Method.

UNIT – II:

ONE DIMENSIONAL BAR PROBLEMS: 1-D bar element, shape functions, Stiffness matrix and load vector, assembly of Matrices, Treatment of boundary conditions- One dimensional quadratic element.

UNIT – III:

ANALYSIS OF TRUSS: Truss element, element Stiffness matrices, simple problems on truss
ANALYSIS OF BEAMS: Beam Element, Shape functions and Element stiffness matrix, load vector for concentrated and Uniformly Distributed Load, simple problems on beams.

UNIT – IV:

TWO DIMENSIONAL PROBLEMS: Finite element modelling of two dimensional Problems - constant strain triangle Element - treatment of boundary conditions 2-D four nodded iso-parametric element, numerical integration , Gaussian Quadrature Approach.

UNIT – V:

STEADY STATE HEAT TRANSFER ANALYSIS: 1- D Thermal analysis of thin plane walls, analysis of a fin.

UNIT – VI:

DYNAMIC ANALYSIS: Free Vibrations, Longitudinal Vibrations and Transverse Vibrations, Eigen Values and Eigen Vectors, Natural Frequencies for bar and beam problems.

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering, Chandraputla, Ashok and Belegundu, Prentice – Hall.
2. Finite Element Analysis, Sk.Md. Jalaluddin, Anuradha Publications.

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REFERENCE BOOKS:

1. An introduction to Finite Element Method, JN Reddy, McGrawHill.
2. A first course in finite element method, Daryl L Logan, Cengage Learning.
3. Finite Element Analysis -Theory and Programming, C. S. Krishnamoorthy, Tata McGraw Hill.

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	4	-	-	40	60	100	3
CAD/CAM							

COURSE OUTCOMES:

CO1: Illustrate the fundamental concepts of the Product cycle and Design process.
CO2: Build the mathematical basis in the technique of representation of geometric entities and the technique of transformation of geometric entities using transformation matrix.
CO3: Develop the 2D and 3D geometries using Modeling packages.
CO4: Understand the NC, CNC and DNC machines and part programming methods.
CO5: Describe the use of GT for the product development and also the use of CAPP for the product development.
CO6: Identify the various elements and their activities in the Computer Integrated Manufacturing Systems

UNIT – I:

INTRODUCTION: Fundamentals of Product cycle- Design process, Computers in design applications, benefits of CAD, Computer configuration for CAD applications, graphics terminal, memory types, input devices, display devices, hard copy devices, and storage devices.
COMPUTER GRAPHICS: Database structure for graphics modelling, 2D and 3D transformations, mathematics of projections, clipping

UNIT – II:

GEOMETRIC MODELING: 3D wire frame modelling, wire frame entities, concept of parametric and non-parametric representation of curves, curve fitting techniques, definitions of cubic spline and Bezier, B-spline.
SURFACE MODELING: Algebraic and geometric form, cylindrical surface, ruled surface, surface of revolution, spherical surface, Composite surface, Bezier surface, B-spline surface.
SOLID MODELING: Sweep representation, constructive solid geometry, boundary representations.

UNIT – III:

CAD SOFTWARE: (Drafting and Modelling)**:** Basic geometric commands, layers, display control commands, editing, dimensioning, sweep representation, solid modelling.

UNIT – IV:

CNC MACHINING AND PART PROGRAMMING: Numerical Control (NC) machine tools, NC Tooling and Automatic Tool Changers – CNC types, constructional details, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming. Direct Numerical Control, Adaptive Control.

UNIT – V:

CELLULAR MANUFACTURING: Group Technology(GT), Part Families, Parts Classification and coding, Simple Problems in Opitz Part Coding system, Production flow Analysis, Cellular Manufacturing, Composite part concept, Machine cell design and layout, Quantitative analysis in Cellular Manufacturing, Rank Order, Clustering Method.

UNIT - VI:

COMPUTER INTEGRATED MANUFACTURING: Types of manufacturing systems, computer aided process planning (CAPP) and types.

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COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM.

TEXT BOOKS:

1. CAD / CAM / CAE, E.Zimmers & M.Groover, Pearson Education.
2. Automation, Production systems & Computer integrated Manufacturing, Groover,P.E.

REFERENCES:

1. CAD / CAM Theory and Practice, Ibrahim Zeid, TMH.
2. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson.
3. Computer Numerical Control Concepts and programming, Warren S Seames, Thomson.

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	4	-	-	40	60	100	3
ELECTIVE –II POWER PLANT ENGINEERING							

COURSE OUTCOMES

CO1: Understand basic power generation types and steam cycles.
CO2: Identify different boilers and their applications
CO3: Solve problems related to Brayton and Rankine cycles.
CO4: Contrast various power generation units in the view of economic, environmental and social requirements
CO5: Observe the contemporary issues like nuclear waste disposal
CO6: Explain the terms related to power plant economics

UNIT – I:
INTRODUCTION TO POWER PLANTS: Power plants, Types, Components and layouts, working principle of Steam, Hydro, Nuclear, Gas Turbine and Diesel power plants, Selection of site, Analysis of steam cycles, Rankine cycle, Reheating and Regenerative cycles.

UNIT – II:
STEAM GENERATORS: Boiler classification, Types of Boilers, Fire tube and Water tube boilers, High pressure and Supercritical boilers, Positive circulation boilers, Fluidized bed boilers, Waste heat recovery Boiler, Feed water heaters, Super heaters, Reheaters, Economiser, Condenser, Cooling tower, Feed water treatment, Air heaters.

UNIT – III:
COMBUSTION AND FIRING METHODS: Coal handling and preparation, Combustion equipment and firing methods, Mechanical stokers, Pulverized coal firing systems, Cyclone furnace, Ash handling systems, Electrostatic Predicator, Fabric filter and Bag house, Forced draft and Induced draft fans-Chimney.

UNIT – IV:
NUCLEAR AND GAS TURBINE POWER PLANTS: Principles of nuclear energy, Energy from nuclear reactions, Energy from fission and fuel Burn up, Boiling water reactor, Pressurized water reactor, Pressurized Heavy Water Reactor, Gas cooled reactor, High temperature gas cooled reactor, Pebble bed reactor, Fast breeder reactor, Liquid metal fast breeder reactor, reactor materials, Radiation shielding, Waste disposal. Gas turbine power plant-Open and closed cycles, Intercooling, Reheating and Regenerating, Combined cycle power plants.

UNIT – V:
HYDRO AND DIESEL POWER PLANTS: Classification of Hydro-electric power plants and their applications, Selection of prime movers, Governing of turbine. Diesel power plant-Subsystems, Starting and stopping, Heat Balance, Supercharging of Diesel engines.

UNIT – VI:
POWER PLANT ECONOMICS AND ENVIRONMENTALCONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor, related exercises. Effluents from power plants and Impact on environment, pollutants and pollution standards, methods of pollution control.
ENERGY AUDITING: Definition and Objectives of energy management, Energy audit- types

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and methodology, Need for energy audit, Types of energy audit, Preliminary energy auditing methodology, detailed energy auditing methodology.

TEXT BOOKS:

1. P. K. Nag, (2001), Power Plant Engineering: Steam and Nuclear, Tata McGraw-Hill Publishing Company Ltd., Second Edition.
2. A course in Power Plant Engineering, Arora and Domkundwar, Dhanpatrai& Co.

REFERENCES:

1. Power Plant Technology, M. M. El-Wakil, McGraw-Hill International Editions
2. A Text Book of Power Plant Engineering, R. K. Rajput, Laxmi Publications.
3. Power Plant Engineering, P.C.Sharma, S.K.Kataria Publications.

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	4	-	-	40	60	100	3

ELECTIVE -II
TRIBOLOGY AND BEARING DESIGN

COURSE OUTCOMES:

CO1: Understand the concepts of tribology, viscosity and different viscometers.
CO2: Outline the hydrostatic squeeze films and its application to journal bearing.
CO3: Illustrate the hydrodynamic lubrication system and hydro dynamic theory applied to journal bearing
CO4: Understand the mechanisms and causes of friction, power losses in journal bearings.
CO5: Understand the concepts of air lubricated bearings.
CO6: Illustrate various types of bearing materials and bearing oil pads.

UNIT – I:

STUDY OF VARIOUS PARAMETERS: Viscosity, flow of fluids, viscosity and its variation-absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers used.

UNIT – II:

HYDROSTATIC LUBRICATION: Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing.

UNIT – III:

HYDRODYNAMIC THEORY OF LUBRICATION: Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions -Effects of side leakage – Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl anti -friction bearing.

UNIT – IV:

FRICTION AND POWER LOSSES IN JOURNAL BEARINGS AND ITS APPLICATIONS: Calibration of friction loss friction in concentric bearings, bearing modulus, Somerfield number, heat balance, practical consideration of journal bearing considerations. Study of current concepts of boundary friction and dry friction.

UNIT – V:

AIR LUBRICATED BEARING: Advantages and disadvantages, application of Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect.

UNIT – VI:

TYPES OF BEARING MATERIALS AND BEARING OIL PADS: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed bearing, partial bearings-externally pressurized bearings. General requirements of bearing materials, types of bearing materials.

TEXT BOOK:

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry: Sushil Kumar Srivatsava, S. Chand &Co.

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REFERENCE:

1. Tribology, B.C. Majumdar, Dhanpatrai.
2. Engineering Tribology, Prasntasahoo ,PHI publishers.
3. Fundamentals of Tribology, Ramsey Gohar, homerrahnejat, World scientific publishing Co.pte.Ltd.

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	4	-	-	40	60	100	3
ELECTIVE -II ADVANCED TOOL DESIGN							

COURSE OUTCOMES:

CO1: Understand tool design methods and punch and die manufacturing techniques.
CO2: Develop design concepts for various cutting tools.
CO3: Identify the gages and their nomenclature.
CO4: Explain the principles of dies design.
CO5: Explain the principles of moulds design.
CO6: Interpret tool design for NC machine tools.

UNIT – I:

TOOL DESIGN METHODS: Introduction, design procedure, statement of the problem, needs analysis – tentative design solutions, finished design, drafting and design techniques in tooling drawings, punch and die manufacturing techniques

UNIT – II:

DESIGN OF CUTTING TOOLS: Metal cutting process - Selection of tool materials - Design of single point and multipoint cutting tool –lathe, Drills, Milling cutters – Problems on design of single point cutting tool.

UNIT – III:

GAUGES AND GAUGE DESIGN: Introduction, fixed gages, gage tolerances, the selection of material for gages, indicating gauges, automatic gauges and design problems.

UNIT – IV:

DESIGN OF DIES: Die-design fundamentals, blanking and piercing die construction, pilots, strippers and pressure pads, presswork materials, bending dies, forming dies, drawing operations

UNIT – V:

MOULD DESIGN: Splits in mould, split locking, two-cavity and multi-cavity moulds, design details of injection moulds.

UNIT – VI:

TOOL DESIGN FOR NC MACHINE TOOLS: Introduction, need for numerical control (NC), basic explanation of NC, NC systems in use today, Fixture deign for NC machine tools, cutting tools for NC, tool holding methods for NC, tool presetting.

TEXT BOOK:

1. Tool Design, Donaldson Cyrll, George H.LeCain and Goold V.C.,TMH, 36th Reprint, 2006.
2. Jigs and Fixtures, Joshi P. H., (2004), 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi

REFERENCES:

1. Fundamentals of Tool Design, Wilson F.W., ASTME, Prentice Hall, India, 2010.
2. Principles of Machine Tools, G.C. Sen and A. Bhattacharya,New Central Book Agency, Kolkata, 2009.
3. Fundamentals of Tool Design,Jeff Lantrip, David A. Smith and John G. Nee, (2003), 5th Edition, Society of Manufacturing Engineers

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	4	-	-	40	60	100	3

ELECTIVE -II

FACILITY LAYOUT AND MATERIAL HANDLING

COURSE OUTCOMES:

CO1: Acquire the knowledge related to the different types of facility layouts & its effects
CO2: Understand Computerized Layout methods
CO3: Understand the different layouts and models of facility layout
CO4: Understand the importance of material handling systems
CO5: Outline the cost and safety in Material handling methods
CO6: Understand Ergonomics of Material handling equipment

UNIT – I:

Introduction-Classification of Lay out, Objectives and principles of plant layout, Advantages and Limitations of different layouts, Layout design procedures. Process layout & product layout: selection, specification, implementation and follow up, comparison of Process layout & product layout. Factors influencing layout

UNIT – II:

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT: Basic inputs, procedure adopted for using these methods, simple problems, major features, advantages and disadvantages, applications

UNIT – III:

Group Layout, Fixed layout, Quadratic assignment model with examples. Branch and bound method with examples

UNIT – IV:

Material handling systems-Introduction and objectives, Material handling principles. Classification of Material handling equipment-Conveyors, Industrial trucks, Cranes & hoists, Containers and Robots, Relationship of material handling to plant layout

UNIT – V:

Selection and Material handling methods, function oriented systems. Methods to minimize cost of material handling, Maintenance of material handling equipment, Safety in handling. Limitations of Automated Material Handling Systems

UNIT – VI:

Ergonomics of Material handling equipment, Objectives of human engineering. Elements of a Material Handling Ergonomics Program, Analyse management operations, Material flow, Workplace, Analysing manual materials handling tasks, Analyse the job tasks&load, Equipment, Work scheduling, Environment, Recommend, review and implement changes, Review. Material Handling Ergonomics for human-beings- Lifting Principles, Lifting Assistance, Push/Pull Principles, Carrying Principles

TEXT BOOKS:

1. Production and Operations Management by R.Panneerselvam, PHI
2. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.

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REFERENCES:

1. Introduction to Material handling by Ray, Siddhartha, New age
2. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
3. Aspects of Material handling, by Dr. KC Arora&Shinde, Lakshmi Publications

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	3	1	-	40	60	100	3
ELECTIVE -III COMPUTATIONAL FLUID DYNAMICS							

COURSE OUTCOMES:

CO1: Demonstrate the knowledge of CFD techniques, basic aspects of discretization and grid generation.
CO2: Sketch fluid flow fields using CFD methods.
CO3: Relate fluid flow problems with fields of heat transfer.
CO4: Observe different convection and diffusion schemes
CO5: Articulate the flow field calculations using different techniques
CO6: Illustrate wave equation and its schemes

UNIT – I:
INTRODUCTION AND GOVERNING EQUATIONS:
Introduction, Impact and applications of CFD in diverse fields, governing equations of fluid dynamics ,Continuity, Momentum and energy, Generic integral form for governing equations, Initial and Boundary conditions, Governing equations for boundary layers, Classification of partial differential equations, Hyperbolic, Parabolic, Elliptic and Mixed types, Applications and relevance.

UNIT – II:
DISCRETIZATION:
Basic aspects of discretization, Discretization techniques, Finite difference, Finitevolume and Finite Element Method, Comparison of discretization by the three methods, Introduction to Finite differences, Transient one-dimensional and two-dimensional conduction, Explicit Implicit, Crank-Nicolson ADI scheme, Stability criterion. Difference equations, Numerical errors, Grid independence test, Optimum step size.

UNIT – III:
GRID GENERATION:
Grid generation, General transformation of the equations, Form of the governing equations suitable for CFD, Boundary fitted co-ordinate systems, Elliptic grid generation, Adaptive grids, Modern developments in grid generation.

UNIT – IV:
CONVECTION – DIFFUSION:
Steady one-dimensional convection and diffusion, Central difference, upwind, quick, exponential, false diffusion, hybrid and power law schemes. Transient one dimensional heat Conduction equation.

UNIT – V:
CALCULATION OF FLOW FIELD:
Representation of the pressure, Gradient term and continuity equation, staggered grid Momentum equations, Pressure and velocity corrections, Pressure Correction equation, Numerical procedure for SIMPLE algorithm, Boundary conditions for the pressure correction method. Stream function, Discussion of case studies.

UNIT – VI:
INTRODUCTION TO FIRST ORDER WAVE EQUATION: Stability of hyperbolic and

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elliptic equations, fundamentals of fluid flow modelling, conservative property, the upwind scheme

TEXT BOOKS:

1. Computational Fluid Dynamics for Engineering/K.A.Hoffman/Vol I –III, Engineering Education System, Austin, Texas.
2. Computational Fluid Dynamics by John D. Anderson /TMH

REFERENCE BOOKS:

1. Computational Fluid Flow and Heat Transfer,K. Muralidhar, T. Sundarajan, (2001), Narosa Publishing House, New Delhi.
2. Numerical Heat Transfer and Fluid Flow, S.V. Patankar, (1999), Hemisphere, New York.

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	3	1	-	40	60	100	3
ELECTIVE -III RAPID PROTOTYPING							

COURSE OUTCOMES:

CO1: Illustrate the knowledge of Rapid Prototyping/Manufacturing technologies.
CO2: Explain liquid based rapid prototyping systems.
CO3: Interpret solid based Rapid Prototyping systems.
CO4: Understand powder based Rapid Prototyping systems.
CO5: Explain the knowledge of Rapid Tooling.
CO6: Identify the required process for different applications.

UNIT – I:

INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

RAPID PROTOTYPING SYSTEM: practical applications, Basic operations, CAD Model, Translator, supports, slice, merge, prepare, build, cleaning, finishing, benefits of Rapid prototyping, comparison with conventional manufacturing process.

UNIT – II:

LIQUID-BASED RAPID PROTOTYPING SYSTEMS:

STEREO LITHOGRAPHY APPARATUS (SLA): Specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages.

SOLID GROUND CURING (SGC): Specifications, process, working principle, applications, advantages and disadvantages.

UNIT – III:

SOLID-BASED RAPID PROTOTYPING SYSTEMS:

LAMINATED OBJECT MANUFACTURING (LOM): Specifications, process, working principle, applications, advantages and disadvantages.

FUSED DEPOSITION MODELLING (FDM): Specifications, process, working principle, applications, advantages and disadvantages.

UNIT – IV:

POWDER BASED RAPID PROTOTYPING SYSTEMS:

SELECTIVE LASER SINTERING (SLS): Specifications, process, working principle, applications, advantages and disadvantages.

THREE DIMENSIONAL PRINTING (3DP): Specifications, process, working principle, applications, advantages and disadvantages.

UNIT – V:

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

UNIT – VI:

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry,

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automotive industry, jewellery industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bimolecular.

TEXT BOOK:

1. Rapid prototyping: Principles and Applications – Chua C.K., Leong K.F. and LIM C.S, World Scientific publications.
2. Rapid Prototyping & Manufacturing – Paul F.Jacobs, ASME Press.

REFERENCE BOOKS:

1. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer.
2. Rapid Automated Prototyping: An Introduction Industrial Press Inc., New York.
3. Wholers Report 2000 – Terry Wohlers, Wohlers Associates.

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	3	1	-	40	60	100	3
ELECTIVE -III ADVANCED MECHANICS OF SOLIDS							

COURSE OUTCOMES:

CO1: Apply mathematical knowledge to calculate the deformation behavior of simple structures.
CO2: Analyze and solve the problems related to mechanical elements by using Winkler-Bach theory.
CO3: Identify the Shear centre for different sections.
CO4: Illustrate Centrifugal Stresses in rotating Discs.
CO5: Analyze the Plane Stress and Principal Stresses for Inclined sections.
CO6: Understand theories of failures for shafts, shells and cylinders.

UNIT – I:

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains– Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II:

STATICALLY INDETERMINATE BEAMS: Introduction, Fixed and propped cantilever beams -Analysis by the differential equations of the Deflection curve, Moment Area Method.
Continuous Beams: Introduction, Clapeyron's theorem of three moments, Beams with constant and varying moments of inertia.

UNIT – III:

SHEAR CENTRE: Bending Axis and Shear Centre, Position of Shear Centre, Shear flow, Shear Centre of Channel section, Angle section, T- section and I- section.

UNIT – IV:

CENTRIFUGAL STRESSES: Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniform strength.

UNIT – IV:

ANALYSIS OF PLANE STRESS: Stresses on inclined Sections, Plane Stress, Principal Stresses and Maximum Shear Stress. Mohr's Circle for Plane Stress. Hooke's Law for Plane Stress.

UNIT – VI:

THEORIES OF FAILURE: Failure Theories, Application to design of shafts. Cylinders and Spherical Shells: Stresses and strains in thin cylinders, Thin spherical shell.

TEXT BOOK:

1. Strength of materials by Sadhu Singh, Khanna Publishers, 11th Edition.
2. Strength of Materials R.K.Bansal, Fifth edition, Laxmi Publishers, 2012

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REFERENCES:

1. Engineering Mechanics of Solids by E.P.Popov, PHI, 2nd Edition.
2. Strength of Materials by S. Ramamrutham, DhanpatRai Publishing Company (P)
3. Ltd, 18th Edition. Introduction to Solid Mechanics by I.H. Shames, PHI, 3rd Edition.

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	3	1	-	40	60	100	3
PRODUCTION PLANNING AND CONTROL							

COURSE OUTCOME:

CO1: Apply the systems concept for the design of production and service systems.
CO2: Make use of forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques.
CO3: Understand the principles and techniques of inventory management.
CO4: Choose routing procedure and able to prepare bill of material.
CO5: Understand the importance and function of scheduling and make use of Gantt chart to solve scheduling problems.
CO6: Identify dispatching procedure and make use of computer in production planning and control.

UNIT – I:
INTRODUCTION

Introduction: Definition, objectives and functions of production planning and control, elements of production control, types of production, organization of production planning and control department, internal organization of department.

UNIT – II:

FORECASTING: Forecasting, importance of forecasting, types of forecasting, their uses general principles of forecasting, forecasting techniques, qualitative methods and quantitive methods.

UNIT – III:
INVENTORY MANAGEMENT

Inventory control, Purpose of holding stock-Effect of demand on inventories-Ordering procedures. Two bin system, Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Elements of Just In Time Systems and kanban system-Fundamentals of MRP II and ERP.

UNIT – IV:

ROUTING : Routing, definition, routing procedure, route sheets, bill of material, factors affecting routing procedure, schedule, definition, difference with loading.

UNIT – V:

PRODUCTION SCHEDULING: Production Control Systems-Loading and scheduling, Master Scheduling-Scheduling rules, Gantt charts-Basic scheduling problems, Line of balance, Flow production scheduling Batch production scheduling.

UNIT – VI:

DISPATCHING: Dispatching, activities of dispatcher, dispatching procedure, follow up, definition, reason for existence of functions, types of follow up, applications of computer in production planning and control.

TEXT BOOK:

1. Elements of Production Planning and Control, Samuel Eilon.
2. Production Planning and Control, Mukhopadyay , PHI.

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REFERENCES:

1. Production Planning Control and Industrial Management, K.C.Jain& L.N. Aggarwal, Khanna Publishers, 6th Edition, 2008.
2. Production and Operations Management, N.G. Nair,Tata McGraw-Hill, 2004.
3. Theory and Problems in Production & Operations Management, S.N.Chary, Tata McGrawHill, 2003.

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	-	-	3	25	50	75	2
CAD/ CAM LAB							

COURSE OBJECTIVES:

CO1: To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for engineering simulation.
CO2: To know various fields of engineering where these tools can be effectively used to improve the output of a product.
CO3: To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools.

I. DRAFTING: Development of part drawings for various components in the form of orthographic and isometric, representation of dimensioning andHEAT TRANSFER LAB
II. tolerances scanning and plotting. Study of script, DXE and IGES files.

1. To develop the Isometric view of 3D part drawings various components by using any modeling package.
2. To generate the 3D model of Machine components shown in figure by using PROTRUSION (Sweep) option in any solid modeling package.

III. 3D-PRINTING:

3. To Manufacture Hexagonal Nut by using 3D Printer.
4. To Manufacture Connecting rod, Piston by using 3D Printer.

IV. ANALYSIS: Analysis software enables you to solve complex structural engineering problems and make better, faster design decisions. With the finite element analysis (FEA) tools available in the suite, you can customize and automate solutions for your structural mechanics problems and parameterize them to analyze multiple design scenarios. You can connect easily to other physics analysis tools for even greater fidelity. ANSYS structural analysis software is used throughout the industry to enable engineers to optimize their product designs and reduce the costs of physical testing.
5. To find the deflections at the nodes and to draw the sheer force and bending moment diagram of beam shown in figure by using ANSYS.
6. To determine the Deflection and Member forces of a given 2D truss by using ANSYS.
7. To find the displacement, maximum, minimum stresses induced in a given cantilever beam with uniformly distributed load and point loads and draw the shear force and bending moment diagrams by using ANSYS tool, also list the results according to the given loads.
8. Estimation of natural frequencies and mode shapes Harmonic response of 2D beam by using ANSYS.

V. CAM:

9. Prepare a Stepped Turned component on X-L Turn CNC machine.
10. Prepare a Grooved and Drilled component on X-L Turn CNC machine.
11. Prepare a "STAR SYMBOL" for a given component on X-L Mill CNC machine.

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	4	-	-	40	60	100	3
OPEN ELECTIVE -III **OPERATIONS RESEARCH**							

COURSE OUTCOMES:

CO1: Understand and solve linear programming problems.
CO2: Solve transportation, assignment problems.
CO3: Solve networking problems.
CO4: Solve queuing, game theory problems
CO5: Solve inventory,
CO6: Solve simulation problems.

UNIT – I:

Development-definition-characteristics and phases-types of operation research models, applications.

LINEAR PROGRAMMING PROBLEM: Formulation-graphical solution, simplex method artificial variables techniques -two–phase method, big-M method, duality principle.

UNIT – II:

TRANSPORTATION PROBLEM: Formulation, types of initial basic feasible solution using north west corner method (NWCM), least cost method (LCM), Vogel approximation method (VAM) optimal solution, unbalanced transportation problem, degeneracy.

ASSIGNMENT PROBLEM: Formulation, optimal solution variants of assignment problem and travelling salesman problem.

UNIT – III:

NETWORKING MODELS: Earliest Completion time of a project and Critical path, Programme Evaluation Review Technique, Total Slack, Free Slack, Probability of achieving completion date, Cost Analysis, Crashing the network, Resource Scheduling, Advantages, Limitations, Cost Analysis, Distinction between PERT and CPM, LPP Formulation

UNIT – IV:

QUEUING MODELS: Poisson arrivals and Exponential service times, Single channel models and Multi channel models.

DECISION MODELS: Game theory, two person zero sum game, Graphic solution, Property of dominance, Algebraic solution.

UNIT – V:

INVENTORY: Inventory models, Various Costs and Concepts, EOQ, Deterministic inventory models, Production models, Stochastic Inventory models, Buffer stock, ABC & VED Analysis.

UNIT – VI:

SIMULATION: Definition, types of simulation models, phases of simulation, applications of simulation, inventory and queuing problems, advantages and disadvantages, simulation languages.

TEXT BOOKS:

1. Operations Research, S.D.Sharma, KedarNath Ram Nath Publishers
2. Operations Research, A.M.Natarajan, P.Balasubramani and A. Tamilarasi, Pearson Education.

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REFERENCES:

1. Introduction to O.R, Hiller & Libermann Tata McGraw Hill
2. Operations Research, R.Pannerselvam, PHI Publications.
3. Operations Research, Wagner, PHI Publications.

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IV B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3

OPEN ELECTIVE -III
ROBOTICS

COURSE OUTCOMES:

CO1: Distinguish between fixed automation and programmable automation.
CO2: Identify various components of robot.
CO3: Select appropriate type of actuator for a joint.
CO4: Illustrate robot applications in manufacturing.
CO5: Analyse kinematics of a robot.
CO6: Develop a programme to control a robot for execution of a work cycle.

UNIT – I:
INTRODUCTION: Automation and Robotics, Components of Robot, Mechanical manipulate or control system and end effectors-Types of end effectors, Requirements and challenges of end effectors classification of robots by coordinate system and control system. Control resolution, accuracy, repeatability and work volume of robot.

UNIT – II:
ROBOT ACTUATORS AND FEEDBACK COMPONENTS:
ACTUATORS: Pneumatic, Hydraulic actuators, electric & stepper motors.
FEEDBACK COMPONENTS: position sensors, potentiometers, resolvers, encoders, velocity sensors.

UNIT – III:
ROBOT APPLICATION IN MANUFACTURING: Material Transfer, Material handling, loading and unloading, Processing, spot and continuous arc welding & spray painting, Assembly and Inspection. Future applications of robots.

UNIT – IV:
MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation, problems. Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics, problems.

UNIT – V:
Differential transformation and manipulators, Jacobians, problems. Dynamics: Lagrange, Euler and Newton, Euler formations, Problems.

UNIT – VI:
Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint integrated motion, straight line motion, Robot programming.

TEXT BOOKS:
1. Industrial Robotics, Groover M P, Pearson Edu.
2. Robotics and Control, Mittal R K &Nagrath I J,Tata McGraw Hill.

REFERENCE BOOKS:
1. Robotics, Fu K S, McGraw Hill.
2. An Introduction to Robot Technology, P. Coiffet and M. ChaironzeKogam, Page Ltd. 1983 London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall.

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	4	-	-	40	60	100	3
ADVANCED MANUFACTURING PROCESS							

COURSE OUTCOMES:

CO1: Illustrate advanced casting methods.
CO2: Understand principles and applications of electron beam, ion beam and laser hybrid welding processes.
CO3: Explain forming process for thin sections.
CO4: Understand abrasive and water jet machining.
CO5: Explain electrical discharge and electro chemical machining processes.
CO6: Illustrate Plasma, Electron beam and Laser beam machining process.

UNIT – I:

Stir casting, Magnetic moulding, metal injection moulding, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting.

UNIT – II:

Electron beam welding and Laser beam welding: Principle, application and advantages of EBW and LBW, process parameters. Hybrid welding process-advantages and its applications.

UNIT – III:

Introduction forming processes, advantages ,limitations and applications, Hydro, Magnetic and High velocity forming, design for forming and forming of thin sections.

UNIT – IV:

Abrasive machining, Water jet machining, Abrasive water jet machining, Abrasive flow finishing, mechanism of material removal-problems on MRR, economic considerations, advantages, limitations and applications.

UNIT – V:

MATERIAL REMOVAL PROCESS (Electrical & Chemical): Basic principles of material removal in electro-spark & electro-chemical machining processes, economic considerations, disadvantages and applications, problems on MRR.

UNIT – VI:

MATERIAL REMOVAL PROCESS (Thermal): Plasma Machining, Electron beam machining, Laser beam machining. Basic principles, theory, mechanism of material removal-problems on MRR, economic considerations, disadvantages and applications.

TEXT BOOKS:

1. "Manufacturing Science" A. Ghosh, and A.K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi.
2. Advanced manufacturing process, V. K. Jain, Allied publications.

REFERENCES:

1. Advanced methods of machining, McGeough, J., Chapman & Hall, 2011.
2. Metal Cutting Theory and Practice, Bhattacharya, A., New Central Book Agency, 2011.
3. Wagoner R. H. and Chenot, J-L, Fundamentals of Metal Forming, Wiley, 2009.

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	3	1	-	40	60	100	3

ELECTIVE-IV
REFRIGERATION & AIR CONDITIONING
(Refrigeration and Psychrometric tables and charts allowed)

COURSE OUTCOMES:

CO1: Understand the difference between refrigeration and air conditioning
CO2: Summarize the VCR system on T-S and P-h charts
CO3: Identify the function of each component of VCR system
CO4: Observe the function of the refrigerant in a refrigeration system and trace its path
CO5: Report different air conditioning methods and its applications
CO6: Classify different components of air conditioning plant

UNIT – I:

INTRODUCTION TO REFRIGERATION: Necessity and applications, unit of refrigeration and C.O.P., Mechanical refrigeration, types of ideal cycles of refrigeration.
AIR REFRIGERATION: Bell Coleman cycle, open and dense air systems, refrigeration systems used in aircrafts and problems.

UNIT – II:

VAPOUR COMPRESSION REFRIGERATION: Working principle and essential components of the plant, simple vapour compression refrigeration cycle, COP, representation of cycle on T-S and p-h charts, effect of sub cooling and super heating, cycle analysis, actual cycle influence of various parameters on system performance, use of p-h charts, numerical problems.

UNIT – III:

REFRIGERANTS, Desirable properties, classification, refrigerants used, nomenclature, ozone depletion, global warming. VCR SYSTEM COMPONENTS: Compressors, general classification, comparison, advantages and disadvantages. Condensers, classification, working principles, evaporators, classification, working principles, expansion d evices, types, working principles.

UNIT – IV:

VAPOR ABSORPTION SYSTEM: Calculation of maximum COP, description and working of NH3, water system and Li Br, water (Two shell & Four shell) System, principle of operation three fluid absorption system, salient features.
STEAM JET REFRIGERATION SYSTEM: Working Principle and basic components. Principle and operation of (i) thermoelectric refrigerator (ii) vortex tube.

UNIT – V:

INTRODUCTION TO AIR CONDITIONING: Psychometric properties & processes, characterization of sensible and latent heat loads, need for ventilation, consideration of infiltration, load concepts of RSHF, GSHF problems, concept of ESHF and ADP temperature. Requirements of human comfort and concept of effective temperature comfortchart, comfort air conditioning, requirements of industrial air conditioning, air conditioning load calculations.

UNIT – VI

AIR CONDITIONING SYSTEM COMPONENTS: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers. heat pump, heat sources, different heat pump circuits.

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TEXT BOOKS:

1. A Course in Refrigeration and Air conditioning, SC Arora & Domkundwar ,Dhanpatrai.
2. Refrigeration and Air Conditioning, CP Arora , TMH.

REFERENCES:

1. Refrigeration and Air Conditioning, Manohar Prasad , New Age.
2. Principles of Refrigeration -Dossat , Pearson Education.
3. Basic Refrigeration and Air-Conditioning – Ananthanarayanan , TMH.

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	3	1	-	40	60	100	3
ELECTIVE-IV CONDITION MONITORING							

COURSE OUTCOMES:

CO1: Explain invaluable insights into the benefits of Condition Monitoring.
CO2: Understanding the reasons for selecting particular maintenance strategies.
CO3: Understanding effective methodologies for implementing Condition Monitoring Techniques.
CO4: Identifying the optimum maintenance strategy for different types of equipment.
CO5: Choose practical approaches to minimise the risk of plant and machinery breakdowns.
CO6: Illustrate International Standards covering asset management.

UNIT – I:

BASICS OF VIBRATION: Basic motion: amplitudes, period, frequency, basic parameters: displacement, velocity, acceleration, units (including Db scales) and conversions, Mass, spring and damper concept, Introduction to SDOF and MDOF systems, Natural frequencies and resonance, Forced response.

UNIT – II:

VIBRATION MEASUREMENTS AND ANALYSIS: Transducers and mounting methods, data acquisition using instrumentation recorders/data loggers, time domain signal analysis, orbit analysis, Filters, Frequency domain analysis (Narrow band FFT analysis), Nyquist criteria, Sampling, aliasing, windowing and averaging.

VIBRATION MEASUREMENT AND ANALYSIS: Use of phase; bode, polar and water fall plots, constant percentage band width analysis (1/3 and1/1 Octave analysis), envelope detection /spike energy analysis, cepstral analysis, advances in analysis (PC based and portable instruments for vibration analysis).

UNIT – III:

Fault Diagnosis, Interpreting vibration measurements for common machine faults, imbalance, misalignment, mechanical looseness, bearing and gearing faults, faults in induction motors, resonances, some case studies, static and Mechanical Engineering dynamic balancing, international standards for vibration condition monitoring.

UNIT – IV:

THERMOGRAPHY: The basics of infrared thermography, differences in equipment and specific wave length limitations, application of it to: electrical inspection, mechanical inspection, energy conservation, how to take good thermal images, hands-on demonstrations focusing on proper camera settings and image interpretation, analysis of thermal images and report generation, study of thermography applications

UNIT – V:

OIL AND WEAR DEBRIS ANALYSIS: Basics of oil analysis, monitoring the condition of oil, lubricant analysis, physio-chemical properties, moisture, tan tbn, wear debris analysis, particle counting, spectroscopy, uses &limitations.

ULTRASONIC MONITORING AND ANALYSIS: Ultrasonic monitoring (leak, crack and thickness) basics of ultrasonic monitoring, ultrasonic theory, test taking philosophy, ultrasonic theory, application of ultrasound to: air leaks, steam trap testing, bearing lubrication, electrical inspection.

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UNIT – VI:

CASE STUDIES: Two stage compressor, cement mill foundation, I.D Fan, Sugar centrifugal, Cooling tower fan, Air separator, Preheater fan.

TEXT BOOKS:

1. The Vibration Analysis Handbook, J I Taylor (1994)
2. Machinery Vibration Condition Monitoring, Lynn, Butterworth (1989)
3. Mechanical Vibration Practice With Basic Theory V.Ramamurti, Narosa publishing house CRC Press.

REFERENCE BOOKS:

1. Machinery Vibration: Measurement and Analysis. Victor Wowk (1991).
2. Mechanical fault diagnosis and condition monitoring, RA Collacott (1977).
3. The Vibration Monitoring Handbook (Coxmoor's Machine & Systems Condition Monitoring) (1998).

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	3	1	-	40	60	100	3
ELECTIVE-IV POWDER METALLURGY							

COURSE OUTCOME:

CO1: Understand the concepts of powder metallurgy and powder production methods.
CO2: Illustrate powder characterization techniques.
CO3: Understand the basic methods of Powder compaction for green compact.
CO4: Explain the powder forming techniques.
CO5: Explain the mechanism of sintering and types sintering for development of mechanical properties.
CO6: Understand causes of defects in Powder metallurgy processed materials and method to minimize defects.

UNIT – I:
INTRODUCTION
Historical and modern developments in powder metallurgy. Advantages, limitations and applications of powder metallurgy. Basic steps for powder metallurgy.
METAL POWDER PRODUCTION METHODS
Atomization, Reduction from oxide, Electrolysis, Crushing, Milling, and Condensation of metal vapour, Hydride and carbonyl processes, Mechanical Alloying, New developments.

UNIT – II:
POWDER CHARACTERIZATION
Powder conditioning, fundamentals of powder compaction, density distribution in green compacts, compressibility, green Strength, pyrophorocity and toxicity, relation between powder production method and powder characteristics.

UNIT – III:
POWDER COMPACTION
Methods Basic aspects, types of compaction presses, compaction tooling and role of lubricants, Single and double die compaction, isostatic pressing, and hot pressing, powder injection moulding.

UNIT – IV:
POWDER FORMING
Powder rolling, powder pressing-hot, uniaxial, isostatic, powder forging, powder extrusion, hydro plastic forming, slip casting, tape casting and explosive forming technique.

UNIT – V:
SINTERING
Basics of sintering, driving forces of sintering, stages of sintering, solid state sintering, liquid phase sintering, pore morphology, sintering mixed powders, sintering techniques, sintering atmosphere, post-sintering operations, issues with nanopowders during compaction and sintering, sintering mechanisms, sintering diagrams.

UNIT – VI:
SINTEREDPRODUCTS
Study of sintered bearings, cutting tools, metallic filters, friction and antifriction parts and electrical contact materials. Defects in Powder metallurgy processed materials and their processing to minimize defects: Friction stir processing etc.

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TEXT BOOKS:

1. Powder Metallurgy Practice and Applications, Sands H.L and Shakespeare C.R.,George Newness Ltd., London, 1996.
2. Powder Metallurgy, Sinha A.K., -Dhanpat Rai, 1982

REFERENCE BOOKS:

1. Principles of Powder Metallugy, Jones W.D., Edward Arnold and Co., 1939.
2. Powder Metallurgy Technology, G.S. Upathaya, Cambridge Inb science Publications, 1997.

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ELECTIVE-IV
QUALITY AND RELIABILITY ENGINEERING
(SQC tables can be used in the examination)

COURSE OUTCOMES:

CO1: Understand quality and reliability concept and acquire fundamental knowledge of statistics and probability.
CO2: Apply control charts to analyze and improve the process quality.
CO3: Develop a simple sampling plan, construct its OC curve and evaluate its effectiveness on a given sampling process.
CO4: Illustrate Quality function deployment.
CO5: Understand the concepts of the reliability and suggests improvements.
CO6: Illustrate complex reliability engineering and replacement techniques.

UNIT – I:

Quality value and engineering, quality systems, quality engineering in product design and production process, system design, parameter design, tolerance design, quality costs, quality improvement.

UNIT – II:

Statistical process control $\bar{X}$, R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index.

UNIT – III:

Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plans.

UNIT – IV:

Loss function, tolerance design-N type, L type, S type, determination of tolerance for these types. Online quality control, variable characteristics, attributes characteristics, parameter design. Quality function deployment, house of quality, QFD matrix, total quality management concepts. Quality information systems, quality circles, introduction to ISO 9000 standards.

UNIT – V:

Reliability, Evaluation of design by tests, Hazard Models, Linear, Raleigh, Weibull. Failure Data Analysis, reliability prediction based on weibull distribution, Reliability improvement in mechanical Engineering.

UNIT – VI:

Complex system, reliability, reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness. Maintainability, availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.

TEXT BOOKS:

1. Reliability Engineering, LS Srinath, Affiliated East West Pvt.Ltd.
2. Statistical quality control - M.S Mahajan by Dhanpat Rai publications.

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REFERENCE BOOKS:

1. Statistical Quality Control: A Modern Introduction "Montgomery, Wiley.
2. Quality Engineering in Production Systems, G Taguchi, McGrawHill. Reliability Engineering, E. Bala Guruswamy, Tata McGraw Hill.

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	4	-	-	40	60	100	3
ELECTIVE-V ALTERNATE SOURCES OF ENERGY							

COURSE OUTCOMES:

CO1: Identity different sources of renewable energy
CO2: Demonstrate different solar collecting/storage devices and its working
CO3: Discuss different wind energy systems and wind data measurements
CO4: Understand the biomass to energy conversion methods
CO5: Discuss the sources of biofuels that can be used in IC engines
CO6: Classify different geothermal energy sources and harvesting of these sources

UNIT – I:

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

UNIT – II:

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT – III:

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications, solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT – IV:

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria, types of winds, wind data measurement.

UNIT – V:

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, biofuels, I.C.Engine operation and economic aspects.

UNIT – VI:

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

TEXT BOOKS:

1. Sukhatme S.P. and J.K.Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2006

REFERENCE BOOKS:

1. Solar Power Engineering, B.S Magal Frank Kreith& J.F Kreith.
2. Principles of Solar Energy, Frank Krieth& John F Kreider.
3. Non-Conventional Energy, Ashok V Desai, Wiley Eastern.
4. Renewable Energy Technologies, Ramesh & Kumar, Narosa Publishers

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	4	-	-	40	60	100	3
ELECTIVE-V EXPERIMENTAL STRESS ANALYSIS							

COURSE OUTCOMES:

CO1: Choose the appropriate method for measuring strain.
CO2: apply optical techniques for measurement of strain & stress.
CO3: Understand the optical photo electric techniques.
CO4: Analyse the results obtained from coating techniques and corroborated with theoretical results.
CO5: Correlate experimental and analytically derived results.
CO6: Understand the different coating techniques.

UNIT – I:

INTRODUCTION: Stress, strain, Plane stress and plane strain conditions, Compatibility conditions. Problems using plane stress and plane strain conditions, stress functions, Mohr's circle for stress strain, Three-dimensional stress strain relations.

UNIT – II:

STRAIN MEASUREMENT AND RECORDINGS: Various types of strain gauges, Electrical Resistance strain gauges, semiconductor strain gauges, strain gauge circuits. Introduction, static recording and data logging, dynamic recording at very low frequencies, dynamic recording at intermediate frequencies, dynamic recording at high frequencies, dynamic recording at very high frequencies, telemetry systems.

UNIT – III:

PHOTO ELASTICITY: Photo elasticity, Polariscope, Plane and circularly polarized light, Bright and dark field setups, Photo elastic materials, isochromatic fringes, Isoclinic.
Three dimensional Photo elasticity: Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear difference method in three dimensions, applications of the Frozen-stress method, the scattered-light method.

UNIT – IV:

BRITTLE COATINGS: Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, and resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

UNIT – V:

MOIRE METHODS: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

UNIT – VI:

BIREFRINGENT COATINGS: Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation methods.

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TEXT BOOKS:

1. Theory of Elasticity, Timoshenke and Goodier Jr., McGraw-Hill
2. Experimental stress analysis, Dally and Riley, McGraw-Hill.

REFERENCES:

1. A treatise on Mathematical theory of Elasticity, LOVE .A.H.
2. Experimental stress analysis, Video course by K.Ramesh / NPTEL.

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	4	-	-	40	60	100	3
ELECTIVE-V GEOMETRICAL MODELING							

COURSE OUTCOMES:

CO1: Select various mathematical equations to represent curves.
CO2: Apply the cubic splines in modelling of a product.
CO3: Build the bezier splines in modelling of a product.
CO4: Develop B-spline cures in modelling a product.
CO5: Select appropriate surfaces in preparing a product
CO6: Select appropriate synthetic curves in modelling process.

UNIT – I:

INTRODUCTION: Definition, explicit and implicit equations, parametric and non-parametric equations-straight line, circle, ellipse, parabola and hyperbola non parametric.

UNIT – II:

CUBIC SPLINES: Algebraic and geometric form of cubic spline, tangent vectors, parametric space of a curve, blending functions, four point form, reparametrization, truncating and subdividing of curves. Graphic construction and interpretation, composite pc curves.

UNIT – III:

BEZIER CURVES: Control polygons and Bernstein basis, equations of Bezier curves, properties, first and second derivatives at the ends, Continuity aspects.

UNIT – IV:

B-SPLINE CURVES: periodic, open and non-uniform knot vectors and corresponding curves, Rational B-splines, NURBS, and Quadratic variety.

UNIT – V:

SURFACES: Bi-cubic surfaces, Coon's surfaces, Bezier surfaces, B-Spline surfaces, surfaces of revolutions, sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussian curvature.

UNIT – VI:

SOLIDS AND SOLID MODELING CONCEPTS: Tricubic solid, Algebraic and geometric form. Wire frames, boundary representation, half space modeling, spatial cell, cell decomposition, classification problem

.

TEXT BOOKS:

1. "CAD/CAM ,Theory and Practice", Ibrahim Zeid, Tata McGraw Hill,2009.
2. "Mathematical Elements for Computer Graphics" ,Roger &Adams, Tata McGrawHill,2nd Edition.

REFERENCES:

1. CAD / CAM / CAE, E.Zimmers & M.Groover, Pearson Education.
2. Geometric Modeling, Michael E. Mortenson, Industrial Press Inc.,U.S.

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	4	-	-	40	60	100	3
ELECTIVE-V OPERATIONS PLANNING AND CONTROL							

COURSE OUTCOMES:

CO1: Illustrate production forecast techniques.
CO2: Choose the best process planning method for identifying better economic order quantity.
CO3: Develop the best production planning method
CO4: Develop the best aggregate planning method
CO5: Explain the materials requirement planning.
CO6: Understand the concepts of production control and line balancing.

UNIT – I:

PRODUCTION FORECASTING: Use of forecast, types of forecasts, statistical forecasting, time series analysis models, effects of trend, seasonal and irregular movements in the model, uncertainty of forecast, monitoring forecast, need for planning and market research.

UNIT – II:

PROCESS PLANNING: Prerequisites of process planning, steps in process planning, break even analysis- analysis- new designs, product mix machine or process selection and make & buy decisions, study of route sheet preparation, economics order quantity of manufacture.

UNIT – III:

PRODUCTION PLANNING: Benefits and basic functions for production planning, project planning various production planning, types of production and their basic characteristics, identification of different production activities, capacity level of each activity, determination of standard hours available, master schedule

UNIT – IV:

AGGREGATE PLANNING: Pure and mixed strategies, Choice of APP, Examples. Master Production Schedule: Concept, Strategies, Chase sales, Lot-for-lot

UNIT – V:

MATERIALS REQUIREMENT PLANNING: Inputs to MRP, Structure of MRP, Examples of MRP routing and scheduling in job, lot and mass production, jobs sequencing and machine loading line of balance technique.

UNIT – VI:

PRODUCTION CONTROL: Functions of production control, effects of production control, dispatching and follow up in job, lot and mass production, evaluating a production control system, designing the production control organization

LINE BALANCING: Operation sequencing and assembly line balancing, minimum number of theoretical workstations, efficiency of assembly line using heuristic approach.

TEXT BOOKS:

1. The fundamentals of production planning and control, Stephen N.Chapmen, Pearson Education.
2. Operations planning and control, James Harnsberger, R.D. Irwin, the University of Wisconsin-Madison.

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I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19MMD1TH01	**COMPUTATIONAL METHODS IN ENGINEERING**						

Course Objectives:

Know how to solve system of equations, ordinary differential equations and partial Differential equations numerically. Understand correlation and regression. Know optimization techniques in solving linear, integer and fractional programming problems.

Learning Outcomes:

Student will be able to

Find the solutions of system of linear and non linear equations.
Solve ordinary and partial differential equations numerically.
Find correlation coefficient and regression.
Optimize linear, integer and fractional programming problems.

UNIT-I

Introduction to numerical methods applied to engineering Problems:

Solving system of linear equations by Gauss Seidel and Relaxation methods. Solving system of non-linear equations by Newton-Raphson method.

UNIT-II

Numerical Solutions of Ordinary Differential Equations:

Boundary Value Problems: Shooting Method–solution through a set of equations - derivative boundary conditions - Rayleigh Ritz Method.

UNIT-III

Numerical Solutions of Partial Differential Equations:

Finite-Difference Approximations to Derivatives, Laplace Equation – Jacobi Method - ADI Method, Parabolic Equation – Crank Nicolsen method.

UNIT-IV

Applied Statistics:

Correlation Analysis - Correlation Coefficient – coefficient of Correlation for grouped bi- variate data – coefficient of determination – Test of significance for correlation coefficient. Regression Analysis - Simple linear regression - Multiple linear regression.

UNIT-V

Optimization Techniques:

Linear Programming Problem – Simplex Method, Artificial variable method –Big-M Method, Integer Programming Problem – Branch and Bound Method, Linear Fractional Programming Problem.

UNIT-VI

Curve fitting and approximation of functions:

Least square approximation fitting of non-linear curves by least squares –computer programs

HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS: Solving wave equation by finite

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differences-stability of numerical method – method of characteristics wave equation in two space dimension-computer programs.

TEXT BOOKS:

1. Steven C.Chapra, Raymond P.Canale "Numerical Methods for Engineers" Tata Mc-Graw Hill
2. Curtis F.Gerald, Partick.O.Wheatly,"Applied numerical analysis", Addison-Wesley,1989.

REFERENCE BOOKS:

1. Douglas J.Faires,RichedBurden"Numerical methods", Brooks/Cole publishing company,1998.Second edition.
2. Ward Cheney and David Kincaid "Numerical mathematics and computing" Brooks/Cole publishing company1999, Fourth edition.
3. Riley K.F,.M.P.Hobson and BenceS.J,"Mathematical methods for physics and engineering", Cambridge University press,1999.
4. S.S.Sastry, Introductory Methods of Numerical Analysis, PHI.
5. Basic Statistics – Agarrval, B.L. Wiley 1991, 2nd edition. Operations Research – S.D. Sarma.

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I M.TECH II SEMESTER (ELECTIVE – III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19MMD2PE31	**ADVANCE OPTIMIZATION TECHNIQUES**						

Course Objectives:

To impart the knowledge of various solution procedures
To introduce different methodologies of designing

Learning Outcomes:

Student will be able to

Classify the optimization problems.
Solve the design issues by using techniques of classical optimization.
Design various mechanical elements.
Apply genetic algorithm for solving the design problems.

UNIT-I :

Introduction: Classification of optimization problems, concepts of design vector, design constraints,design space constraints surface, objective function, surface and multilevel optimization, parametric linear programming.

UNIT-II

Classical Optimization Techniques: Single variable optimization, multilevel Optimization without constraints – multilevel optimization with equality and inequality constraints – Lagrange multipliers methods Kuhn – Tucker conditions.

UNIT-III

Non – Linear Optimization: One–dimensional minimization methods–Fibonacci method, Goldensection method,

Unconstrained Optimization methods: Hooke and jeeves methods, Powell's method,gradient of afunction, Cauchy method, Fletcher – Reeves method, Types of penalty methods for handling constraints.

UNIT-IV

Applications of Optimization in Design and Manufacturing Systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

UNIT-V

Non-Traditional Optimization Techniques: Genetic algorithm (GA) - Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA.

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UNIT-VI

GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP. Concepts of simulated annealing, ANN, optimization of fuzzy systems.

TEXT BOOKS:

1. Kalyanmoy Deb , "Optimization for Engineering Design", PHI Publishers, 2nd Edition
2. S.S.Rao , "Engineering Optimization", New Age Publishers,4th Edition.

REFERENCE BOOKS:

1. D.E. Goldberg, Addison, "Genetic algorithms in Search, Optimization, and Machine learning", Wesley Publishers,2007
2. Kalyanmoy Deb , "Multi objective Genetic algorithms" , PHI Publishers,2nd Edition
3. JasbirArora , "Introduction to Optimum Design", McGraw Hill (international) Publishers,3rd Edition.
4. CE Ebeling ,"An Introductgion to Reliability and Maintainability Engineering" , Waveland Printgers Inc., 2009
5. I Bazovsky , "Reliability Theory and Practice", Dover Publications, 2013.

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I M.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19MTE1TH01	**RESEARCH METHODOLOGY AND IPR**						

Course objectives:

- To know the knowledge of framework of research process and various research designs and techniques.
- To understand the various sources of information for literature review and data collection and ethical dimensions of conducting applied research

Course Outcomes:

Students will be able to:

- Develop understanding of the basic framework of research process.
- Develop an understanding of various research designs and techniques.
- Identify various sources of information for literature review and data collection.
- Understand of the ethical dimensions of conducting applied research.

UNIT-1

Research Problem: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT – II

Measurement and Scaling Concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion, measures of variation, Correlation and Regression.

UNIT– III

Technical Writing & Research Proposal

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT– IV

Intellectual Property Rights A: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. B: International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT– V

Patent Rights: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

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UNIT– VI

Case Studies: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. PrabhuddhaGanguli: 'Intellectual Property Rights" Tata Mc-Graw–Hill, New Delhi
2. M.Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right" Serials Pub.
3. Carlos M.Correa- ''Intellectual property rights , The WTO and Developing countries"-Zed books
4. Law relating to patents, trademarks, copyright designs, Wadehra, B.L. & 2 ed. Universal Law Publishing 2000.
5. C.R.Kothari, "Research Methodology" New Age International Publishers, Fourth edition, 2018
6. Donald Cooper & Pamela Schindler, "Business Research Methods", TMGH, 9th edition.
7. Alan Bryman& Emma Bell, "Business Research Methods", Oxford University Press.

E Resources:

1. https://www.wto.org/english/tratop_e/trips_e/trips_e.htm
2. https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm7_e.htm
3. http://nptel.ac.in/courses/110999906/
4. http://nptel.ac.in/courses/109105112/

REFERENCE BOOKS:

1. Optimization theory & Applications, S.S Rao, New Age International
2. Introductory to operation research, Kasan& Kumar, Springer
3. Optimization Techniques theory and practice, M.C Joshi, K.M &Moudgalya, Narosa Publications.
4. Operation Research, H.A. Taha, Tata McGraw-Hill Publications
5. Optimization in operations research, R.L Rardin, Prentice Hall
6. Optimization Techniques, Benugundu&Chandraputla, Pearson Asi

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3

FLUID MECHANICS

COURSE OUTCOMES:

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

- Properties of the fluid, hydrostatic forces acting on different surfaces and also problem solving techniques
- Basic laws of fluids, flow patterns
- Basic laws of fluid dynamics and its applications
- Dimensionless parameters and scaling laws to predict the prototype behavior
- Different major and minor losses in the pipes
- Boundary layer development on flow over flat plate and to understand the flow over the bodies

UNIT - I:

PROPERTIES OF FLUIDS AND FLUID STATICS: Fluid properties: Mass density, specific weight, specific volume, specific gravity, viscosity, vapor pressure, compressibility, surface tension and capillarity.

Fluid statics: fluid pressure at a point, variation of pressure within a static fluid, hydrostatic law - Pressure head, Pascal's law, Measurement of pressure - Piezometric tube, U-Tube manometer, Differential U-Tube manometer, Inverted U-Tube manometer.

UNIT - II:

FLUID KINEMATICS: Lagrangian and Eulerian description of fluid flow: velocity and acceleration of fluid particles, different types of fluid flow, description of flow pattern: Stream line, streak line, path line. Principle of conservation of mass: Continuity equation, applications of continuity equation.

UNIT – III:

FLUID DYNAMICS: Euler's equation of motion along a stream line - Bernoulli's equation, Practical applications of Bernoulli's equation in flow measurement devices like venturimeter, orifice meter and Pitot tube, Concept of impulse momentum equation & angular momentum principle with applications.

UNIT – IV:

DIMENSIONAL AND MODEL ANALYSIS: Dimensional analysis: dimensions, dimensional homogeneity, methods of dimensional analysis-Buckingham Pi theorem, Raley's method Model analysis - Advantages and applications of model testing. Similitude, derivations of important dimensionless numbers, model laws.

UNIT - V:

FLOW THROUGH PIPES: Laminar and turbulent flow characteristics, laminar flow through circular pipes - Hagen Poiseuille law, major and minor losses in pipes, pipe friction, Darcy-Weisbach equation, parallel, series and branched pipes.

UNIT - VI:

BOUNDARY LAYER THEORY AND FLUID FLOW OVER BODIES: Boundary layer development on a flat plate and its characteristics - Boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Momentum equation for boundary layer by

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Vonkarman, drag on flat plate, boundary layer separation and its control. Aero foil theory, lift and drag coefficients, streamlined and bluff bodies.

TEXT BOOKS:

1. Fluid Mechanics and Hydraulics Machines by R.K.Bansal, Laxmi publications
2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput, S. Chand Publications

REFERENCE BOOKS:

1. Fluid Mechanics by White.F.M, Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
2. Hydraulics and Fluid Mechanics by P.N.Modi and S.M.Sethi, Standard Book House, New Delhi.
3. Fluid Mechanics by Yunus A Cengel and John M. Cimbala, Tata McGraw Hill Edition, New Delhi, 2006.

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	1	-	4	40	60	100	3

MACHINE DRAWING AND CAD LAB

COURSE OUTCOMES:

At the end of the course, students will be able to identify and classify

- The functionalities of various machine elements such as vices, bearings, screw jacks, shafts, fasteners, keys, cotters, pins, etc., and their assemblies.
- The students will be able to draw full and half sectional views of machine parts and their assemblies both manually and by using software packages such as AUTOCAD.

A.MACHINE DRAWING:

1. Introduction: full and half sectional views, limits, fits and tolerances.
2. Screwed fasteners: Screw thread nomenclature - types & classification of screw threads, Square & Hexagonal headed bolted joints.
3. Keys, Cotters and Pin joints: Saddle & Sunk Keys, Cotter Joint with sleeve, Knuckle Joint.
4. Assembly Drawings: Screw Jack, Tail Stock, Eccentric, Pipe vice, Plummer block.

B.C OMPUTER AIDED DRAFTING (CAD): using AUTO CAD

1. Introduction: Basic Drawing, Modify, editing & dimensioning commands, layers, AutoCAD - Screen Menus
2. Sectional views of castings
3. Assembly Drawings : (Any Two)
   a. Pipe vice, b. Tail Stock , c. Swivel Bearing, d. Screw Jack
4. Part Drawings : (Any Two)
   a. Single tool post
   b. Engine Connecting Rod
   c. Plummer block

TEXT BOOKS:

1. Machine Drawing by K.L.Narayana, P.Kannaiah & K.Venkata Reddy, New Age International, and 3rd Edition.
2. AutoCAD-14 for Engineering Drawing Made Easy by P.Nageswara Rao, TMH, 2010.

REFERENCE BOOKS:

1. Machine Drawing by K.R.Gopala Krishnan ,Subhas Publications, 20th Edition, 2007.
2. An Introduction to AutoCAD 2000 by A.Yarwood, Longman Publishers

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	-	-	3	25	50	75	2

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

COURSE OUTCOMES:

Upon completion of this subject student can able to

- Calculate the efficiency of a Machines and Transformers and draw the performance curves of each.
- Draw the no-load curve of a dc generator and calculate critical speed and critical resistance.
- Plot the diode and amplifier characteristics, Rectifier output waveforms.

Any five experiments are to be conducted from each part

SECTION A:

ELECTRICAL ENGINEERING:

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performance characteristics).
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. Shunt Motor.

SECTION B:

ELECTRONICS ENGINEERING:

1. PN junction Diode characteristics
   A. Forward bias B. Reverse bias. (Cut in voltage & Resistance calculations)
2. Transistor CE Characteristics (Input and Output).
3. Full wave Rectifier with and without filters.
4. CE Amplifiers.
5. RC Phase Shift Oscillator.
6. Class A Power Amplifier.

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	-	-	3	25	50	75	2

MECHANICS OF SOLIDS & METALLURGY LAB

COURSE OUTCOMES:

1. Experiment with different materials for the evaluation of material properties through various destructive testing procedures.
2. Examine the microstructures of different materials and also identify the hardness values.

NOTE: Any 6 experiments from each section A and B.

(A) MECHNICS OF SOLIDS LAB:

1. Direct tension test-brittle and ductile materials
2. Fatigue Test
3. 3-point bend test
4. Unsymmetrical bend test
5. Specimen preparation and characterization
6. Torsion test
7. Vickers hardness Test
8. Test on springs
9. Compression test on cube
10. Impact test
11. Punch shear test
12. Brinell's and Rockwell's hardness test
13. Simply Supported beam

(B) METALLURGY LAB:

I. Preparation and study of the Micro Structure of Ferrous materials-

a) Cast Iron

1. Grey cast iron
2. Nodular cast iron
3. White cast iron

b) Steel

4. Mild steel
5. Low carbon steel
6. High carbon Steel

II. Preparation and study of the Micro Structure of Non-Ferrous materials-

7. Brass
8. Aluminium
9. Copper

10. Hardeneability of steels by Jominy End Quench Test.
11. Die penetration Test

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	3	-	-	-	-	-	-

VERBAL ABILITY

COURSE OUTCOMES:

At the end of the course Students will be able to

1. Use appropriate words effectively in their communication
2. Identify and correct Grammar and vocabulary related errors
3. Construct the sentences effectively using appropriate verbal reasoning abilities
4. Demonstrate understanding and comprehensive skills

UNIT - I:

Synonyms1, Synonyms2, Antonyms1, Antonyms2, One-Word Substitution, Phrasal Verbs, Idioms & Phrases, Word Family Operation, Commonly Confused words, Odd man out

UNIT – II:

Tenses, Voice, Parts of speech, Direct & Indirect Speech, Sentence Completion & Correction, Reconstruction of Sentences, Sentence Improvement, Choosing the Incorrect Sentences, Transformation

UNIT - III:

Common Errors1, Common Errors2, Common Errors3, Common Errors4, Common Errors5, Indianisms1, Indianisms2

UNIT - IV:

Direct / simple Analogy, Completing the analogous pair, choosing the Analogous pair, Double Analogy, Choosing a similar word, Detecting Analogies, Multiple-word Analogy

UNIT - V:

Reading Comprehension1, Reading Comprehension2, Reading Comprehension3, Reading Comprehension4, Cloze Passage1, Cloze Passage2, Cloze Passage3, Cloze Passage4

UNIT - VI:

Hidden Assumptions, Fallacies, Induction & Deduction Methods, Arguments, Truth, Validity, Soundness

TEXT BOOKS:

1. 30 Days to a More Powerful Vocabulary by Funk.
2. Practical English Usage by Michael Swan
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman
4. Kaplan MCAT Verbal Reasoning and Writing Review
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon
6. Understanding and Using English Grammar by Betty SchrampferAzar

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REFERENCES:

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

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	3	1	-	40	60	100	3

THEORY OF MACHINES

COURSE OUTCOMES:

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

- Know the purpose of kinematics, kinematic joint & mechanism.
- Learn the velocity and acceleration diagrams and the theories involved in cams and their working principles.
- Understand the cams and followers.
- Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.
- Understand governors and their working principles
- Understand balancing of reciprocating and rotary masses.

UNIT – I:

MECHANISMS: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Gubralrs criteria, Grashoff's law, Degrees of freedom, Kutzbach criterian for planar mechanisms, Mechanism and machines –Classification of machines – kinematic chain – inversion of mechanism –inversion of mechanism – inversions of quadric cycle, chain – single anddouble slider crank chains.

UNIT – II:

KINEMATICS: Velocity and acceleration – Motion of a link in machine –Determination of Velocity and acceleration diagrams – Graphical method –Application of relative velocity method four bar chain. Velocity and acceleration analysis of a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration. Plane motion of body: Instantaneous center of rotation, centroids and axodes– relative motion between two bodies – Three centres in line theorem –Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – III:

CAMS: Definitions of cam and followers – their uses – Types of followers and cams– Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases. Analysis of motion of followers: Roller follower – circular cam with straight.

UNIT – IV:

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships, static and dynamic force analysis of planar mechanisms.

UNIT - V:

GOVERNERS AND FLY WHEELS: Watt, porter and proell governors, spring loaded governors– Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms andhunting. Turning moment diagram , fly wheels and their design.

UNIT – VI:

GEAR: Higher pairs, friction wheels and toothed gears–types – law ofgearing, condition for

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constant velocity ratio for transmission of motion,velocity of sliding –phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact.

GEAR TRAINS: Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio –Epicyclic gear trains.

TEXT BOOKS:

1. Theory of Machines by S.S.Ratan, Mc. Graw Hill Publ.
2. Theory of machines by Khurmi ,S.Chand publications

REFERENCES:

1. Theory of Machines by Sadhu Singh Pearsons Education
2. Theory of Machines by Thomas Bevan/ CBS
3. Mechanism and machine theory by Ashok G. Ambedkar, PHI Publications.

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	3	1	-	40	60	100	3

APPLIED THERMODYNAMICS

COURSE OUTCOMES:

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

- To make the student learn and understand the reasons and affects of various losses that occurs in the actual engine operation.
- To familiarize the student with the various engine systems along with their function and necessity.
- To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.
- To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.
- To make students learn about different types of compressors and to calculate power and efficiency of reciprocating compressors and rotary compressors.

UNIT - I:

ACTUAL CYCLES AND THEIR ANALYSIS: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT - II:

WORKING OF I.C ENGINES: Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems -Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of Wankle engine, principles of supercharging and turbocharging

UNIT - III:

COMBUSTION IN S.I. ENGINES: Normal Combustion and abnormal combustion - Importance of flame speed and effect of engine variables - Type of Abnormal combustion, pre-ignition and knocking - Fuel requirements and fuel rating, anti knock additives -combustion chamber- requirements, types.

COMBUSTION IN C.I. ENGINES: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT - IV:

MEASUREMENT, TESTING AND PERFORMANCE: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power - Performance test – Heat balance Sheet

UNIT - V:

COMPRESSORS: Classification - positive displacement and roto dynamic machinery - power producing and power absorbing machines, fan, blower and compressor-positive displacement and dynamic types-reciprocating and rotary types.

Rotary (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor - mechanical details and principle of working - efficiency considerations.

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UNIT-VI:

ROTARY COMPRESSORS: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation –velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency-pressure rise calculations – Polytrophic efficiency.

TEXT BOOKS:

1. Internal Combustion Engines by V.Ganesan, Tata McGraw Hills Publications
2. A treatise on heat power engineering by Vasandani & D.S.Kumar, Metropolitan Book Co. Ltd.

REFERENCES:

1. Internal Combustion Engine by M.L.Mathur and R.P.Sharma, DhanpatRai Publications
2. Thermal Engineering by R.S.Khurmi and J.K.Guptha, S.Chand Publicationss

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	3	1	-	40	60	100	3

HYDRAULIC MACHINERY AND PNEUMATIC SYSTEMS

COURSE OUTCOMES:

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

- Understand about the force required to move the vane using by Jet
- Know the turbines and its functions
- Operating conditions of Centrifugal and Reciprocating pumps
- Understand about the Hydraulic Valves and Hydraulic System Accessories
- Know the Pneumatic systems and control valves
- Understand about the Pneumatic circuits

UNIT - I:
BASICS OF TURBO MACHINERY: Hydrodynamic force or jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes

UNIT - II:
HYDRAULIC TURBINES: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine – working proportions, work done, efficiencies, hydraulic design-draft tube-theory-functions and efficiency.

UNIT - III:
CENTRIFUGAL PUMPS: Classification, working, work done - manometric head losses and efficiencies, specific speed- pumps in series and parallel-performance characteristic curves, NSPH; Reciprocating pumps: Working, Discharge, Slip, Indicator diagrams

UNIT - IV:
HYDRAULIC VALVES AND HYDRAULIC SYSTEM ACCESSORIES: Basic principles of hydraulics, Direction control valves, Pressure control valves, Flow control valves, Non-return valves, Reservoirs, Accumulators, Heating & cooling devices, Hoses. Selection of valves for circuits.

UNIT - V:
INTRODUCTION TO PNEUMATIC SYSTEMS: Basic requirements for pneumatics systems, Applications, Pneumatic fundamentals, Construction, Working principle and operation of pneumatic power transmission system components, FRL unit, Actuators and control valves - DCV, FCV, PCV, time delay, quick exhaust, twin pressure, shuttle

UNIT - VI:
PNEUMATIC CIRCUITS: Basic pneumatic circuits, Development of single Actuator Circuits, Development of multiple Actuator Circuits, Cascade method for sequencing, introduction to piping and its software's.

TEXTBOOKS:

1. Hydraulics, Fluid Mechanics and Hydraulic Machinery by P.N. Modi, S.M. Seth, Standard Book House.

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2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput, S. Chand *Publishing*
3. Industrial Hydraulics by John Pippenger and Tyler Hicks, McGraw Hill.
4. Basic Pneumatic Systems, Principle and Maintenance by S R Majumdar, McGraw Hill.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S.Kumar, SK Kataria and Sons.
2. Fluid Power with Applications by Anthony Esposito, Pearson.
3. Hydraulic and Pneumatic Controls: Understanding made Easy by K.Shanmuga Sundaram, S.Chand, New Delhi, 2006.

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II B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3

MANUFACTURING TECHNOLOGY

COURSE OUTCOMES:

At the end of this course student will acquire ability to

- Understand different manufacturing processes and fundamentals of casting.
- Distinguish different types of furnaces and design gating system for preparation of a casting.
- Identify and Recommend appropriate type of welding process for fabrication of metals.
- Distinguish process details of advanced welding processes.
- Demonstrate the characteristics of cold and hot working processes.
- Explain principles of sheet metal working, plastic injection and blow moulding processes.

UNIT - I:
Introduction to Manufacturing Processes, Difference between Production and Manufacturing.
FOUNDRY: Introduction to casting process, steps involved in making a casting, Advantages of casting and its applications, Types of patterns, Materials used for patterns, Pattern allowances, sand moulding procedure, Moulding materials, Importance of constituents, Cores, Types of Sand moulding-CO_2 Moulding and Shell Moulding.

UNIT - II:
GATING SYSTEM: Elements of gating system, Gating system design, Calculation of gating system dimensions for simple objects, riser design and its function, Solidification of casting.
SPECIAL CASTING METHODS: Permanent Mould Casting, Die Casting, Centrifugal Casting, Investment Casting, Continuous Casting, Fettling of Castings, Casting Defects: causes and remedies.

UNIT - III:
WELDING: Classification of welding processes, Types of welds and types of joints.
GAS WELDING: Equipment, Oxy-Acetylene flame, types, Gas welding procedure, Gas cutting.
ARC WELDING: Principle of Arc welding, Equipment, Electrodes, Electrode coatings, AC and DC Welding, Arc Blow, Arc Length Characteristics, Related Simple Problems. Welding defects-Causes and Remedies.

UNIT - IV:
RESISTANCE WELDING: Principle, Butt welding, spot welding and seam welding. Simple problems on resistance welding.
OTHER WELDING PROCESSES: Thermit welding, Inert gas welding - TIG and MIG welding, submerged arc welding, plasma arc welding, soldering and brazing.

UNIT - V:
FORMING AND FORGING: Fundamentals, Introduction to metal working process, Hot working, Cold working.
ROLLING: Rolling fundamentals, Analysis of rolling process- Derivation of Length of deformation zone, Angle of bite, Maximum reduction possible for one pass, Rolling stand arrangements.

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UNIT - VI:

EXTRUSION & DRAWING: Extrusion fundamentals, Classification of Extrusion- Forward Extrusion, Backward Extrusion, Impact extrusion, Hydrostatic extrusion. Types of drawing: Wire drawing, Tube drawing.

TEXT BOOKS:

1. Manufacturing Technology Vol-I by P.N. Rao, Tata McGraw Hill Publications.
2. Production Technology by P. C. Sharma, S. Chand Publications.

REFERENCES:

1. Welding Technology by Little by Tata McGraw Hill Publications.
2. Manufacturing Engineering and Technology by Kalpak Jain, Pearson Education/PHI.

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	-	-	3	25	50	75	2

APPLIED THERMODYNAMICS LAB

COURSE OUT COMES:

- The student will be able to estimate the performance and efficiency of IC engines at various horse powers and also for compressors.

LIST OF EXPERIMENTS:

1. Determination of flash point, fire point.
2. Determination of calorific value of fuel using Bomb Calorimeter.
3. Determination of viscosity of fluid.
4. I.C. Engine Valve Timing Diagram
5. I.C. Engine Port Timing Diagram
6. I.C. Engine Performance Test on Single Cylinder 4 Stroke Diesel Engine
7. Evaluation of Engine Friction by Conducting Morse Test on 4 - Stroke Petrol Engine.
8. Evaluation of Engine Friction by Conducting Motoring/Retardation Test on Single Cylinder 4 Stroke Diesel Engine
9. Heat Balance Test on Single Cylinder 4 Stroke Diesel Engine
10. Performance Test on Variable Compression Ratio
11. Volumetric Efficiency of a Reciprocating Air Compressor
12. Disassembly/Assembly of I.C. Engine

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	-	-	3	25	50	75	2

MANUFACTURING TECHNOLOGY LAB

COURSE OUTCOMES:

- Prepare green sand mold for single-piece and multi-piece patterns.
- Create joints using electric arc, spot, and gas welding techniques.
- Form plastic parts using injection and blow molding.
- Fabricate a pipe bend and a washer using hydraulic press.
- Fabricate alloy or composite using Stir Casting Machine

LIST OF EXPERIMENTS:

I. MOLDING PRACTICE:

1. Preparation of a green sand mould using single piece pattern.
2. Preparation of a green sand mould using multi piece pattern.
3. Sand testing: green strength, dry strength, grain fineness number, permeability etc.

II. WELDING PRACTICE:

1. Preparation of a T joint using electric arc welding.
2. Preparation of a Butt Joint using gas welding.
3. Preparation of a lap joint using spot welding.

III. PLASTIC MOLDING:

INJECTION MOLDING:

4. Preparation of a key chain by using two plate mold.

BLOW MOLDING:

5. Preparation of a bottle by using blow molding technique.

IV. MECHANICAL PRESSES:

6. Preparation of a rod bends using hydraulic press.
7. Preparation of a washer using hydraulic press.

V. DEMONSTRATION OF STIR CASTING MACHINE:

8. Preparation of Aluminum casting with stir casting machine

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	-	-	3	25	50	75	2

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

COURSE OUTCOME:

1. Experiment with different turbines & pumps to determine the efficiency
2. Determine the pipe losses.

LIST OF EXPERIMENTS:

1. Impact of jet on Vane.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head in a pipe flow
12. Pneumatic trainer.

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	-	-	-	25	50	75	1

MINI PROJECT - 1

The main intention of Mini Project is to make student enable to apply the knowledge and skills learned out of courses studied to Solve/implement predefined practical problem. The students undergo various laboratory/tutorial/simulation laboratory/work shop courses in which they do experimentation based on the curriculum requirement. The Mini Project may be beyond the scope of curriculum of courses taken or may be based on the courses but thrust should be on

- ¬ Learning additional skills
- ¬ Development of ability to define and design the problem and lead to its accomplishment with proper planning
- ¬ Learn the behavioral science by working in a group

(The group may have maximum four (04) students. Each group will be assigned one faculty as a supervisor. The college should keep proper assessment record of progress of the project and at the end of the semester it should be assessed for awarding the marks. The progress of the work may be examined by approved internal faculty appointed by the head of the institute. The final examination will be based on demonstration in front of internal and external examiner. In the examination each individual student should be assessed for his/her contribution, understanding and knowledge gained about the task completed)
The students may use this opportunity to learn different computational techniques as well as some model development. This they can achieve by making proper selection of Mini Projects.

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III Year – I SEMESTER

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METAL CUTTING & MACHINE TOOLS

Course objectives:

1. The course provides students with fundamental knowledge and principles in material removal processes.
2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
3. To demonstrate the fundamentals of machining processes and machine tools.
4. To develop knowledge and importance of metal cutting parameters.
5. To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

UNIT – I

FUNDAMENTALS OF MACHINING:

Elementary treatment of metal cutting theory – element of cutting process – geometry of single point tool angles, chip formation and types of chips – built up edge and its effects chip breakers, mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials.

UNIT – II

LATHE MACHINES:

Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes – tool layout and cam design for automats.

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UNIT - III

SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working – principal parts – specifications, operations performed, machining time calculations.

DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

UNIT - IV

MILLING MACHINES: Principles of working – specifications – classification of Milling Machines – Principle features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, geometry of milling cutters – methods of indexing, accessories to milling machines.

UNIT –V

FINISHING PROCESSES: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

UNIT - VI

JIGS & FIXTURES: Principles of design of jigs and fixtures and uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, typical examples of jigs and fixtures.

CNC MACHINE TOOLS: CNC Machines, working principle, classification, constructional features of CNC machines, CNC controller, types of motion controls in CNC machines, applications of CNC machines.

TEXT BOOKS:

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Workshop Technology – B.S.Raghu Vamshi – Vol II

REFERENCES:

1. Metal cutting Principles by M.C. Shaw
2. Metal cutting and machine tools by Boothroyd
3. Production Technology by H.M.T. (Hindustan Machine Tools).
4. Production Engineering, K.C Jain & A.K Chitaley, PHI Publishers

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5. Manufacturing technology II, P.N Rao
6. Technology of machine tools, S.F.Krar, A.R. Gill, Peter SMID, TMH (I)

Course Outcomes :

Upon successful completion of this course, the students will be able to:

1) Apply cutting mechanics to metal machining based on cutting force and power consumption.
2) Operate lathe, milling machines, drill press, grinding machines, etc.
3) Select cutting tool materials and tool geometries for different metals.
4) Select appropriate machining processes and conditions for different metals.
5) Learn machine tool structures and machining economics.
6) Write simple CNC programs and conduct CNC machining.

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III Year – I SEMESTER

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DESIGN OF MACHINE MEMBERS – I

Course Objectives:

1. The student shall gain appreciation and understanding of the design function in mechanical engineering, the steps involved in designing and the relation of design activity with manufacturing activity
2. Selection of proper materials to different machine elements based on their physical and mechanical properties.
3. Learn and understanding of the different types of failure modes and criteria.
4. Procedure for the different machine elements such as fasteners, shafts, couplings, keys, axially loaded joints etc.

UNIT – I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design, tolerances and fits –BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses – combined stresses – torsional and bending stresses – impact stresses – stress strain relation – various theories of failure – factor of safety – design for strength and rigidity – preferred numbers. the concept of stiffness in tension, bending, torsion and combined situations – static strength design based on fracture toughness.

UNIT – II

STRENGTH OF MACHINE ELEMENTS: Stress concentration – theoretical stress concentration factor – fatigue stress concentration factor notch sensitivity – design for fluctuating stresses – endurance limit – estimation of endurance strength – goodman's line – soderberg's line – modified goodman's line.

UNIT – III

Riveted and welded joints – design of joints with initial stresses – eccentric loading.

Bolted joints – design of bolts with pre-stresses – design of joints under eccentric loading – locking devices – both of uniform strength, different seals.

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UNIT – IV

KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints-knuckle joints.

SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code. Use of internal and external circlips, gaskets and seals (stationary & rotary).

UNIT – V

SHAFT COUPLING: Rigid couplings – muff, split muff and flange couplings, flexible couplings – flange coupling (modified).

UNIT – VI

MECHANICAL SPRINGS:

Stresses and deflections of helical springs – extension -compression springs – springs for fatigue loading, energy storage capacity – helical torsion springs – co-axial springs, leaf springs.

TEXT BOOKS:

1. Machine Design, V.Bandari, TMH Publishers
2. Machine design – Pandya & Shah
3. Machine Design PSG Data hand book

REFERENCES:

1. Design of Machine Elements / V.M. Faires
2. Machine design / Schaum Series.
3. Data books (1) PSG College of technology (2) Mahadevan

Course outcomes:

Upon successful completion of this course student should be able to:

1. Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constraints.
2. Select suitable materials and significance of tolerances and fits in critical design applications.
3. Utilize design data hand book and design the elements for strength, stiffness and fatigue.
4. Identify the loads, the machine members subjected and calculate static and dynamic stresses to ensure safe design.

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III Year – I SEMESTER

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INSTRUMENTATION & CONTROL SYSTEMS

Course Objectives:

The course focuses on imparting the principles of measurement which includes the working mechanism of various sensors and devices, that are in use to measure the important physical variables of various mechatronic systems.

UNIT – I

Definition – Basic principles of measurement – measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. dynamic performance characteristics – sources of error, classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – piezo electric, inductive, capacitance, resistance, ionization and photo electric transducers, calibration procedures.

UNIT – II

MEASUREMENT OF TEMPERATURE: Classification – ranges – various principles of measurement – expansion, electrical resistance – thermistor – thermocouple – pyrometers – temperature indicators.

MEASUREMENT OF PRESSURE: Units – classification – different principles used. manometers, piston, bourdon pressure gauges, bellows – diaphragm gauges. low pressure measurement – thermal conductivity gauges – ionization pressure gauges, mcleod pressure gauge.

UNIT – III

MEASUREMENT OF LEVEL : Direct method – indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – bubler level indicators.

FLOW MEASUREMENT: Rotameter, magnetic, ultrasonic, turbine flow meter, hot – wire anemometer, laser doppler anemometer (LDA).

MEASUREMENT OF SPEED : Mechanical tachometers – electrical tachometers – stroboscope, noncontact type of tachometer

Measurement of Acceleration and Vibration: Different simple instruments – principles of seismic instruments – vibrometer and accelerometer using this principle.

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UNIT – IV

STRESS STRAIN MEASUREMENTS : Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strain gauge rosettes.

UNIT – V

MEASUREMENT OF HUMIDITY – Moisture content of gases, sling psychrometer, absorption psychrometer, dew point meter.

MEASUREMENT OF FORCE, TORQUE AND POWER- Elastic force meters, load cells, torsion meters, dynamometers.

UNIT – VI

ELEMENTS OF CONTROL SYSTEMS : Introduction, importance – classification – open and closed systems, servomechanisms–examples with block diagrams–temperature, speed & position control systems.

TEXT BOOKS:

1. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI / PE.

REFERENCES:

1. Measurement systems: Application and design, Doeblin Earnest. O. Adaptation by Manik and Dhanesh/ TMH.
2. Experimental Methods for Engineers / Holman.
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH.

Course outcomes:

After undergoing the course the student can select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.

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III Year – I SEMESTER

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THERMAL ENGINEERING – II

(Use of steam tables and Mollier chart is allowed)

Course objectives:

This course is intended to provide basic knowledge of components being used in steam and gas power plant cycles and to analyse the energy transfers and transformations in these components including individual performance evaluation.

UNIT – I

BASIC CONCEPTS: Rankine cycle - schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance – regeneration & reheating. combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, stoichiometry, flue gas analysis.

UNIT II

BOILERS : Classification – working principles of L.P & H.P boilers with sketches – mountings and accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

UNIT – III

STEAM NOZZLES: Function of a nozzle – applications - types, flow through nozzles, thermodynamic analysis – assumptions -velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

STEAM TURBINES: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity & pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency.

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UNIT IV

REACTION TURBINE: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency – calculation of blade height.

STEAM CONDENSERS: Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump- cooling water requirement.

UNIT – V

GAS TURBINES: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed and semi-closed cycles – merits and demerits, types of combustion chambers.

UNIT – VI

JET PROPULSION : Principle of operation –classification of jet propulsive engines – working principles with schematic diagrams and representation on t-s diagram - thrust, thrust power and propulsion efficiency – turbo jet engines – needs and demands met by turbo jet – schematic diagram, thermodynamic cycle, performance evaluation, thrust augmentation – methods.

Rockets : Application – working principle – classification – propellant type – thrust, propulsive efficiency – specific impulse – solid and liquid propellant rocket engines.

TEXT BOOKS:

1. Thermodynamics and Heat Engines, Volume 2 - R.Yadav- Central book depot.
2. Gas Turbines – V.Ganesan /TMH
3. Heat Engineering – V.P Vasandani and D.S Kumar- Metropolitan Book Company, New Delhi

REFERENCES:

1. Gas Turbines and Propulsive Systems – P.Khajuria & S.P.Dubey - /Dhanpatrai
2. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
3. Thermal Engineering-R.S Khurmi/JS Gupta/S.Chand.

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4. Thermal Engineering-P.L.Bellaney/ Khanna publishers.
5. Thermal Engineering-M.L.Marthur & Mehta/Jain bros

Course outcomes:

After undergoing this course the student is expected to understand the working of steam and gas power plant cycles and also should be able to analyze and evaluate the performance of individual components. The student also should be in a position to understand basic principles of Jet propulsion and rocket engineering.

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III Year – I SEMESTER

T	P	C
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METROLOGY

Course objectives:

The students will learn

1. Inspection of engineering parts with various precision instruments.
2. Design of part, tolerances and fits.
3. Principles of measuring instruments and gauges and their uses.
4. Evaluation and inspection of surface roughness.
5. Inspection of spur gear and thread elements.
6. Machine tool testing to evaluate machine tool quality.

UNIT-I

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, tolerance, limits, deviations, fits -Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, determistic & statistical tolerancing, selective assembly. International standard system of tolerances, selection of limits and tolerances for correct functioning.

UNIT-II

LINEAR MEASUREMENT: Length standards, end standards, slip gauges- calibration of the slip gauges, dial indicators, micrometers.

MEASUREMENT OF ANGLES AND TAPERS:

Different methods – bevel protractor, angle slip gauges- angle dekkor- spirit levels- sine bar- sine table, rollers and spheres used to measure angles and tapers.

LIMIT GAUGES:

Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges.

UNIT-III

OPTICAL MEASURING INSTRUMENTS: Tools maker's microscope and uses - autocollimators, optical projector, optical flats and their uses.

INTERFEROMETRY:

Interference of light, Michaleson's interferometer, NPL flatness interferometer, and NPL gauge interferometer.

UNIT-IV

SURFACE ROUGHNESS MEASUREMENT: Differences between

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surface roughness and surface waviness –Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, Method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

COMPARATORS: Types - mechanical, optical , electrical and electronic, pneumatic comparators and their uses.

UNIT – V

GEAR MEASUREMENT: Nomenclature of gear tooth, tooth thickness measurement with gear tooth vernier & flange micro meter, pitch measurement, total composite error and tooth to tooth composite errors, rolling gear tester, involute profile checking.

SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads- concept of virtual effective diameter, measurement of effective diameter, angle of thread and thread pitch, and profile thread gauges.

UNIT – VI

FLATNESS MEASUREMENT:

Measurement of flatness of surfaces- instruments used- straight edges-surface plates – auto collimator.

MACHINE TOOL ALIGNMENT TESTS: Principles of machine tool alignment testing on lathe, drilling and milling machines.

TEXT BOOKS:

1. Engineering Metrology by R.K.Jain / Khanna Publishers
2. Engineering Metrology by Mahajan / Dhanpat Rai Publishers

REFERENCE BOOKS:

1. Dimensional Metrology, Connie Dotson, Cengage Learning.
2. Engineering Metrology by I.C.Gupta / Dhanpat Rai Publishers.
3. Precision Engineering in Manufacturing by R.L.Murthy / New Age.
4. Engineering Metrology and Measurements by NV Raghavendra, L Krishna murthy, Oxford publishers.
5. Engineering Metrology by KL Narayana, Scitech publishers.

Course outcomes:

Students will be able to design tolerances and fits for selected product quality. They can choose appropriate method and instruments for inspection of various gear elements and thread elements. They can understand the standards of length, angles, they can understand the evaluation of surface finish and measure the parts with various comparators. The quality of the machine tool with alignment test can also be evaluated by them.

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III Year – I SEMESTER

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METROLOGY & INSTRUMENTATION LAB

Course Objectives:

The Metrology and instrumentation Laboratory course is designed for measuring and gauging instruments for inspection of precision linear, geometric forms, angular and surface finish measurements. The student can learn the measurements with and calibration of instruments. They also understand the machine tool alignment test. Instrumentation lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments for measuring pressure, temperature, displacement, speed, vibration etc.

Note: The students have to conduct at least 8 experiments from each lab.

METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier caliper for tooth thickness inspection and flange micro meter for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on drilling machine.
6. Machine tool alignment test on milling machine.
7. Angle and taper measurements with bevel protractor, Sine bars, rollers and balls.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Thread inspection with two wire/ three wire method & tool makers microscope.
10. Surface roughness measurement with roughness measuring instrument.

INSTRUMENTATION LAB

1. Calibration of pressure gauge.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.

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4. Calibration of strain gauge.
5. Calibration of thermocouple.
6. Calibration of capacitive transducer.
7. Study and calibration of photo and magnetic speed pickups.
8. Calibration of resistance temperature detector.
9. Study and calibration of a rotameter.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

Course outcomes:

Metrology Lab

Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc).

Instrumentation Lab:

Students will be able to select proper measuring instrument and know requirement of calibration, errors in measurement etc. They can perform accurate measurements.

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III Year – I SEMESTER

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MACHINE TOOLS LAB

Course objectives:

The students are required to understand the parts of various machine tools and operate them. They are required to understand the different shapes of products that can be produced on these machine tools.

1. Introduction of general purpose machines -lathe, drilling machine, milling machine, shaper, planing machine, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. Drilling and tapping
5. Shaping and planning
6. Slotting
7. Milling
8. Cylindrical surface grinding
9. Grinding of tool angles.

Course outcomes:

The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality.

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III Year – I SEMESTER

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INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Unit I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

Unit II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

Unit III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Unit IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

Unit V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

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Unit VI

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime.

REFERENCE BOOKS:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi.
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press).
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections.
4. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi.
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
7. M.Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right" Serials Pub.

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III Year – II SEMESTER

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OPERATIONS RESEARCH

Course Objectives:

To learn the importance of Operations Research in the design, planning, scheduling, manufacturing and business applications and to use the various techniques of Operations Research in solving such problems.

UNIT – I

Development – definition– characteristics and phases – types of operation research models – applications.

ALLOCATION: Linear programming problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – degeneracy, assignment problem – formulation – optimal solution - variants of assignment problem- traveling salesman problem.

SEQUENCING – Introduction – flow –shop sequencing – *n* jobs through two machines – *n* jobs through three machines – job shop sequencing – two jobs through 'm' machines.

UNIT – III

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT – IV

THEORY OF GAMES: Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

WAITING LINES: Introduction – single channel – poison arrivals – exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

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UNIT – V

INVENTORY : Introduction – single item – deterministic models – purchase inventory models with one price break and multiple price breaks – shortages are not allowed – stochastic models – demand may be discrete variable or continuous variable – instantaneous production. Instantaneous demand and continuous demand and no set up cost. ABC & VED Analysis.

UNIT – VI

DYNAMIC PROGRAMMING: Introduction – Bellman's principle of optimality – applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

SIMULATION: Definition – types of simulation models – phases of simulation– applications of simulation – inventory and queuing problems – advantages and disadvantages – simulation languages.

TEXT BOOKS:

1. Operations Research / S.D.Sharma-Kedarnath

REFERENCES:

1. Introduction to O.R/Hiller & Libermann (TMH).
2. Operations Research / A.M.Natarajan, P. Balasubramani, A. Tamilarasi / Pearson Education.
3. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman.
4. Operations Research / R.Pannerselvam,PHI Publications.
5. Operations Research / Wagner/ PHI Publications.
6. Operation Research /J.K.Sharma/MacMilan.
7. Operations Research/ Pai/ Oxford Publications
8. Operations Research/S Kalavathy / Vikas Publishers
9. Operations Research / DS Cheema/University Science Press
10. Operations Research / Ravindran, Philips, Solberg / Wiley publishers.

Course Outcomes:

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

To solve the LP and DP problems.

To solve the Transportation, assignment, game, inventory, replacement, sequencing, queuing problems.

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INTERACTIVE COMPUTER GRAPHICS

Course objectives:

This course allows the students to:

1. Understand the fundamental concepts and theory of computer graphics.
2. Understand modeling, and interactive control of 3D computer graphics applications.
3. The underlying parametric surface concepts be understood.
4. Learn multimedia authoring tools.

UNIT-I

INTRODUCTION: Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

UNIT-II

OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, mid-point circle algorithm,

Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

2-D GEOMETRICAL TRANSFORMATIONS: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.

UNIT -III

2-D VIEWING : The viewing pipe-line, viewing coordinat4 reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm.

UNIT -IV

3-D OBJECT REPRESENTATION: spline representation, Hermite curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, , Solid modeling Schalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces, Basic illumination models, shading algorithms.

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UNIT -V

3-D GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformation and composite transformations. Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting.

UNIT-VI

COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification.

TEXT BOOKS:

1. " Computer Graphics C version" Donald Hearn and M. Pauline Baker, Pearson/PHI
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

REFERENCES:

1. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
4. Computer Graphics, Steven Harrington, TMH.

Course outcomes:

Upon successful completion of the course, students will be able to:

1. Use the principles and commonly used paradigms and techniques of computer graphics.
2. Write basic graphics application programs including animation.
3. Design programs to display graphic images to given specifications.
4. Possess in-depth knowledge of display systems, image synthesis, shape modeling, and interactive control of 3D computer graphics applications.

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DESIGN OF MACHINE MEMBERS– II

Course Objectives:

- This course gives the insight of slider and roller bearings and the life prediction.
- Learn to design I.C engine parts.
- Design the mechanical systems for power transmission elements such as gears,belts,ropes,chains, keys and levers.

UNIT – I

BEARINGS: Classification of bearings- applications, types of journal bearings – lubrication – bearing modulus – full and partial bearings – clearance ratio – heat dissipation of bearings, bearing materials – journal bearing design – ball and roller bearings – static loading of ball & roller bearings, bearing life.

UNIT – II

ENGINE PARTS: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – cranks and crank shafts, strength and proportions of over hung and center cranks – crank pins, crank shafts.

UNIT –III

Pistons, forces acting on piston – construction design and proportions of piston, cylinder, cylinder liners.

UNIT – IV

Design of curved beams: introduction, stresses in curved beams, expression for radius of neutral axis for rectangular, circular, trapezoidal and t-section, design of crane hooks, c –clamps.

UNIT – V

POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by belt and rope drives , transmission efficiencies, belts – flat and v types – ropes - pulleys for belt and rope drives, materials, chain drives

DESIGN OF POWER SCREWS: Design of screw, square ACME, buttress screws, design of nut, compound screw, differential screw, ball screw-possible failures.

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UNIT – VI

SPUR & HELICAL GEAR DRIVES: Spur gears- helical gears – load concentration factor – dynamic load factor, surface compressive strength – bending strength – design analysis of spur gears – estimation of centre distance, module and face width, check for plastic deformation, check for dynamic and wear considerations.

MACHINE TOOL ELEMENTS: Levers and brackets: design of levers – hand levers-foot lever – cranked lever – lever of a lever loaded safety valve-rocker arm straight – angular- design of a crank pin – brackets- hangers- wall boxes.

TEXT BOOKS:

1. Machine Design, V.Bandari, TMH Publishers
2. Machine Design PSG Data hand book
3. Machine Design, Pandya & Shaw, Charotar publishers

REFERENCES:

1. Machine Design / R.N. Norton
2. Data Books : (I) P.S.G. College of Technology (ii) Mahadevan
3. Mech. Engg. Design / JE Shigley

Course outcomes:

At the end of the course

1. The student will able to select the suitable bearing based on the application of the loads and predict the life of the bearing.
2. Design power transmission elements such as gears, belts, chains, pulleys, ropes, levers and power screws.
3. Design of IC Engines parts.

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ROBOTICS

Course Objectives:

1. To give students practice in applying their knowledge of mathematics, science, and Engineering and to expand this knowledge into the vast area of robotics.
2. The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning.
3. Mathematical approach to explain how the robotic arm motion can be described.
4. The students will understand the functioning of sensors and actuators.

UNIT-I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

UNIT – II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT – IV

Differential transformation and manipulators, Jacobians – problems

Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT V

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint

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integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language..

UNIT VI

ROBOT ACTUATORS AND FEED BACK COMPONENTS:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

ROBOT APPLICATIONS IN MANUFACTURING: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

REFERENCES:

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall.
3. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
4. Introduction to Robotics / John J Craig / Pearson Edu.

Course outcomes:

Upon successful completion of this course you should be able to:

1. Identify various robot configuration and components.
2. Select appropriate actuators and sensors for a robot based on specific application.
3. Carry out kinematic and dynamic analysis for simple serial kinematic chains.
4. Perform trajectory planning for a manipulator by avoiding obstacles.

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HEAT TRANSFER

(Heat transfer data book allowed)

Course Objectives:

This course is intended to impart knowledge of principles of heat transfer and analyze the heat exchange process in various modes for the evaluation of rate of heat transfer and the temperature distribution in different configurations.

UNIT – I

INTRODUCTION: Modes and mechanisms of heat transfer – basic laws of heat transfer –General discussion about applications of heat transfer.

CONDUCTION HEAT TRANSFER: Fourier rate equation – general heat conduction equation in cartesian, cylindrical and Spherical coordinates. Steady, unsteady and periodic heat transfer – initial and boundary conditions.

ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – critical radius of insulation- Variable thermal conductivity – systems with heat sources or heat generation.

UNIT – II

extended surface (fins) heat Transfer – long fin, fin with insulated tip and short fin, application to error measurement of temperature.

ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER: Systems with negligible internal resistance – significance of biot and fourier numbers - chart solutions of transient conduction systems.

UNIT – III

CONVECTIVE HEAT TRANSFER: Classification of convective heat transfer – dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem for forced and free convection, application for developing semi – empirical non- dimensional correlation for convective heat transfer – Significance of non-dimensional numbers – concepts of continuity, momentum and Energy Equations.

UNIT –IV

FORCED CONVECTION

EXTERNAL FLOWS: Concepts about hydrodynamic and thermal

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boundary layer and use of empirical correlations for convective heat transfer -flat plates and cylinders.

INTERNAL FLOWS: Concepts about hydrodynamic and thermal entry lengths – division of internal flow based on this –use of empirical relations for horizontal pipe flow and annulus flow.

FREE CONVECTION: Development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for vertical plates and pipes.

UNIT V

HEAT TRANSFER WITH PHASE CHANGE

BOILING: Pool boiling – regimes- calculations on nucleate boiling, critical heat flux and film boiling.

CONDENSATION: Film wise and drop wise condensation –nusselt's theory of condensation on a vertical plate - film condensation on vertical and horizontal cylinders using empirical correlations.

HEAT EXCHANGERS:

Classification of heat exchangers – overall heat transfer coefficient and fouling factor – concepts of LMTD and NTU methods – Problems.

UNIT VI

RADIATION HEAT TRANSFER:

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. Heat Transfer - HOLMAN/TMH
2. Heat Transfer – P.K.Nag/ TMH
3. Principles of Heat Transfer – Frank Kreith, RM Manglik & MS Bohn, Cengage learning publishers.

REFERENCE BOOKS:

1. Heat and Mass Transfer – Arora and Domkundwar, Dhanpatrai & sons.
2. Fundamentals of Engg. Heat and Mass Transfer / R.C.SACHDEVA / New Age International.
3. Heat and Mass Transfer –Cengel- McGraw Hill.

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4. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria & Sons.

Course outcomes:

The student after undergoing this course is expected to know the principles of heat transfer and be able to apply to practical situations where in heat exchange takes place through various modes of heat transfer including phase change.

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INDUSTRIAL ENGINEERING & MANAGEMENT

Course Objectives:

1. To impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial Management and Engineering.
2. To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
3. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
4. To enable students to understand their role as engineers and their impact to society at the national and global context.

Unit – I

INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.

Unit – II

PLANT LAYOUT: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and breakdown maintenance.

Unit – III

OPERATIONS MANAGEMENT: Importance, types of production, applications, workstudy, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs.

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Unit – IV

STATISTICAL QUALITY CONTROL: Quality control, its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – $\overline{X}$ and R – charts $\overline{X}$ AND S charts and their applications, numerical examples.

TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation, applications, ISO quality systems. six sigma – definition, basic concepts

Unit – V

RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, types.

Unit - VI

VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

PROJECT MANAGEMENT: PERT, CPM – differences & applications, critical path, determination of floats, importance, project crashing, smoothing and numerical examples.

TEXT BOOKS:

1. Industrial Engineering and management by O.P Khanna, Khanna Publishers.
2. Industrial Engineering and Production Management, Martand Telsang, S.Chand & Company Ltd. New Delhi.

Reference Books:

1. Industrial Management by Bhattacharya DK, Vikas publishers.
2. Operations Management by J.G Monks, McGrawHill Publishers.
3. Industrial Engineering by Banga & Sharma.
4. Principles of Management by Koontz O' Donnel, McGraw Hill Publishers.
5. Statistical Quality Control by Gupta.
6. Industrial Engineering and Management by Raju, Cengage Publishers.

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Course outcome:

Upon successful completion of this course you should be able to:

1. Design and conduct experiments, analyse, interpret data and synthesise valid conclusions.
2. Design a system, component, or process, and synthesise solutions to achieve desired needs.
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints.
4. Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management.

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DEPARTMENTAL ELECTIVE – I

REFRIGERATION & AIR CONDITIONING
(Refrigeration and Psychrometric tables and charts allowed)

Course objectives:

The course is to understand the basic cycles of various refrigerating systems, their performance evaluation along with details of system components and refrigerant properties. The course is also aimed at imparting knowledge of psychrometric properties, processes which are used in airconditioning systems for comfort and industrial applications.

UNIT – I

INTRODUCTION TO REFRIGERATION: Necessity and applications – unit of refrigeration and C.O.P. – Mechanical refrigeration – types of ideal cycles of refrigeration. air refrigeration: bell coleman cycle - open and dense air systems – refrigeration systems used in air crafts and problems.

UNIT – II

VAPOUR COMPRESSION REFRIGERATION: Working principle and essential components of the plant – simple vapour compression refrigeration cycle – COP – representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – actual cycle influence of various parameters on system performance – use of p-h charts – numerical problems.

UNIT III

REFRIGERANTS – Desirable properties – classification - refrigerants used – nomenclature – ozone depletion – global warming.

VCR SYSTEM COMPONENTS: Compressors – general classification – comparison – advantages and disadvantages. condensers – classification – working principles evaporators – classification – working principles expansion devices – types – working principles.

UNIT IV

VAPOR ABSORPTION SYSTEM: Calculation of maximum COP – description and working of NH_3 – water system and Li Br –water (Two shell & Four shell) System, principle of operation three fluid absorption system, salient features.

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STEAM JET REFRIGERATION SYSTEM: Working Principle and basic components. principle and operation of (i) thermoelectric refrigerator (ii) vortex tube.

UNIT – V

INTRODUCTION TO AIR CONDITIONING: Psychometric properties & processes – characterization of sensible and latent heat loads –– need for ventilation, consideration of infiltration – load concepts of RSHF, GSHF-problems, concept of ESHF and ADP temperature.

Requirements of human comfort and concept of effective temperature-comfort chart –comfort air conditioning – requirements of industrial air conditioning, air conditioning load calculations.

UNIT – VI

AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers. heat pump – heat sources – different heat pump circuits.

TEXT BOOKS:

1. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai.
2. Refrigeration and Air Conditioning / CP Arora / TMH.

REFERENCES:

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
2. Principles of Refrigeration - Dossat / Pearson Education.
3. Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH

Course outcomes: At the end of the course the students should be able to:
After undergoing the course the student should be in a position to analyze various refrigerating cycles and evaluate their performance. The student also should be able to perform cooling load calculations and select the appropriate process and equipment for the required comfort and industrial airconditioning.

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III Year – II SEMESTER

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HEAT TRANSFER LAB

Objectives:

The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer including condensation & boiling for several geometries.

1. Determination of overall heat transfer co-efficient of a composite slab.
2. Determination of heat transfer rate through a lagged pipe.
3. Determination of heat transfer rate through a concentric sphere.
4. Determination of thermal conductivity of a metal rod.
5. Determination of efficiency of a pin-fin.
6. Determination of heat transfer coefficient in forced convection.
7. Determination of heat transfer coefficient in natural convection.
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzman constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Demonstration of heat pipe.
14. Study of two – phase flow.

Outcomes: The student should be able to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries and should be able to compare the performance of extended surfaces and heat exchangers.

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IV Year – I SEMESTER

T	P	C
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AUTOMOBILE ENGINEERING

Course Objectives:
The course imparts the principles of automobile systems and provides the salient features of safety, emission and service of automobiles.

UNIT – I

INTRODUCTION: Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft.

UNIT – II

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

UNIT – III

STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

UNIT – IV

SUSPENSION SYSTEM: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder requirement of brake fluid, pneumatic and vacuum brakes.

ELECTRICAL SYSTEM: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting

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systems, horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT – V

ENGINE SPECIFICATION AND SAFETY SYSTEMS: Introduction-engine specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc.

Safety: Introduction, safety systems - seat belt, air bags, bumper, anti lock brake system (ABS), wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.

UNIT – VI

ENGINE EMISSION CONTROL: Introduction – types of pollutants, mechanism of formation, concentration measurement, methods of controlling-engine modification, exhaust gas treatment-thermal and catalytic converters-use of alternative fuels for emission control – National and International pollution standards

ENGINE SERVICE: Introduction, service details of engine cylinder head, valves and valve mechanism, piston-connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions.

TEXT BOOKS:

1. Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Sing, standard publishers.
2. Automobile Engineering / William Crouse, TMH Distributors .
3. Automobile Engineering- P.S Gill, S.K. Kataria & Sons, New Delhi.

REFERENCES:

1. Automotive Engines Theory and Servicing, James D. Halderman and Chase D. Mitchell Jr., Pearson education inc.
2. Automotive Engineering / Newton Steeds & Garrett.
3. Automotive Mechanics / Heitner.

Course Outcomes:

The student after undergoing the course, shall visualize the layout of an automobile and its systems like transmission, steering, suspension, braking, safety etc and should know the vehicle troubleshooting.

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IV Year – I SEMESTER

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CAD/CAM

Course Objectives:

The general objectives of the course are to enable the students to

1. Understand the basic fundamentals of computer aided design and manufacturing.
2. To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.
3. To understand the different geometric modeling techniques like solid modeling, surface modeling, feature based modeling etc. and to visualize how the components look like before its manufacturing or fabrication.
4. To learn the part programming, importance of group technology, computer aided process planning, computer aided quality control.
5. To learn the overall configuration and elements of computer integrated manufacturing systems.

UNIT – I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – III

PART PROGRAMMING FOR NC MACHINES: NC, NC modes, NC elements, CNC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

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Direct Numerical Control, Adaptive Control.

UNIT – IV

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages.

Computer aided processes planning – importance, types.

UNIT – V

COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods-contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – VI

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of manufacturing systems, machine tools and related equipment, material handling systems, material requrirement planning, computer control systems, human labor in manufacturing systems, CIMS benefits.

TEXT BOOKS:

1. CAD / CAM / CAE E Zimmers & M.Groover/Pearson Education
2. Automation, Production systems & Computer integrated Manufacturing/ Groover/P.E

REFERENCES:

1. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH.
2. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson.
3. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.
4. Product manufacturing and cost estimation using CAD/CAE/ Kuang Hua Chang, Elsevier Publishers.

Course Outcome:

At the end of the course the students shall be able to:

1. Describe the mathematical basis in the technique of representation of geometric entities including points, lines, and parametric curves, surfaces and solid, and the technique of transformation of geometric entities using transformation matrix.
2. Describe the use of GT and CAPP for the product development.
3. Identify the various elements and their activities in the Computer Integrated Manufacturing Systems.

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FINITE ELEMENT METHODS

Course Objectives:

1. To learn basic principles of finite element analysis procedure .
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.
4. Learn to model complex geometry problems and solution techniques.

UNIT-I

Introduction to finite element method, stress and equilibrium, strain – displacement relations, stress – strain relations, plane stress and plane strain conditions, variational and weighted residual methods, concept of potential energy, one dimensional problems.

UNIT – II

Discretization of domain, element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions.

UNIT – III

Analysis of Trusses: Finite element modeling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations. Analysis of Beams: Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.

UNIT – IV

Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems.

UNIT-V

Higher order and isoparametric elements: One dimensional quadratic and cubic

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elements in natural coordinates, two dimensional four noded isoparametric elements and numerical integration.

UNIT – VI

Steady state heat transfer analysis : one dimensional analysis of a fin and two dimensional analysis of thin plate, analysis of a uniform shaft subjected to torsion. Dynamic Analysis: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering / Chandraputla, Ashok and Belegundu / Prentice – Hall.
2. The Finite Element Methods in Engineering / SS Rao / Pergamon.

REFERENCES:

1. Finite Element Method with applications in Engineering / YM Desai, Eldho & Shah /Pearson publishers.
2. An introduction to Finite Element Method / JN Reddy / McGrawHill.
3. The Finite Element Method for Engineers – Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith and Ted G. Byrom / John Wiley & sons (ASIA) Pte Ltd.
4. Finite Element Analysis: Theory and Application with Ansys, Saeed Moaveniu, Pearson Education.

Course outcomes:

Upon successful completion of this course you should be able to:

1. Understand the concepts behind variational methods and weighted residual methods in FEM.
2. Identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements, and 3-D element.
3. Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
4. Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
5. Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

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IV Year – I SEMESTER

T	P	C
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UN CONVENTIONAL MACHINING PROCESSES

Course Objectives:

- The course aims in identifying the classification of unconventional machining processes.
- To understand the principle, mechanism of metal removal of various unconventional machining processes.
- To study the various process parameters and their effect on the component machined on various unconventional machining processes.
- To understand the applications of different processes.

UNIT – I

INTRODUCTION: Need for non-traditional machining methods-classification of modern machining processes – considerations in process selection, applications.

Ultrasonic machining – Elements of the process, mechanics of material removal, MRR process parameters, economic considerations, applications and limitations.

UNIT – II

ELECTRO – CHEMICAL MACHINING: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate, fundamentals of chemical, machining, advantages and applications.

UNIT - III

THERMAL METAL REMOVAL PROCESSES: General principle and applications of Electric Discharge Machining, Electric Discharge Grinding and wire EDM – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface.

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UNIT – VI

Electron Beam Machining, Laser Beam Machining - Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications

UNIT-V

Plasma Machining: Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

UNIT – VI

Abrasive jet machining, Water jet machining and abrasive water jet machining: Basic principles, equipments, process variables, mechanics of material removal, MRR, application and limitations.

Magnetic abrasive finishing, abrasive flow finishing, Electrostream drilling, shaped tube electrolytic machining.

TEXT BOOK:

1. Advanced machining processes/ VK Jain/ Allied publishers.

REFERENCES:

1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
2. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.

Course outcomes:

After completion of course, the student shall understand the principle of working, mechanism of metal removal in the various unconventional machining process. The student is able to identify the process parameters, their effect and applications of different processes.

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NANO TECHNOLOGY
(OPEN ELECTIVE)

Course objective

On successful completion of the course, students should be able to: Understand the basic cientific concepts of nanoscience. Understand the properties of nano materials, characterization of materials, synthesis and fabrication. Understand the applications of nano technology in various science, engineering and technology fields.

UNIT-I

INTRODUCTION: History of nano science, definition of nano meter, nano materials, nano technology. Classification of nano materials. Crystal symmetries, crystal directions, crystal planes. Band structure.

UNIT-II

PROPERTIES OF MATERIALS:

Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-III

SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

UNIT-IV

CHARECTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

UNIT-V

CARBON NANO TECHNOLOGY:

Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nano crystalling diamond

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films, grapheme, applications of carbon nano tubes.

UNIT-VI

APPLICATIONS OF NANO TECHNOLOGY:

Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin fins, applications of quantum dots.

TEXT BOOKS:

1. Nano science and nano technology by M.S Ramachandra Rao, Shubra Singh, Wiley publishers.

REFERENCE BOOKS:

1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Nanotechnology by Jermy J Ramsden, Elsevier publishers.
3. Nano Materials- A.K.Bandyopadhyay/ New Age Introdu.
4. Nano Essentials- T.Pradeep/TMH.
5. Nanotechnology the Science of Small by M.A Shah, K.A Shah, Wiley Publishers.
6. Principles of Nanotechnology by Phani Kumar, Scitech.

Course outcomes:

Upon successful completion of this course the student shall be able to:

Identify the essential concepts used in nanotechnology. Identify the materials, properties, syntheses and fabrication, characterization and applications in various fields.

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DESIGN FOR MANUFACTURE
(DEPARTMENTAL ELECTIVE – II)

Course Objectives:

1. Understand the design rules and considerations with reference to various manufacturing processes.
2. To discusses capabilities and limitations of each manufacturing process in relation to part design and cost.
3. To examine DFM principles including how the design affects manufacturing cost, lean manufacturing, six sigma, etc.

UNIT - I

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production - creativity in design.

UNIT - II

Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness-Design for machining – ease –redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT - III

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

UNIT - IV

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints. Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

UNIT – V

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

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UNIT – VI

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

TEXT BOOKS:

1. Design for manufacture, John cobert, Adisson Wesley 1995
2. Design for Manufacture by Boothroyd
3. Design for manufacture, James Bralla

REFERENCE:

1. ASM Hand book Vol.20

Course outcomes:

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

1. Design components for machining.
2. Simulate the casting design and choose the best casting process for a specific product.
3. Evaluate the effect of thermal stresses in weld joints.
4. Design components for sheet metal work by understanding in depth the sheet metal processes and their formation mechanisms.
5. Design plastic components for machining and joining and selecting a proper processes for different joining cases.

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IV Year – I SEMESTER

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SIMULATION LAB

Course Objectives:

1. To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for Engineering Simulation.
2. To know various fields of engineering where these tools can be effectively used to improve the output of a product.
3. To impart knowledge on how these tools are ued in Industries by solving some real time problems using these tools..

1. **DRAFTING :** Development of part drawings for various components in the form of orthographic andisometric. representation of dimensioning and tolerances scanning and plotting. study of script, DXE and IGES files.

2. **PART MODELING :** Generation of various 3D models through protrusion, revolve, shell sweep. creation of various features. study of parent child relation. feature based and boolean based modeling surface and assembly modeling. study of various standard translators. design simple components.

3. a) Determination of deflection and stresses in 2D and 3D trusses and beams.
   b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.
   c) Determination of stresses in 3D and shell structures (at least one example in each case)
   d) Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
   e) Steady state heat transfer Analysis of plane and Axisymmetric components.

4. a) Development of process sheets for various components based on tooling Machines.
   b) Development of manufacturing and tool management systems.
   c) Study of various post processors used in NC Machines.
   d) Development of NC code for free form and sculptured surfaces using CAM packages.

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e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.
f) Quality Control and inspection.

Packages to be provided to cater to drafting, modeling & analysis from the following:

Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

Course outcomes:

Upon successful completion of this course student should be able to:

1. The student will be able to appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems.
2. Use of these tools for any engineering and real time applications.
3. Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.

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IV Year – I SEMESTER

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DESIGN / FABRICATION PROJECT

Objective:

To develop the ability to conceptualize a product, apply standard/innovative design techniques and realize the product through fabrication with focus on design-manufacturing integration.

Course content:

Identification of possible improvements in an existing product, conceptualization of a new product/part, design of the part using design methodologies, selection of material(s), preparation of process flow chart for manufacturing, fabrication of the part using the available in-house facilities, assembly, testing of the functionality of the product.

The students should come up with their own original and innovative ideas for product design. The task may be performed by student teams/groups.

Course Outcome:

Through this course the student is expected to learn realization of a product, conceptualized and designed by him. The student gets hand on experience of the entire chain of manufacturing steps with an understanding of design-manufacturing integration.

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IV Year – II SEMESTER

T	P	C
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PRODUCTION PLANNING AND CONTROL

Course objectives:

This subject provides students with

1. An understanding of the concepts of production and service systems;
2. The ability to apply principles and techniques in the design, planning and control of these systems to optimise/make best use of resources in achieving their objectives.
3. Identify different strategies employed in manufacturing and service industries to plan production and control inventory.
4. Measure the effectiveness, identify likely areas for improvement, develop and implement improved planning and control methods for production systems.

UNIT – I

Introduction: Definition – objectives and functions of production planning and control – elements of production control – types of production – organization of production planning and control department – internal organization of department.

UNIT – II

Forecasting – importance of forecasting – types of forecasting, their uses – general principles of forecasting – forecasting techniques – qualitative methods and quantitive methods.

UNIT – III

Inventory management – functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems.

Introduction to MRP I, MRP II, ERP, LOB (Line of Balance), JIT and KANBAN system.

UNIT – IV

Routing – definition – routing procedure –route sheets – bill of material – factors affecting routing procedure, schedule –definition – difference with loading.

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UNIT – V

Scheduling policies – techniques, standard scheduling methods.
Line Balancing, aggregate planning, chase planning, expediting, controlling aspects.

UNIT – VI

Dispatching – activities of dispatcher – dispatching procedure – follow up – definition – reason for existence of functions – types of follow up, applications of computer in production planning and control.

TEXT BOOKS:

1. Elements of Production Planning and Control / Samuel Eilon.
2. Manufacturing, Planning and Control, Partik Jonsson Stig-Arne Mattsson, Tata Mc Graw Hill.

REFERENCES:

1. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
2. Production Planning and Control, Mukhopadyay, PHI.
3. Production Control A Quantitative Approach / John E. Biegel.
4. Production Control / Moore.

Course outcome:

Upon completion of the subject, students will be able to

1. Apply the systems concept for the design of production and service systems.
2. Make forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques.
3. Apply the principles and techniques for planning and control of the production and service systems to optimize/make best use of resources.
4. Understand the importance and function of inventory and to be able to apply selected techniques for its control and management under dependent and independent demand circumstances.

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IV Year – II SEMESTER

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GREEN ENGINEERING SYSTEMS

Course Objective:

The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

UNIT-I

INTRODUCTION:

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT – II

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT – III

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants,

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thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT –IV

ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V

ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

UNIT – VI

GREEN BUILDINGS: Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

TEXT BOOKS:

1. Sukhatme S.P. and J.K.Nayak, *Solar Energy – Principles of Thermal Collection and Storage*, TMH.
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2006.
3. Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2013.

REFERENCES:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Ra.

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2. Principles of Solar Energy / Frank Krieth & John F Kreider.
3. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Renewable Energy Technologies/ G.D Roy

Course outcome:

The student shall understand the principles and working of solar, wind, biomass, geo thermal, ocean energies and green energy systems and appreciate their significance in view of their importance in the current scenario and their potential future applications.

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POWER PLANT ENGINEERING
(DEPARTMENTAL ELECTIVE – III)

Course Objectives:

The course is aimed at providing knowledge of power generation through different prime movers viz steam, ICGT, Hydro, nuclear and hybrid systems along with their economics and environmental considerations.

UNIT – I

Introduction to the sources of energy – resources and development of power in india.

STEAM POWER PLANT: Plant layout, working of different circuits, fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, ash handling systems. Combustion: properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, dust collectors, cooling towers and heat rejection. corrosion and feed water treatment.

UNIT – II

INTERNAL COMBUSTION AND GAS TURBINE POWER PLANTS:

DIESEL POWER PLANT: Plant layout with auxiliaries – fuel supply system, air starting equipment, super charging.

GAS TURBINE PLANT: Introduction – classification - construction – layout with auxiliaries, combined cycle power plants and comparison.

UNIT – III

HYDRO ELECTRIC POWER PLANT: Water power – hydrological cycle / flow measurement – drainage area characteristics – hydrographs – storage and pondage – classification of dams and spill ways.

HYDRO PROJECTS AND PLANT: Classification – typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding – radioactive waste disposal.

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UNIT – V

COMBINED OPERATIONS OF DIFFERENT POWER PLANTS: Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, pump storage plant in combination with steam or nuclear power plant, co-ordination of hydro-electric and gas turbine stations, co-ordination of hydro-electric and nuclear power stations, co-ordination of different types of power plants.

POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O_2 and CO_2 measurements, measurement of smoke and dust, measurement of moisture in carbon dioxide circuit, nuclear measurements.

UNIT – VI

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor – related exercises. effluents from power plants and Impact on environment – pollutants and pollution standards – methods of pollution control.

TEXT BOOKS:

1. A course in Power Plant Engineering – Arora and Domkundwar, Dhanpatrai & Co.
2. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub

REFERENCES:

1. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
2. Power station Engineering – ElWakil / McHill.
3. An Introduction to Power Plant Technology / G.D. Rai.

Course outcomes:

After undergoing this course the student can understand various conventional methods of power generation and principle of operation and performance of respective prime movers along with their economics and their impact on environment.

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GAS DYNAMICS AND JET PROPULSION
(DEPARTMENTAL ELECTIVE – IV)

Course objectives:

The purpose of this course is to provide the student with the knowledge of basic principles of gas dynamics and its importance in jet propulsion applications.

UNIT-I

Introduction to gas dynamics: control volume and system approaches acoustic waves and sonic velocity - mach number - classification of fluid flow based on mach number - mach cone-compressibility factor - general features of one dimensional flow of a compressible fluid - continuity and momentum equations for a control volume.

UNIT-II

Isentropic flow of an ideal gas: basic equation - stagnation enthalpy, temperature, pressure and density-stagnation, acoustic speed - critical speed of sound- dimensionless velocity-governing equations for isentropic flow of a perfect gas - critical flow area - stream thrust and impulse function.

Steady one dimensional isentropic flow with area change-effect of area change on flow parameters- chocking- convergent nozzle - performance of a nozzle under decreasing back pressure -De lavel nozzle - optimum area ratio effect of back pressure - nozzle discharge coefficients - nozzle efficiencies.

UNIT- III

Simple frictional flow: adiabatic flow with friction in a constant area duct-governing equations - fanno line limiting conditions - effect of wall friction on flow properties in an Isothermal flow with friction in a constant area duct-governing equations - limiting conditions.

Steady one dimensional flow with heat transfer in constant area ducts-governing equations - Rayleigh line entropy change caused by heat transfer - conditions of maximum enthalpy and entropy.

UNIT-IV

Effect of heat transfer on flow parameters: Intersection of Fanno and Rayleigh lines. Shock waves in perfect gas- properties of flow across a normal shock - governing equations - Rankine Hugoniat equations - Prandtl's velocity relationship - converging diverging nozzle flow with shock thickness - shock strength.

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UNIT- V

Propulsion: Air craft propulsion: - types of jet engines - energy flow through jet engines, thrust, thrust power and propulsive efficiency turbojet components-diffuser, compressor, combustion chamber, turbines, exhaust systems.

UNIT-VI

Performance of turbo propeller engines, ramjet and pulsejet, scramjet engines. Rocket propulsion - rocket engines, Basic theory of equations - thrust equation - effective jet velocity - specific impulse - rocket engine performance - solid and liquid propellant rockets - comparison of various propulsion systems.

TEXT BOOKS:

1. Compressible fluid flow - A. H. Shapiro.
2. Fundamentals of compressible flow with aircraft and rocket propulsion- S. M. Yahya.
3. Fundamental of Gas dynamics, 2nd edition– Zucker- Wiley publishers.

REFERENCES

1. Elements of gas dynamics - Liepman & Roshko.
2. Aircraft & Missile propulsion - Zucrow.
3. Gas dynamics - M.J. Zucrow & Joe D.Holfman.

Course outcomes:

Up on successful completion of this course the student should be able to analyze the gas flow in different situations with and without friction, with and without heat transfer in particular jet propulsion and rocket engineering applications.

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2018 - 2019

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
FUNCTIONAL ENGLISH (Common to All Branches)							

Course Objectives:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

Course Outcomes:

Learners are able to

- Speak clearly, effortlessly, confidently and appropriately.
- Write coherently with acceptable accuracy, organizing ideas logically.
- Listen and read to comprehend different discourses and different genres of texts.
- The learner will be able to read and infer, analyze, predict, interpret and draw conclusions any printed text.

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual and activity based

UNIT-I:

Hours of Instruction per unit: 8

HUMOUR: An Astrologer's Day

Objective: To criticize the superstitious beliefs of the people in the contemporary society. To make the learners understand that an astrologer is not trustworthy as he deceives the people by bewitching them in order to get some money. So we should not believe anyone by means of outward appearance.

Outcome: To students will develop rational thinking instead of believing blindly everything without reason.

a. Vocabulary : Prefixes, Suffixes (www.englishhints.com, www.enchantedlearning.com, www.learnenglish.de/grammar/prefixtext.html)

b. Grammar : Nouns, Pronouns, Articles

c. Writing : Sentences structures

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UNIT-II:

Hours of Instruction per unit: 8

INSPIRATION: Building a New State

Objective: To make the students know the value of natural resources that are abundantly available in our country.

Outcome: Learner will understand the importance of the natural resources that are valuable in nature in order to develop our nation.

a. Vocabulary : Homophones, Homographs, Homonyms Synonyms & Antonyms and Commonly confused words (http://www.magickeys.com/books/riddles/words.html)
b. Grammar : Finite verbs, Non-finite verbs & question tags
c. Listening : Main points & sub-points
d. Writing : Paragraphs, Note making, Expansion of Proverbs

UNIT-III

Hours of Instruction per unit: 8

SUSTAINABLE DEVELOPMENT: Water: The Elixir of Life

Objective: To inform the learner how precious the water is, as well as the advantages and the characteristics of water.

Outcome: The learner will understand that water is the elixir of life and it should not be wasted but should be utilized in a proper way.

a. Vocabulary : One Word Substitutes, (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
b. Grammar : Tenses
c. Listening : Listening for the theme and gist
d. Writing : Official letters, Curricula vitae, Covering Letters

UNIT-IV

Hours of Instruction per unit: 8

RELATIONSHIPS: The Wood rose

Objective: To enlighten the learner the value of human relationships as we are social animals and the need to maintain good relationship with elders and senior citizens.

Outcome: The learner will come to know that the old people are not to be ignored but it is the duty of the children to consider the wishes, feelings, emotions, ideas and thoughts of the older generation.

a. Vocabulary : Phrasal verbs & idioms
b. Grammar : Subject verb agreement, Active and Passive voice, Prepositions
c. Listening : Listening for specific detail and information.
d. Writing : Official reports (Fundamentals of technical communication Pg.No. (119- 153)

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UNIT-V
Hours of Instruction per unit: 8
SCIENCE AND HUMANISIM: Progress
Objective:

- To enable the learner grasp the negative aspect of scientific inventions which are responsible for the anti-social activities of the present day.

Outcome: Understand that Science and Technology is a double edged knife and must be used with discrimination

a. Vocabulary : Collocations, Technical vocabulary, common errors in vocabulary
b. Grammar : Conditional sentences, conjunctions, common errors in grammar
c. Listening : Listening for opinions and attitude.
d. Writing : Events and essays

UNIT-VI
Hours of Instruction per unit: 8
READING

Objectives:

- To understand types and sub-skills of reading and apply techniques to improve reading speed.

Outcomes:

- Demonstrate reading speed and comprehend the gist of passage.
- Intensive reading, Extensive reading, predicting the content, skimming, scanning, Inferring meanings: lexical and contextual.

TEXTBOOK:

1. Using English – Orient Black Swan Pvt.Ltd.Publishers

REFERENCES:

1. Meenakshi raman, Sangeeta, Sharma *Fundamentals of technical communication*, Pg: 119-153 Oxford University Press, 2015
2. Rutherford, Andrea. J, *Basic Communication Skills for Technology.* Pearson, New Delhi. 2001
3. Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
4. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
5. Michael Swan, *Practical English Usage,* Oxford University Press, 1996

Online Sources:

1. www.englishhints.com, www.enchantedlearning.com,
2. www.learnenglish.de/grammar/prefixtext.html
3. http://www.magickeys.com/books/riddles/words.html

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I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
MATHEMATICAL METHODS (Common to All Branches)							

Course Objectives:

- The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering student.
- The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes:

Upon successful completion of the course, the students should be able to

- Solve simultaneous linear equations using matrix methods.
- Calculate Eigen values and Eigen vectors of matrices that are essential for vibration / design analysis.
- Understand the concept of Double and Triple integrals and their applications to calculations of areas, volumes.
- Understand the most basic numerical methods to solve simultaneous linear equations.

UNIT-I: LINEAR SYSTEMS OF EQUATIONS

Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.

Application: Finding the current in a electrical circuit

UNIT – II: EIGENVALUES AND EIGENVECTORS

Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive negative definite, semi definite, index, signature.

Application: Finding powers and inverse of a square matrix using Cayley – Hamilton's Theorem.

UNIT-III: APPLICATION OF INTEGRATION AND MULTIPLE INTEGRALS:

Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple Integrals- double and triple integrals, Change of Variables, Change of order of Integration.

UNIT – IV: SOLUTION OF TRANSCENDENTAL EQUATIONS:

Introduction - Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method (One variable and Simultaneous Equations), Secant method.

UNIT – V: INTERPOLATION:

Introduction – Errors in Polynomial Interpolation – Finite differences – Forward Differences – central differences – Symbolic relations and separation of symbols. Differences of Polynomial – Newton's formulae for Interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula – Newton's Divided difference formula.

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UNIT-VI: NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Solution by Taylor's series. Euler's Method. modified Euler's Method. Runge – kutta Method (fourth order only). R-K method for simultaneous differential equations. Trepezoidal rule. Simpon's $(1/3)^{rd}$ rule. Simpons's $(3/8)^{th}$ rule.

TEXT BOOK:

1. B.S.Grewal, *"Higher Engineering Mathematics"*, 42nd Edition, Khanna Publisher.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, *"Engineering Mathematics"*, University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. V. Ravindranath and P. Vijayalaxmi, *"Mathematical Methods"*, Himalaya Publishing House.
3. Dean G Duffy, *"Advanced Engineering Mathematics with MATLAB"*, CRC Press.
4. Erwyn Kreyszig, *"Advanced Engineering Mathematics"*, 9th Edition, Wiley-India.
5. Srimanta Pal and Suboth C. bhunia, *"Engineering Mathematics"*, oxford University Press, 2015.
6. Steven C.Chapra, Raymond P.Canale *"Numerical Methods for Engineers"*, Tata Mc-Graw Hill.

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I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	40	60	100	3
ENGINEERING GRAPHICS (Common to CSE, ECE & EEE)							

Course objectives:

- Impart basic knowledge and skills required to prepare engineering drawing which is an universal language of engineers for communication, designing and production
- Get enhanced imagination capacity, visualize and communicate geometrical elements
- Understand the fundamentals of geometry like engineering curves, planes, solids, sections, developments & isometric views and its applications in design and manufacturing of various engineering components

Course Outcomes:

Upon successful completion of the course, the students should be able to

- Apply principles of drawing to represent dimensions of an object and use the different types of scales for drawing of various sizes of engineering curves
- Draw various polygons and Ellipse
- Draw Orthographic projections in 1st and 3rd angle projections
- Draw different orientations of points, lines, planes and solids with reference to principal planes.
- Draw orthographic views (2D) from the given isometric view (3D) and vice versa

UNIT-I

Introduction to engineering drawing: Importance, Drawing Instruments and their uses. Basics of Geometric construction.

Polygons: Construct the regular polygons using given length of a side, inscription of polygons and circumscription of polygons.

Ellipse- Arcs of circles Method and Oblong Method

Scales: Representation fraction-Construction of plain, diagonal and vernier scale.

UNIT-II

Orthographic projections: Principle of orthographic projections, first and third angle projections, projections of points.

Projection of Straight lines: parallel to both the planes, parallel to one plane and inclined to the other plane.

UNIT-III

Projection of Straight lines inclined to both the planes, determination of true length, angles of inclination and Traces.

UNIT-IV

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-V

Projections of solids-prisms, pyramids, cones and cylinders with the axis inclined to one of the planes

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UNIT-VI

Conversion of isometric views to orthographic views; Conversion orthographic views to isometric views

TEXT BOOKS:

1. N.D. Butt, "*Engineering Drawing*", Chariot Publications.
2. K.L.Narayana and P. Kannaiah, "*Engineering Drawing*", Scitech Publishers.
3. PI Varghese, "*Engineering Graphics*", McGrawHill Publishers.

REFERENCES:

1. K.C. John, "*Engineering Graphics for Degree*", PHI Publishers.
2. Agarwal and Agarwal, "*Engineering Drawing*", Tata McGraw Hill Publishers.

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I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
BASIC COMMUNICATION SKILLS LAB (Common to All Branches)							

COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication to enable them to interact with the people in various social situations.
- To enable the learners develop better pronunciation through emphasis on word accent, intonation and Rhythm

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Improve their basic communication skills to interact with peers and others in various social situations
- Speak English effortlessly with good pronunciation
- Take part in various conversations/discourses using the formal and informal expressions they have learned.

Unit-1

a. Greeting, Introducing and Taking leave

b. Pure Vowels

Unit-2

a. Giving information and Asking for information

b. Diphthongs

Unit-3

a. Inviting, Accepting and Declining Invitations

b. Consonants

Unit-4

a. Commands, Instructions and Requests

b. Accent and Rhythm

Unit-5

a. Suggestions and Opinions

b. Intonation

TEXT BOOK:

"Strengthen Your Communication Skills", Maruthi Publications, 2013.

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REFERENCES:

1. "*Personality Development and Soft Skills*", Oxford University Press, New Delhi.

2. J.D.O Conner, "*Better English Pronunciation*", Cambridge University Press 1980.

3. T.Balasubramanian, "*A Text Book of English Phonetics for Indian Students*", Macmillan, 1981.

4. Sanjay Kumar, Puspha Latha, "*Communication skills*", Oxford University Press 2005.

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I B.TECH - I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ELECTRONIC WORKSHOP AND IT WORKSHOP							

COURSE OBJECTIVE:

- Enabling the student to understand basic electronic components, measuring instruments, and computer hardware and software tools through practical exposure.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Knowledge on different passive components and active devices used in laboratory.
- Knowledge on soldering of components and measuring instruments used in laboratory.
- Knowledge on computer system such as system unit, input devices, output devices connected to the computer and to understand the booting process and loading of the operating system, and getting it ready for use.
- Knowledge to understand the working of the internet that includes the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc., and familiarize with parts of Word window, Excel window and PowerPoint.

PART A: ELECTRONIC WORKSHOP

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: IT WORKSHOP

PC HARDWARE:

Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Trouble shooting Hardware and Software some tips and tricks.

INTERNET & WORLD WIDE WEB:

Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber-attacks.

PRODUCTIVITY TOOLS: Crafting professional word documents; excel spread sheets, power point presentations and personal websites using the Microsoft suite of office tools.

PC HARDWARE

TASK 1: IDENTIFICATION OF THE PERIPHERALS OF A COMPUTER.

To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.

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TASK 2: (Optional): A Practice on disassembling the components of a PC and assembling them to back to working condition.

TASK 3: Examples of Operating Systems- DOS, MS Windows, Installation of MS windows on a PC

TASK 4: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

TASK 5: HARDWARE TROUBLESHOOTING (Demonstration): Identification of a problem and fixing a defective PC (improper assembly or defective peripherals).

SOFTWARE TROUBLESHOOTING (Demonstration): Identification of problem and fixing the PC for any software issues.

INTERNET & NETWORKING INFRASTRUCTURE

TASK 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices-Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.

ORIENTATION & CONNECTIVITY BOOT CAMP AND WEB BROWSING: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

TASK 7: SEARCH ENGINES & NETIQUETTE

Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

TASK 8: CYBER HYGIENE (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced

WORD

TASK 9: MS Word Orientation:

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

TASK 10 : CREATING PROJECT : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Excel

TASK 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.

CREATING SCHEDULER - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.

LOOKUP/VLOOKUP

TASK 12: PERFORMANCE ANALYSIS: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

Power Point

TASK 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

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TASK 14: Focusing on the power and potential of Microsoft power point Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

TEXT BOOKS:

1. Anita Goel," *Computer Fundamentals*", Pearson.
2. Scott. Mueller QUE, *"Scott Mueller's Upgrading and Repairing PCs"*, 18/e, Pearson, 2008.

REFERENCES:

1. Dr. N.B. Venkateswarlu, "*Essential Computer and IT Fundamentals for Engineering and Science Students*".
2. G Praveen Babu, M V Narayana, *"Information Technology Workshop"*, 3e, BS Publications.
3. Vikas Gupta, "*Comdex Information Technology* ", Dreamtech.

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I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3

INTERACTIVE ENGLISH
(Common to All Branches)

COURSE OBJECTIVES:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To enhance the skills of listening, reading and critical thinking.
- To integrate English Language learning with training for employability skills.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Speak clearly, effortlessly, confidently and effectively.
- Write coherently and flawlessly, organizing ideas logically.
- Listen and read to comprehend different discourses and different genres of texts.

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual, and activity based

PART-I: COMMUNICATION SKILLS
Hours of Instruction per week: 8

PART-I COURSE OBJECTIVES:

1. Understand the significance of using formal language in communication and Identify different language patterns in communication.
2. Understand the importance of clarity and conciseness of writing.
3. To enhance word power and usage of lexicons among the learners.

PART-I COURSE OUTCOMES:

1. Apply Formal and Informal Language in office correspondence and real life situations.
2. Apply the Clarity, Conciseness and Formal language in E-mail writing, letter writing, report writing, paragraph writing and essay writing.
3. Use words in different contexts while speaking and decipher meaning of the words contextually while reading.

1. **Effective communication**
   a. Role and significance of communication
   b. Features of Human Communication
   c. Process of Communication
   d. Types of Communication, barriers to communication
2. **Oral Communication**
   a. Importance of Listening for effective communication

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b. Interpersonal communication
c. Models of Interpersonal relationship development
d. Styles of communication
e. Persuasion techniques
f. Telephone and Cell phone etiquette

3. **Written Communication**

a. Paragraph writing **b.** Summaries **c.** Expansion of Proverbs
d. Essay writing **e.** Report writing **f.** The scientific paper
g. Letter writing **h.** Letters of Complaint **i.** Request to complaint
j. letters of inquiry and responses **k.** Resume writing **l.** Visumes
m. statement of purpose **n.** E-mail

(Fundamentals of technical communication Page No. 119 - 153)

Remedial English

a. Importance of vocabulary and grammar,
b. Homonyms, Homophone and Homographs
c. Synonyms and antonyms
d. One word substitutes
e. Idioms
f. Words often confused
g. Subject-Verb agreement
h. active and passive voice
i. direct and indirect speech
j. Articles
k. Adjectives
l. Prepositions
m. Tense and aspect
n. Suffixes
o. Question tags
p. Prefixes
q. Punctuation
r. Common Errors
s. Correction of common errors

PART-II: READING FOR ENRICHMENT

PART-II COURSE OBJECTIVE:

- To inspire the learners by giving the success stories of the various fields and teach them that achievement comes only after burning the midnight oil.

PART-II COURSE OUTCOME:

- The students will emulate the achievers and develop perseverance, determination, dedication and industry

1. APJ Abdul Kalam
2. An Interview with Microsoft CEO Satya Nadella
3. Azim Premji

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4. Sachin Tendulkar
5. Sam Pitroda: The Knowledge Revolution
6. Indra Nooyi: http://www.thefamouspeople.com/profiles/indra-nooyi-6440.php

TEXTBOOK:

1. E Suresh Kumar," *Engineering English* ", Orient Black Swan Pvt. Ltd. Publishers.

REFERENCES:

1. Raman, Meenakshi and Sangeetha Sharma, "*Technical Communication: Principles and Practice* ", Oxford University Press, New Delhi. 2011.
2. Rutherford, Andrea. J *Basic Communication Skills for Technology*. Pearson, New Delhi. 2001
3. Raymong Murphy, "*Murphy's English Grammar* ", Cambridge University Press 2004.
4. Meenakshi Raman, Sangeeta Sharma, "*Technical Communication: English Skills for Engineers* ", Oxford University Press, 2009.
5. Meenakshi Raman, Sangeeta Sharma, "*Fundamentals of technical communication* ", Oxford University Press, 2015.

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I B.TECH – II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
INTEGRAL TRANSFORMS AND VECTOR CALCULUS (Common to All Branches)							

Course Objectives:

- The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering student.
- The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes:

Upon successful completion of the course, the students should be able to

- Learn the technique of Laplace transform and apply it to solve differential equations.
- Learn the technique of Z-transform and apply it to solve difference equations.
- Extend the concept of integration to vector functions, understand the significance of the operators, gradient, divergence and curl.
- Understand Fourier series, integral, transforms and they are provided with practice in their application and interpretation in a range of situations.
- Find surface areas and Volumes of certain solids using Green, Stokes and Gauss divergence theorems.

UNIT –I: LAPLACE TRANSFORMATIONS

Laplace transform and its properties, Unit step function and unit impulse function, Transform of periodic functions, Transform of derivatives and integrals, Multiplication by t^n, division by t, evolutions of integrals by Laplace Transforms. Inverse Laplace Transformations. Introduction, Finding inverse transforms by the method of partial fractions, other methods of finding inverse Laplace Transforms, Convolution theorem(without proof), Solutions Initial and Boundary Value Problems.

UNIT –II: Z – TRANSFORMS

Introduction, properties, Damping rule, Shifting rule, Initial and Final value theorems, Inverse z-transform, Convolution theorem, Solutions of difference equations.

UNIT – III: FOURIER SERIES

Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of Discontinuity, change of interval, even and odd functions, Half – range sine and cosine series.

UNIT – IV: FOURIER TRANSFORMS

Introduction, Definition, Fourier Integrals, Fourier Sine and Cosine Integral, Fourier Transforms, Fourier sine and cosine transforms, Finite Fourier transforms.

UNIT-V: VECTOR DIFFERENTIATION

Gradient, Divergence, Curl, Laplacian and second order operators, vector identities, Equation of continuity, potential surfaces.

UNIT-VI: VECTOR INTEGRATION

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Line integral, work done, potential function, area surface and volume integrals, vector integral theorems: Green's, Stoke's and Gauss Divergence theorems (without proof) and related Problems.

TEXT BOOK:

1. B.S.Grewal, "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publisher.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. B.V. Ramana, "*Higher Engineering Mathematics*", Tata Mc Graw Hill.
3. Erwyn Kreyszig, "*Advanced Engineering Mathematics*", 9thEditi on, Wiley-India.
4. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th Edition, Cengage Learning, 2011.
5. Srimanta Pal and Suboth C. Bhunia, "*Engineering Mathematics*", Oxford University Press, 2015.

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I B.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
PROGRAMMING WITH C (Common to ECE, EEE, Civil and Mechanical)							

COURSE OBJECTIVES:

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Study and Understand basics of computer Hardware and Software.
- Study, Analyze and Understand logical structure of computer programming and different constructs to develop programs in C language.
- Understand and Analyze simple data structures and use of pointers and dynamic memory allocation technique.
- Create files and apply file I/O operations.

UNIT I:

Introduction: Computer systems, Hardware and Software Concepts,

Problem Solving: Algorithm / Pseudo code, flowchart, program development steps, computer languages: machine, symbolic and high-level languages, Creating and Running Programs: Writing, Editing(vi/emacs editor), Compiling(gcc), Linking and Executing in under Linux.

BASICS OF C: Structure of a C program, identifiers, basic data types and sizes. Constants, Variables, Arthmetic , relational and logical operators, increment and decrement operators, conditional operator, assignment operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

UNIT II:

SELECTION – MAKING DECISION: TWO WAY SELECTION: if-else, null else, nested if, examples, Multi-way selection: switch, else-if, examples.

ITERATIVE: loops- while, do-while and for statements, break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.

ARRAYS: Arrays- concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix.

STRINGS: concepts, c strings.

UNIT III:

FUNCTIONS- MODULAR PROGRAMMING: functions, basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs, Passing 1-D arrays, 2-D arrays to functions.

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UNIT IV:

POINTERS: pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT V:

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, program applications

UNIT VI:

FILE HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs

TEXT BOOKS:

1. Reema Thareja, *"Programming in C"*, Oxford.
2. Dennis Richie and Brian Kernighan, *"The C programming Language"*, 2nd ed.

REFERENCES:

1. Dr. E. Balaguruswamy, *"Programming in ANSI C"*, Tata McGraw Hill Education.
2. Hanly, Koffman, *"Problem Solving and Program Design in C"*, 7th ed, Pearson.
3. Forouzan, Gilberg, Prasad, *"C Programming, A Problem Solving Approach"*, Cengage.
4. Ashok N.Kamthane, *"Programming in C"*, Second Edition, Pearson.

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I B.TECH- II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
NETWORK ANALYSIS							

COURSE OBJECTIVES:

- To learn the basics of the D.C. and A.C. electrical circuits
- To learn the concepts of mesh, node analysis, and star delta transformation.
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To learn the graphical representation of a network , transient analysis and application of
- Laplace transforms to RLC circuits.
- To learn the concepts of two port network parameters and different types of networks

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Analyse the D.C., A.C. electrical circuits and magnetic circuits by using mesh current and node voltage equations.
- Analyse transient behaviour of circuits comprises various passive components when subjected to different inputs.
- Compute the two port network parameters.
- Apply circuit theorem concepts to various circuits and analyse the magnetic circuits.
- Analyze the frequency response of AC circuits.

UNIT – I: INTRODUCTION TO ELECTRICAL CIRCUITS

Network elements classification, Electric charge and current, Electric energy and potential, Series and parallel connection of circuit elements. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchhoff's laws, Mesh analysis and Nodal analysis.

UNIT – II: A.C. FUNDAMENTALS

Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, and explanation with relevant theory. Principal of Duality.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

UNIT – III: STEADY STATE ANALYSIS OF A.C. CIRCUITS

Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving

RESONANCE: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti-resonance, Bandwidth of

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parallel resonance.

UNIT – IV: NETWORK THEOREMS

Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens Theorems, problem solving for using dependent sources also .

UNIT – V: TWO-PORT NETWORKS

Z-parameters, Y parameters, Transmission line parameters, h-parameters, Inverse h parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks.

COUPLED CIRCUITS:

Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

UNIT – VI: TRANSIENTS

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

TEXT BOOKS:

1. M E Van Valkenburg, *"Network Analysis "*, 3rd Edition, Prentice Hall of India, 2000.
2. K. Satya Prasad and S Sivanagaraju, *"Network Analysis"*, Cengage Learning
3. William Hayt and Jack E.Kimmarle, *"Engineering Circuit Analysis"*, 6th Edition , TMH.

REFERENCES:

1. John. D. Ryder,"*Network Lines and Fields*", 2nd edition, Asia publishing house.
2. DR Cunninghan, *"Basic Circuit Analysis"*, Jaico Publishers.
3. Chadha, *"Network Analysis and Filter Design"*, Umesh Publications.

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I B.TECH - IISEMESTER	L	T	P	INTERNALMARKS	EXTERNALMARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
PROFESSIONAL ETHICS, VALUES AND PAPTENTS (Common to all branches)							

COURSE OBJECTIVES:

- To equip the student with the basic knowledge relating to the ethical behaviour in engineering discipline.
- To make the students understand the rules and regulation relating to intellectual property rights (Patents, copyrights, trademarks etc.,)

COURSE OUTCOME:

Upon successful completion of the course, the students should be able to

- The outcome of this program is that the student learns necessary behavioural skills relating to the Ethics at industrial sector and to gain fundamental knowledge relating to IPR's.

Unit-I

Human Values: Ethics, Morals, Values, Integrity, Work Ethics- Service Learning – Civic Virtue- Respect for Others- Living Peacefully- Caring- Sharing- Honesty- Courage- Value Time- Cooperation- Commitment – Empathy- Self-Confidence- Spirituality- Character.

Unit-II

Engineering Ethics: Professional Roles to Be Played By Engineer- Engineers Role As Managers, Consultants And Leaders- Ethical Theories And its Uses.

Unit-III

Engineers Responsibilities and Rights: Professional Rights And Responsibilities, Whistle Blowing, Cross Cultural Issues And Occupational Crimes- Industrial Espionage.

Unit-IV

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Legal Tasks in Intellectual Property Law – Ethical obligations in Intellectual Property Law - Introduction to Cyber Law – Innovations and Inventions Trade related Intellectual Property Right.

Unit-V

Intellectual property Rights : Basics, Types of Intellectual Property- Copy Rights – Principles- Subject Matter of Copy Rights- Copy Right Formalities and Registration- Patent Law – Rights and Limitations – Patent Requirements – Patent Registration Process.

Unit-VI

Trademark: Trademark Registration Process- Post Registration Process – Transfer of Rights- Trade Secrets – Maintaining Trade Secrets- Physical Security- Employee Confidentiality Agreement- Cyber Law and Cybercrimes.

TEXT BOOKS:

1. Prof. A.R.Arasri, Dharanikota Suyodhana, *"Professional Ethics and Morals"*, Maruthi

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Publications.

REFERENCES:

1. Deborah e. Bouchoux, *"Intellectual property"*, Cengage learning, New Delhi.
2. Kompal Bansal and Parishit Bansal,*"Fundamentals of IPR for Engineers"*, BS Publications.
3. *Cyber Law:Texts & Cases*, South- Western's special topics collections.
4. M. Ashok kumar and Mohd. Iqbal Ali, *"Intellectual property right"*, serials pub.
5. M. Govindarajan, S. Natarajan and V.S. Senthil Kumar, *"Engineering Ethics and Human Values"*, PHI Learning PVT. Ltd, 2009

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I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2

ENHANCING COMMUNICATION SKILLS LAB
(Common to All Branches)

COURSE OBJECTIVES:

- To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
- To make the students understand the importance of body language.
- To develop positive attitude and soft skills to improve their employability quotient.
- To expose the students to variety of a self-instructional, learner friendly, electronic media and stimulate intellectual faculties/resources

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Give presentations and attend job interviews confidently.
- Speak confidently in challenging situations.
- Know the importance of Non-verbal communication and interpret nonverbal symbols
- Face computer based competitive exams like GRE, TOFEL, and IELTS.

Unit-1: Body Language

Unit-2: Dialogues

Unit-3: Presentation Skills

Unit-4: Group Discussion

Unit-5: Interviews and Telephonic Interviews

Unit-6: Debates

TEXT BOOK:

"Strengthen your Communication Skills", Maruthi Publications, 2013.

REFERENCE:

1. *"Personality Development and Soft Skills"*, Oxford University Press, New Delhi.
2. M Ashraf Rizvi, *"Effective Technical Communication skills"*, McGraw-Hill, 2005.
3. Barun K Mitra, *"Personality Development and Soft Skills"*, Oxford University Press, 2011.
4. Konar N, *"Communication Skills for Professionals"*, PHI Learning Private Limited, 2011.

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I B.TECH - II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ENGINEERING CHEMISTRY LAB (Common to all Branches)							

COURSE OBJECTIVES:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results, and
- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

List of Experiments

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

Volumetric Analysis

1. Estimation of NaOH using standard HCl solution
2. Estimation of Mohr's salt using potassium dichromate ($K_2Cr_2O_7$) solution
3. Estimation of $CuSO_4$ using sodium thiosulphate ($Na_2S_2O_3$) solution.

Water Analysis

4. Determination of hardness of water sample by EDTA method
5. Determination of alkalinity of water sample
6. Determination of free chlorine in bleaching powder
7. Determination of turbidity of water sample

Conductometric Titrations

8. Conductometric titration between strong acid and strong base (HCl + NaOH)
9. Conductometric titration between mixture of acids and strong base (HCl and CH_3COOH + NaOH)

Food analysis

10. Estimation of Vitamin-C

Preparation of Polymeric Resins

11. Preparation of phenol formaldehyde resin
12. Preparation of urea formaldehyde resin

TEXT BOOKS:

1. K. Mukkanti, etal, *"Practical Engineering Chemistry"*, B.S. Publications, Hyderabad.
2. S.S. Dara, *"A text book on experiments and calculation Engg."*

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3. Chatwal, Anand, "*Instrumental methods of chemical analysis*", Himalaya Publications
4. "*Chemistry Practical Manual*", Lorven Publications
5. Vogel, "*Inorganic quantitative analysis*".

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I B.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
COMPUTER PROGRAMMING LAB (Common to ECE, EEE, Civil and Mechanical)							

COURSE OBJECTIVE:

- The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

- Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language.
- Know how to write, compile and debug programs in C Language.
- Understand and analyse data types, typecasting and operator precedence.
- Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.
- Explain and analyse simple data structures, use of pointers and dynamic memory allocation techniques.
- Summarize the role of functions involving the idea of modularity, know how to create files and apply file I/O operations.

Exercise 1

a) Write an Algorithm, Flowchart and Program to calculate the area of triangle using the formula Area = (s (s-a) (s-b) (s-c)) 1/2 where s= (a+b+c)/2.

b) Write an Algorithm, Flowchart and Program to find the largest of three numbers using ternary operator.

c) Write an Algorithm, Flowchart and Program to swap two numbers without using a temporary variable.

Exercise 2

a) Write a C program to find the roots of a quadratic equation.

b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.

b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 4

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

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b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.
c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5
a) Write a C program to interchange the largest and smallest numbers in the array.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

Exercise 6
a) Write a C Program to find both the largest and smallest number of an array of integers
b) Write a C Program to find transpose of a matrix.

Exercise 7
Write C programs that use both recursive and non-recursive functions for the following
i) To find the factorial of a given integer.
ii) To find the GCD (greatest common divisor) of two given integers.

Exercise 8
Write a C Program for the following.
i) To find Fibonacci sequence
ii) Write C programs illustrating call by value and call by reference concepts.

Exercise 9
Write C Programs for the following string operations without using the built in functions - to concatenate two strings
a) To append a string to another string
b) To compare two strings

Exercise 10
Write C Programs for the following string operations without using the built in functions
a) To find the length of a string
b) To find whether a given string is palindrome or not

Exercise 11
Write a C program that uses functions to perform the following operations:
i. To insert a sub-string in to given main string from a given position.
ii. To delete n Characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location

Exercise 12
a) Write a C program to implement a linear search.
b) Write a C program to implement binary search
c) Write a C program to implement sorting of an array of elements.

Exercise 13
a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two arrays using pointers
c) Write a C program to swap two numbers using pointers

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Exercise 14
Examples which explores the use of structures, union and other user defined variables

Exercise 15
a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

TEXT BOOKS:
1. Reema Thareja, "*Programming in C*", Oxford.
2. Dennis Richie and Brian Kernighan, *"The C programming Language"*, 2nd ed.

REFERENCES:
1 Dr. E. Balaguruswamy, *"Programming in ANSI C"* , Tata McGraw-Hill Education.
2. Hanly, Koffman, *"Problem Solving and Program Design in C"*, 7th ed, Pearson.
3. Forouzan, Gilberg, Prasad, *"C Programming, A Problem Solving Approach"*, Cengage.
4. Ashok N.Kamthane, *"Programming in C"*, Second Edition, Pearson.

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ELECTRONIC DEVICES AND CIRCUITS							

COURSE OBJECTIVES:

Students undergoing this course are expected to

1. Know the properties of semiconductor materials.
2. Understand the operation and principles of P-N diode and special diodes.
3. Understand various types of rectifiers and filters.
4. Know the working of BJT and need for transistor biasing and stabilization.
5. Know the working of FET and other Transistors.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Explore the semiconductors.
CO2: Use P-N diodes and special diodes in electronic circuits.
CO3: Analyze BJT and its thermal stability.
CO4: Explore the operation of FET, other transistors and their applications.

SYLLABUS:

UNIT- I: OVERVIEW OF SEMICONDUCTORS

Insulators, Semiconductors and Metals – Classification using Energy gap, Intrinsic and Extrinsic Semiconductors – Electrons and Holes, Conductivity, Mobility, Drift and Diffusion Currents, Transportation of Charge Carriers - Generation and Recombination of Carriers, Charge Densities in Semiconductors, Hall Effect - Quantitative Analysis and Applications, Continuity Equation, Mass Action Law, Einstein's Equation, Fermi level in intrinsic and extrinsic semiconductors.

UNIT- II: JUNCTION DIODE CHARACTERISTICS

P-N Junction Diode - Formation of P-N Junction, Open Circuited P-N Junction, Biased P-N Junction - Forward Bias, Reverse Bias, Current Components in P-N Junction Diode, Law of Junction, Diode Current Equation - Quantitative Analysis, V-I Characteristics of Diode - Forward Bias, Reverse Bias, Breakdown in P-N Junction Diode, Temperature Dependence on V-I Characteristics, Diode Resistance-Static Resistance, Dynamic Resistance, Reverse Resistance, Diode Capacitance - Transition Capacitance, Diffusion Capacitance, Energy Band Diagram of P-N Junction Diode.

UNIT- III: SPECIAL DIODES AND RECTIFIERS

Zener Diode - V-I Characteristics, Applications, Breakdown Mechanisms - Zener Breakdown and Avalanche Breakdown, Construction, Operation, Characteristics and applications of LED, LCD, Photodiode, Varactor Diode and Tunnel diode.

Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, L– Section and π- Section, Derive and compare rectifier parameters with and without filter.

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UNIT- IV: BIPOLAR JUNCTION TRANSISTOR (BJT)

Bipolar Junction Transistor – Types, Symbols and Operation, Transistor Current Components, Transistor Equation - Relation among I_C, I_B, I_{CBO}, Transistor Configurations - CB, CE and CC, Transistor as a switch, Transistor switching times, Transistor as an Amplifier, Characteristics of Transistor in Common Base Configuration, Common Emitter and Common Collector Configurations - Input and output characteristics, Early effect, Transistor parameters, Current amplification factor, Relation among α, β, and γ, Comparison of CB, CE and CC Configurations, Punch Through/ Reach through, Typical transistor junction voltage values, Photo Transistor.

UNIT- V: BJT BIASING AND THERMAL STABILITY

Need For Biasing, Operating Point, Load Line Analysis - D.C. Load Line, A.C. Load Line, Biasing - Methods, Basic Stability, Fixed Bias, Collector-to-base Bias and Self Bias, Stabilization against variations in V_{BE}, I_c and β, Stability Factors S, S' and S'', Bias Compensation - Thermistor, Sensistor, Diode Compensation for variation in I_{CO}, Thermal Runaway, Thermal Stability.

UNIT- VI: FET & OTHER TRANSISTORS

FET Types and Symbols - JFET and MOSFET/IGFET, JFET: N- Channel and P-Channel Construction, Operation, Characteristics - Drain and Transfer, Parameters - Drain Resistance, Amplification factor, Transconductance, Pinch-off voltage, MOSFET - Types - Depletion MOSFET - N Channel and P Channel, Enhancement MOSFET - N-Channel and P-Channel, Construction, Operation, Characteristics - Transfer and Drain Characteristics for Depletion and Enhancement Modes , Comparison between JFET and MOSFET.

SCR- Symbol, Two-Transistor version, UJT - Negative Resistance Property and Applications.

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman, C. Halkias, Tata McGraw-Hill, Third Edition, 2010.
2. Electronic Devices and Circuits – Allen Mottershed, PHI, 2011.
3. Electronic Devices and Circuits – Salivahanan, N. Suresh Kumar, A. Vallavaraj, Tata McGraw-Hill, Second Edition, 2008.

REFERENCE BOOKS:

1. Integrated Electronics – Jacob Millman, C. Halkies, C.D. Parikh, Satyabrata Jit, Tata McGraw-Hill, Second Edition, 2011.
2. Electronic Devices and Circuit Theory – R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.
3. Electronic Devices and Circuits – A.P. Godse and U.A. Bakshi, Technical Publications, First Edition, 2009.

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
SIGNALS AND SYSTEMS							

COURSE OBJECTIVES:

1. To get an in-depth knowledge about signals and analysis of the same using various transforms.
2. Able to know different types of signals and their frequency domain analysis.
3. Understand the principle, filter characteristics and bandwidth of a linear system.
4. Understand the concepts of auto correlation, cross correlation and power density.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Know about basic signals and its operations.
CO2 : Represent time-domain signals in frequency-domain using different transforms.
CO3 : Understand the LTI system and responses for different inputs using Convolution method.
CO4 : Understand Sampling theorem and its applications, Correlation and its applications.

SYLLABUS:

UNIT- I: SIGNAL ANALYSIS

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition. Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function. Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT- II: FOURIER SERIES

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Conversion of Exponential Fourier Series from Trigonometric Fourier series & vice versa.

UNIT- III: FOURIER TRANSFORMS

Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of periodic signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT- IV: LAPLACE TRANSFORMS AND SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS

Laplace Transforms

Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Properties of Laplace transforms, Relation between Laplace transform and Fourier transform.

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Signal Transmission through Linear Systems

System and its types: Linear & Non-Linear, Time Variant & Time Invariant, Causal & Non Causal, Static & Dynamic, Stable & Unstable. Impulse response of a linear time invariant (LTI) system and linear time variant (LTV) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF and its characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT- V: SAMPLING

Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

UNIT- VI: CONVOLUTION, CORRELATION AND PSD OF SIGNALS

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms, Cross correlation and auto correlation functions, Properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function, Relation between convolution and correlation.

TEXT BOOKS:

1. Signals, Systems and Communications – B.P. Lathi, BS Publications, 2008.
2. Signals and Systems – Simon Haykin and Van Veen, Wiley, Second Edition, 2003.

REFERENCE BOOKS:

1. Signals and Systems – A.V. Oppenheim, A.S. Will sky and S.H. Nawab, PHI, Second Edition, 2013.
2. Signals and Systems – Ramesh Babu, SciTech Publications, Third Edition, 2011.
3. Signals and Systems – A. Anand Kumar, PHI Publications, Third Edition, 2013.

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	3	1	0	40	60	100	3
CONTROL SYSTEMS							

COURSE OBJECTIVES:

1. Learn the fundamental concepts of Control systems and mathematical modeling of the system.
2. Know various systems and time response analysis for various inputs.
3. Understand the basics of stability analysis of the system.
4. Study the frequency response analysis of the system and classical control design techniques.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Represent the mathematical model of a system.
CO2 : Determine the time response of different order systems for various inputs.
CO3 : Analyze the stability of the system.
CO4 : Understand the frequency response analysis of the system and classical control design techniques.

SYLLABUS:

UNIT- I: INTRODUCTION

Concepts of Control Systems: Open loop and Closed loop control systems and their differences, Different examples of control systems, Classification of control systems, Feed-Back characteristics, Effects of feedback: Gain, Stability, External Disturbance or Noise and Sensitivity, Mathematical models: Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems, Analogous Systems: Force-voltage, Force-Current, Torque-voltage, Torque-Current.

UNIT- II: TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servomotors: Armature controlled and Field Controlled DC Servomotor, Transfer Function of AC Servo motor, Block diagram representation of systems considering electrical systems as examples: Block diagram algebra, Representation by Signal flow graph, Terms used in SFG, Reduction using Mason's gain formula.

UNIT- III: TIME RESPONSE ANALYSIS

Unit Standard test signals: Step, Ramp, Parabolic and Impulse, Time response of first order systems: step, unit ramp and unit impulse, Characteristic Equation of Feedback control systems, Transient response of second order systems: Unit step input, Time domain specifications: Delay time, Rise time, Peak time, Peak over shoot and Settling time, Steady state response: Steady state errors and error constants – K_p, K_v and K_a, Effects of proportional derivative, proportional integral systems.

UNIT- IV: STABILITY ANALYSIS IN S-DOMAIN AND ROOT LOCUS TECHNIQUE

Stability Analysis in S-Domain

The concept of stability, Necessary condition for stability, Routh's stability criterion, Difficulties

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in the formation of Routh table. Qualitative stability and Conditional stability.

Root Locus Technique

The root locus concept: construction of root loci, Effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT- V: FREQUENCY RESPONSE ANALYSIS AND STABILITY ANALYSIS IN FREQUENCY DOMAIN

Frequency Response Analysis

Introduction to Frequency domain specifications: Resonant peak, Resonant frequency, Bandwidth, Bode diagrams: Determination of frequency domain specifications and transfer function from the Bode diagram, Phase margin and Gain margin, Stability Analysis from Bode plots.

Stability Analysis in Frequency Domain

Polar plots, Nyquist plots, Stability analysis, Determination of Phase margin and Gain margin.

UNIT- VI: CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques: Lag, Lead, Lead-Lag Controllers design in frequency domain, PID controllers, State Space Analysis of continuous systems Concepts of state, state variables and state model, state space representation using physical variables: Electrical systems, state space representation using phase variables: state model from differential equations and Transfer functions, Diagonalization, solving the time invariant state equations, State transition matrix, Properties, Concepts of controllability and observability.

TEXT BOOKS:

1. Control Systems Engineering – I. J. Nagrath and M. Gopal, New Age International Pvt Ltd, Sixth Edition, 2017.
2. Automatic Control Systems – B.C. Kuo, John Wiley & Sons, Eighth Edition, 2003.

REFERENCE BOOKS:

1. Modern Control Engineering – Katsuhiko Ogata, Pearson, Fifth Edition, 2009.
2. Control Systems – N. K. Sinha, New Age International, Fourth Edition, 2013.
3. Control Systems – A. Anand Kumar, PHI Learning Pvt. Ltd, Second Edition, 2014.

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	3	1	0	40	60	100	3
DATA STRUCTURES							

COURSE OBJECTIVES:

1. Comprehensive knowledge of data structures and exposure to recursive algorithms, searching and sorting techniques
2. Apply stack and queue data structures for logical operations
3. Understand Linked-list representation models in various types of applications
4. Implementation of trees in various forms, orientation on graphs, representation of graphs, graph traversals

COURSE OUTCOMES:

After the completion of this course, the student should be able to

CO1: Analyze algorithms, searching and sorting techniques
CO2: Explain elementary data structures such as stacks, queues and linked lists
CO3: Implement trees and advanced concepts of trees in various forms
CO4: Design a variety of graph data structures and used in practical applications

SYLLABUS:

UNIT- I: INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS

Basic Terminology, Elementary Data Structure Organization, Classification of Data structures, Operations on Data structures, Abstract Data Type. **Recursion**: Pseudo code, recursive examples, Factorial, GCD implementation, Fibonacci numbers.

UNIT- II: SEARCHING AND SORTING

Introduction to Searching, Linear Search, Binary Search, Introduction to Sorting, Internal Sorting, External Sorting, Insertion sort, Merge sort.

UNIT- III: STACKS AND QUEUES

Stacks

Introduction to Stacks, Array Representation of stacks, Operations on stack, Push operation, pop operation, peek operation, Linked representation of stacks, operations on a linked stack, Push operation, pop operation, Applications of stacks, Evaluation of a postfix expression, Conversion of infix expression into a prefix expression.

Queues

Introduction, Array Representation of Queues, Linked representation of Queues, Circular Queues, Applications of queues.

UNIT- IV: LINKED LISTS

Introduction, Basic terminologies, Linked lists versus Arrays, Memory allocation and De-allocation for a linked list, single linked list, Traversing a Linked List, Searching a value in a linked list, inserting a new node in a linked list, Deleting a node from a linked list, Circular linked list, inserting a new node in a Circular linked list, Deleting a node from a Circular linked list, Doubly linked list, inserting a new node in a Doubly linked list, Deleting a node from a Doubly

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linked list.

UNIT- V: TREES

Introduction, Basic Terminology, Types of Trees, General Trees, Forests, Binary Trees,, Expression Trees, Traversing a Binary Tree, Pre-order Traversal, In-order Traversal, Post-order traversal, Level order traversal, (recursive & non-recursive), Constructing a Binary Tree from Traversals, Binary Search Trees, operations on Binary Search Trees, Searching for a node in Binary Search Tree, inserting a new node in Binary Search Tree, Deleting a node from a Binary Search Tree.

UNIT- VI: GRAPHS

Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Graph Traversal algorithms, Breadth- First Search Algorithm, Depth-First-Search Algorithm.

TEXT BOOKS:

1. Data Structures using C - Reema Thareja, Oxford, Second Edition, 2014.
2. Data Structures - Richard F. Gilberg, Cengage. Second Edition, 2007.

REFERENCE BOOKS:

1. Data Structures and Algorithms - G. A. V. Pai, TMH, 2008.
2. Data Structure with C - Seymour Lipschutz, TMH, 2010.
3. Data structures and algorithm analysis in C - Mark Allen Weiss, Pearson, Second Edition, 2002.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106102064/1

nptel.ac.in/courses/106103069

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	3	1	0	40	60	100	3

ELECTRICAL AND MECHANICAL TECHNOLOGY

COURSE OBJECTIVES:

1. To understand the principle of operation and construction details of DC machines and Transformers.
2. To understand the principle of operation and construction details of alternator and induction motor.
2. To understand the principles and construction of various measuring instruments.

COURSE OUTCOMES:

Upon completion of the course, students are able to

CO1: Understand the operation of DC machines and transformers.
CO2: Know about Principle of operation of three-phase induction motors and working principle of various measuring instruments.
CO3: Learn about different Modes of heat transfer
CO4: Analyse the Working principle of DC Generators and Motors

SYLLABUS:

UNIT- I: DC MACHINES AND TRANSFORMERS

DC Machines

Principle of operation of DC generator - emf equation - types of DC machine - torque equation of DC motor - applications - three point starter, speed control methods - OCC of DC generator - **(Simple Problems only)**

Transformers

Principle of operation of single phase transformers - e.m.f equation - losses - efficiency and regulation **(Simple Problems only)**

UNIT- II: AC ROTATING MACHINES

Principle of operation of 3-Phase induction motor - slip-torque characteristics - efficiency - applications.

Principle of operation of alternators - regulation by synchronous impedance method - **(Simple Problems only)**

UNIT– III: MEASURING INSTRUMENTS

Classification - Deflection, controlling, damping torque, ammeter, voltmeter, wattmeter, MI, MC instruments - Energy meter - Construction of CRO.

UNIT- IV: JOINING AND FORMING PROCESSES

Types of joining, arc welding, resistance welding, gas welding, brazing and soldering. Metal forming: forging, rolling and extrusion – operations, working and principle.

UNIT- V: HEAT TRANSFER

Modes of heat transfer - heat transfer parameters, various thermo physical properties. Conduction

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- heat transfer for extended surfaces. Fins. Convection - Mechanism, Natural and Forced Convection. Radiation- Thermal radiation, Blackbody radiation, Radiation intensity, Radiative properties.

UNIT- VI: POWER TRANSMISSION

Different types - power transmission by belts, ropes and chain. Gears: classification of gears, applications.

TEXT BOOKS:

1. Electrical Technology - Surinder Pal Bali, Pearson Publications, 2013.
2. Electrical Circuit Theory and Technology - John Bird, Routledge Taylor & Francis Group, Fifth Edition, 2014.
3. Electrical Machines - P.S.bimbra, Khanna Publishers, Seventh Edition, 2004.
4. Electrical Machines - J. B. Guptha, S. K. Kataria and sons Publishers, First Edition, 2010.
5. Workshop Technology - Vol I and II –Hazra Chowdary, Media promoters and Publications Pvt. Ltd.
6. Elements of Mechanical Engineering - V. K. Manglik, PHI Publications, 2013.

REFERENCE BOOKS

1. Basic Electrical Engineering - M.S.Naidu and S.Kamakshiah, TMH Publications
2. Fundamentals of Electrical Engineering - Rajendra Prasad, PHI Publications, Second Edition
3. Basic Electrical Engineering - Nagsarkar and Sukhija, Oxford Publications, Second Edition
4. Electrical Engineering - Prasad and Sivanagaraju, Cengage Learning
5. Electrical machines - D. P. Kothari, I. J. Nagarth, McGraw-Hill Publications, Fourth Edition.
6. Basic electrical engineering - M. S. Naidu and S. kamaksiah, TMH Publications.
7. Elements of Mechanical Engineering - Mathur, and Mehta, Jain Brothers, 2013
8. Internal Combustion Engines - V. Ganesan, Tata McGraw-Hill publications.

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	4	0	0	40	60	100	3
BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS							

COURSE OBJECTIVE:

To equip the student with the fundamental knowledge relating to economic principles, management concepts and fundamentals of the accounting.

COURSE OUTCOMES:

Upon completion of the course, students are able to

CO1: Learns necessary skills relating to the economics, management and accountancy which are useful for decision making.

CO2: Equip themselves with the basic principles of accounting which will be of help to them to know the fundamentals of accounting.

CO3: Acquire necessary skills relating to various functional aspects of management viz., Human Resource Management, Marketing Management etc.

CO4: Acquaint with the latest management concepts and practices which are used in the industry.

SYLLABUS:

UNIT- I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definitions, Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants- Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Demand Forecasting Techniques.

UNIT- II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Function- Law of Variable Proportions- Economies of Scale- Cost Concepts- CVP Analysis (With Simple Problems) - Significance- Limitations- Introduction to Markets – Features of various markets- Perfect competition, Monopoly and Oligopoly.

UNIT- III: INTRODUCTION TO FINANCIAL ACCOUNTING

Definition- GAAP principles- types of accounting- Double Entry System- Journal Entries - Ledger- Trial Balance- Income statement-Balance sheet-Final Accounts with Simple Adjustments.

UNIT- IV: INTRODUCTION TO MANAGEMENT

Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management- F. W. Taylors Scientific Management- Douglas Mc Gregors Theory X and Y- Challenges of Management.

UNIT- V: FUNCTIONAL AREAS OF MANAGEMENT (1)

Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing Manager- Production Management-Functions of Production Management – Methods of Production- Job Production, Batch Production and Mass Production – Method Study- Inventory Management- ABC Analysis – EOQ Analysis.

UNIT- VI: FUNCTIONAL AREAS OF MANAGEMENT (2)

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Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis- Financial Management- Concepts of Capital –Working Capital- Capital Budgeting- Functions of Financial Management.

TEXT BOOKS:

1. Managerial economics and financial analysis - Dr. N. APPARAO, Dr. P. Vijay Kumar, Cengage publication's. New Delhi. 2011.
2. Managerial Economics and Financial Analysis - Dr. A. R. Aryasri, TMH, 2011.
3. Managerial Science - Dr. P. Vijaya Kumar, Dr. N. Appa Rao, Cengage. Delhi, 2012.

REFERENCE BOOKS:

1. Managerial Economies – Varshney, Maheswari, Sultan Chand and Sons, New Delhi.
2. Managerial Economics - Suma Damodaran, Oxford, 2011.
3. Essentials of Management – Koontz, Weihrich, TMH, 2011.
4. Strategic Management – Hitt, Vijaya Kumar, Cengage learning, New Delhi, 2010.

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	0	0	3	25	50	75	2
ELECTRONIC DEVICES AND CIRCUITS LAB							

COURSE OBJECTIVE:

This lab course is intended to know the usage of various electronic equipment and to study the characteristics of different electronic devices.

COURSE OUTCOMES:

After the completion of this course, the student should be able to

CO1 : Understand and analyze the behavior of PN junction diode, Zener diode, LED and their applications.

CO2 : Understand the characteristics of BJT in CE, CB, CC configurations and FET in CS configuration and their applications.

CO3 : Understand the characteristics and applications of SCR and UJT.

LIST OF EXPERIMENTS:

1. P-N Junction Diode Characteristics.
   Part A: Germanium Diode (Forward bias & Reverse bias).
   Part B: Silicon Diode (Forward bias & Reverse bias).
2. Zener Diode Characteristics.
   Part A: V-I Characteristics.
   Part B: As a Voltage Regulator.
3. V-I Characteristics of LED
4. Half-wave Rectifier (without and with filter).
5. Full-wave Rectifier (without and with filter).
6. Switching characteristics of BJT
7. BJT Characteristics (CE Configuration).
   Part A: Input Characteristics.
   Part B: Output Characteristics.
8. BJT Characteristics (CB Configuration).
   Part A: Input Characteristics.
   Part B: Output Characteristics.
9. BJT Characteristics (CC Configuration).
   Part A: Input Characteristics.
   Part B: Output Characteristics.
10. FET Characteristics (CS Configuration).
    Part A: Drain Characteristics.
    Part B: Transfer Characteristics.
11. SCR Characteristics.
12. UJT Characteristics.

Equipment required for Laboratory

1. Breadboard Trainers.
2. Ammeters (Analog or Digital).
3. Voltmeters (Analog or Digital).
4. Regulated Power Supplies.
5. Analog/Digital Storage Oscilloscopes.

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6. Analog/Digital Function Generators.
7. Digital Multimeters.
8. Decade Résistance Boxes/Rheostats.
9. Decade Capacitance Boxes.
10. Cathode Ray Oscilloscopes.

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
NETWORKS & ELECTRICAL TECHNOLOGY LAB							

COURSE OBJECTIVES:

1. To learn the steps used for verification of circuit theorems, the concepts of resonance in series and parallel circuits and calculate network parameters.
2. To determine the losses and efficiencies of a DC Machine, Transformer and Induction Machine.
3. To draw the performance curves and speed control of DC machines.

COURSE OUTCOMES:

Upon completion of the course, students are able to

CO1: Calculate the efficiency of Machines and Transformers and draw the performance curves of each.

CO2: Draw the no-load curve of a DC generator and calculate critical speed and critical resistance.

CO3: Verify and understand the basic circuit principles and theorems

Any five experiments are to be conducted from each part

PART – A

1. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q -factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z - Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem with both DC and AC supply with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

PART – B

1. Magnetization characteristics of D.C Shunt generator. Determination of critical field resistance.
2. Load Test on DC Series Generator.
3. Swinburne's Test on DC shunt machine (Predeterming efficiency of a given DC Shunt machine working as motor and generator).
4. Brake test on DC shunt motor. Determination of performance characteristics.
5. OC & SC tests on Single - phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
6. Brake test on 3-phase Induction motor (performance characteristics).

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	0	0	0	0
QUANTITATIVE ABILITY							

COURSE OBJECTIVES:

1. To train students in analyzing real life scenarios, considering all factors.
2. To educate the students on principles of mathematical problems and problem solving methods.
3. To train students for campus placements.

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student is able to:

CO1 : Prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements

CO2 : Critically evaluate various real life situations by resorting to Analysis of key issues and factors.

CO3 : Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

CO4 : Solve complex mathematical problems in the shortest time possible by applying shortcuts.

SYLLABUS FOR QUANTITATIVE APTITUDE:

UNIT– I: SIMPLE EQUATIONS, RATIO, PROPORTION AND VARIATION

1. **Simple equations**
   a. Definition of Linear Equations
   b. Formation of simple equations
   c. Problems on Ages, Fractions and Digits
   d. Indeterminate system of equations
   e. Special cases in indeterminate system of equations
2. **Ratio and proportion**
   a. Definition of Ratio
   b. Properties of Ratios
   c. Comparison of Ratios
   d. Problems on Ratios
   e. Compound Ratio
   f. Problems on Proportion, Mean proportional and Continued Proportion
3. **Variation**
   a. Direct variation
   b. Inverse variation
   c. Joint variation
   d. Problems on Variations

UNIT- II: PERCENTAGES, PROFIT AND LOSS, PARTNERSHIP, SIMPLE INTEREST AND COMPOUND INTEREST, QUADRATIC EQUATIONS AND PROGRESSIONS

1. **Percentages**
   a. Introduction
   b. Converting a percentage into decimals
   c. Converting a Decimal into a percentage
   d. Percentage equivalent of fractions
   e. Problems on percentages
2. **Profit And Loss**
   a. Problems on Profit and Loss percentage
   b. Relation between Cost Price and Selling price
   c. Discount and Marked Price
   d. Two different articles sold at same Selling Price
   e. Two different articles sold at same Cost Price
   f. Gain% / Loss% on Selling Price

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3. **Partnership**
   a) Introduction
   b) Relation between capitals, Period of investments and Shares
4. **Simple Interest**
   a) Definitions
   b) Problems on interest and amount
   c) Problems when rate of interest and time period are numerically equal
5. **Compound Interest**
   a) Definition and formula for amount in compound interest
   b) Difference between simple interest and compound interest for 2 years on the same Principle and time period
6. **Quadratic equations**
   a) General form of Quadratic equations
   b) Finding the roots of Quadratic equations
   c) Nature of the roots
   d) Relation between the roots
   e) Maximum and minimum value of Quadratic Expression
7. **Progressions**
   a) Arithmetic Progression
   b) Geometric Progression
   c) Harmonic Progression
   d) Arithmetic Mean, Geometric Mean, Harmonic Mean and their relation.

SYLLABUS FOR REASONING:

UNIT- III: DEDUCTIONS & CONNECTIVES

1. **Deductions**
   a) Finding the conclusions using Venn diagram method
   b) Finding the conclusions using syllogism method
2. **Connectives**
   a) Definition of a simple statement
   b) Definition of compound statement
   c) Finding the Implications for compound statements
   d) Finding the Negations for compound statements

UNIT-IV: ANALYTICAL REASONING PUZZLES

1. **Analytical Reasoning puzzles**
   a) Problems on Linear arrangement
   b) Problems on Circular arrangement
   c) Problems on Double line-up
   d) Problems on Selections
   e) Problems on Comparisons

UNIT-V: CLOCKS, CALENDARS & BLOOD RELATIONS

1. **Clocks**
   a) Finding the angle when the time is given
   b) Finding the time when the angle is known
   c) Relation between Angle, Minutes and Hours
   d) Exceptional cases in clocks
2. **Calendars**
   a) Definition of a Leap Year
   b) Finding the number of Odd days
   c) Framing the year code for centuries

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d) Finding the day of any random calendar date

3. **Blood relations**
   a) Defining the various relations among the members of a family
   b) Solving Blood Relation puzzles
   c) Solving the problems on Blood Relations using symbols and notations

TEXT BOOKS:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

REFERENCES BOOKS:

1. www.careerbless.com/**aptitude**/qa/home.php
2. www.affairscloud.com/**quantitative-aptitude**-questions
3. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
4. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
5. www.indiabix.com

www.practice**aptitude**tests.com/numerical-**reasoning**-tests

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3

SWITCHING THEORY AND LOGIC DESIGN

COURSE OBJECTIVES:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations & to familiarize with the concepts of Boolean algebra.
4. To design combinational logic circuits, sequential logic circuits.
5. To implement synchronous and asynchronous state machines using flip-flops.

COURSE OUTCOMES:

Upon Successful completion of the course, the students are able to

CO1 : Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.

CO2 : Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

CO3 : Design and analyze combinational circuits and sequential circuits

CO4 : Apply different models of Finite State Machines for design of sequential circuits.

SYLLABUS:

UNIT- I: NUMBER SYSTEMS & CODES

Number systems: Representation of numbers of different radix, Conversation from one radix to another radix, R-1's compliments and r's compliments of signed numbers, Problem solving. Arithmetic operations (addition & subtraction): Binary, Octal, Decimal & Hexadecimal. Binary Codes: Classifications, BCD, Execess-3, Gray and their Properties, Error detecting and correcting codes: Parity checking, Even parity, Odd parity, Hamming code (7, 12 & 15 bit).

UNIT- II: LOGIC OPERATIONS AND MINIMIZATION TECHNIQUES

Logic Operations

Basic logic operations- AND, OR, NOT, Universal building blocks, EX-OR, EX- NOR gates, Boolean theorems, Principle of complementation & Duality, De-Morgan theorems, Standard SOP & POS forms and their conversions, Two level NAND – NAND and NOR- NOR realizations.

Minimization Techniques

Minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, Tabular (Quine-McCluskey) minimization, Problem solving.

UNIT- III: COMBINATIONAL LOGIC CIRCUITS DESIGN

Introduction, Design procedure, Adders & Subtractors: Design of Half adder, Full adder, Half subtractor, Full subtractor, Applications: 4-bit binary parallel adder, Binary parallel subtractor, Adder-Subtractor circuits & Look ahead carry adder. BCD adder circuit, Excess 3 adder circuit. Encoders & Decoder: Design of decoder, Encoder, 4- priority encoder, Realization of Boolean functions using decoders. Multiplexers & Demultiplexers: Design, Higher order,

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Realization of Boolean functions using multiplexers & demultiplexers. Comparators: Design of 2. 3 & 4-bit digital comparator.

UNIT- IV: INTRODUCTION TO PLDs

Introduction to PLDs, Realization of switching functions using PROM, PLA and PAL, Basics structures, Programming tables of PLDs, Merits & demerits of PROM, PAL and PLA comparison, Implementation of code converters.

UNIT- V: SEQUENTIAL CIRCUITS – I

Basic Architectural Distinctions between Combinational and Sequential circuits, Fundamentals of Sequential Machine Operation.

Latches and Flip Flops

SR, JK, D and T type Flip Flops, Race Around Condition in JK, JK Master Slave flip flop, Excitation table of all Flip Flops. Conversion from one flip-flop to another flip-flop.

Registers and Counters

Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Bidirectional Shift Registers, Universal Shift Register. Applications of Shift Registers, Design of synchronous and Asynchronous Counters, Design and Operation of Ring and Twisted Ring Counter.

UNIT- VI: SEQUENTIAL CIRCUITS – II

Finite State Machine: Analysis of clocked sequential circuits, State diagrams, State tables, Reduction of state tables using Partition technique and State assignment, Design procedures. Realization of circuits using various flip-flops. Mealy to Moore conversion and vice-versa.

TEXT BOOKS:

1. Digital Design – M. Morris Mano, PHI, Fourth Edition, 2008.
2. Switching and Finite Automata Theory – Zvi Kohavi, Cambridge University Press, Third Edition, 2009.
3. Switching Theory and Logic Design – A. Anand Kumar, Prentice-Hall of India Pvt.Ltd, Second Edition, 2014.

REFERENCE BOOKS:

1. Modern Digital Electronics – R. P. Jain, TMH, Fourth Edition, 2010.
2. Fundamentals of Logic Design – Charles H. Roth, Jr, Jaico Publishing House, Fourth Edition, 2006.
3. Microelectronics – Jacob Millman, Arvin Grabel, TMH, Second Edition, 2009.
4. Introduction to Switching Theory & Logical Design – Frederick J. Hill & Gerald R. Peterson, John Wiley & Sons Inc. Second Edition, 1974.

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	3	1	0	40	60	100	3
ELECTRONIC CIRCUIT ANALYSIS							

COURSE OBJECTIVES:

1. Analysis of single stage and multistage amplifiers
2. Frequency response of single stage and multistage amplifiers.
3. Different power amplifiers and tuned amplifiers.
4. Concept of negative feedback in amplifiers.
5. Operation, types and stability of Oscillators

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Understand the transistor configuration at different frequency responses.
CO2 : Design different single stage and multistage amplifiers.
CO3 : Know the importance of negative feedback in amplifiers
CO4 : Understand the applications of oscillators, power and tuned amplifiers.

SYLLABUS:

UNIT- I: THE TRANSISTOR AT LOW FREQUENCIES

Graphical Analysis of the CE configuration, Two port devices and the Hybrid Model, Transistor Hybrid Model, Determination of h-parameters from characteristics, Conversion of h-parameters, Analysis of a transistor amplifier circuit using h-parameters, The emitter follower, Comparison of Transistor amplifier configurations. Simplified common emitter hybrid model-Current gain, Input impedance, Voltage gain and output impedance.

FET: FET small signal model, Low frequency common source and common drain amplifiers, FET as Voltage Variable Resistor, Biasing the FET.

UNIT- II: THE TRANSISTOR AT HIGH FREQUENCIES

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model-elements in the hybrid- π, Hybrid π parameter values, Hybrid π conductance- transistor trans conductance, Input conductance, Feedback conductance, Base spreading resistance, Output resistance, Hybrid π capacitances, Validity of hybrid π model, High frequency analysis of CE amplifier-CE short circuit current gain, Current gain with resistive load, Single stage CE transistor amplifier response, Cut-off frequencies and Gain bandwidth product.

FET: Analysis of common source and common drain Amplifier circuits at high frequencies.

UNIT- III: MULTISTAGE AMPLIFIERS

Introduction, Classification of Amplifiers, Distortion in amplifiers, RC coupled amplifier, Low frequency response of an RC coupled stage, High frequency response of two cascaded CE transistor stage, High input resistance transistor circuits- Darlington pair, Biasing problem, Bootstrapped Darlington circuit.

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UNIT– IV: FEEDBACK AMPLIFIERS

Feedback principle and concept. Types of feedback, Classification of amplifiers- Voltage amplifier, Current amplifier, Transconductance amplifier, Transresistance amplifier, Feedback topologies, Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers, Analysis feedback amplifier- Voltage series feedback, Current shunt feedback.

UNIT- V: OSCILLATORS

Introduction, Oscillator principle and condition for oscillation, Types of oscillators, RC phase shift oscillator using BJT, RC phase shift oscillator using BJT with cascade connection of high pass and low pass filters. Wien bridge oscillator using BJT, Generalized analysis of LC oscillators-load impedance, Voltage gain without feedback, feedback fraction, equation of the oscillator, Hartley oscillator with BJT and their analysis, Colpitts Oscillator with BJT and their analysis and Crystal oscillators-quartz crystal construction.

UNIT- VI: POWER AMPLIFIERS

Introduction, Definition and Amplifier types - Class A, Class B, Class AB, Class C and Class D amplifiers, Amplifier efficiency, Series fed class A amplifier-D.C. bias operation, AC operation, Efficiency, Maximum efficiency, Transformer coupled Class A amplifier-transformer action, Operation of amplifier stage efficiency, Class B amplifier operation- Input power, Output power, Efficiency, Class B amplifier circuits – Transformer coupled push pull circuits, Complementary symmetry circuits, Power transistor heat sinking, Class C and Class D amplifiers.

TEXT BOOKS:

1. Integrated Electronics Analog and Digital Circuits and Systems – Jacob Millman, Christos C Halkias, Tata McGraw-Hill, Fifty Edition, 1991.
2. Electronic Devices and Circuit Theory – R.L. Boylestad and Louis Nashelsky, Pearson Publications, Eleventh Edition, 2013.

REFERENCE BOOKS:

1. Electronic Devices and Circuits – Salivahanan, N. Suresh Kumar, A. Vallavaraj, Tata McGraw-Hill, Second Edition, 2008.
2. Introductory Electronic Devices and Circuits – Robert T. Paynter, Pearson Education, Seventh Edition, 2006.
3. Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, Fifth Edition, 2004.
4. Electronic Circuit Analysis and Design – Donald A. Neaman, Tata McGraw-Hill, Second Edition, 2001.

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	3	1	0	40	60	100	3
PULSE AND DIGITAL CIRCUITS							

COURSE OBJECTIVES:

1. Study the concepts of wave shaping circuits, switching characteristics of diode and transistor.
2. Analyze different types of Multi vibrators and their design procedures.
3. Study the Time-base Generators.
4. Study Sampling Gates and design NAND and NOR gates using various logic families.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Understand different linear and non-linear wave shaping circuits.
CO2 : Understand different diode and transistor switching times.
CO3 : Design different multi-vibrators.
CO4 : Analyze time base generators and sampling gates.

SYLLABUS:

UNIT- I: LINEAR WAVE SHAPING

The high pass and low pass RC circuits: Sinusoidal input, Step input, Pulse input, Square and Ramp input, RC network as a differentiator and an integrator, RL and RLC circuits and their response for step input.

UNIT- II: NON-LINEAR WAVE SHAPING

Diode and its characteristics, Diode series clippers, Diode parallel clippers, Transistor clippers, Two level clipping circuits and Emitter coupled clipper, Comparators, Applications of voltage comparators, Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem, Practical clamping circuits, Effect of diode characteristics on clamping voltage.

UNIT- III: SWITCHING CHARACTERISTICS OF DEVICES

Diode as a switch, Diode switching times, Piecewise linear diode characteristics, Transistor as a switch, Transistor switching times (delay time, rise time, storage time and fall time), Break down voltage consideration of transistor, Design of transistor switch, Characteristics of logic family, Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families.

UNIT- IV: MULTIVIBRATORS-I

Introduction to multivibrator, Types of multivibrator, Analysis and design of fixed bias, self-bias bistable multivibrator, Calculation of heaviest load current, Collector catching Diodes, Commutating Capacitors, Methods of Triggering using RC network & Diode.

UNIT- V: MULTIVIBRATORS-II

Analysis and design of collector coupled monostable multivibrator, Triggering methods of a monostable multivibrator, Application of monostable multivibrator as a voltage to time converter, Analysis and design of collector coupled astable multivibrator, Expression for time period T,

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Astable Multivibrator as a voltage to frequency converter. Schmitt trigger: operation of the circuit, Hysteresis, calculation of UTP and LTP and applications.

UNIT- VI: TIME BASE GENERATORS AND SAMPLING GATES

Time Base Generators

General features of a time-base signal, Errors and expressions for sweep speed error, displacement error and transmission error, Relation between e_s, e_d and e_t, Methods of generating time base waveform, Miller and Bootstrap time base generators and basic principles, Transistor Miller time base generator, Transistor Bootstrap time base generator, Current Time-base generators.

Sampling Gates

Basic operating principles of sampling gates, Unidirectional sampling gates, Bidirectional sampling gates, Two diode sampling gates, four diode sampling gate, Sampling oscilloscope, Reduction of pedestal in gate circuits, Applications of sampling gates.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms – J. Millman, H. Taub and Mothiki S. Prakash Rao, Tata McGraw-Hill, Second Edition, 2008.
2. Solid State Pulse circuits – David A. Bell, PHI, Fourth Edition, 2002.

REFERENCE BOOKS:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, Second Edition, 2005.
2. Wave Generation and Shaping – L. Strauss, Tata McGraw-Hill, Second Edition, 1970.
3. Pulse and Digital Circuits – Mothiki S. Prakash Rao, Tata McGraw-Hill, 2006.
4. Pulse and Digital Circuits – Venkata Rao K, Rama Sudha K, Manmadha Rao G, Pearson Education India, 2010.

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ANALOG COMMUNICATIONS							

COURSE OBJECTIVES:

1. Understand Modulation & demodulation techniques of AM, DSB, SSB,VSB and know Frequency Division Multiplexing
2. Understand Modulation & demodulation techniques and Know Properties of FM
3. Know Noise Figure in AM & FM receiver systems
4. Understand Function of various stages of AM, FM transmitters and Characteristics of AM & FM receivers.
5. Understand Modulation & demodulation techniques of PAM & PTM.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Analyze the percentage of modulation in FM systems and spectrum of FM signal.
CO2: Describe signal power by using power spectral characteristics in AM and FM systems.
CO3: Analyze noise characteristics in the channel communications.
CO4: Design AM and FM transmitters and receivers.

SYLLABUS:

UNIT- I: AMPLITUDE MODULATION

Introduction to communication system-Block Diagram Of Communication Systems, Need for modulation, Types of Modulation-Continuous Wave Modulation, Pulse Modulation, Amplitude Modulation, Time and frequency domains description, Single tone modulation-Modulation Index, Degree Of Modulation, Power relations in AM waves-Efficiency of modulation, AM current calculation, Generation of AM waves-Square law Modulator, Switching modulator,
Detection of AM waves-Square law detector and Envelope detector.

UNIT- II: DSB & SSB MODULATION

DSBSC Time and Frequency domain description-Bandwidth of DSB-SC wave, Power calculation in DSB-SC Wave, Generation of DSBSC Waves-Balanced Modulator, Ring modulator, Coherent detection of DSB-SC Modulated Wave-Effect of Phase Error, Effect of Frequency Error and COSTAS Loop.
SSBSC Time and Frequency domain description-Power Relations in SSB-Wave, Generation methods of AM SSB Waves -Frequency discrimination, Phase discrimination, Weavers method, Demodulation of SSB Waves-Coherent Detection, Envelop Detector, VSB modulation: Time and Frequency domain description, Generation of VSB Modulated wave, Comparison of AM Techniques, Applications of different AM Systems

UNIT- III: ANGLE MODULATION

Basic concepts-Time domain description of FM, Time domain description of PM, Frequency Modulation, Single tone frequency modulation-Frequency Deviation, Modulation index, Percent Modulation, Spectrum Analysis of Sinusoidal FM Wave-Constant BW FM, Narrow band FM-Generation of NBFM Wave, Frequency spectrum of NBFM, Phasor diagram of NBFM, Wide

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band FM-Important properties of Bessel Function, Frequency spectrum of WBFM, Constant Average Power, Transmission bandwidth of FM Wave, Generation of FM Waves -Armstrong method, Direct FM, Varactor Diode Modulator, Reactance Tube Modulator, Detection of FM Waves-Slope detector, Foster-seely discriminator, Ratio detector, Balanced Frequency discriminator, Zero crossing detector, Phase Locked Loop and Comparison of FM &AM

UNIT- IV: NOISE

Introduction to Noise, Types of Noises –Man made noise, Thermal Noise, White Gaussian Noise, Noise in Analog communication System-Calculate Figure of merit, SNR, Noise in DSB & SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

UNIT- V: RADIO TRANSMITTERS & RECEIVERS

Radio Transmitters-Function of a Transmitter, Basic Components of a Radio Transmitter, Classification of Transmitter- MW, SW, UHF and VHF, Micro Wave Transmitter, AM, FM, PM, TV, Radiobroadcasting Transmitters, AM Transmitter-Low-Level Transmitter, High Level Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type, Phase modulated FM Transmitter, Frequency stability in FM Transmitter

Radio Receivers - Receiver Types- AM, FM, Communication, Television, Radar Receivers, And Radio Receivers, Tuned radio frequency receiver-Block Diagram of TRF Receiver, Draw backs of TRF Receiver, Super heterodyne receiver-Block Diagram of Super heterodyne Receiver, And Advantages, RF section and Characteristics- Tuned Circuit, RF Amplifier, Sensitivity, Selectivity, Fidelity, Noise Figure, Image Frequency and its Rejection, Frequency changing and tracking-Conversion Trans Conductance, Separately Excited Mixer, Self-Excited Mixer, Padder Tracking, Trimmer Tracking, Three Point Tracking, Intermediate frequency - Choice of Intermediate Frequency, IF Amplifier AGC-Simple AGC, Delayed AGC, FM Receiver-RF Amplifier Section, Oscillator and Mixer, IF Amplifier and Amplitude limiting.

UNIT– VI: PULSE MODULATION

Types of Pulse modulation- PAM, PPM, PWM, Difference between Pulse Analog and Digital Modulation Techniques, PAM (Single polarity, Double polarity): Generation and demodulation-Naturally Sampled PAM Signal, Ideally Sampled PAM Signal, Flat –Top Sampled PAM Signal, Generation and Demodulation of PAM Wave, Advantages and Disadvantages of PAM Wave.

PTM- PWM and PPM, PWM: Generation & demodulation-Frequency spectrum for PWM Wave, Advantages and Disadvantages of PWM Wave, PPM: Generation and demodulation-Advantages and Disadvantages of PPM Wave

Multiplexing: Frequency Division Multiplexing-Define Multiplexing, Block Diagram of FDM, Advantages and Disadvantages of FDM, Time Division Multiplexing-Block Diagram of TDM, Advantages and Disadvantages of TDM, Comparison between TDM and FDM.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub, D. Schilling and Gautam Saha, TMH, Third Edition, 2008.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, Fifth Edition, 2011.
3. Communication Systems – B.P. Lathi, BS Publication, 2008.

REFERENCE BOOKS:

1. Communication Systems – Simon Haykin, John Wiley, Fifth Edition, 2017.

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2. Communication Systems – R.P. Singh, S.D. Sapre, TMH, Second Edition, 2007.
3. Fundamentals of Communication Systems - John G. Proakis, Masoud, Salehi, Pearson, Second Edition, 2014.

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
EM WAVES AND TRANSMISSION LINES							

COURSE OBJECTIVES:

1. To introduce the concepts of Electrostatics and Magneto statics.
2. To understand Electromagnetic Waves and their Propagation.
3. To understand the Maxwell's Equations and boundary conditions.
4. To familiarize with the transmission line concepts.

COURSE OUTCOMES:

After completion of this course, the students will be able to

CO1: Apply the concepts of Electric and Magnetic Fields in different applications.

CO2: Apply Maxwell's equations in electromagnetics.

CO3: Understand wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media.

CO4: Understand wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications.

SYLLABUS:

UNIT- I: ELECTROSTATICS

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Field Intensity due to point charge, Infinite line charge, Infinite sheet of charge, Uniformly charged sphere, Electric Potential - Electric Potential due to point charge and infinite line charge, Energy Density, Poisson's and Laplace's Equations.

UNIT- II: MAGNETOSTATICS

Biot-Savart Law, Ampere's Law and Applications, Magnetic Flux Density, Magnetic Vector Potential.

UNIT- III: MAXWELL'S EQUATIONS

Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Continuity Equation, Maxwell's Equations in Differential and Integral Forms and Word Statements for static fields and time varying fields of electric and magnetic.

UNIT- IV: EM WAVES

Types of Media, Wave Propagation in Perfect Dielectrics, Lossy (General Case - conducting) media. Uniform Plane Waves – Definition, Uniform Plane Wave Propagation in Free Space and Conducting media, Conductors & Dielectrics – Characterization. Poynting Vector and Poynting Theorem – Applications.

UNIT- V: EM WAVE CHARACTERISTICS

Electric and Magnetic Boundary Conditions, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidence on Perfect Dielectric and conductor, Brewster Angle, Critical Angle and Total Internal Reflection Surface Impedance.

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UNIT- VI: TRANSMISSION LINES

Types, Parameters, Transmission Line Equations, Primary and Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless/Low Loss Characterization, Distortion – Condition for Distortionless and Minimum Attenuation, Loading - Types of Loading, Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR,. UHF Lines as Circuit Elements: $\lambda/4$, $\lambda/2$ and $\lambda/8$ Lines.

TEXT BOOKS:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, Second Edition, 2000.
2. Elements of Electromagnetics – Matthew N.O. Sadiku, Oxford Univ. Press, Third Edition, 2001.
3. Electromagnetic Waves and Transmission Lines – G. S. N. Raju, Pearson Education India, 2006.

REFERENCE BOOKS:

1. Electromagnetic Field Theory and Transmission Lines – G. Sasi Bhushana Rao, Wiley India Pvt Ltd, 2012.
2. Electromagnetics – J. D. Kraus, Keith R. Carver, TMH, Third Edition, 1984.
3. Schaum's Outline of Electromagnetics – J.A. Edminister, Mahmood Nahvi, TMH, Fourth Edition, 2014.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2010.

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II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
DATABASE MANAGEMENT SYSTEMS							

COURSE OBJECTIVE:

This course Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Acquire knowledge in fundamentals of DBMS and identify the differences between traditional file system and DB systems.

CO2 : Understand various DBMS models and how queries are being processed and executed in RDBMS.

CO3 : Analyse DB design methodology and normalization process.

CO4 : Discuss the various transaction and concurrency management techniques and various files indexing techniques.

SYLLABUS:

UNIT- I: INTRODUCTION

Database system, Characteristics - Database vs. File System, Database Users -Actors on Scene, Workers behind the scene; Advantages of Data base systems, and Database applications, Brief introduction of different Data Models - Hierarchical, Network and Relational; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, Centralized and Client Server architecture for the database.

UNIT- II: ENTITY RELATIONSHIP MODEL

Introduction, Representation of entities, attributes, entity set, relationship, relationship set, Key constraints - Key constraints for Ternary Relationships, participation constraints, class hierarchies, Aggregation; sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT- III: SQL

Form of a basic SQL Query, Examples of Basic SQL Queries, Expressions and Strings in the SELECT Command, Simple Database schema, data types, table definitions, different DML operations, basic SQL querying using where clause, arithmetic and logical operations, SQL functions - Date and Time, Numeric, String conversion; Creating tables with relationship, implementation of key and integrity constraints, nested queries, correlated Nested Queries, set-Comparison Operators, sub queries, grouping, aggregate operators, ordering, implementation of different types of joins, view - updatable and non-updatable; relational set operations, SQL constructs that grant access or revoke access from user or user groups.

UNIT- IV: RELATIONAL MODEL

Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values - Comparisons Using Null Values, Logical Connectives AND, OR, and NOT, Impact on

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SQL Constructs. Disallowing Null Values; Integrity constraints in SQL - Domain constraints, Entity constraints. Referential integrity constraints. Assertions.

UNIT- V: SCHEMA REFINEMENT (NORMALIZATION)

Problems Caused by Redundancy (Null Values), Decompositions. Problems Related to Decomposition, Functional dependency, Properties of Functional dependency, Normal forms based on functional dependency - 1NF, 2NF and 3NF.

Transaction Management: Transaction - Single-User versus Multiuser Systems; Transactions, Database Items, Read and Write Operations, and DBMS Buffers.

UNIT- VI: CONCURRENCY CONTROL

Why Concurrency Control Is Needed, Why Recovery Is Needed, Transaction States and Additional Operations, The System Log, Commit Point of a Transaction, properties of transactions, Characterizing Schedules Based on Serializability - Serial, Non serial, Two-Phase Locking Techniques for Concurrency Control - Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking, Dealing with Deadlock and Starvation.

Introduction to Indexing:

Types of Single- Level Ordered Indexes - Primary Indexes, Clustering Indexes, Secondary Indexes.

TEXT BOOKS:

1. Database Management Systems - Raghuram Krishnan, Johannes Gehrke, TMH, Third Edition, 2003.
2. Fundamentals of Database Systems - Ramez Elmasri, Shamkant B. Navathe, PEA, Sixth Edition, 2010.

REFERENCE BOOKS:

1. Database System Concepts - Silberschatz, Korth, TMH, Fifth Edition, 2006.
2. Introduction to Database Systems - C J Date, PEA, Eighth Edition, 2006.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106093
2. nptel.ac.in/courses/106104135

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II B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
ELECTRONIC CIRCUITS & PULSE AND DIGITAL CIRCUITS LAB							

COURSE OBJECTIVES:

1. Frequency response of single stage and multi stage amplifiers.
2. Working of Power amplifier.
3. How frequency response varies by applying negative feedback on amplifiers.
4. Different frequency sinusoidal signal generation.

COURSE OUTCOMES:

After Completion of this course, student must be able to

CO1: Understand the effect of capacitors on frequency response of amplifier.

CO2: Determine the efficiency of power amplifiers.

CO3: Generate Sinusoidal signals with different frequencies and know the difference between different Multivibrators.

LIST OF EXPERIMENTS:

I) DESIGN AND SIMULATION IN SIMULATION LABORATORY USING MULTISIM OR PSPICE OR EQUIVALENT SIMULATION SOFTWARE & VERYFING THE RESULT BY HARDWARE (Any Six):

1. Two Stage RC Coupled Amplifier
2. Voltage series feedback amplifier - Freq. response, Impedances measurement(with and without feedback)
3. Current series feedback amplifier - Freq. response, Impedances measurement(with and without feedback)
4. Wien Bridge oscillator using Transistors –Design for different frequencies
5. RC Phase Shift Oscillator using Transistors- Design for different frequencies
6. Class A Power Amplifier (with and without Transformer load)
7. Class B Power Amplifier
8. Boot strapped emitter follower

II) PULSE AND DIGITAL CIRCUITS (Any six)-By Designing the circuit

1. Linear wave shaping (Diff. Time Constants, Differentiator, Integrator)
2. Non –linear wave shaping-clippers., Clampers
3. Bistable Multivibrator
4. Astable Multivibrator (voltage-frequency convertor)
5. Monostable Multivibrator
6. Schmitt Trigger
7. Study and implementation of logic gates
8. Study and implement applications of Flip flops- Counters and Registers

Equipment required for Laboratory

Software:

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i. Analog and Digital design/ Simulation software
ii. Computer Systems with required specifications

Hardware:
1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)

Active & Passive Electronic Components

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	0	0	3	25	50	75	2
ANALOG COMMUNICATIONS LAB							

COURSE OBJECTIVES:

1. Analog Communication system modulation and demodulation techniques.
2. Analysis of Signal Spectrum characteristics.
3. Pulse Modulation techniques.

COURSE OUTCOMES:

After Completion of this course, the students must be able to

CO1: Design and measure performance of AM and FM communication systems.
CO2: Identify and measure factors which hamper communication systems.
CO3: Routinely use communications test equipment.

LIST OF EXPERIMENTS:

Twelve experiments to be done: (a. Hardware, b. MATLAB Simulink)

1. Amplitude Modulation and Demodulation
2. AM - DSBSC Modulation and Demodulation
3. Spectrum Analysis of Modulated signal using Spectrum Analyzer.
4. Diode Detector Characteristics
5. Pre-emphasis and De-emphasis
6. Frequency Modulation and Demodulation
7. AGC Circuit
8. Sampling Theorem
9. Pulse Amplitude Modulation and Demodulation
10. Pulse Width Modulation and Demodulation
11. Pulse Position Modulation and Demodulation
12. Phase Locked Loop

Equipment Required for Laboratories:

1. RPS -0 –30 V
2. CRO -0 –20 M Hz.
3. Function Generators -0 – 1 M Hz
4. RF Generators -0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Analog Communication
7. Components
8. Spectrum Analyzer -60 M Hz.

Software Required:

1. Computer systems with latest specifications
2. Connected in LAN (optional)
3. Operating system (windows XP)
4. Simulations software (MATLAB-Simulink)

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II B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	0	0	0	0
VERBAL ABILITY							

COURSE OBJECTIVES:

1. To make students understand the usage of words, relationships; the alternatives and their meanings.
2. To give fair idea about understanding and comprehension skills
3. To make students understand arguments, draw conclusions and to deal in critical manner
4. To teach students-ways to overcome the confusions related to Grammar and Vocabulary

COURSE OUTCOMES:

At the end of the course, Students will be able to

CO1 : Use appropriate words effectively in their communication
CO2 : Identify and correct Grammar and vocabulary related errors
CO3 : Construct the sentences effectively using appropriate verbal reasoning abilities
CO4 : Demonstrate understanding and comprehensive skills.

SYLLABUS:

TEACHING METHODOLOGY:

The methodology of teaching will be chalk & talk, Ppt., Audio-Visual and activity based.

No. of Periods per Unit	8	No. of tutorial periods	1

UNIT- I: VOCABULARY BUILDING

(Direct links to content used from the web page:

a. http://grammar.ccc.commnet.edu/grammar/vocabulary.htm
b. http://www.enhancemyvocabulary.com/
c. http://celi.olemiss.edu/wp-content/uploads/sites/7/2014/01/StrategiesVocabulary-080808.pdf)

UNIT- II: SENTENCE CONSTRUCTION

(Direct links to content used from the web page:

a. http://www.learnenglish.de/grammar/sentencetext.html
b. http://www.bbc.co.uk/skillswise/factsheet/en30stru-l1-f-rules-and-egs-to-help-you-make-a-sentence
c. http://www.dummies.com/how-to/education-languages/language-arts/Grammar-Usage/Sentence-Construction.html
d. https://www.liberty.edu/media/2030/Sentence_Construction.pdf
e. http://www2.isu.edu/success/writing/handouts/sent-structure.pdf)

UNIT- III: ENGLISH USAGE AND REMEDIAL GRAMMAR

(Direct links to content used from the web page:

a. http://ihecs-langues.be/remedial/grammar.htm
b. http://mdudde.net/books/BA/BA%20I%20year/English/ba-1st-engish-paperB.pdf

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c. http://www.sakshieducation.com/Engg/EnggAcademia/CommonSubjects/English-GRAMMAR.pdf

Books with page numbers:

1. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007; Pg.No.2.233-2.236.
2. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No: 630 – 662.)

UNIT- IV: ANALOGIES AND REVERSE ANALOGIES

(Direct links to content used from the web page:

a. http://www.jagranjosh.com/articles/verbal-ability-analogies-and-reverse-analogies-questions-for-cat-1335522802-1
b. http://www.testprepreview.com/modules/analogies1.htm
c. http://www.gmat-pacer.com/gre-guidetc.html

Books with page numbers:

1. A Modern Approach to Verbal & Non – Verbal Reasoning by Dr. R.S. Aggarwal, 1994, S.Chand & Co, Pg. Nos 35-142.
2. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No's 2.95-2.103.)

UNIT- V: READING COMPREHENSION, CLOSE PASSAGE & FILL IN THE BLANKS

(Direct links to content used from the web page:

a. http://www.majortests.com/sat/reading-comprehension.php
b. http://cat.wordpandit.com/rc-passage-36/
c. http://www.mycatprep.com/FreepracticeQuestionsEnglish.html
d. http://www.lofoya.com/Verbal-Test-Questions-and-Answers/Reading-Comprehension/intro
e. http://mba.hitbullseye.com/free_mock_cat/Reading-Comprehension-CAT.php

Books with page numbers:

1. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No 1.11-1.99
2. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No's: 340-462.)

UNIT- VI: FACTS, INFERENCES & JUDGMENTS

Books with page numbers:

1. A Modern Approach to Verbal & Non – Verbal Reasoning by Dr. R.S. Aggarwal, 1994, S.Chand & Co, Section-II Pg. No's: 1-224
2. How to prepare for the Verbal Ability and Reading Comprehension for the CAT, Arun Sharma, Meenakshi Upadhyay, Tata McGraw-Hill Publishing Company Limited, 2007, Pg. No's: 3.5 – 3.27; 3.63 – 3.64
3. The Official Guide for GMAT Review, 11th edition, Blanche Brann LP, Lawrenceville NJ, Pg. No 464-506

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No. of Periods for assessments for all units	2

REFERENCES:

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

BOOKS:

1. 30 Days to a More Powerful Vocabulary by Funk.
2. Practical English Usage by Michael Swan.
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman.
4. Kaplan MCAT Verbal Reasoning and Writing Review.
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon.
6. Understanding and Using English Grammar by Betty Schrampfer Azar

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III B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
LINEAR AND DIGITAL IC APPLICATIONS							

COURSE OBJECTIVES:

1. To familiarize with the functioning of various Linear ICs such as OP-AMP, Timer, Voltage Controlled Oscillator and Phase Locked Loop.
2. To introduce different digital MSI ICs and memories.
3. To extend logic gate concepts to realize combinational and sequential circuits.
4. To familiarize with CAD tools.

COURSE OUTCOMES:

At the end of the course, Students will be able to

CO1: Recall the basics of FET, MOSFET, amplifiers, standard memories and their characteristics.

CO2: Define basic logic gates, combinational and sequential circuits.

CO3: Extend the logic gate concept to realize basic combinational and sequential circuits for various Boolean expressions.

CO4: Illustrate the operation of IC 555 timer, utilization of filters, VCO, data converters and PLL in the development of various circuits.

CO5: Demonstrate the applications of Operational amplifier and IC 555 timer such as Adder, Substractor, V-I, I-V converter, Differentiator, Integrator, and Triangular, Square wave generators, PWM, PPM generation respectively.

CO6: Make use of the computer-aided design tools for development of complex digital logic circuits.

UNIT – I: OPERATIONAL AMPLIFIER AND ITS APPLICATIONS

The Operational Amplifier, Ideal Operational Amplifier, Operational Amplifier internal circuit, DC and AC characteristics, compensation techniques, Analysis of data sheets of IC 741, Op-amp applications: Adder, Subtractor, V to I and I to V converters, Sample and Hold circuit, Log and Anti log Amplifiers, Integrator and Differentiator, Triangular and Square wave generators.

UNIT – II: D-A AND A-D CONVERTERS & 555 IC TIMER

Need for D-A and A-D conversion, Basic DAC techniques, A-D converters, DAC/ADC Specifications. 555 IC Timer- Pin diagram, functional description, Monostable and Astable operation.

UNIT – III: ACTIVE FILTERS, VCO & PHASE LOCKED LOOP

Active filters, Voltage Controlled Oscillator (VCO)-IC 566- Pin diagram, Block diagram Description, 565 IC PLL- Pin diagram, block schematic, basic principle of operation, PLL applications.

UNIT – IV: DIGITAL LOGIC FAMILIES AND INTERFACING

Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, TTL families, CMOS/TTL interfacing, Emitter coupled logic, Comparison of CMOS, TTL and ECL.

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UNIT – V: DESIGN OF COMBINATIONAL & SEQUENTIAL LOGIC CIRCUITS

Ripple adders and subtractors-74x999,283, Design of decoders, Encoders, Priority encoder, Multiplexers, Demultiplexers, Parity circuits, Comparators, Simple Floating-Point Encoder and basic flip-flops with relevant Digital ICs, design of Counters, Counter Applications, MSI Registers, Shift registers, bi-directional shift register, universal shift register with relevant Digital ICs.

UNIT – VI: MEMORIES & INTRODUCTION TO VHDL

Memories: ROM, Static RAM, standard SRAMS, synchronous SRAMS, Dynamic RAM, Synchronous DRAMs.

History of VHDL, Design flow, program structure, Modeling Styles of VHDL, Statements used in VHDL, Packages, Libraries, Objects and Classes, Subprograms, VHDL Modelling - Simulation, Logic Synthesis, Inside a logic Synthesizer, Constraints, Technology Libraries. Example programs.

Text Books:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuits", 4th Multi Colour Edition, New Age International (p) Ltd, 2010.
2. John F. Wakerly, "Digital Design Principles & Practices", 3rd Edition, PHI/ Pearson Education Asia, 2005.

Reference Books:

1. Ramakanth, A. Gayakwad, "OP-Amps & Linear ICs", PHI, 1987.
2. J. Bhasker, "VHDL Primer", 3rd Edition, Pearson Education/ PHI.
3. Atul P.Godse and Deepali A.Godse, "Digital IC Applications", Technical Publ., Pune, 2005.
4. K. Lal Kishore, V. S. V. Prabhakar, "VLSI Design", I.K International publishing house,Pvt Ltd.

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III B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
DIGITAL COMMUNICATIONS							

COURSE OBJECTIVES:

1. To introduce the concepts of different pulse modulation and digital modulation Techniques.
2. To familiarize with the error detection and correction techniques.
3. To study the concept of entropy and need for source encoding.
4. To understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability error.

COURSE OUTCOMES:

After completion of the course, the student will be able to

CO1: Define various Pulse Digital Modulation Techniques

CO2: Compare various modulation schemes for Digital information transmission

CO3: Solve Probability of error of various Digital Modulation Techniques

CO4: Demonstrate the transfer function of the Matched and Optimum filters.

CO5: Illustrate the channel capacities of different channels and Demonstrate the error correction and detection capabilities of Linear Block and Convolution codes.

CO6: Make use of various source coding techniques to compute and analyze Block codes, Cyclic codes and Convolution codes.

UNIT – I: PULSE DIGITAL MODULATION

Elements of digital communication systems- Information source, source encoder and decoder, channel encoder and decoder, digital modulators and de modulators, communication channel, Advantages of Digital Communication Systems, sampling theorem, Elements of PCM -PCM generator, PCM receiver, transmission band width in PCM, Sampling, Quantization & Coding, Quantization error Companding in PCM systems - μ-law companding for speech signals, A-law companding , signal to noise ratio of companded PCM, Differential PCM systems (DPCM) - Principle of DPCM, DPCM transmitter, reconstruction of DPCM Signal, Delta Modulation- Operating Principle of DM, DM transmitter, DM Receiver, advantages and disadvantages of DM, Noise in PCM and DM Systems- Slope over load distortion, granular noise, Transmission noise, quantization noise, Comparison of PCM and DM Systems.

UNIT – II: DIGITAL MODULATION TECHNIQUES

Amplitude Shift Keying-Signal space diagram of ASK, ASK generator and ASK detector, non-coherent ASK reception, Frequency Shift Keying-BFSK Transmitter, Spectrum and Bandwidth of BFSK, coherent BFSK Receiver, non-coherent BFSK Receiver, signal space representation, advantage and disadvantage, Phase Shift Keying-Principle of BPSK, Graphical Representation of BPSK , Generation and reception of BPSK signal, Spectrum of BPSK Signal, signal space diagram of BPSK , Bandwidth of BPSK signals, Differential Phase Shift Keying(DPSK)-Transmitter and Receiver, Band width of DPSK signal, Advantages and disadvantages of DPSK Quadrature Phase Shift Keying-QPSK Transmitter and Receiver, Signal Space Representation of QPSK Signals, Bandwidth of QPSK Signal, Advantages of QPSK, Spectrum of QPSK, M-aray Phase Shift Keying and Frequency Shift Keying Signal space diagram, Power Spectral Density of M-array PSK, Bandwidth Euclidean Distance, Transmitter and receiver, Similarity of BFSK and

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UNIT – III: DATA TRANSMISSION

Base band signal receiver-Signal to noise ratio of the integrator and dump filter, probability of error in integrate and dump filter receiver, probability of error-Probability of error of optimum filter, matched filter, probability of error using matched filter, Impulse response of the matched filter, probability of error of the matched filter, properties of matched filter coherent reception correlator Calculation of error probability of ASK, BPSK, BFSK.

UNIT – IV: INFORMATION THEORY AND SOURCE CODING

Discrete messages and information content-Measure of information concept of amount of information and its properties, Entropy and its properties, Information rate, Mutual information and its properties, Shannon's theorem-Capacity of Gaussian Channel, Band width S/N trade off Shannon -Fano coding, Huffman coding, Discrete Communication Channels, channel capacity of discrete and analog channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT – V: LINEAR BLOCK CODES

Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, syndrome calculation, BCH Codes.

UNIT – VI: CONVOLUTION CODES

Encoding of convolution codes-Time domain approach, transform domain approach, Graphical approach-state, tree and trellis diagram, Viterbi decoding algorithm.

Text Books:

1. Simon Haykin, "Digital Communications" Student Edition, John Wiley, 2010.
2. H. Taub and D. Schilling, "Principles of Communication Systems", TMH, 2003.
3. B.P.Lathi, "Modern Analog and Digital Communication", 3rd Edition, Oxford reprint, 2004.

Reference Books:

1. J. S. chitode, "Digital communication". 2nd revised edition 2009.
2. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
3. John Proakis, "Digital Communications", TMH, 1983.

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III B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ANTENNAS AND WAVE PROPAGATION							

COURSE OBJECTIVES:

1. Understand the applications of the electromagnetic waves in free space.
2. To introduce radiation mechanism for understanding various forms of Antennas.
3. To familiarize with Measure various parameters of antenna, and the concepts of wave propagation and its characteristics in atmospheric conditions.

COURSE OUTCOMES:

After completion of the course, the student will be able to

CO1: Illustrate the radiation mechanism and basic antenna parameters.

CO2: Interpret wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and microstrip antennas.

CO3: Develop the fields radiated by various types of antenna.

CO4: Build different types of antenna arrays.

CO5: Demonstrate antenna measurements to know antenna's performance.

CO6: Identify the characteristics of radio wave propagation.

UNIT – I: ANTENNA FUNDAMENTALS

Definition and function of Antenna. Radiation Mechanism – single wire, 2-wire, dipoles, Current Distribution on a thin wire antenna. Characteristics of Antenna- Radiation Pattern, Radiation intensity, Beam solid angle, Directivity, Gain, Polarization, efficiency, Equivalent areas, Radiation Resistance, Effective length, antenna temperature; Relation between Maximum Directivity and effective area, illustrated Problems.

UNIT – II: LINEAR WIRE ANTENNA

Potential function- Maxwell's Equation approach, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance. Introduction to Antenna Theorems and Loop antennas.

UNIT – III: ANTENNA ARRAYS

Introduction, 2 element arrays – different cases; Arrays of N isotropic point sources Broadside, End-fire Arrays, EFA with Increased Directivity. Principle of pattern multiplication, Binomial and Phased array.

UNIT – IV: HF, VHF, UHF ANTENNAS

Introduction, Traveling wave radiators – basic concepts, Long wire antennas, V-Antenna, Rhombic Antenna, Folded Dipole, Yagi-Uda Antenna, Helical Antenna, Reflector antennas, Parabolic antennas.

UNIT – V: MICROWAVE ANTENNAS AND ANTENNA MEASUREMENTS

Horn Antenna, Lens Antenna. Micro strip antenna.

Antenna Measurements: Radiation pattern, Gain transfer method, Absolute measurement, Directivity.

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UNIT – VI: WAVE PROPAGATION

Friss Free space Equation for wave Propagation, Ground wave Propagation, Space wave Propagation- Field strength calculation, Line of Sight, Duct Propagation, Tropospheric Scattering. Sky wave Propagation-Formation of Ionospheric Layers, Mechanism of Reflection and Refraction and their Characteristics, Ionospheric Abnormalities and Absorption.

Text Books:

1. Constantine A.Balanis, "Antenna Theory: Analysis and Design", 4th Edition, John Wiley & Sons, 2016.
2. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation" –Tech India Publications, New Delhi, 2001.

Reference Books:

1. J. D. Kraus, R. J. Marhefka, "Antennas and Wave Propagations", 4th Edition, McGraw-Hill, 2010.
2. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2007.
3. F.E. Terman, "Electronic and Radio Engineering", 4th Edition, McGraw-Hill, 1955.

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III B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
COMPUTER ORGANISATION & MICROPROCESSORS							

COURSE OBJECTIVES:

1. To familiarize with the computer system.
2. To learn the concepts of computer arithmetic operations, computer instructions and its memory organization.
3. To understand the 8086 architecture and its programming.
4. Explore how to interface the memory and I/O devices to 8086 microprocessor.

COURSE OUTCOMES:

After completion of the course, students will be able to

CO1: Recall the basic concepts, elements & operations of digital computer system.

CO2: Demonstrate memory organization and I/O processing.

CO3: Illustrate the instruction set present in a processor for arithmetic, logical and control operations.

CO4: Make use of Instruction set in developing the assembly language programming

CO5: Develop application based programs using digital interfacing.

CO6: Model an 8086 based microcomputer system by interfacing memory and I/O devices.

UNIT – I: COMPUTER SYSTEM

Computer components, computer function, Interconnection structures, Bus interconnection, arithmetic and logic unit, integer representation, integer arithmetic, floating point representation, floating point arithmetic.

UNIT – II: CENTRAL PROCESSING UNIT

Instruction Sets, Characteristics and addressing modes – Machine instruction characteristics, Types of operands and operators, addressing modes, instruction formats, Assembly language,
Process Structure and Functions – Process organization, register organization, instruction cycle, instruction pipelining, The RISC versus CISC

UNIT – III: CONTROL UNIT AND MICRO PROGRAMMED CONTROL

Micro operations, control of the processor, hardwired implementation, micro programmed control, micro instruction sequencing and micro instruction execution.
The Memory System: Computer Memory System Overview, Cache Memory Principles, Semiconductor Main Memory, Advanced DRAM Organization, Magnetic Disk, Optical Memory, DMA.

UNIT – IV: 8086 MICROPROCESSORS

Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, Minimum mode, maximum mode of 8086 system and timings, machine language instruction formats, addressing mode of 8086, instruction set off 8086,assembler directives and operators.

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UNIT – V: PROGRAMMING WITH 8086 MICROPROCESSOR

Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

UNIT – VI: 8086 INTERFACING

Semiconductor memory interfacing, Interfacing i/o ports, PIO 8255 modes of operation of 8255,interfacing to D/A and A/D converters, stepper motor interfacing, Programmable interrupt controller 8259A, the keyboard /display controller8279, programmable communication interface 8251 USART, DMA Controller 8257.

Text Books:

1. William Stallings, "Computer Organization and Architecture", 8th Edition, Pearson, 2010.
2. A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.

References Books:

1. Morris Mano, "Computer system architecture", 3rd Edition, Pearson Education, 2007.
2. Douglas V Hall, "Microprocessors and interfacing, Programming and Hardware", 2nd Edition, TMH, 2006

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	0	0	3	25	50	75	2
LINEAR & DIGITAL IC APPLICATIONS LAB							

COURSE OBJECTIVES:

1. Demonstrate applications of OP-Amp and IC 555 timer
2. Classify the operation of analog filters
3. Illustrate and compare the operation of multivibrators and different voltage regulators
4. Develop the internal circuits for different digital operations

COURSE OUTCOMES:

After successful completion of this course the student will be able to

CO1: Demonstrate the applications of Op-amp such as Adder, Subtractor, Comparator, Integrator and Differentiator Circuits.

CO2: Classify the active filters such as LPF, HPF, BPF and Band Reject Filters.

CO3: Interpret the operation of Oscillator circuits.

CO4: Illustrate the operation of Multivibrator circuits.

CO5: Compare various types of voltage regulators.

CO6: Develop the complex digital logic circuits including both combinational and sequential logics by using computer-aided design tools.

SECTION-I:

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF , BPF, Band Reject Filters.
4. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
5. IC 555 Timer – Monostable & Astable Operation Circuit.
6. Schmitt Trigger Circuits – using IC 741 and IC 555.
7. Voltage Regulator
   A) Using IC 723.
   B) Three Terminal Voltage Regulators – 7805, 7809, 7912.
8. 4 bit DAC using OP AMP.

EQUIPMENT REQUIRED FOR LABORATORIES:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

SECTION-II:

1. Realization of Logic Gates.
2. 3 to 8 Decoder- 74138

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3. 8*1 Multiplexer-74151 and De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Counters
    A) 4 Bit Counter-7493
    B) Decade Counter- 7490
7. Universal shift register-74194/195
8. RAM (16×4)-74189 (read and write operations)

Equipment Required:

1. Xilinx ISE software-latest version
2. Personal computer with necessary peripherals
3. Hardware kits- Various FPGA families.

Note: Six Experiments from each section.

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	0	0	3	25	50	75	2
DIGITAL COMMUNICATIONS LAB							

COURSE OBJECTIVES:

1. Illustrate the concept of time division multiplexing and demultiplexing
2. Understand different digital modulation techniques
3. Know the translation of analog signals into digital data
4. Understand the usage of Simulation tool for companding technique
5. Know various channel encoding schemes

COURSE OUTCOMES:

On successful completion of the course, students will be able to

CO1: Experiment with different digital modulation techniques and observe their results.
CO2: Demonstrate Time Division Multiplexing and demultiplexing.
CO3: Translate analog signals into digital data.
CO4: Interpret different techniques in modern digital communications, in particular in source coding using Simulation tools.
CO5: Apply Simulation tool for companding technique.
CO6: Identify the various channel encoding schemes for a given data stream.

List of Experiments

1. Time Division Multiplexing.
2. Pulse Code Modulation.
3. Analyze Of Differential Pulse Code Modulation.
4. Delta Modulation.
5. Frequency Shift Keying.
6. Phase Shift Keying.
7. Differential Phase Shift Keying.
8. Companding.
9. Source Encoding and Decoding.
10. Design Linear Block Encoder and Decoder.
11. Design Binary Cyclic Encoder and Decoder.
12. Design Convolution Encoder and Decoder.

Equipment Required For Laboratories:

1. RPS-(0-30V).
2. CRO-(0-20MHz).
3. Function Generators-(0-1MHz).
4. RF Generators –(0-1000MHz/0-100MHz).
5. Multimeters.
6. Lab experimental Kits for Digital Communication.
7. Components.
8. Radio Receiver/TV Receiver Demo Kits or Trainers.

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MICROPROCESSORS AND INTERFACING LAB							

COURSE OBJECTIVES:

1. To become familiar with the architecture and Instruction set of Intel 8086 microprocessor.
2. To provide practical hands on experience with Assembly Language Programming.
3. To familiarize the students with interfacing of various peripheral devices with 8086 microprocessor.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Apply the fundamentals of assembly level programming of microprocessors.
CO2: Build various assembly language programs using 8086.
CO3: Summarize the concepts of Assembly level language programming and its applications.
CO4: Develop the assembly level programming using 8086 instruction set.
CO5: Interpret how different I/O devices can be interfaced to processor and explore several techniques of interfacing.

PART-I: MICROPROCESSOR 8086

1. Write an ALP in 8086 for arithmetic operations: addition, subtraction, multiplication and division on multi-byte numbers.
2. Write an ALP in 8086 to find the factorial of an 8-bit number.
3. Write an ALP in 8086 to sort an array of 8-bit numbers in ascending order
4. Write an ALP in 8086 to convert BCD number to ASCII number and vice versa.
5. Write an ALP in 8086 for string operations - Move Block, Reverse string, Inserting, Deleting, Length of the string, String comparison.
6. Write an ALP in 8086 to count even and odd numbers in a given series of 16-bit numbers.
7. DOS Programming-Reading the characters from keyboard and Display the characters.

PART-II: INTERFACING WITH MICROPROCESSOR

1. 8259 – Interrupt Controller - Generate an interrupt using 8259 timer.
2. 8279 – Keyboard Display - Write a program to display a string of characters.
3. 8255 – PPI - Write ALP to generate sinusoidal wave using PPI.
4. 8251 – USART - Write a program in ALP to establish Communication between two processors.

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	3	0	0	-	-	-	-

QUANTITATIVE APTITUDE AND REASONING - II

COURSE OBJECTIVES:

1. To train students in analysing real life scenarios considering all factors
2. To educate the students on principles of mathematical problems and problem solving methods
3. To train students for campus placements

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

CO1: Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements

CO2: Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.

CO3: Will be able to demonstrate various principles involved in solving mathematical

CO4: Problems and thereby reducing the time taken for performing job functions.

Unit I: Numbers, Time and Distance, Time and work, Averages, Mixtures and Allegations

1. Numbers

a) Classification of numbers
b) Divisibility rules
c) Finding the units digit
d) Finding remainders in divisions involving higher powers
e) LCM and HCF Model

2. Time and Distance

a) Relation between speed, distance and time
b) Converting km/h into m/s and vice versa
c) Problems on average speed
d) Problems on relative speed
e) Problems on trains
f) Problems on boats and streams
g) Problems on circular tracks
h) Problems on races

3. Time and Work

a) Problems on Unitary method
b) Relation between Men, Days, Hours and Work
c) Problems on Man-Day-Hours method
d) Problems on alternate days
e) Problems on Pipes and Cisterns

4. Averages, Mixtures and Allegations

a) Definition of Average
b) Rules of Average
c) Problems on Average
d) Problems on Weighted Average
e) Finding average using assumed mean method
f) Problems on mixtures
g) Allegation rule
h) Problems on Allegation

Unit II: Data Interpretation, Data Sufficiency, Mensuration, Permutation and Combinations, Probability

1. Data Interpretation

a) Problems on tabular form
b) Problems on Line Graphs
c) Problems on Bar Graphs
d) Problems on Pie Charts

2. Data Sufficiency

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a) Different models in Data Sufficiency
b) Problems on data redundancy

3. Mensuration

a) Formulas for Areas
b) Formulas for Volumes of different solids
c) Problems on Areas
d) Problems on Volumes
e) Problems on Surface Areas

4. Permutation and Combinations

a) Definition of permutation
b) Problems on Permutations
c) Definition of Combinations
d) Problems on Combinations

5. Probability

a) Definition of Probability
b) Problems on coins
c) Problems on dice
d) Problems on Deck of cards
e) Problems on Years

SYLLABUS FOR REASONING

Unit III: Cubes, Venn diagrams, Binary Logic

1. Cubes

a) Basics of a cube
b) Formulae for finding volume and surface area of a cube
c) Finding the minimum number of cuts when the number of identical pieces are given
d) Finding the maximum number of pieces when cuts are given
e) Problems on painted cubes of same and different colors
f) Problems on cuboids
g) Problems on painted cuboids
h) Problems on diagonal cuts

Venn diagrams

a) Representing the given data in the form of a Venn diagram
b) Problems on Venn diagrams with two sets
c) Problems on Venn diagrams with three sets
d) Problems on Venn diagrams with four sets

2. Binary Logic

a) Definition of a truth-teller
b) Definition of a liar
c) Definition of an alternator
d) Solving problems using method of assumptions
e) Solving analytical puzzles using binary logic

Unit IV: Number and letter series, Number and letter Analogies, Odd man out

1. Number and letter series

a) Difference series
b) Product series
c) Squares series
d) Cubes series
e) Alternate series
f) Combination series
g) Miscellaneous series
h) Place values of letters

2. Number and Letter Analogies

a) Definition of Analogy
b) Problems on number analogy
c) Problems on letter analogy
d) Problems on verbal analogy

3. Odd man out

a) Problems on number Odd man out
b) Problems on letter Odd man out

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c) Problems on verbal Odd man out

Unit V: Coding and decoding, Direction sense, Critical Reasoning, Lateral reasoning puzzle

1. Coding and decoding

a) Coding using same set of letters
b) Coding using different set of letters
c) Coding into a number
d) Problems on R-model

2. Direction sense

a) Solving problems by drawing the paths
b) Finding the net distance travelled
c) Finding the direction
d) Problems on clocks
e) Problems on shadows
f) Problems on damaged compass
g) Problems on direction sense using symbols and notations

3. Critical Reasoning

a) Problems on assumption
b) Problems on conclusions
c) Problems on inferences
d) Problems on strengthening and weakening of arguments
e) Problems on principle
f) Problems on paradox

Lateral reasoning puzzle

a) Problems on common balance
b) Problems on digital balance
c) Problems on coins
d) Problems on lockers
e) Problems on heights
f) Digit puzzles using basic arithmetic operations

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

References:

1. www.careerbless.com/**aptitude**/qa/home.php
2. www.affairscloud.com/**quantitative-aptitude**-questions
3. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
4. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practice**aptitude**tests.com/numerical-**reasoning**-tests

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	3	1	0	40	60	100	3
VLSI DESIGN							

COURSE OBJECTIVES:

1. Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
2. Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
3. Learn the various subsystem designs and issues raised in the VLSI design.

COURSE OUTCOMES:

On successful completion of this course, student will be able to

CO1: Recall the basic structural and electrical aspects of MOS transistors, architecture of FPGA and CPLD.

CO2: Compare the properties of NMOS, PMOS, CMOS and Bipolar technologies.

CO3: Outline the basic logic circuits using MOSFETs.

CO4: Interpret the pass transistor, inverters, Latch-up in CMOS circuits and scaling rules of MOS technology.

CO5: Build the sub systems like adders, 4 -bit processors and ALU.

CO6: Explain inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design.

CO7: Summarize various design rules and design issues in the VLSI.

UNIT-I: INTRODUCTION

Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes, BiCMOS Technology, Comparison between CMOS and Bipolar technologies, GaAs Technologies.

UNIT-II: BASIC ELECTRICAL PROPERTIES OF MOS AND BI-CMOS CIRCUITS

I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS circuits and BiCMOS Latch-up Susceptibility.

UNIT-III: VLSI CIRCUIT DESIGN PROCESSES

MOS layers, stick diagrams, design rules and layout, 2μ.meter, 1. 2μ.meter CMOS rules, Layout Diagrams of universal gates and CMOS inverter, Symbolic diagrams-Translation to Mask

UNIT-IV: BASIC CIRCUIT CONCEPTS

Sheet Resistance R_s and its concepts to MOS, Area Capacitance calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, choice of layers.

Scaling of MOS circuits: Scaling models, Scaling function for device parameters, Limitation of Scaling.

UNIT-V: SUB SYSTEM DESIGN

Architectural issues, switch logic, Gate logic, examples of structural design (Combinational logic) and some clocked sequential circuits. Subsystem Design Process: General Arrangement of 4-bit arithmetic processor, Design of an ALU subsystem.

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UNIT-VI: VLSI DESIGN ISSUES

VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, FPGA design flow, Basic FPGA architecture, basic CPLD architecture comparison of FPGA, ASIC and CPLD.

Text Books:

1. Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, "Essentials of VLSI Circuits and Systems", Prentice-Hall of India Private Limited, 2009 Edition.
2. K.V.K.K. Prasad, Kattula Shyamala, "VLSI Design-Black Book", Kogent Learning Solutions Inc.2012 Edition.

Reference Books:

1. A. Albert Raj & T. Latha, "VLSI Design", PHI Learning Private Limited, 2010.
2. A. Shanthi and A. Kavita, "VLSI Design", 1st Edition, New Age International Private Limited, 2006.

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	4	0	0	40	60	100	3
MICROWAVE AND OPTICAL COMMUNICATIONS							

COURSE OBJECTIVES:

1. To get knowledge on different microwave sources.
2. To familiarize different waveguides and their field expression.
3. To introduce the microwave components and measurement of power, attenuation, frequency and VSWR using microwave bench.
4. To familiarize with different types of optical fibers, light sources and detectors.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Illustrate the waveguides and waveguide components.
CO2: Tell how the microwave parameters will measure.
CO3: Infer different microwave sources.
CO4: Summarize about different optical fibers and characteristics.
CO5: Compare different optical detectors as well as optical sources.
CO6: Demonstrate an optical system.

UNIT-I: MICROWAVE TRANSMISSION LINES

Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Dominant and Degenerate Modes, Introduction to Circular wave guides, related problems.

UNIT-II: MICROWAVE COMPONENTS & MICROWAVE TUBES

Waveguide Attenuators – Resistive Card and Rotary Vane types; Calculation of scattering matrix for E plane, H plane, Magic Tee and Directional Coupler; Ferrite Components – Gyrator, Isolator, Circulator. Classification of Microwave Tubes, Two Cavity Klystron – Structure, Velocity Modulation Equation, Applegate Diagram; Reflex Klystron – Structure, Applegate Diagram; Travelling Wave Tube – operation, Magnetron operation.

UNIT-III: MICROWAVE SOLID STATE DEVICES & MEASUREMENTS

Gunn Diode – Principle, RWH Theory; IMPATT Diode, Description of Microwave Bench, Measurement of Attenuation, Frequency, VSWR using Microwave Bench and Power measurement using Bolometer Method.

UNIT-IV: OVERVIEW OF OPTICAL FIBER COMMUNICATION

Historical development, the general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Types of rays, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Related problems.

UNIT-V: OPTICAL SOURCES LEDS

Structures, quantum efficiency, modulation; Laser diodes principle, modes, threshold conditions, external quantum efficiency, resonant frequencies, Reliability of LED & ILD.

UNIT-VI: PHOTO DETECTORS PHOTODIODES

Principle, PIN and avalanche photo diodes; comparison of photo detectors, Temperature effect on avalanche gain, noise in photo detectors, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, performance Receiver configuration, Digital receiver, Probability of Error Optical system design-Point-to-point links-Component choice and

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considerations. Link power budget. Rise time budget with examples.

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3rd Edition, PHI, 2003.
2. Gerd Keiser, "Optical fiber communications", 4th Edition, MGH, 2008.

Reference Books:

1. R.E. Collin, "Foundations for Microwave Engineering", IEEE Press, 2nd Edition, John Wiley, 2002.
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, "Microwave Principles", CBS Publishers and Distributors, New Delhi, 2004.
3. Djafar K. Mynbaev and Lowell L. Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, 2001.
4. M. Kulkarn, "Microwave and Radar Engineering", 3rd Edition, Umesh Publications New Delhi., 2008.

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	3	1	0	40	60	100	3
DIGITAL SIGNAL PROCESSING							

COURSE OBJECTIVES:

1. Enhance the analytical ability of the students in facing the challenges posed by growing trends in communication, control and signal processing areas.
2. Develop ability among students for problem formulation, system design and solving skills.
3. Demonstrate basic knowledge of Digital Signal Processing by understanding various transformations.
4. Understand Various Discrete-time signals and class of linear shift-invariant systems will be studied using the convolution sum, and the frequency domain, using transformations.
5. Design system with digital network composed of adders, delay elements, and coefficient multipliers.

COURSE OUTCOMES:

After completion of the course, the student will be able to

CO1: Analyze the signals and system in Time and Frequency domain through its respective tools.

CO2: Find DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithm.

CO3: Illustrate the significance of various filter structures and effects of round off errors.

CO4: Demonstrate knowledge of complex number, Fourier series and ability to design electrical and electronics systems.

CO5: Construct the digital filter circuits for generating desired signal wave shapes (non-sinusoidal) for different applications like computers, control systems and counting and timing systems.

CO6: Interpret the digital computer or digital hardware for quantizing amplitudes of signals.

UNIT-I: INTRODUCTION

Review of Discrete Time Signals: Some Elementary Discrete-Time Signals, Classification of Discrete–Time Signals, Simple Manipulations of Discrete–Time Signals, Discrete Time Systems: Input-Output Description of Systems, Block Diagram Representation of Discrete-Time Systems, and Classification of Discrete-Time Systems Interconnection of Discrete-Time Systems. Frequency domain representation of Discrete Time Signals and Systems, Discrete-Time Fourier Transform (DTFT): Existence of DTFT, properties of DTFT.DISCRETE FOURIER SERIES: Properties of Discrete Fourier Series, DFS representation of periodic sequences.

UNIT-II: DISCRETE FOURIER TRANSFORMS

Properties of DFT, Circular & Linear Convolution of Sequences using DFT, and Computation of DFT: Direct evaluation of the DFT. FAST FOURIER TRANSFORMS:Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT, and Inverse FFT: IDFT-FFT.

UNIT-III: REALIZATION OF IIR FILTERS

Review of Z-Transforms: z-transform and ROC of finite and infinite sequence, properties of z-transform, relationship between the Fourier transform and z-transform, inverse z-transform. Solution of Difference Equations of Digital Filters, Block Diagram Representation of Linear Constant Coefficient Difference Equations, Basic structures of IIR systems: Direct form-I realization, Direct form-II realization, transposed, cascade form, parallel form. Lattice structures of IIR systems, Conversion from Lattice structure to direct form, Conversion from direct form to Lattice structure, Lattice-ladder structure.

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UNIT-IV: REALIZATION OF FIR FILTERS

Basic structures of FIR systems: Transversal structure, Linear phase, Lattice structure, Polyphase Lattice structures of FIR systems, Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure, Lattice-ladder structure.

UNIT-V: IIR DIGITAL FILTERS

Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter. Frequency Transformations in digital domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter.

UNIT-VI: FIR DIGITAL FILTERS

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques: Rectangular Window, Triangular or Bartlett Window, Raised Cosine Window Hanning Window, Blackman Window, Kaiser Window, Frequency Sampling Technique: Frequency Sampling Realization, Frequency Response, Design, Comparison of IIR and FIR filter, Illustrative Problems.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications", 4th Edition, Pearson Education/PHI, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", 2nd Edition, PHI, 2008.

Reference Books:

1. Ramesh Babu, "Digital Signal Processing", Scitech Publications, 2011.
2. Andreas Antoniou, "Digital signal processing", TATA McGraw Hill, 2006.
3. R S Kaler, M Kulkarni,, Umesh Gupta, "A Text book on Digital Signal processing", I K International Publishing House Pvt. Ltd, 2010.
4. M H Hayes, Schaum's outlines, "Digital signal processing", TATA Mc-Graw Hill, 2007.

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	3	1	0	40	60	100	3
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION							

COURSE OBJECTIVES:

1 List out Performance Characteristics of Different Electronic Measuring Instruments, its Analysis and Calibration Techniques.
2 Memorize Signal Generator and Wave Analyzers for Analysis of EM Spectrum.
3 Describe Concepts of Passive and Active Transducers.
4 Explain about all AC bridges and Q-meters, Design Methods and its Applications.
5 Review the concepts of electrical and electronics measurements with different techniques.
6 Illustrate concepts of computer controlled test systems, storage elements and display instruments.
7 Make use of transducers and instruments in lab experiments for applications.

COURSE OUTCOMES:

After going through this course, the student will be able to

CO1: List out Electronic Instruments, their Characteristics and use, Peculiar Errors Associated with the Instruments and how to minimize such Errors
CO2: Classify the Instruments based on Static and Dynamic Characteristics.
CO3: Review the Principle of Operation of Electronic Measuring Instruments.
CO4: Relate Concepts of Passive and Active Transducers.
CO5: Experiment with transducers, electrical and electronic instruments.
CO6: Select transducers, computer controlled test systems, storage and display instruments for experimenting.
CO7: Illustrate various concepts of electrical instruments and electronic instruments.

UNIT-I: BASIC MEASUREMENTS

Functional Elements of measurement system- Examples - Characteristics of instruments: Static characteristics, Dynamic characteristics, Types of errors, sources of errors, methods of eliminating Errors, Histogram, Mean, Measure of dispersion from the mean, Range Deviation Average deviation, Standard Deviation, Variance, Bourdon Tubes.

UNIT-II: TRANSDUCERS

Transducers- Classification of Transducers, Characteristics, Basic Requirements of a Tansducer, Resistive Transducer, Strain Gauge, Inductive Transducer, Capacitive displacement transducer, LVDT, Load cell Transducers, Thermocouple, Thermistor, Radiation Pyrometers.

UNIT-III: ELECTRICAL MEASUREMENTS

Measurement of Voltage and Current: D'Arsonval Galvanometer, permanent magnet moving coil, permanent magnet moving iron, Dynamometer, Measurement of Resistance, Inductance and Capacitance: Wheat stone bridge, Kelvin double bridge, Wien Bridge, Hay's bridge, Maxwell bridge, Anderson bridge, Q- Meter, Schering bridge, Ohmmeter.

UNIT-IV: ELECTRONIC MEASUREMENTS

Signal generators: Function Generator, RF Signal Generator, Random Noise Generator, Sweep generators- Wave Analyzer- Harmonic, Distortion Analyzer - Spectrum Analyzer - DC & AC Voltmeters, Digital Voltmeters, Electronic Multimeters, VOM meters.

UNIT-V: COMPUTER CONTROLLED TEST SYSTEMS

Testing an Audio Amplifier, Testing a Radio Amplifier, Instruments used in Computer Controlled Instrumentation, Micro Processor based System and Measurement Frequency Counter, Measurement of

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physical parameters force, pressure, velocity, humidity and Data acquisition systems.

UNIT-VI: STORAGE AND DISPLAY INSTRUMENTS

Cathode Ray Oscilloscopes – CRT Circuit, Vertical Deflection System, Delay Line, Horizontal Deflection System, Oscilloscope Techniques, Special Oscilloscopes, Recorders -XY & Magnetic Tape Dot Matrix Display.

Text Books:

1. A.K.Sawhney," Electrical, Electronic measurement & Instrumentation", 18th Edition, Dhanpat Rai & Sons, Reprint 2010
2. Albert.D.Helfrick & William.D.Cooper, "Modern Electronic Instrumentation & Measurement Techniques", PHI , 2003.

Reference Books:

1. E.W. Golding and F.C. Widdis, "Electrical Measurements and measuring Instruments", 5th Edition, AH Wheeler & Company, 1993.
2. Alan Morris, "Principles of Measurements & Instrumentation", 2nd Edition, PHI , 2003.
3. R. K. Rajput, "Electronic Measurements & Implementation", S. Chand Publications, 2012.

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III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ANALOG IC DESIGN *(Professional Elective – I)*							

COURSE OBJECTIVES:

1 The student will be able to understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
2 In this course, students can study CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
3 The concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

COURSE OUTCOMES:

After completion of the course, the student will be able to

CO1: Define the basic concepts of MOS transistor like switch , amplifiers and Oscillators.
CO2: Interpret the CMOS modeling, measurement techniques of OP-AMP and general concepts of Oscillators.
CO3: Demonstrate the Op-AMP and comparators using CMOS circuits.
CO4: Illustrate cascode amplifiers, cascode OP-AMPs, open loop comparators and phase detectors.
CO5: Summarize current sinks and sources, compensation of OP-AMP and performance of comparators
CO6: Outline the general concepts of current mirrors, oscillators and PLL

UNIT-I: MOS DEVICES AND MODELING

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor.

UNIT-II: ANALOG CMOS SUB-CIRCUITS

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-III: CMOS AMPLIFIERS

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT-IV: CMOS OPERATIONAL AMPLIFIERS

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power-Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT-V: COMPARATORS

Characterization of Comparator, Two-Stage, Open-loop Comparators, Other Open-loop Comparators, Improving the Performance of Open-loop Comparators, Discrete-Time Comparators.

UNIT-VI: OSCILLATORS & PHASE-LOCKED LOOPS

General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators, PLL concepts- simple PLL, charge pump PLLs, Non -ideal effects in PLLs, phase Detector.

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Text Books:

1. Philip E. Allen and Douglas R. Holberg, "CMOS Analog Circuit Design", International Second Edition/Indian Edition, Oxford University Press 2010.
2. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", 2nd Edition, McGraw-Hill Education, 2017.

Reference Books:

1. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, "Analysis and Design of Analog Integrated Circuits", 5th Edition, Wiley India, 2010.
2. David A. Johns, Ken Martin, "Analog Integrated Circuit Design", Student Edition, Wiley India, 2013.

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III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ELECTRONIC SWITCHING SYSTEMS *(Professional Elective – I)*							

COURSE OBJECTIVES:

1. The student will be able to understand the process of telecommunication.
2. The concepts of measuring the traffic.
3. In this course, students can study various digital switching techniques.
4. Design simple applications.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Recall the primitive and conventional telecommunication terminology.
CO2: Summarize various telecommunication switching mechanisms.
CO3: Illustrate different telecommunication networks and their working.
CO4: Interpret modern telecommunication standards.
CO5: Demonstrate a telecommunication system for a specific application.
CO6: Solve problems related to telecommunication issues.

UNIT-I: INTRODUCTION

Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks. Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT-II: ELECTRONIC SPACE DIVISION SWITCHING

Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n- Stage Networks. Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three-Stage Combination Switching, n- Stage Combination Switching.

UNIT-III: TELEPHONE NETWORKS

Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signalling Techniques, In-channel Signalling, Common Channel Signalling, Cellular Mobile Telephony.

Signalling: Customer Line Signalling, Audio- Frequency Junctions and Trunk Circuits, FDM Carrier Systems, PCM Signalling, Inter- Register Signalling, Common- Channel Signalling Principles, CCITT Signalling System no.6, CCITT Signalling System no.7, Digital Customer Line Signalling.

UNIT-IV: PACKET SWITCHING

Statistical Multiplexing, Local- Area and Wide- Area Networks, Large-scale Networks, Broadband Networks. Electronics & Communication Engineering 145 Telecommunications Traffic: The Unit of Traffic, Congestion, Traffic Measurement, A Mathematical Model, Lost-call Systems, Queuing Systems.

UNIT-V: SWITCHING NETWORKS

Single- Stage Networks, Grading, Link Systems, Grades of service of link systems, Application of Graph Theory to link Systems, Use of Expansion, Call Packing, Rearrange-able Networks, Strict Sense non-blocking Networks, Sectionalized Switching Networks

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UNIT-VI: INTEGRATED SERVICES DIGITAL NETWORK

Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User- Network Interfaces, Signalling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration. Applications of telecommunication for modern day requirements.

Text Books:

1. Thiagarajan Viswanathan, "Telecommunication Switching Systems and Networks", PHI, 2008.
2. J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson Education, 2006.

Reference Books:

1. J. Bellamy, "Digital Telephony", 2nd Edition, John Wiley, 2001.
2. Achyut S. Godbole, "Data Communications and Networks", TMH, 2004.
3. H. Taub & D. Schilling, "Principles of Communication Ststems", 2nd Edition, TMH, 2003.
4. B. A. Forouzan, "Data Communication & Networking", 3rd Edition, TMH, 2004.
5. Roger L. Freeman, "Telecommunication System Engineering", 4th Edition, Wiley-Inter Science, John Wiley & Sons, 2004.

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III B.TECH. II - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ADVANCED COMPUTER ARCHITECTURE *(Professional Elective – I)*							

COURSE OBJECTIVES:

1. Computer design, RISC, CISC instruction sets.
2. Cache Coherence and Message Passing Mechanisms.
3. Different trends in parallelism.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to do the following:

CO1: Interpret the concepts of computer architecture, MIMD and SIMD computers.

CO2: Demonstrate the Design Space of Processors and Memory hierarchy.

CO3: Summarize various models & problems of Linear and Non Linear pipeline Processors.

CO4: Compare and Contrast different Cache coherence problems and message passing mechanisms.

CO5: Outline the implementation models of SIMD and MIMD organizations.

CO6: Relate different forms of parallelism in parallel systems.

UNIT –I: PARALLEL COMPUTER

The state of computing- Computer Development Milestones, Elements of Modern Computers, Evolution of Computer Architecture, System Attributes to performance; Multiprocessors and Multicomputer-Shared Memory Multiprocessors, Distributed Memory Multiprocessors, A Taxonomy of MIMD Computers; Multivector and SIMD Computers-Vector Super computers, SIMD Supercomputers.

UNIT–II: PROCESSOR AND MEMORY HIERARCHY

Design space of processors, Instruction-set Architectures, Characteristics of typical CISC and RISC Architecture, Hierarchical Memory Technology, Inclusion, Coherence and Locality.

UNIT-III: LINEAR AND NONLINEAR PIPELINE PROCESSORS

Asynchronous and Synchronous models, Clocking and Timing control, Speedup, Efficiency and Throughput; Nonlinear pipeline processors: Reservation and Latency analysis-Problems, Collision Free Scheduling-problems, Instruction Execution Phases.

UNIT–IV: CACHE COHERENCE AND MESSAGE PASSING MECHANISMS

Cache Coherence problem-Two protocol approaches, Snoopy Bus Protocols, Directory based Protocols; Message Passing Mechanisms- Message-Routing Schemes, Deadlock Virtual Channels, Flow Control Strategies, Multicast Routing Algorithms.

UNIT –V: SIMD AND MIMD COMPUTER ORGANIZATIONS

Implementation models, The CM-2 Architecture; A Synchronized MIMD Machine, Control Processors and Processing Nodes, Interprocessor Communications.

UNIT–VI: TRENDS IN PARALLEL SYSTEMS

Forms of Parallelism- Structural Parallelism versus Instruction Level Parallelism, a Simple Parallel Computation, Parallel Algorithms, Stream Processing; Cray Line of Computer Systems.

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Text Book:

1. Kai Hwang & Naresh Jotwani "Advanced Computer Architecture- Parallelism, Scalability, Programmability" Second Edition, Mc Graw Hill Publishing.

Reference Books:

1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

2. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architecture – A Design Space Approach", Pearson Ed.

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III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3

CODING THEORY AND PRACTICE
(Professional Elective – I)

COURSE OBJECTIVES:

1. Understand the concepts of information, entropy, mutual information and study the Shannon's fundamental limits, theorems on information transmission.
2. Introduce and classify the Error correcting codes and understand the encoding and decoding of various linear block codes, Convolutional codes.
3. Know the mathematical description of error correcting codes.
4. Introduce the extension field called Galois field and their role in the design of BCH and RS codes.
5. Study the applications of error correcting codes.

COURSE OUTCOMES:

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

CO1: Illustrate the significance of entropy and mutual information in communications
CO2: Interpret the limits of data transmission
CO3: Identify the importance of source encoding in data transmission
CO4: Build new structures for encoder and decoder to address the issues in evaluating performance of communication system
CO5: Make use of convolution and block codes in error detection and correction
CO6: Summarize various advanced codes for communication system reliability improvement

UNIT-I: INFORMATION THEORY

Entropy, Information rate, source coding, Shannon-Fano and Huffman coding techniques, Mutual Information, Channel capacity of Discrete Channel, Shannon- Hartley law, Trade-off between bandwidth and SNR.

Error Control Codes: Examples of the use of error control codes, basic notions, Characterization of Error control codes performance of error control codes, comparison of uncoded and coded systems.

UNIT-II: CONVOLUTION CODES

Convolution encoders, structural properties of convolution codes, Trellis Diagrams, Viterbi Algorithm, Performance Analysis.

Linear Block Codes: Linear block Codes and their properties, standard arrays, Syndromes, Weight Distribution. Error Detection/Correction Properties, Modified Linear block codes.

UNIT-III: FINITE FIELDS

Groups, Rings, Fields Properties of finite Fields, Extension Fields, Polynomials over Finite Fields, Minimal Polynomials, Conjugates.

UNIT-IV: CYCLIC CODES

General theory, Shift Register Implementations, Shortened Cyclic codes, CRCs for Error Detection.

UNIT-V: BCH AND RS CODES

Algebraic Description, Frequency Domain Description, Decoding Algorithms for BCH and RS Codes.

UNIT-VI: APPLICATIONS

Concatenated Codes, Interleaves, The Compact Disc, Codes for Magnetic recording.

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Text Books:

1. Stephen B. Wicker, "Error Control Systems for Digital Communication and storage", US Ed Edition, Prentice Hall, 1995.
2. Bernard Sklar, "Digital communications: Fundamentals and applications", 2nd Edition, Prentice Hall, 2001.
3. Shu lin and Daniel J. Costello, "Error Control Coding", 2nd Edition, Pearson, 2004.

Reference Books:

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons, 2001.
2. Salvatore Gravano, "Introduction to error control codes", Oxford University press, 2001.
3. John G. Proakis, "Digital communication", 4th Edition, McGraw Hill, 2001.
4. R.P.Singh,S. D. Sapre, "Communication systems", 2nd Edition, MGH, 2008.

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III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
DIGITAL IMAGE PROCESSING *(Professional Elective – I)*							

COURSE OBJECTIVES:

1. Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
2. Introduce the students to some advanced topics in digital image processing.
3. Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

COURSE OUTCOMES:

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

CO1: Recall the Digital Image Fundamentals & Image Transforms.

CO2: Implement basic image processing algorithms or techniques (Spatial Domain & Frequency Domain

CO3: Summarize Image Restoration using Degradation Model, Algebraic Approach, Inverse Filtering, Least Mean Square Filters, and Constrained Least Squares Filters

CO4: Compare three (RGB, CMY and HIS) color models, pseudo color image processing and full color image processing,

CO5: Illustrate wavelets multi-resolution processing and different image compression techniques.

CO6: Demonstrate the Image Segmentation and Morphological Image Processing.

UNIT–I: DIGITAL IMAGE FUNDAMENTALS & IMAGE TRANSFORMS

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels, Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT–II: IMAGE ENHANCEMENT (SPATIAL &FREQUENCY DOMAIN)

Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, Linear and Non — Linear Gray Level Transformation, Local or Neighborhood Operation, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT–III: IMAGE RESTORATION AND RECONSTRUCTION

Degradation and Restoration Model, Noise models, Restoration in the presence of noise only, Spatial filtering, Periodic noise reduction by frequency domain filtering, Linear Position Invariant degradations, Estimation of degradation, Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT–IV: COLOR IMAGE PROCESSING

Color fundamentals, color models, pseudo color image processing, Basics of full color image Processing, Color transforms, Smoothing and Sharpening, image segmentation based on color, Noise in color images, Color image Compression

UNIT–V: WAVELETS AND MULTI-RESOLUTION PROCESSING

Image pyramids, Sub band coding & Haar transforms, Multi resolution expressions, Wavelet transforms in one dimensions, Fast wavelet transform dimensions, Wavelet packets. Image Compression: Fundamentals, Various compression methods-coding techniques, digital image

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UNIT–VI: MORPHOLOGICAL IMAGE PROCESSING

Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, the Hit or Miss Transformation. Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, Thresholding, Region Oriented Segmentation.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, " Digital Image Processing", 3rd Edition, Pearson, 2008
2. S Jayaraman, S Esakkirajan and T Veerakumar, "Digital Image Processing", TMH, 2010.

Reference Books:

1. Scotte Umbaugh, "Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools", 2nd Edition, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, "Digital Image Processing using MATLAB", 2nd Edition, TMH, 2010.
3. A.K. Jain, " Fundamentals of Digital Image Processing" PHI, 1989
4. Somka, Hlavac Boyle, "Digital Image Processing and Computer Vision", Cengage Learning (Indian edition) 2008.
5. Adrian low, "Introductory Computer Vision Imaging Techniques and Solutions", 2nd Edition, 2008
6. John C. Russ, J. Christian Russ, "Introduction to Image Processing & Analysis", CRC Press, 2010.
7. Vipula Singh, "Digital Image Processing with MATLAB & Lab view", Elsevier, 2012.

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	0	0	3	25	50	75	2
DIGITAL SIGNAL PROCESSING LAB							

COURSE OBJECTIVES:

1 Illustrate time and frequency domain response of signals and systems
2 Learn to program a DSP processor to filter signals
3 Develop IIR filters and FIR filters
4 Understand an LTI system and measure of power density spectrum of a sequences

COURSE OUTCOMES:

After successful completion of this course the student will be able to

CO1: Outline the architecture of DSP chips – TMS 320C 5X/6X and its instruction set.
CO2: Illustrate time and Frequency domain response of signals and systems through simulation.
CO3: Develop IIR filters and extend it to convert into FIR filters using windowing techniques.
CO4: Interpret the LTI system and measure of power density spectrum of a sequence.
CO5: Demonstrate linear and circular convolution.
CO6: Experiment with FFT algorithm to represent Frequency domain analysis of a sequence with less number of complex additions and multiplications.
CO7: Identify the frequency response of analog LP/HP filters.

LIST OF EXPERIMENTS:

1. To Study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
2. Time domain and Frequency domain Analysis of signals and systems.
3. To obtain spectrum of the discrete time sequence (without using default functions)
4. To obtain output of LTI system (without using default functions).
5. To verify linear and circular convolution.
6. To design FIR filter (LP/HP) using windowing technique
   a) Using rectangular window
   b) Using triangular window
   c) Using Kaiser window
7. To Implement IIR filter (LP/HP) on DSP Processors
8. N-point FFT algorithm.
9. Program to find frequency response of analog LP/HP filters using simulation tools.
10. To compute power density spectrum of a sequence.

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III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
MICROWAVE AND OPTICAL COMMUNICATIONS LAB							

COURSE OBJECTIVES:

1. Know about practical application of microwave components
2. Obtain knowledge in microwave parameters
3. Get ability to build analog/digital link setup
4. Identify better optical source for the required applications

COURSE OUTCOMES:

After completion of the course, the students will be able to

CO1: Illustrate the different microwave sources
CO2: Obtain the characteristics of microwave components.
CO3: Measure signal parameters at microwave frequencies.
CO4: Find numerical aperture of an optical fiber.
CO5: Obtain the characteristics of optical sources
CO6: Build Analog/Digital link set up

List of Experiments:

1. Reflex Klystron characteristics.
2. Gunn-diode characteristics.
3. VSWR measurement.
4. Frequency measurement.
5. Directional coupler characteristics.
6. Attenuation measurement.
7. Verification of the expression, $\frac{1}{\lambda_0^2} = \frac{1}{\lambda_c^2} + \frac{1}{\lambda_g^2}$
8. Scattering parameters of Magic Tee.
9. Directional coupler characteristics.
10. Characterization of LED.
11. Characterization of Laser Diode.
12. Analog link set up using optical fiber.
13. Measurement of Numerical aperture.

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III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
ADVANCED COMMUNICATION SKILLS							

COURSE OBJECTIVES:

1. To make the students conscious about their Non-Verbal communication
2. Train the students to use the language effectively to face interviews and participate in Group Discussions.
3. To develop effective written communication skills in academic, technical and professional contexts.
4. Develop critical thinking skills necessary to become employable.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: Interpret English language fluently, accurately and appropriately
CO2: Illustrate how body language is used in communication and interpret non-verbal symbols.
CO3: Demonstrate the nuances of the written language and write technical reports effectively.
CO4: Participate in Group discussions and successfully face interviews.

Unit-1: **Non-Verbal Communication**

Unit-2: **Resume Preparation**

Unit-3: **E-mail writing & Professional Letter writing**

Unit-4: **Essay Writing & Paragraph writing**

Unit-5: **Group discussion**

Unit-6: **Interview skills**

Reference Books:

1. Rajendra Pal, J S KorlahaHi, *Essentials of Business Communication,* Sultan Chand & Sons
2. Andrea J. Rutherford, *Basic Communication Skills for Technology,* Pearson Education Asia
3. V. Prasad, *Advanced Communication Skills,* Atma Ram Publications
4. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press
5. Sanjay Kumar, Pushp Lata, *Communication Skills,* Oxford University Press
6. Meenakshi Raman, Sangeeta Sharma, *Fundamentals of Technical Communication,* Oxford University Press

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IV Year – I SEMESTER

T	P	C
3+1	0	3

VLSI DESIGN

OBJECTIVES

The student will be introduced to

Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.

Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.

Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.

The concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).

Design static CMOS combinational and sequential logic at the transistor level, including mask layout.

Unit-I:

Introduction : Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes, BiCMOS Technology, Comparison between CMOS and Bipolar technologies.

Basic Electrical Properties Of MOS and Bi-CMOS Circuits: I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS circuits and BiCMOS Latch-up Susceptibility.

Unit-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design

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rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µm Double Metal, Double Poly CMOS rules. Layout Diagrams of NAND and NOR gates and CMOS inverter. Symbolic Diagrams-Translation to Mask Form.

Unit-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers, Transistor switches, Realization of gates using NMOS, PMOS and CMOS technologies.

Scaling Of MOS Circuits: Scaling models, Scaling factors for device parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise.

Unit-IV:

Subsystem Design: Architectural issues, switch logic, Gate logic, examples of structured design, clocked sequential circuits, system considerations, general considerations of subsystem design processes, an illustration of design processes.

Unit-V:

VlSI Design Issues: VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, FPGA design flow, introduction to SoC design.

Unit-VI:

FPGA Design: Basic FPGA architecture, , FPGA configuration, configuration modes, FPGA design process- FPGA design flow, FPGA families, FPGA design examples-stack, queue and shift register implementation using VHDL, step-by-step approach of FPGA design process on Xilinx environment.

Text Books:

1. Essentials of VLSI Circuits and Systems By Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited,2005 Edition.
2. VLSI Design-Black Book By Dr. K.V.K.K. Prasad, Kattula Shyamala, Kogent Learning Solutions Inc.2012 Edition.

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References:

1. VLSI Design By A.Albert Raj & T.Latha,PHI Learning Private Limited,2010.
2. VLSI Design-A.Shanthi and A.Kavita. New Age International Private Limited, 2006 First Edition.

OUTCOMES

After going through this course the student will be able to

Apply the Concept of design rules during the layout of a circuit.

Model and simulate digital VLSI systems using hardware design language.

Synthesize digital VLSI systems from register-transfer or higher level descriptions

Understand current trends in semiconductor technology, and how it impacts scaling and performance.

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IV Year – I SEMESTER

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3+1	0	3

COMPUTER NETWORKS

Objectives

The aim of this course is to introduce key concepts and principles of computer networks. The course will use a top-down approach to study the Internet and its protocol stack. Architecture, protocol, application-examples will include email, web and media-streaming. We will cover communications services (e.g., TCP/IP) required to support such network applications. The implementation and deployment of communications services in practical networks: including wired and wireless LAN environments, will be followed by a discussion of issues of network-security and network-management. Internet's architecture and protocols will be used as the primary examples to illustrate the fundamental principles of computer networking.

UNIT I
INTRODUCTION

OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

UNIT II PHYSICAL
LAYER

Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications; Narrow band, broad band ISDN and ATM.

UNIT III
DATA LINK LAYER

Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, wireless LANS, Bridges.

UNIT IV NETWORK
LAYER

Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. **DYNAMIC ROUTING:** Broadcast routing, Rotary for mobility, Congestion, Control Algorithms – General Principles of Congestion prevention policies. Internetworking: The Network layer in the internet and in the ATM Networks.

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UNIT V TRANSPORT LAYER

Transport Services, Connection management, TCP and UDP protocols: ATM AAL Layer Protocol.

UNIT VI
APPLICATION LAYER

Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

TEXT BOOKS

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan.Third Edition TMH.

REFERENCES

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition,Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

Outcomes:

The student will be able to

Analyze a communication system by separating out the different functions provided by the network; and some example networks

Understand various network topologies required for communication

Understand that there are fundamental limits to any communications system;

Understand the general principles behind addressing, routing, reliable transmission and other stateful protocols as well as specific examples of each;

Have an informed view of both the internal workings of the Internet and of a number of common Internet applications and protocols.

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IV Year – I SEMESTER

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DIGITAL IMAGE PROCESSING

OBJECTIVES

The student will

Learn the fundamental concepts and applications of Digital Image Processing.

Learn the concepts of and how to perform Intensity transformations and spatial filtering.

Understand the relationship between Filtering in spatial and frequency domains.

Understand the concepts of and how to perform Image restoration and reconstruction.

Understand the concepts of different color models and Color image processing.

Learn the concepts of Wavelets and multi-resolution processing, Image compression and Watermarking, Morphological image processing, Image segmentation, Representation and description.

UNIT-1

Introduction: Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing

Image Transforms: Need for image transforms, Spatial Frequencies in image processing, introduction to Fourier transform, discrete Fourier transform, fast Fourier transform and its algorithm, properties of Fourier transform. Discrete sine transforms. Walsh Transform. Hadamard transform. Haar Transform. Slant transforms, SVD and KL Transforms or Hotelling Transform

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters,

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Combining spatial enhancement methods, using fuzzy techniques for intensity transformations and spatial filtering

Filtering in the frequency domain: Preliminary concepts, Sampling and the Fourier transform of sampled functions, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing using frequency domain filters, Selective filtering, Implementation

UNIT-3

Image restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the degradation function, Inverse filtering, Minimum mean square error(Wiener) filtering ,constrained least squares filtering ,geometric mean filtering ,image reconstruction from projections.

Unit-4

Color image processing: color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression

Unit-5

Wavelets and Multi-resolution Processing: image pyramids, sub band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimensions. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets.

Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking

Unit-6

Morphological image processing: preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, grey –scale morphology

Image segmentation: Fundamentals, point, line, edge detection thresholding, region –based segmentation, segmentation using Morphological watersheds, the use of motion in segmentation

TEXT BOOKS :

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall , 2008.

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2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , Digital Image Processing Using MATLAB , 2rd edition, Prentice Hall, 2009.
3. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002
4. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education, 2011

Reference : Missing

OUTCOMES

After going through this course the student will be able to

Perform different transforms on image useful for image processing applications

Perform spatial and frequency domain filtering on image and can implement all smoothing and sharpening operations on images

Perform image restoration operations/techniques on images

Operate effectively on color images and different color conversions on images and can code images to achieve good compression

Do wavelet based image processing and image compression using wavelets

Perform all morphological operations on images and can be able to do image segmentation also.

Develop simple algorithms for image processing and use the various techniques involved in Bio Medical applications, etc.

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IV Year – I SEMESTER

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COMPUTER ARCHITECTURE AND ORGANIZATION

Objectives

The student will

Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.

Understand the principles and the implementation of computer arithmetic and ALU.

Understand the memory system, I/O organization

Understand the operation of modern CPUs including interfacing, pipelining, memory systems and busses.

Understand the principles of operation of multiprocessor systems

UNIT-I

BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data types, Complements, Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.

COMPUTER ARITHMETIC: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-II

REGISTER TRANSFER LANGUAGE AND MICRO-OPERATIONS: Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Micro-operations, logic micro operations, shift micro-operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions –Instruction cycle. Memory Reference Instructions. Input Onput and Interrupt. **CENTRAL PROCESSING UNIT** - Stack organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer

UNIT-III

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, Design of control unit-Hard wired control. Micro programmed control

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UNIT-IV

THE MEMORY SYSTEM: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware

UNIT-V

INPUT-OUTPUT ORGANIZATION : Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Serial communication:

UNIT-VI

PIPELINE AND VECTOR PROCESSING: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors. **Multi processors:** Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Synchronization, Cache Coherence.

TEXT BOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafwatZaky, V Edition, McGraw Hill, 2002.

REFERENCES:

1. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson, 2006.
2. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.

Objectives :

Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
Understand the principles and the implementation of computer arithmetic and ALU.
Understand the memory system, I/O organization
Understand the operation of modern CPUs including interfacing, pipelining, memory systems and busses.
Understand the principles of operation of multiprocessor systems.
Demonstrate the relationship between the software and the hardware and focuses on the foundational concepts that are the basis for current computer design.

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IV Year – I SEMESTER

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Elective I

ELECTRONIC SWITCHING SYSTEMS

Objectives :

The student will

Understand the means of measuring traffic.

Understand the implication of the traffic level on system design.

UNIT -I:

Introduction: Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT -II:

Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n- Stage Networks.

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three-Stage Combination Switching, n- Stage Combination Switching.

UNIT -III:

Telephone Networks: Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, Cellular Mobile Telephony

Signaling: Customer Line Signaling, Audio- Frequency Junctions and Trunk Circuits, FDM Carrier Systems, PCM Signaling, Inter- Register Signaling, Common- Channel Signaling Principles, CCITT Signaling System no.6, CCITT Signaling System no.7, Digital Customer Line Signaling.

UNIT -IV:

Packet Switching: Statistical Multiplexing, Local- Area and Wide- Area Networks, Large-scale Networks, Broadband Networks.

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Telecommunications Traffic: The Unit of Traffic, Congestion, Traffic Measurement, A Mathematical Model, Lost-call Systems, Queuing Systems.

UNIT -V:

Switching Networks: Single- Stage Networks, Grading, Link Systems, Grades of service of link systems, Application of Graph Theory to link Systems, Use of Expansion, Call Packing, Rearrange-able Networks, Strict- Sense non-blocking Networks, Sectionalized Switching Networks

UNIT -VI:

Integrated Services Digital Network: Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User-Network Interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration.

TEXT BOOKS:

1. Telecommunication Switching Systems and Networks- Thiagarajan Viswanathan, 2000, PHI.
2. Telecommunications Switching, Traffic and Networks- J. E. Flood, 2006, Pearson Education.

REFERENCES:

1. Digital Telephony- J. Bellamy, 2nd Edition, 2001, John Wiley.
2. Data Communications and Networks- Achyut S. Godbole, 2004, TMH.
3. Principles of Communication Ststems- H. Taub & D. Schilling, 2nd Edition, 2003, TMH.
4. Data Communication & Networking- B. A. Forouzan, 3rd Edition, 2004, TMH.
5. Telecommunication System Engineering – Roger L. Freeman, 4th Ed., Wiley-Inter Science, John Wiley & Sons, 2004.

Outcomes

The student will be able to

- Evaluate the time and space parameters of a switched signal
- Establish the digital signal path in time and space, between two terminals
- Evaluate the inherent facilities within the system to test some of the SLIC, CODEC and digital switch functions.
- Investigate the traffic capacity of the system.
- Evaluate methods of collecting traffic data.
- Evaluate the method of interconnecting two separate digital switches.

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ANALOG IC DESIGN

(Elective I)

OBJECTIVES

The student will be introduced to

The student will be able to understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.

In this course, students can study CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.

Another main object of this course is to motivate the graduate students to design and to develop the Analog CMOS Circuits for different Analog operations.

The concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

UNIT -I:

MOS Devices and Modeling: The MOS Transistor, Passive Components-Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV:

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -V:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

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UNIT -VI:

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.
Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

References:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn, 2013.

OUTCOMES

After going through this course the student will be able to

Understand the concepts of MOS Devices and Modeling.

Design and analyze any Analog Circuits in real time applications.

Extend the Analog Circuit Design to Different Applications in Real Time.

Understand of Open-Loop Comparators and Different Types of Oscillators.

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OBJECT ORIENTED PROGRAMMING & OPERATING SYSTEM

(Elective I)

Course Objectives:

By the end of the course student will

Describe the general architecture of computers

Describe object oriented concepts

Describe, contrast and compare differing structures for operating Systems

Understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

UNIT-I:

Introduction to OOP

Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP

UNIT-II:

Computer System and Operating System Overview: Overview of computer operating systems, operating systems functions, protection and security, distributed systems, special purpose systems, operating systems structures and systems calls, operating systems generation.

UNIT-III:

Process Management – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT-IV:

Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation

UNIT-V:

Virtual Memory Management:

virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing

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UNIT-VI:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

TEXT BOOKS:

1. The Complete Reference Java, 8ed, Herbert Schildt, TMH
2. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
3. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education

REFERENCES:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/ Operating%20Systems/New_index1.html
2. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH
3. Operating System A Design Approach-Crowley, TMH.
4. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.

Course Outcomes:

By the end of the course student will be able to

describe the general architecture of computers

describe object oriented concepts

describe, contrast and compare differing structures for operating Systems

understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

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RADAR SYSTEMS

(Elective-I)

OBJECTIVES

The student will be introduced to

the knowledge of different Antennas systems and communication equipment required for the operation of RADAR.

different parameters of Transmitter and Receiver of RADAR

the concept of Doppler Effect to measure parameters of RADAR.

different types of RADARS and applications based on the type of Transmitters, Receivers, and their functions.

Pre requisites: Antennas and wave propagation; Electromagnetics and Communications

UNIT – I

Introduction: Nature of Radar. Maximum Unambiguous Range. Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Related Problems. Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets-sphere, cone-sphere). Transmitter power.

UNIT – II

PRF and Range Ambiguities, System Losses (Qualitative treatment). Related Problems. CW and Frequency Modulated Radar: Doppler effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirement, Applications of CW radar. FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

UNIT – III

MTI and Pulse Doppler Radar: Introduction, Principle, MTIR Radar with-Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler Radar. Tracking Rader : Tracking with Rader, Sequential Lobing, Conical Scan, Mono-pulse Tracking.

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UNIT – IV

Rader Amplitude Comparison Mono-pulse (one – and two –coordinates). Phase Comparison Mono-pulse. Target Reflection Characteristics and Angular Accuracy. Tracking in Range Acquisition and Scanning Patterns. Comparison of Trackers. Radar Antennas – Antenna Parameters. Reflector Antennas. Lens Antennas. Lens Antennas Cosecant- Squared Antenna Pattern. Radomes.

UNIT- V

Electronically Steered Phased Array Antennas. Phase Shifters. Frequency – scan Arrays. Radiation for Phased Array. Architecture for Phased Arrays. Detection of Radar Signals in Noise: Introduction. Matched Filter Receiver – Response Characteristics and Derivation. Correlation detection. Detection criteria. Detector Characteristics. Automatic Detection. Constant False Alarm Rate Receiver

UNIT – VI

Radar Receivers – Noise Figure and Noise Temperature. Displays – types. Duplexer – Branch type and Balanced type. Circulators as Duplexers. Introduction to Phased Array Antennas- Basic Concepts. Radiation Pattern. Beam Steering and Beam Width changes. Series versus Parallel Feeds. Applications. Advantages and Limitations.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik. SECOND EDITION. McGraw – Hill. 1981.
2. Radar Engineering and fundamentals of Navigational Aids-G.S.N.Raju. I.K International. 2008.

REFERENCES:

1. Introduction to Radar Systems – Merrill I. Skolnik. THIRD EDITION. Tata McGraw – Hill. 2001.
2. Radar: Principles. Technologies. Applications- Byron Edde. Pearson Education.

OUTCOMES

After going through this course the student will be able to

Acquire the knowledge to apply and to design required parameters for a RADAR system.

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Apply the techniques learned, to choose suitable RADAR from the available, for the required application.

ADVANCED COMPUTER ARCHITECTURE

(Elective I)

UNIT -I:

Fundamentals of Computer Design:

Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law.

Instruction set principles and examples- Introduction, Classifying instruction set- MEmory addressing- type and size of operands, Operations in the instruction set.

UNIT –II:

Pipelines:

Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design:

Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT -III:

Instruction Level Parallelism the Hardware Approach:

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

UNIT-IV

ILP Software Approach

Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

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UNIT –V:

Multi Processors and Thread Level Parallelism:

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

UNIT –VI:

Inter Connection and Networks:

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:

1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCES:

1. John P. Shen and Miikko H. Lipasti - Modern Processor Design : Fundamentals of Super Scalar Processors
2. Computer Architecture and Parallel Processing - Kai Hwang, Faye A.Brigs., MC Graw Hill.
3. Advanced Computer Architecture - A Design Space Approach - Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed.

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IV Year – I SEMESTER

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Elective II

OPTICAL COMMUNICATIONS

OBJECTIVES

The student will be introduced to

the functionality of each of the components that comprise a fiber-optic communication system

the properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.

the principles of single and multi-mode optical fibers and their characteristics

working of semiconductor lasers, and differentiate between direct modulation and external electro-optic modulation.

Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral

properties, bandwidth, and circuits) and apply in optical systems.

Analyze and design optical communication and fiber optic sensor systems.

the models of analog and digital receivers.

UNIT I

Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II

Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity

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determination. Group delay. Types of Dispersion:- Material dispersion. Wave-guide dispersion. Polarization-Mode dispersion. Intermodal dispersion. Pulse broadening in Graded index fiber. Related problems.

UNIT III

Optical fiber Connectors-Connector types. Single mode fiber connectors. Connector return loss. Fiber Splicing- Splicing techniques. Splicing single mode fibers. Fiber alignment and joint loss- Multimode fiber joints. single mode fiber joints.

UNIT IV

Optical sources- LEDs. Structures. Materials. Quantum efficiency. Power. Modulation. Power bandwidth product. Injection Laser Diodes- Modes. Threshold conditions. External quantum efficiency. Laser diode rate equations. Resonant frequencies. Reliability of LED&ILD. Optical detectors- Physical principles of PIN and APD. Detector response time. Temperature effect on Avalanche gain. Comparison of Photo detectors. Related problems.

UNIT V

Source to fiber power launching - Output patterns. Power coupling. Power launching. Equilibrium Numerical Aperture. Laser diode to fiber coupling. Optical receiver operation- Fundamental receiver operation. Digital signal transmission. error sources. Receiver configuration. Digital receiver performance. Probability of Error. Quantum limit. Analog receivers.

UNIT VI

Optical system design - Point-to- point links- Component choice and considerations. Link power budget. Rise time budget with examples. Line coding in Optical links. WDM. Necessity. Principles. Measurement of Attenuation and Dispersion. Eye pattern.

TEXT BOOKS :

1. Optical Fiber Communications – Gerd Keiser. Mc Graw-Hill International edition. 3rd Edition. 2000.
2. Optical Fiber Communications – John M. Senior. PHI. 2nd Edition. 2002.

RERFERENCES :

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner. Pearson Education.2005.
2. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta. PHI. 2005.

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3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.

4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

OUTCOMES

After going through this course the student will be able to

Choose necessary components required in modern optical communications systems .

Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.

Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.

Choose the optical cables for better communication with minimum losses

Design, build, and demonstrate optical fiber experiments in the laboratory.

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DIGITAL IC DESIGN

(Elective II)

OBJECTIVES

The student will be able to understand the MOS Design.

In this course, students can study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.

Another main object of this course is to motivate the graduate students to design and to develop the Digital Integreated Circuits for different Applications.

The concepts of Semiconductor Memories, Flash Memory, RAM array organization.

UNIT-I:

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III:

Sequential MOS Logic Circuits: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV:

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

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UNIT-V:

Interconnect: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconncet Techniques.

UNIT-VI:

Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash.

Text Books:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

References:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson

OUTCOMES

After going through this course the student will be able to

Understand the concepts of MOS Design.

Design and analysis of Combinational and Sequential MOS Circuits.

Extend the Digital IC Design to Different Applications.

Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

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SPEECH PROCESSING

(ELECTIVE – II)

UNIT –I:

Fundamentals of Digital Speech Processing:

Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

UNIT –II:

Time Domain Models for Speech Processing:

Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT –III:

Linear Predictive Coding (LPC) Analysis:

Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT –IV:

Homomorphic Speech Processing:

Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

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UNIT-V

Speech Enhancement:

Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach : spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

UNIT-VI:

Automatic Speech & Speaker Recognition:

Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System

Hidden Markov Model (HMM) for Speech:

Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS,

Speaker Recognition:

Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

TEXT BOOKS:

1. Digital Processing of Speech Signals - L.R. Rabiner and S. W. Schafer. Pearson Education.
2. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., Wiley India, 2000.
3. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, Pearson Education.

REFERENCE BOOKS:

1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed., PE.
2. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st Ed., Wiley.

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Artificial Neural Networks and Fuzzy Logic

(Elective II)

1. Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Potential Applications of ANN.

Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN-Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

2. Feed Forward Neural Networks

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training

Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence

theorem, Limitations of the Perceptron Model, Applications.

Multilayer Feed Forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back-propagation (BP)

Training, Summary of Back-propagation Algorithm, Kolmogorov Theorem, Learning

Difficulties and Improvements.

3. Associative Memories

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem. Architecture of

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Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

4. **Self-Organizing Maps (SOM) and Adaptive Resonance Theory (ART)**

Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability- Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications.

5. **Classical & Fuzzy Sets**

Introduction to classical sets – properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, Properties, fuzzy relations, cardinalities, membership functions.

6. **Fuzzy Logic System Components**

Fuzzification, Membership Value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Applications :

Neural network applications: Process identification, Fraction Approximation, Control and Process Monitoring, Fault diagnosis and Load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

Text Books:

1. Neural Netwroks, Fuzy logic , Gnenetic algorithms: synthesis and applications by Rajasekharan and Rai- PHI Publication.
2. Introduction to Artificial Neural Systems- Jacek M.Zurada, Jaico Publishing House, 1997.

Reference Books:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Netwroks – James A Freeman and Davis Skapura, Pearson, 2002
3. Neural Netwroks – Simon Hykins, Pearson Education.
4. Neural Engineering by C. Eliasmith and CH. Anderson, PHI.

   Neural Netwroks and Fuzzy Logic System by Brok Kosko, PHI Publications.

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NETWORK SECURITY & CRYPTOGRAPHY

(Elective-II)

Course objectives:

The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment. During this course the students will gain knowledge (both theoretical and practical) in various kinds of software security problems, and techniques that could be used to protect the software from security threats. The students will also learn to understand the "modus operandi" of adversaries; which could be used for increasing software dependability.

Course outcomes:

1. be able to individually reason about software security problems and protection techniques on both an abstract and a more technically advanced level.
2. be able to individually explain how software exploitation techniques, used by adversaries, function and how to protect against them.

Syllabus:

UNIT I : Classical Encryption Techniques

Objectives: *The Objectives of this unit is to present an overview of the main concepts of cryptography, understand the threats & attacks, understand ethical hacking.*

Introduction: Security attacks, services & mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Cyber threats and their defense (Phishing Defensive measures, web based attacks, SQL injection & Defense techniques) TEXT BOOK 2), Buffer overflow & format string vulnerabilities, TCP session hijacking (ARP attacks, route table modification) UDP hijacking (man-in-the-middle attacks) (TEXT BOOK3).

UNIT II: Block Ciphers & Symmetric Key Cryptography

Objectives: *The Objectives of this unit is to understand the difference between stream ciphers & block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA.*

Traditional Block Cipher Structure, DES, Block Cipher Design Principles, AES-Structure, Transformation functions, Key Expansion, Blowfish, CAST-

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128. IDEA, Block Cipher Modes of Operations

UNIT III: Number Theory & Asymmetric Key Cryptography
Objectives: *Presents the basic principles of public key cryptography, Distinct uses of public key cryptosystems*

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms.

Public Key Cryptography: Principles, publickeycryptographyalgorithms, RSA Algorithms, Diffie Hellman Key Exchange, Elgamal encryption & decryption, Elliptic Curve Cryptography.

UNIT IV : Cryptographic Hash Functions & Digital Signatures
Objectives: *Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature*

Application of Cryptographic hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures, NIST Digital Signature Algorithm. Key management & distribution.

UNIT V: User Authentication, Transport Layer Security & Email Security
Objectives: *Present an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches, overview of SSL & TLS. Present an overview of electronic mail security.*

User Authentication: Remote user authentication principles, Kerberos
Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell(SSH)
Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT VI: IP Security & Intrusion Detection Systems
Objectives: *Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques*

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining

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Security Associations and Key Management.

Intrusion detection: Overview, Approaches for IDS/IPS, Signature based IDS, Host based IDS/IPS. (TEXT BOOK 2)

TEXT BOOKS:

1. Cryptography & Network Security: Principles and Practices, William Stallings, PEA, Sixth edition.
2. Introduction to Computer Networks & Cyber Security, Chwan Hwa Wu, J.David Irwin, CRC press
3. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech.

REFERENCE BOOKS:

1. Everyday Cryptography, Fundamental Principles & Applications, Keith Martin, Oxford
2. Network Security & Cryptography, Bernard Menezes, Cengage, 2010.

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IV Year – I SEMESTER

T	P	C
0	3	2

VLSI Laboratory

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using CMOS 130nm Technology with necessary EDA tools (Mentor Graphics/Tanner)

List of Experiments:

1. Design and implementation of an inverter
2. Design and implementation of universal gates
3. Design and implementation of full adder
4. Design and implementation of full subtractor
5. Design and implementation of RS-latch
6. Design and implementation of D-latch
7. Design and implementation asynchronous counter
8. Design and Implementation of static RAM cell
9. Design and Implementation of differential amplifier
10. Design and Implementation of ring oscillator

Equipment Required:

1. Mentor Graphics/Tanner software-latest version
2. Personal computer with necessary peripherals.

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IV Year – I SEMESTER

T P C 0 3 2

MICROWAVE ENGINEERING LAB

Minimum Twelve Experiments to be conducted: Part – A (Any 7 Experiments) :

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance and Frequency Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Circulator.
9. Scattering parameters of Magic Tee.

Part – B (Any 5 Experiments) :

10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1. Regulated Klystron Power Supply
2. VSWR Meter -
3. Micro Ammeter - 0 – 500 μA
4. Multi meter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Reflex Klystron

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8. Crystal Diodes
9. Micro wave components (Attenuation)
10. Frequency Meter
11. Slotted line carriage
12. Probe detector
13. wave guide shorts
14. Pyramidal Horn Antennas
15. Directional Coupler
16. E. H. Magic Tees
17. Circulators, Isolator
18. Matched Loads
19. Fiber Optic Analog Trainer based LED
20. Fiber Optic Analog Trainer based laser
21. Fiber Optic Digital Trainer
22. Fiber cables - (Plastic, Glass)

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IV Year – II SEMESTER

T	P	C
3+1	0	3

CELLULAR AND MOBILE COMMUNICATIONS

UNIT I

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN : General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT II

INTERFERENCE : Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-cochannel interference-different types. **CELL COVERAGE FOR SIGNAL AND TRAFFIC:** Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

UNIT III

CELL SITE AND MOBILE ANTENNAS : Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT IV

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT V

Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem

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handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

UNIT VI

DIGITAL CELLULAR NETWORKS : GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

TEXTBOOKS :

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

REFERENCES :

1. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Mobile Cellular Communication – G Sasibhushana Rao Pearson
3. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
4. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

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IV Year – II SEMESTER

3+1 0 3

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT I

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error, DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt, Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi-meter for Voltage, Current and resistance measurements.

UNIT II

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, . Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT IV

AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT V

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

UNIT VI

Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.

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TEXTBOOKS :

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
3. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

OUTCOMES

The student will be able to

Select the instrument to be used based on the requirements.
Understand and analyze different signal generators and analyzers.
Understand the design of oscilloscopes for different applications.
Design different transducers for measurement of different parameters.

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IV Year – II SEMESTER

3+1 0 3

ELECTIVE – III

SATELLITE COMMUNICATIONS

UNIT I

INTRODUCTION : Origin of Satellite Communications, Historical Background, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

UNIT II

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT III

SATELLITE SUBSYSTEMS : Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT IV

SATELLITE LINK DESIGN : Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception.

UNIT V

EARTH STATION TECHNOLOGY : Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

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UNIT VI

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM [1] : Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES :

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

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MIXED SIGNAL DESIGN

(ELECTIVE – III)

OBJECTIVES

The student will be introduced to

Understand the Switched capacitors Circuits and Operation and Analysis, PLLS.

In this course, students can study Data Converter Fundamentals, Nyquist Rate A/D Converters.

Another main object of this course is to motivate the graduate students to study and to analyze the Oversampling Converters and Continuous-Time Filters.

The concepts of Continuous-Time Filters, CMOS Transconductors Using Triode and Active Transistors and MOSFET-C Filters.

UNIT-I:

Switched Capacitor Circuits: Introduction to Switched Capacitor circuits-basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT-II:

Phased Lock Loop (PLL): Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III:

Data Converter Fundamentals: DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV:

Nyquist Rate A/D Converters: Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

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UNIT-V:

Oversampling Converters: Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A

UNIT-VI:

Continuous-Time Filters: Introduction to Gm-C Filters, Bipolar Transconductors, CMOS transconductors Using Triode and Active Transistors, BiCMOS Tran conductors, MOSFET-C Filters.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.
2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

OUTCOMES

After going through this course the student will be able to

Understand the concepts of Switched Capacitor circuits.

Design and analysis of Nyquist Rate A/D Converters.

Extend the Mixed Signal Design to Different Applications.

Concepts of Oversampling Converters and Continuous-Time Filters.

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EMBEDDED SYSTEMS

(ELECTIVE – III)

OBJECTIVES

After going through this course the student will be able to

Understand the building blocks of typical embedded system and different memory technology and memory types.

Learn the characteristics of an embedded system, quality attributes of embedded systems, application specific and domain specific embedded system.

Learn about communication devices and basics about VLSI and integrated circuit design and learn concept of firmware design approaches, ISR concept, Interrupt sources, interrupt servicing mechanism, multiple interrupts.

Understand the concepts of c versus embedded c and compiler versus cross-compiler.

Learn about the integrated development environment, software utility tool. Also learn about quality assurance and testing of the design, testing on host machine, simulators.

Unit-I:

Introduction: Embedded System-Definition, History, Classification, application areas and purpose of embedded systems, The typical embedded system-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an embedded system.

Unit-II:

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

Unit-III:

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

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Unit-IV:

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose an RTOS.

Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

Unit-V:

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Unit-VI:

Embedded System Implementation And Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications, 2005
2. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications.

References:

1. Embedded Systems, Raj Kamal-Tata McGraw Hill Education Private Limited, Second Edition, 2008
2. Embedding system building blocks By Labrosse, CMP publishers.

OUTCOMES

After going through this course the student will be able to

Know basics of embedded system, classification, memories, different communication interface and what embedded firmware is and its role in embedded system, different system components.

Distinguish all communication devices in embedded system, other peripheral device.

Distinguish concepts of C versus embedded C and compiler versus cross-compiler.

Choose an operating system, and learn how to choose an RTOS

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RF CIRCUIT DESIGN

(ELECTIVE – III)

UNIT -I:

Introduction to RF Electronics:

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

UNIT -II:

Transmission Line Analysis: Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. **Single And Multiport Networks:** The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT -III:

Matching and Biasing Networks:

Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks.

UNIT-IV

RF Passive & Active Components: Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

UNIT -V:

RF Transistor Amplifier Design: Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT -VI:

Oscillators: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. **RF Mixers:**

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Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers. Frequency domain considerations.

TEXT BOOKS:

1. RF Circuit design: Theory and applications by Reinhold Ludwing. Pavel Bretchko. Pearson Education Asia Publication. New Delhi 2001.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons

REFERENCE BOOKS:

1. Radio frequency and Microwave Electronics - Mathew M.Radmangh, 2001, PE Asia Publ.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Design - Joseph Carr., 3rd Edition, Tab Electronics.
4. Complete Wireless Design - Cotter W. Sawyer, 2nd Edition, Mc-Graw Hill.
5. Practical RF Circuit Design for Modem Wireless Systems Vol.2 -Less Besser and Rowan Gilmore.

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Cloud Computing
(ELECTIVE – III)

Course Objectives: The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

Course Outcomes:

1. Understanding the key dimensions of the challenge of Cloud Computing
2. Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
3. Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
4. Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas

Syllabus:

UNIT I: Systems modeling, Clustering and virtualization:

Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency

UNIT II: Virtual Machines and Virtualization of Clusters and Data Centers:

Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

UNIT III: Cloud Platform Architecture:

Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

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UNIT IV: Cloud Programming and Software Environments:

Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

UNIT V: Cloud Resource Management and Scheduling:

Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds, Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling Map Reduce Applications Subject to Deadlines.

UNIT VI:

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service(S3)

TEXT BOOKS:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press

REFERNCE BOOK:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH

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IV Year – II SEMESTER

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ELECTIVE - IV

WIRELESS SENSORS AND NETWORKS

UNIT I

OVERVIEW OF WIRELESS SENSOR NETWORKS:

Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints an challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

ARCHITECTURES:

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT II

NETWORKING Technologies:

Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT-III

MAC Protocols for Wireless Sensor Networks:

Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT-IV

ROUTING PROTOCOLS:

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing

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UNIT-V

TRANSPORT LAYER AND SECURITY PROTOCOLS:

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT- VI SECURITY

IN WSNs:

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

SENSOR NETWORK PLATFORMS AND TOOLS:

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

APPLICATIONS of WSN:

S Ultra wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

REFERENCES:

1. . Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer
5. Wireless Sensor Networks – S Anandamurugan , Lakshmi Publications

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SYSTEM ON CHIP

(ELECTIVE - IV)

OBJECTIVES

After going through this course the student will be able to

Understand the System Architecture and Processor Architecture. approach for a SOC Design.

Learn the, Basic concepts in Processor Micro Architecture, and Learn Different Types of Processors like VLIW Processors, Superscalar Processors etc.

Learn about SOC external memory, Scratchpads and Cache memory and Multilevel Caches.

Learn the SOC Design approach, Design and evaluation, Applications Like Image compression etc…

UNIT-I:

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II:

Processors : Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III:

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation . SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV:

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor

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UNIT-V:

Interconnect Configuration: Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-VI:

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Text Books:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

Reference Books:

1. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.
2. System on Chip Verification – Methodologies and Techniques – Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

OUTCOMES

After going through this course the student will be able to

Know basics of System Architecture and Processor Architecture.

Know different Types of Processors Like VLIW Processors, Superscalar Processors etc. and Basic concepts in Processor Micro Architecture.

Distinguish Cache memory and Multilevel Caches, SOC external memory.

Know the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies.

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LOW POWER VLSI DESIGN

(ELECTIVE - IV)

OBJECTIVES

The student will be able to understand the Fundamentals of Low Power VLSI Design.

In this course, students can study low-Power Design Approaches, Power estimation and analysis.

Another main object of this course is to motivate the graduate students to study and to analyze the Low-Voltage Low-Power Adders, Multipliers.

The concepts of Low-Voltage Low-Power Memories and Future Trend and Development of DRAM.

UNIT-I:

Fundamentals of Low Power VLSI Design: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT-II:

Low-Power Design Approaches:

Low-Power Design through Voltage Scaling: VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.

Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III:

Power estimation and analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power and gate level capacitance estimation.

UNIT-IV:

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power

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Design Techniques –Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT-V:

Low-Voltage Low-Power Multipliers Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT-VI:

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

Text Books:

1. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

Reference Books:

1. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
2. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002.

OUTCOMES

After going through this course the student will be able to

Understand the concepts of Low-Power Design Approaches.

Design and analysis of Low-Voltage Low-Power Circuits.

Extend the Low Power Design to Different Applications.

Understand of Low-Voltage Low-Power Memories and Basics of DRAM.

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BIO-MEDICAL INSTRUMENTATION

(ELECTIVE - IV)

UNIT-I

Sources of Bioelectric potentials and Electrodes: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals.

UNIT-II

The Cardiovascular System: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT- III

Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-IV

Bio telemetry and Instrumentation for the clinical laboratory Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT-V

X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention,

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UNIT-VI

Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John willey & Sons Inc.

Reference:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)

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EMI / EMC

Pre requisites: EMTL and AWP Courses.

Objectives:

Student shall be able to understand the root causes for Electromagnetic Noise (EMI), its sources.

Shall be able to understand the effects of EMI and the required precautions to be taken/to be discussed with his peer group.

Shall be able to understand the different measurement techniques of EMI (for conducted and normal) and their influences in detail.

Shall be able to understand different compatibility techniques (EMC) to reduce/suppress EMI.

Shall be able to understand different standards being followed across the world in the fields of EMI/EMC.

UNIT-I: Natural and Nuclear sources of EMI / EMC : Introduction, Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT-II: EMI from apparatus, circuits and open area test sites : Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive inter modulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI). Open area test sites and measurements.

UNIT-III: Radiated and conducted interference measurements: Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements.

UNIT-IV:ESD, Grounding, shielding, bonding and EMI filters : Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design. ESD, Electrical fast transients / bursts, electrical surges.

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UNIT-V: Cables, connectors, components: Introduction, EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, opto-isolators, Transient and Surge Suppression Devices.

UNIT-VI: EMC standards- National / International .: Introduction, Standards for EMI and EMC, MIL-Standards, IEEE/ANSI standards, CISPR/IEC standards, FCC regulations, Euro norms, British Standards, EMI/EMC standards in JAPAN, Conclusions.

Text Books :

1. Engineering Electromagnetic Compatibility by **Dr. V.P. Kodali, IEEE Publication**, Printed in India by *S. Chand & Co. Ltd., New Delhi, 2000*.
2. Electromagnetic Interference and Compatibility **IMPACT series, IIT – Delhi, Modules 1 – 9**.

References :

1. Introduction to Electromagnetic Compatibility, NY, **John Wiley, 1992, by C.R. Pal.**

Outcomes-

At the end of this Course,

- Students shall be able to distinguish effects of EMI and counter measures by EMC-techniques.
- Students shall apply the knowledge gained in selecting proper gadget/device/appliance/system, as per EMC-norms specified by regulating authorities.
- Students shall choose career in the fields of EMI/EMC as an Engineer/Researcher/Entrepreneur in India/abroad.

IV Year – II SEMESTER

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Project & Seminar

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3

DIGITAL SYSTEM DESIGN

Course Objectives:

- Students will study the transformation of sequential machines and digital design concepts.
- Students must be able to design SM charts and fault modeling.
- Students learn about PODEM, fault diagnosis.

Course Outcomes:

Upon completion of this course, the student will be able to

- An ability to describe, transformation of sequential machines.
- An ability to describe, digital design concepts.
- An ability to rapidly design SM charts.
- An ability to rapidly design fault modeling.
- An ability to study PODEM.
- An ability to identify fault diagnosis.

UNIT-I

Minimization and Transformation of Sequential Machines: The Finite State Model – Capabilities and limitations of FSM, State equivalence and Machine minimization, Simplification of incompletely specified machines. Fundamental mode model – Flow table – State reduction – Minimal closed covers – Races, Cycles and Hazards.

UNIT-II

Digital Design: Digital Design Using ROMs, PALs and PLAs , BCD Adder, 32 – bit adder, State graphs for control circuits, Scoreboard and Controller, A shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider.

UNIT-III

SM Charts: State machine charts, Derivation of SM Charts, Realization of SM Chart, Implementation of Binary Multiplier, dice game controller.

UNIT-IV

Fault Modeling: Logic Fault model – Fault detection & Redundancy- Fault equivalence and fault location –Fault dominance – Single stuck at fault model – Multiple stuck at fault models – Bridging fault model. Fault diagnosis of combinational circuits by conventional methods – Path sensitization techniques, Boolean Difference method – Kohavi algorithm.

UNIT-V

Test Pattern Generation: Test algorithms – D algorithm, PODEM, Random testing, Transition count testing, Signature analysis and test bridging faults.

UNIT-VI

Fault Diagnosis in Sequential Circuits: Circuit Test Approach, Transition Check Approach – State identification and fault detection experiment, Machine identification, Design of fault detection experiment. 22 2013-14

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TEXT BOOKS:

1. Charles H. Roth, "*Fundamentals of Logic Design*", 5th Ed., Cengage Learning.
2. Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman, "*Digital Systems Testing and Testable Design*", John Wiley & Sons Inc.
3. N. N. Biswas, "*Logic Design Theory*", PHI

REFERENCES:

1. Z. Kohavi, "*Switching and Finite Automata Theory*", 2nd Ed., TMH, 2001.
2. Morris Mano, M.D.Ciletti, " *Digital Design*", 4th Edition, PHI.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
VLSI TECHNOLOGY AND DESIGN							

Course Objectives:

- Be able to create models of ASIC, FPGA, moderately sized CMOS circuits that realize specified digital functions.
- Be able to understand VLSI design issues, BiCMOS circuits.
- Have an understanding of subsystem design and layout, subsystem design processes

Course Outcomes:

Upon completion of this course, the student will be able to

- use mathematical methods and circuit analysis models in analysis of CMOS circuits.
- create models of ASIC,FPGA that realize specified digital functions.
- apply design issues for testability.
- understand of the characteristics of BiCMOS circuit.
- understand subsystem design and layout.
- understand chip design, floor planning.

UNIT-I

VLSI Technology: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

VLSI Design: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:

CMOS VLSI Design: MOS Technology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

Building Blocks of a VLSI circuit: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

UNIT-III:

VLSI Design Issues: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-IV:

Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-V:

Subsystem Design and Layout: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

Subsystem Design Processes: Some general considerations and an illustration of design processes, design of an ALU subsystem. 24 2013-14

UNIT-VI:

Floor Planning: Introduction, Floor planning methods, off-chip connections.

Architecture Design: Introduction, Register-Transfer design, highlevel synthesis, architectures for low power, architecture testing.

Chip Design: Introduction and design methodologies.

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TEXT BOOKS:

1. K. Eshraghian, Douglas A. Pucknell, Sholeh Eshraghian, *"Essentials of VLSI Circuits and Systems"*, PHI Publications, 2005.
2. Wayne Wolf, *"Modern VLSI Design"*, 3rd Ed., Pearson Education, 1997.
3. Dr.K.V.K.K.Prasad, KattulaShyamala, *"VLSI Design"*, Kogent Learning Solutions Inc., 2012.

REFERENCES:

1. Randall L.Geiger, Phillip E.Allen, Noel R.Strader, *"VLSI Design Technologies for Analog and Digital Circuits"*, TMH Publications, 2010.
2. Ming-BO Lin, *"Introduction to VLSI Systems: A Logic, Circuit and System Perspective"*, CRC Press, 2011.
3. N.H.E Weste, K. Eshraghian, "*Principals of CMOS VLSI Design*", 2nd Edition, Addison Wesley.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DIGITAL DATA COMMUNICATIONS							

Course Objectives:

- Introduce students to the evolution of digital modulation schemes and the concepts data communication.
- Awareness of different error correction codes, data link protocols.
- Introduction of different networks and multiple access techniques.

Course Outcomes:

Upon completion of this course, the student will be able to

- To understand the different digital modulation schemes.
- To understand the different concepts of data communication.
- To understand the different error correction codes.
- To understand the different data link protocols.
- To understand the different networks and multiple access techniques.

UNIT-I

Digital Modulation Schemes:

BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT-II

Basic Concepts of Data Communications, Interfaces and Modems:

Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/ IP Protocol suite and Comparison with OSI model.

UNIT-III

Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code

UNIT-IV

Data Link Control: Line Discipline, Flow Control, Error Control **Data Link Protocols:** Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT-V

Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL. **Local Area Networks:** Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.

Metropolitan Area Networks: IEEE 802.6, SMDS **Switching:** Circuit Switching, Packet Switching, Message Switching. **Networking and Interfacing Devices:** Repeaters, Bridges, Routers, Gateway, Other Devices.

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UNIT-VI

Multiple Access Techniques:

Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), OFDM and OFDMA.

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A.Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.

REFERENCES:

1. Prakash C. Gupta, *"Data Communications and Computer Networks"*, PHI, 2006.
2. William Stallings, "*Data and Computer Communications*", 8th Ed. , PHI, 2007.
3. T. Housely, "*Data Communication and Tele Processing Systems* ", 2nd Ed, BSP, 2008.
4. Brijendra Singh, "*Data Communications and Computer Networks*", 2nd Ed., PHI, 2005.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADVANCED COMPUTER ARCHITECTURE							

Course Objectives:

- The course focus on computer design, pipelining, RISC instruction set.
- To introduce dynamic scheduling, different ILP software Techniques.
- To understand the concept of memory architecture, interconnection and intel architecture.

Course Outcomes:

Upon completion of this course, the student will be able to

- Know the classes of computers and new trends and developments in computer design.
- Understand pipelining, RISC processor, cache memory performance.
- Understand the various techniques to enhance a processors ability to exploit instruction level parallelism (ILP) and its challenges.
- Understand the architecture of Very large instruction word (VLIW).
- Describe the concept of systematic and distributed shared memory architecture.
- Understand the performance of interconnection network and intel architecture.

UNIT-I

Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, Classifying instruction set- Memory addressing- type and size of operands, Operations in the instruction set.

UNIT–II

Pipelines: Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT-III

Instruction Level Parallelism the Hardware Approach: Instruction- Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- hardware based speculation.

UNIT-IV

ILP Software Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT–V

Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism - Introduction; Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization. 28 2013-14

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UNIT–VI

Inter Connection and Networks: Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:

1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCE BOOKS:

1. Kai Hwang, Faye A. Brigs., "*Computer Architecture and Parallel Processing*", MC Graw Hill.
2. Dezso Sima, Terence Fountain, Peter Kacsuk , "*Advanced Computer Architecture – A Design Space Approach*", Pearson Ed.

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I M.TECH-I SEMESTER (ELECTIVE– I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3

WIRELESS COMMUNICATION AND NETWORKS

Course Objectives:

- To understand the concepts of basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference.
- To understand the Mobile radio propagation for small scale fading and multipath, large scale path loss.
- To study the different generations of mobile networks, WAN and IEEE 802.11.

Course Outcomes:

Upon completion of this course, the student will be able to

- Able to understand the concepts of spectrum allocation, basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference, improving coverage and capacity, cell splitting.
- Able to understand the Mobile radio propagation large scale path loss.
- To understand the different outdoor propagation models.
- To understand Mobile radio propagation for small scale fading and multipath.
- Able to understand the different equalizers and diversity techniques.
- To understand the different wireless networks, development of wireless networks.

UNIT-I

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT–II

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction- Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knifeedge Diffraction, Scattering.

UNIT–III

Outdoor Propagation Models- Longley- Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT–IV

Mobile Radio Propagation: Small –Scale Fading and Multipath Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels 30 2013-14 Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading,

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Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT–V

Equalization and Diversity Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT-VI

Wireless Networks Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

1. Theodore, S. Rappaport, "*Wireless Communications, Principles, Practice*", 2nd Ed., PHI, 2002.
2. Andrea Goldsmith, "*Wireless Communications*", Cambridge University Press, 2005.
3. Gottapu Sasibhushana Rao, "*Mobile Cellular Communication*", Pearson Education, 2012.

REFERENCES:

1. KavehPahLaven and P. Krishna Murthy, "*Principles of Wireless Networks*", PE, 2002.
2. Kamilo Feher, "*Wireless Digital Communications* ", PHI, 1999.
3. William Stallings, "*Wireless Communication and Networking*", PHI, 2003.
4. UpenDalal, "*Wireless Communication*", Oxford Univ. Press
5. Vijay K. Gary, "*Wireless Communications and Networking*", Elsevier

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I M.TECH-I SEMESTER (ELECTIVE–I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DIGITAL DESIGN USING HDL							

Course Objectives:

- Students will study the signals, variables, combinational logic circuit design using VHDL.
- Students must be able to design sequential logic circuit design using VHDL and digital logic circuits using Verilog HDL
- Students learn about synthesis and testing of digital logic circuit,CAD tools.

Course Outcomes:

Upon completion of this course, the student will be able to

- Demonstrate the use and application of signals, variables.
- Demonstrate the use and application of combinational logic circuit design using VHDL.
- Be able to simulate and debug sequential logic circuit described in VHDL.
- Be able to simulate and debug digital logic circuits using Verilog HDL.
- To synthesize digital circuits at several level of abstractions.
- To test digital logic using CAD tools

UNIT-I

Digital Logic Design using VHDL Introduction, designing with VHDL, design entry methods, logic synthesis , entities , architecture , packages and configurations, types of models: dataflow , behavioral , structural, signals vs. variables, generics, data types, concurrent vs. sequential statements , loops and program controls.

Digital Logic Design using Verilog HDL Introduction, Verilog Data types and Operators, Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

UNIT-II

Combinational Logic Circuit Design using VHDL Combinational circuits building blocks: Multiplexers, Decoders , Encoders , Code converters, Arithmetic comparison circuits , VHDL for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Look-Ahead Adder, Subtraction, Multiplication.

UNIT-III

Sequential Logic Circuit Design using VHDL Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

UNIT-IV

Digital Logic Circuit Design Examples using Verilog HDL Behavioral modeling , Data types, Boolean-Equation-Based behavioral models of combinational logics , Propagation delay and continuous assignments, latches and level-sensitive circuits in Verilog, Cyclic behavioral models of flip-flops and latches and Edge detection, comparison of styles for behavioral model; Behavioral model, Multiplexers, Encoders and Digital Systems & Computer Electronics 33Decoders, Counters, Shift Registers, Register files, Dataflow models of a linear feedback shift register, Machines with multi cycle operations, ASM and ASMD charts for behavioral modeling, Design examples, Keypad scanner and encoder.

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UNIT-V

Synthesis of Digital Logic Circuit Design Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines, Registers and counters.

UNIT-VI

Testing of Digital Logic Circuits and CAD Tools Testing of logic circuits, fault model, complexity of a test set, path-sensitization, circuits with tree structure, random tests, testing of sequential circuits, built in self test, printed circuit boards, computer aided design tools, synthesis, physical design.

TEXT BOOKS:

1. Stephen Brown &ZvonkoVranesic, "*Fundamentals of Digital logic design with VHDL*", Tata McGraw Hill,2nd edition.
2. Michael D. Ciletti, "*Advanced digital design with the Verilog HDL*", Eastern economy edition, PHI.

REFERENCES:

1. Stephen Brown & ZvonkoVranesic, "*Fundamentals of Digital logic with Verilog design*", Tata McGraw Hill,2nd edition.
2. Bhaskar, "*VHDL Primer*", 3rd Edition, PHI Publications.
3. Ian Grout, "*Digital systems design with FPGAs and CPLDs*", Elsevier Publications.

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I M.TECH-I SEMESTER (ELECTIVE– I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ANALOG AND DIGITAL IC DESIGN							

Course Objectives:

- Students will study the current mirrors and amplifiers, PLL and comparators
- Students must be able to design combinational and sequential IC design using Verilog.
- Students learn about synthesis and test D/A and A/D converters.

Course Outcomes:

Upon completion of this course, the student will be able to

- An ability to describe, current mirrors.
- An ability to describe, current mirrors.
- An ability to rapidly design combinational logic that works.
- An ability to rapidly design sequential circuits.
- An ability to synthesize logic design Nyquist rate A/D .
- An ability to synthesize logic design Nyquist rate D/A .

UNIT-I

Current Mirrors And Single Stage Amplifiers: Simple COMS, BJT current mirror, Cascode, Wilson and Widlar current mirrors. Common Source amplifier source follower, common gate amplifier

Operational Amplifiers: General considerations one – state op-amps, two stage opamps-gains boosting stage- comparison I/P range limitations slew rate.

Phased Locked Loop Design: PLL concepts- The phase locked loop in the locked condition Integrated circuit PLLs – phase Detector- Voltage controlled oscillator case study.

UNIT-II

Comporators: Using an op-amp for a comparator-charge injection error- latched Comparator **Swithched Capacitors Circuits:** Basic Building blocks op-amps capacitors switches –non-over lapping clocks-Basic operations and analysis-resistor equivalence of la switched capacitor-parasitic sensitive integrator parasitic insensitive integrators signal flow graph analysis-First order filters- switch sharing fully differential filters.

UNIT-III

Combinational IC Design By Using Verilog: VERILOG modeling for decoders, encoders, multiplexers, adders and subtractors.

UNIT-IV

Sequential IC Design By Using VHD: VERILOG modeling for larches, flip flops, counters, shift registers, FSMs.

LOGIC FAMILIES & CHARACTERISTICS: COMS, TTL, ECL, logic families COMS / TTL- interfacing and comparison of logic families.

UNIT-V

Digital Integrated System Building Blocks: Multiplexers, decoders, barrel shifters, counters and digital single bit adders.

NYQUIST RATE D/A Converters: Decoder based converter resistor storing converters folded resistor string converter – Binary scale converters – Binary weighted resistor converters – Reduced resistance ratio ladders – R-2R based converters – Thermometer code current mode D/A converters.

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UNIT-VI

NYQUIST RATE A/D Converters: Integrating converters – successive approximation converters. DAC based successive approximation – flash converters time interleaved A/D converters.

TEXT BOOKS:

1. David A Johns, Ken Martin, "*Analog Integrated circuit Design*", John Wiley & Sons.
2. BehzadRazavi, "*Design of Analog CMOS Integrated Circuits*", TMH
3. Ken Martin, "*Digital Integrated Circuit Design*", Oxford University, 2000
4. John F Wakerly, "*Digital Design Principles and Practices*", 3rd Ed., Pearson Education & Xilinx Design Series, 2002.

REFERENCES:

1. Ken Martin, "Digital *Integrated Circuit Design*", Oxford University, 2000.
2. Samir Palnitkar, "Verylog HDL-A Guide to Digital Design and Synthesis", Prentice Hall India, 2002.

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I M.TECH-I SEMESTER (ELECTIVE–I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DATA CONVERTERS							

Course Objectives:

- Students will study the characteristics of AD/DA and switch capacitor concepts.
- Students must be able understand comparators and converters.
- Students learn about pipeline and sigma delta converters.

Course Outcomes:

Upon completion of this course, the student will be able to

- An ability to describe, characteristics of AD/DA .
- An ability to describe, switch capacitor concepts.
- An ability to rapidly design comparators.
- An ability to rapidly design fault modeling.
- An ability to study pipeline.
- An ability to understand sigma delta converters.

UNIT-I

Introduction And Characteristics Of AD/DA Converter Characteristics

Evolution, types and applications of AD/DA characteristics, issues in sampling, quantization and reconstruction, oversampling and antialiasing filters.

UNIT-II

Switch Capacitor Circuits Comparators

Switched-capacitor amplifiers, switched capacitor integrator, switched capacitor common mode feedback.

UNIT-III

Comparators

Single stage amplifier as comparator, cascaded amplifier stages as comparator, latched comparators. offset cancellation, Op Amp offset cancellation, Calibration techniques

UNIT-IV

NYQUIST RATE D/A Converters

Current Steering DACs, capacitive DACs, Binary weighted versus thermometer DACs, issues in current element matching, clock feed through, zero order hold circuits, DNL, INL and other performance metrics of ADCs and DACs

UNIT-V

Pipeline and Other ADCs

Performance metrics, Flash architecture, Pipelined Architecture, Successive approximation architecture, Time interleaved architecture.

UNIT-VI

Sigma Delta Converters

STF, NTF, first order and second order sigma delta modulator characteristics, Estimating the maximum stable amplitude, CTDSMs, OP-Amp nonlinearities

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TEXT BOOKS:

1. BehzadRazavi, *"Principles of data conversion system design"*, IEEE press, 1995.
2. M. Pelgrom, *"Analog-to-Digital Conversion"*, Springer, 2010.
3. Rudy van de Plassche, *"CMOS Integrated Analog-to-Digital and Digital-to-Analog converters"*, Kluwer Academic Publishers, Boston, 2003.

REFERENCES:

1. R. Schreier, G. Temes, *"Understanding Delta-Sigma Data Converters"*, Wiley-IEEE Press, 2004.
2. Digital Signal Processing, *"J. G. Proakis, D. G. Manolakis"*, Prentice Hall, 1995.

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I M.TECH-I SEMESTER (ELECTIVE–I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
EMBEDDED C							

Course Objectives:

- To learn the basic concepts of C programming and to learn the basic concepts of 8051 I/O Interfacing
- To learn the objective oriented programming with C and to learn the hardware and software delay creations
- To learn the example case study and to learn the applications of embedded c language

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand the basic c programming
- Understand the basic Embedded C programming
- Understand the 8051 I/O Port programming
- Develop small embedded projects

UNIT – I

Programming Embedded Systems in C: Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions.

UNIT–II

Introducing the 8051 Microcontroller Family: Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements ,Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption ,Conclusions

UNIT–III

Reading Switches: Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT–IV

Adding Structure to the Code: Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT–V

Meeting Real-Time Constraints: Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT–VI

Case Study: Intruder Alarm System: Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions

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TEXT BOOKS:

1. Michael J. Pont, "*Embedded C*", Pearson Education.

REFERENCES:

1. Nigel Gardner, *"PIC micro MCU C-An introduction to programming, The Microchip PIC in CCS C"*.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
SYSTEM MODELING AND SIMULATION							

Course Objectives:

- Students will study the system models, simulators.
- Students must be able understand probability concepts in simulation and queuing theory.
- Students learn about discrete system simulation, GPSS and SEMSCRIPT.

Course Outcomes:

Upon completion of this course, the student will be able to

- An ability to describe, system models.
- An ability to describe, simulators.
- An ability to rapidly design probability concepts in simulation.
- An ability to rapidly design queuing theory.
- An ability to study discrete system simulation.
- An ability to understand GPSS and SEMSCRIPT.

UNIT-I

System Models: Concepts, continuous and Discrete Systems, systems modeling, types of models, subsystems, corporate model, system study.

System simulation: Techniques, comparison of simulation and analytical methods, types of simulation, distributed log models, cobwed models.

UNIT-II

Continuous system simulation: Numerical solution of differential equations, analog computers, hybrid computers, continuous system simulation languages – CSMP, system dynamic growth models, logistic curves.

UNIT-III

Probability concepts in simulation: Monte Carlo techniques, stochastic variables, probability functions, random number generation algorithms.

UNIT-IV

Queuing Theory: Arrival pattern distribution, service times, queuing disciplines, measure of queues, mathematical solutions to queuing problems.

UNIT-V

Discrete Systems Simulation: Events generation of arrival patterns, simulation programming tasks, analysis of simulation output.

UNIT- VI

GPSS and SEMSCRIPT: General description of GPSS and SEMSCRIPT, programming in GPSS.

Simulation Programming techniques: Data Structures, implementation of activities, events and queues, event scanning, simulation algorithms in GPSS and SEMSCRIPT.

TEXT BOOK:

1. Geoffery Gordan, *"Systems Simulation"*, PHI, 1978.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
NETWORK SECURITY AND CRYPTOGRAPHY							

Course Objectives:

- Understand the Security services and Data Encryption Algorithms.
- Gain knowledge on Cryptography Message authentication and Hash functions.
- Understand Hash Algorithms and IP security.

Course Outcomes:

Upon completion of this course, the student will be able to

- Study the Security and classical encryption Techniques.
- Conduct research in Network Security.
- Apply Security principles in System design.
- Encrypt and Decrypt the messages using Cipher Algorithms.
- Use Hash and MAC algorithms in Authentication principles.
- Use firewall design concepts and IP security.

UNIT-I

Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT-II

Encryption Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers. **Conventional Encryption :**Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT-III

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. **Number Theory:** Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primarily, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT-IV

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

UNIT-V

Hash and Mac Algorithms MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD- 160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards. 36 2013-14

Authentication Applications: Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

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UNIT–VI

IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms, Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. William Stallings, "*Cryptography and Network Security: Principles and Practice*",Pearson Education.
2. William Stallings, *"Network Security Essentials (Applications and Standards)"*, Pearson Education.

REFERENCES:

1. Eric Maiwald, " *Fundamentals of Network Security*", Dreamtech press.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "*Network Security - Private Communication in a Public World*", PHI.
3. Whitman, *"Principles of Information Security"*, Thomson.
4. Robert Bragg, Mark Rhodes, "*Network Security: The complete reference*", TMH
5. Buchmann, "*Introduction to Cryptography*".

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ANALOG INTEGRATED CIRCUIT DESIGN							

Course Objectives:

The student will be able to

- Understand the concepts of Single Stage Amplifiers and their High frequency characteristics.
- Gain the knowledge on Noise presence in Feedback and Operational Amplifiers.
- Understand the general considerations in Operational Amplifiers

Course Outcomes:

Upon completion of this course, the student will be able to

- Design Single Stage Amplifiers and study current mirror configurations.
- Observe the High frequency characteristics of Amplifiers.
- Can estimate Noise occurrence & Noise Characteristics in Differential Amplifiers.
- Extend the Feedback amplifier concepts to Different Applications in Real Time.
- Gain the knowledge of Different Compensation techniques.
- Apply knowledge of Bandgap and references in Amplifier designing.

UNIT-I

Single Stage Amplifiers

Basic MOS physics and equivalent circuits and models, CS, CG and Source Follower cascode and folded cascade configurations, differential amplifiers and current mirror configurations.

UNIT-II

High Frequency Characteristics Amplifiers

Current mirrors, cascode stages for current mirrors, current mirror loads for differential pairs. Miller effect, association of poles with nodes, frequency response of CS, CG and source follower, cascade and differential pair stages

UNIT-III

Noise of Characteristics Amplifiers

Statistical characteristics of noise, noise in single stage amplifiers, noise in differential amplifiers.

UNIT-IV

Feedback And Operational Amplifiers

Properties and types of negative feedback circuits, effect of loading in feedback networks, operational amplifier performance parameters, One-stage Op Amps, Two-stage Op Amps, Input range limitations, Gain boosting, slew rate, power supply rejection, noise in Op Amps.

UNIT-V

Stability And Frequency Compensation

General considerations, Multipole systems, Phase Margin, Frequency Compensation, Compensation of two stage Op Amps, Slewing in two stage Op Amps, Other compensation techniques.

UNIT-VI

Bandgap References

supply independent biasing, temperature independent references, PTAT current generation,Constant-Gm Biasing.

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TEXT BOOKS:

1. BehzadRazavi, "*Design of Analog CMOS Integrated Circuits*", Tata McGraw Hill, 2001
2. Willey M.C. Sansen, "*Analog Design Essentials*", Springer, 2006.
3. Grebene, "*Bipolar and MOS Analog Integrated circuit design*", John Wiley & Sons, Inc., 2003.

REFERENCES:

1. Phillip E.Allen, DouglasR.Holberg, "*CMOS Analog Circuit Design*", Second edition, Oxford University Press, 2002
2. Recorded lecture available at http://www.ee.iitm.ac.in/~ani/ee5390/index.html
3. Jacob Baker "*CMOS: Circuit Design, Layout, and Simulation*", Third Edition, Wiley IEEE Press, 2010.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADVANCED DIGITAL SYSTEM DESIGN							

Course Objectives:

The student will be able to

- Understand the analysis of Synchronous and Asynchronous Sequential circuits.
- Introduced to Multi-Input
-
- control design.
- Understand the Implementation of System Controllers using Combinational and Sequential Circuits.

Course Outcomes:

Upon completion of this course, the student will be able to

- Analyze Procedural Design steps of Synchronous.
- Analyze Procedural Design steps of Asynchronous Sequential circuits.
- Design Synchronous and Asynchronous Sequential circuits.
- Apply Multi-Input system control design concepts to develop Different Vending Machine applications in Real Time.
- Design System Controllers using Combinational MSI/LSI Circuits.
- Design Programmable System Controllers using Sequential Circuits.

UNIT-I

Synchronous Sequential Circuit Design

Analysis of clocked synchronous sequential circuits – Moore / Mealy State diagrams, State Table, State Reduction and Assignment - Design of synchronous sequential circuits.

UNIT-II

Analysis Of Asynchronous Sequential Circuit

Analysis of asynchronous sequential circuit – Cycles – Races - Static, Dynamic and Essential hazards – Primitive Flow Table.

UNIT-III

Asynchronous Sequential Circuit Design

State Reductions and State Assignment - Design of asynchronous sequential circuits.

UNIT-IV

VEM and Introduction To Multi-Input System Controller Design

Variable Entered Maps – simplification - System Controllers – Design Phases – MDS Diagram Generation – MDSD Symbology – Choosing the controller architecture – State Assignment – Next State decoder – Examples of 2s complement system and Pop Vending Machine – Concepts related to the use of conditional outputs.

UNIT-V

System Controllers Using Combinational MSI / LSI Circuits

Decoders and Multiplexers in system controllers – Indirect-Addressed MUX configuration – System controllers using ROM.

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UNIT-VI

Sequential and Programmable System Controllers

System controllers using Shift Registers and Counters – General requirements of a programmable controller - Microinstructions – Programmable controllers with fixed instruction set.

TEXT BOOKS:

1. William I. Fletcher, "*An Engineering Approach to Digital Design*", Prentice Hall India, 2011
2. Charles H. Roth Jr, "*Fundamentals of Logic Design*", Thomson Learning, 2004

REFERENCES:

1. Nripendra N Biswas "Logic Design Theory" Prentice Hall of India,2001

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	4	-	-	40	60	100	3
PATTERN RECOGNITION							

Course Objectives:

- Introduce the fundamentals of statistical pattern recognition and Bayes decision theory.
- Understand the techniques of parameter estimation and density estimation.
- Understand the Linear discriminant functions and clustering.

Course Outcomes:

Upon completion of this course, the student will be able to

- Gain idea on fundamental concepts in pattern recognition
- Use the Bayesian decision theory concepts from ground level
- Use the maximum likelihood estimation, Bayesian estimation in real-time applications.
- Use the Non-Parametric estimation in real-time applications.
- Clearly understand the Linear discriminant functions and clustering
- Engage in life-long learning in the area of pattern recognition.

UNIT– I

Introduction

Machine Perception, Pattern recognition systems, the design cycle, learning and adaption.

UNIT–II

Bayesian Decision Theory

Bayesian decision theory – Continuous features, Minimum error rate classification, Classifiers, Discriminant Functions and decision surfaces, the normal density, discriminant functions for the normal density, Bayes decision theory – Discrete features.

UNIT–III

Maximum-Likelihood and Bayesian Parameter Estimation

Maximum-Likelihood Estimation, Bayesian Parameter Estimation, Bayesian Parameter Estimation: Gaussian case, Bayesian Parameter Estimation: General theory, Problems of Dimensionality, Hidden Markov Models.

UNIT–IV

Non-Parametric Techniques

Density Estimation, Parzen Windows, k_n-Nearest Neighbor Estimation, the Nearest Neighbor rule, Metrics and Nearest-Neighbor classification.

UNIT–V

Linear Discriminant Functions

Linear Discriminant Functions and decision surfaces, Generalized Linear Discriminant Functions, the two-category linearly separable case, Minimizing the Perception criterion function, Relaxation procedures, Non-separable behavior, minimum squared-error procedures, the Ho-Kashyap procedures.

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UNIT–VI

Unsupervised Learning and Clustering

Mixture densities and Identifiability, Maximum-Likelihood Estimates, Application to Normal mixtures, Unsupervised Bayesian learning, Data description and Clustering, Criterion functions for clustering, Hierarchical clustering, Component Analysis.

TEXT BOOKS:

1. Richard O. Duda, Peter E, Hart and David G. Stork, *"Pattern Classification"*, Second Edition, Wiley Publications, 2001, ISBN: 978-0-471-05669-0.

REFERENCES:

1. T.M. Mitchell, "*Machine learning*", McGraw-Hill, New York, 1997.
2. S. Theodoridis, K. Koutroumbas, *"Pattern Recognition"*, Academic Press, 1999.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	6	40	60	100	3
DESIGN AND SIMULATION LABORATORY							

Course Objectives:

- Student able to design logic gates.
- Student able to learn about converters.
- Student able to understand the importance of embedded theory

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to design logic gates and ALU.
- Ability to design Finite State Machine logic Circuit.
- Ability to design Combinational circuits like Full Adder.
- Ability to design A to D & D to A converters.
- Ability to create a new task.
- Ability to implement BANKER'S algorithm.

PART-A

VLSI Lab (Front-end Environment)

• The students are required to design the logic circuit to perform the following experiments using necessary simulator (Xilinx ISE Simulator/ Mentor Graphics Questa Simulator) to verify the logical /functional operation and to perform the analysis with appropriate synthesizer (Xilinx ISE Synthesizer/Mentor Graphics Precision RTL) and then verify the implemented logic with different hardware modules/kits (CPLD/ FPGA kits).

• The students are required to acquire the knowledge in both the Platforms (Xilinx and Mentor graphics) by perform at least FOUR experiments on each Platform.

LIST OF EXPERIMENTS:

1. Realization of Logic gates.
2. Parity Encoder.
3. Random Counter.
4. Synchronous RAM.
5. ALU.
6. UART Model.
7. Traffic Light Controller using Sequential Logic circuits
8. Finite State Machine (FSM) based logic circuit.

PART-B

VLSI Lab (Back-end Environment)

• The students are required to design and implement the Layout of the following experiments of any THREE using CMOS 130nm Technology with Mentor Graphics Tool. 38 2013-14

LIST OF EXPERIMENTS:

1. Inverter Characteristics.
2. Full Adder.
3. RS-Latch, D-Latch and Clock Divider.
4. Synchronous Counter and Asynchronous Counter.
5. Digital-to-Analog-Converter.
6. Analog-to-Digital Converter.

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LAB REQUIREMENTS FOR PART-A AND PART-B:

Software: Xilinx ISE Suite 13.2 Version, Mentor Graphics-Questa Simulator, Mentor Graphics-Precision RTL, Mentor Graphics Back End/Tanner Software tool.

Hardware: Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.

PART-C

Embedded Systems Laboratory

• The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits.

• The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.

• The students are required to perform at least THREE experiments.

LIST OF EXPERIMENTS: (using ARM-926 with PERFECT RTOS)

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
   Digital Systems & Computer Electronics 39
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER'S algorithm.

Lab Requirements for PART-C:

Software:

(i) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library

(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

Hardware:

(i) The development kits of ARM-926 Developer Kits Boards.

(ii) Serial Cables, Network Cables and recommended power supply for the board.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADHOC AND WIRELESS SENSOR NETWORKS							

Course Objectives:

- Students will be able to describe the unique issues in IEEE 802.11 standard, Bluetooth Adhoc/sensor networks.
- Students will be able to discuss the challenges in designing mac, routing and transport protocols for wireless ad-hoc/sensor networks.
- Students will be able to understand the challenges in quality of service energy management, usage of mac protocols for sensor networks.

Course Outcomes:

Upon completion of this course, the student will be able to

- Acquire the fundamental knowledge of LANs and PANs, mobile IP and optimizing web over wireless.
- Understand the concepts of Ad Hoc wireless networks and their applications.
- Understand the basics of routing protocol, classification and its application to Ad Hoc wireless network.
- Discuss the transport and security protocols, their applications to Ad Hoc WSN and their challenges.
- Discuss the issue and challenges of quality of service and energy management IN Ad hoc WSN.
- Understand the basic concepts of WSN, data gathering and their issues.

UNIT-I

Wireless LANS and PANS:

Introduction, Fundamentals of WLANS, IEEE 802.11Standard, HIPERLAN Standard, Bluetooth, Home RF.

Wireless Internet:

Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web over Wireless.

UNIT-II

AD HOC Wireless Networks:

Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

MAC Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention – Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT –III

Routing Protocols:

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On –Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

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UNIT–IV

Transport Layer and Security Protocols:

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc
Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

UNIT–V

Quality of Service:

Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks.

Energy Management: Introduction, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Ad Hoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.

UNIT–VI

Wireless Sensor Networks:

Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:

1. C. Siva Ram Murthy and B.S.Manoj, "*Ad Hoc Wireless Networks: Architectures and Protocols*", PHI, 2004.
2. Jagannathan Sarangapani, "*Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control*", CRC Press.

REFERENCES:

1. C.K. Toh, "*Ad-Hoc Mobile Wireless Networks: Protocols & Systems*", Pearson Education.
2. C. S. Raghavendra, Krishna M. Sivalingam, "Wireless Sensor Networks", Springer, 2004.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
CMOS ANALOG AND DIGITAL IC DESIGN							

Course Objectives:

- Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- Understand the design concepts of Combinational and Sequential MOS logic circuits.
- Understand the concepts of Sub circuits and CMOS Amplifiers like Differential Amplifiers,
- Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.

Course Outcomes:

Upon completion of this course, the student will be able to

- Design MOS devices and estimate their Electrical behavior.
- Design Combinational MOS logic circuits.
- Design Sequential MOS logic circuits.
- Use the Dynamic logic circuits and Memories.
- Extend the Analog Circuit Design to Different Applications in Real Time.
- Measure characteristics of CMOS amplifiers.

UNIT-I

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large- Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II

Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III

Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT -IV

Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

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UNIT -V

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-VI

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power-Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

TEXT BOOKS:

1. Ken Martin, "*Digital Integrated Circuit Design*", Oxford University Press, 2011.
2. Sung-Mo Kang, Yusuf Leblebici, "*CMOS Digital Integrated Circuits Analysis and Design*", 3rd Ed., TMH, 2011.
3. Philip E. Allen and Douglas R. Holberg, "*CMOS Analog Circuit Design*", Oxford University Press, International Second Edition/Indian Edition, 2010.
4. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, "*Analysis and Design of Analog Integrated Circuits*", Fifth Edition, Wiley India, 2010.

REFERENCES:

1. David A. Johns, Ken Martin, "*Analog Integrated Circuit Design*", Wiley Student Edn, 2013.
2. Behzad Razavi, "*Design of Analog CMOS Integrated Circuits*", TMH Edition.
3. Baker, Li and Boyce, "*CMOS: Circuit Design, Layout and Simulation*", PHI.
4. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, *"Digital Integrated Circuits – A Design Perspective"*, 2nd Ed., PHI.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DSP PROCESSORS AND ARCHITECTURES							

Course Objectives:

- Gain concepts of digital signal processing techniques, implementation of DSP & FFT & their computational accuracies in DSP implementation.
- Understand the concepts of DSP Processor and its architectures and program a DSP processor to filter signals.
- Understand the concepts of various DSP device families & Interfacing of P-DSPs with Memory and peripherals

Course Outcomes:

Upon completion of this course, the student will be able to

- Comprehends the knowledge & concepts of digital signal processing techniques, basic building blocks, implementation of DSP & FFT algorithms
- Estimate their computational accuracies in DSP implementation.
- Design Programmable DSP devices
- Use the DSP processors TMS 320C 54XX for implementation of DSP algorithms & its interfacing techniques with various I/O peripherals.
- Use various Analog Device Family of DSP Devices
- Interface Memory and I/O Peripherals to DSP processors.

UNIT–I

Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation.

UNIT–II

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT–III

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-IV

Programmable Digital Signal Processors: Commercial Digital signal processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of MS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts ofTMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

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UNIT–V

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of HardwareProcessing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT -VI

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

1. Avtar Singh and S. Srinivasan, "*Digital Signal Processing*", Thomson Publications, 2004.
2. K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, *"A Practical Approach to Digital Signal Processing"*, New Age International, 2006/2009
3. Woon- SengGan, Sen M. Kuo, *"Embedded Signal Processing with the Micro Signal Architecture Publisher*", Wiley-IEEE Press, 2007

REFERENCES:

1. B. Venkataramani and M. Bhaskar, *"Digital Signal Processors, Architecture, Programming and Applications "*, TMH, 2002.
2. Jonatham Stein, "*Digital Signal Processing*", John Wiley, 2005.
3. Lapsley et al., "*DSP Processor Fundamentals, Architectures & Features*", S. Chand & Co. ,2000.
4. *Digital Signal Processing Applications Using the ADSP-2100 Family,* The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI.
5. Steven W. Smith, "*The Scientist and Engineer's Guide to Digital Signal Processing*", California Technical Publishing, ISBN 0- 9660176-3-3, 1997
6. David J. Katz and Rick Gentile, "*Embedded Media Processing*", Analog Devices, Newnes , ISBN 0750679123, 2005.

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	4	-	-	40	60	100	3
DESIGN OF FAULT TOLERANT SYSTEMS							

Course Objectives:

- Students will be able to describe the basic issues in fault tolerant design various self - checking circuits.
- Students will be able to understand the fundamentals of design for testability.
- Students will be able to understand the concepts of scan architectures and techniques and the basics of BIST

Course Outcomes:

Upon completion of this course, the student will be able to

- Acquire the fundamental knowledge of fault tolerance design.
- Discuss the concepts of fail- safe design and self -checking circuits.
- Understand the basics of design for testability and various delay faults.
- Discuss the transport and security protocols, their applications to Ad Hoc WSN and their challenges.
- Understand the Reed Muller's technique, use of control and syndrome testability design.
- Acquire the knowledge of built-in-Test concepts.

UNIT-I

Fault Tolerant Design Basic Concepts: Reliability concepts, Failure & Faults, Reliability and Failure rate, Relation between Reliability and Meantime between failure, Maintainability and Availability, Reliability of series, Parallel and Parallel-Series combinational circuits.

Fault Tolerant Design: Basic Concepts-Static, dynamic, hybrid Triple Modular Redundant System, self purging redundancy, Sift-out Modular redundancy (SMR), 5 MR reconfiguration techniques, use of error correcting code, Time redundancy and Software redundancy.

UNIT-II

Self-checking circuits & Fail safe design Self checking circuits:

Basic concepts of self-checking circuits, Design of totally self-checking checker, checkers using m out of n codes, Berger code, Low cost residue code.

Fail safe design: Strongly fault secure circuits, fail safe design of sequential circuits using partition theory and Berger code, totally self-checking PLA design.

UNIT-III

ATPG Fundamentals & Design for Testability for Combinational Circuits Introduction to ATPG Process -Testability and Fault analysis methods- Fault masking- Transition delay fault ATPG, path delay, fault ATPG.

UNIT-IV

Design for Testability for Combinational Circuits: Basic concepts of Testability, Controllability and Observability, the Reed Muller's expansion technique, OR-AND-OR Design, Use of control and Syndrome Testable Designs.

UNIT-V

Scan Architectures & Techniques Introduction to Scan Based testing, Functional testing, The Scan effective Circuit, The MUX-D Style Scan flip-flops, The Scan shift register, scan cell operation. Scan test Sequencing, Scan test timing, Partial Scan, Multiple Scan Chains, Scan based

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Design rules(LSSD).At-speed scan testing and Architecture, multiple clock and scan domain operation .critical paths for At speed scan test.

UNIT-VI

Built-In-Self-Test (BIST) BIST concepts, Test Pattern generation for BIST exhaustive testing, pseudorandom testing, Pseudo exhaustive testing, constant weight patterns, Generic offline BIST architecture, Memory Test architecture.

TEXT BOOKS:

1. Parag K. Lala, "*Fault Tolerant & Fault Testable Hardware Design*", PHI, 1984.
2. Alfred L.Crouch, "*Design for Test for Digital IC's and Embedded Core Systems*", Pearson Education, 2008.

REFERENCES:

1. Mirano Abramovici, Melvin A. Breuer and Arthur D. Friedman, "*Design Systems Testing and testable Design*", Jaico Books
2. Michael L. Bushnell, Vishwani D. Agrawal, "*Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits*", Springer.

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I M.TECH-II SEMESTER (ELECTIVE–III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
SYSTEM ON CHIP DESIGN							

Course Objectives:

- Students will be introduce to system architectural concepts and complexities, concepts of processors
- Students will be able to understand the fundamentals of memory design for SoC and inter connections.
- Students will be able to understand the mapping, reconfiguration design approaches and image compression.

Course Outcomes:

Upon completion of this course, the student will be able to

- Acquire the fundamental knowledge of system architectural concepts
- Discuss the concepts processor micro architecture instructional handling.
- Understand the SoC memory concepts and models of simple processor memory instructions
- Discuss the interconnection concepts and SoC customization.
- In this course student will be able to give interconnections on SoC
- Understand the applications of SoC ,AES algorithms and image compression

UNIT-I

Introduction to the System Approach System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT-II

Processors Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III

Memory Design for SOC Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV

Interconnect Customization Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor.

UNIT-V

Interconnect Configuration

Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

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UNIT-VI

Application Studies / Case Studies SOC Design approach. AES algorithms. Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

1. Michael J. Flynn and Wayne Luk, "*Computer System Design System-on-Chip*", Wiely India Pvt. Ltd.
2. Steve Furber, "*ARM System on Chip Architecture*", 2nd Ed., Addison Wesley Professional, 2000.

REFERENCES:

1. Ricardo Reis, "*Design of System on a Chip: Devices and Components*", 1st Ed., Springer, 2004
2. Jason Andrews, "*Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology)*" — Newnes, BK and CDROM.
3. Prakash Rashinkar, Peter Paterson and Leena Singh L, "*System on Chip Verification – Methodologies and Techniques*", 2001, Kluwer Academic Publishers.

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I M.TECH-II SEMESTER (ELECTIVE–III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
SOFT COMPUTING TECHNIQUES							

Course Objectives:

- To understand the architecture of intelligent control and concepts of artificial neural networks.
- To have an exposure about basic concepts of and its control methodologies of fuzzy logic system.
- To know the basic concepts of genetic algorithm, its steps, GA applications and fuzzy logic controller using MATLAB.

Course Outcomes:

Upon completion of this course, the student will be able to

- Gain the knowledge of intelligent control architecture and rule based systems.
- Realize the concepts of artificial neural network sand basic mathematical.
- Know about fuzzy logic system, basic operation and approximate reasoning..
- Understand the fuzzy logic modeling and control schemes.
- Know about basic concepts of Genetic algorithms and its detailed steps. .
- In this course student will be able to understand the applications of genetic algorithm.

UNIT–I

Introduction: Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT–II

Artificial Neural Networks: Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT–III

Fuzzy Logic System: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inference and defuzzification, Fuzzy knowledge and rule bases

UNIT– IV

Fuzzy Logic Control: Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT–V

Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant-colony search techniques for solving optimization problems.

UNIT –VI

Applications: GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox.

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Stability analysis of Neural-Network interconnection systems. Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox. Stability analysis of fuzzy control systems.

TEXT BOOKS:

1. Jacek.M.Zurada, "*Introduction to Artificial Neural Systems*", Jaico Publishing House, 1999.
2. Kosko, B," *Neural Networks and Fuzzy Systems*", Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCES:

1. Klir G.J. and Folger T.A., "*Fuzzy Sets, Uncertainty and Information*", Prentice-Hall of India Pvt. Ltd., 1993.
2. Zimmerman H.J., "*Fuzzy Set Theory and Its Applications*", Kluwer Academic Publishers, 1994.
3. Driankov, Hellendroon, "Introduction *to Fuzzy Control*", Narosa Publishers.
4. Dr. B. Yagananarayana, "*Artificial Neural Networks*", PHI, New Delhi, 1999.
5. Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, "*Elements of Artificial Neural Networks*", Penram International.
6. Simon Haykin, "*Artificial Neural Network* ", 2nd Ed., Pearson Education.
7. S.N. Shivanandam, S. Sumati, S. N. Deepa, "*Introduction Neural Networks Using MATLAB 6.0*", 1/e, TMH, New Delhi.

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I M.TECH-II SEMESTER (ELECTIVE–III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
SOLID STATE DEVICE MODELING AND SIMULATION							

Course Objectives:

- To impart the detailed knowledge of MOSFET circuit and device simulations in VLSI
- To have an exposure about sparse matrix technique, adaptive multistep methods.
- To know the basic mathematical techniques for basic device simulations and computation of basic devices' characteristics.

Course Outcomes:

Upon completion of this course, the student will be able to

- Gain the knowledge operation modeling equivalent circuit and analysis of MOSET
- Realize the concepts circuit and device simulation.
- Know about sparse matrix techniques and solutions to nonlinear networks.\
- Understand the adaptation of multistep methods to the solution of electrical networks.
- Impart the mathematical knowledge for device simulations.
- Realize the computation of characteristics of simple devices.

UNIT-I

MOSFET Device Physics

MOSFET capacitor, Basic operation, Basic modeling, Advanced MOSFET modeling, RF modeling of MOS transistors, Equivalent circuit representation of MOS transistor, High frequency behavior of MOS transistor and A.C small signal modeling, model parameter extraction, modeling parasitic BJT, Resistors, Capacitors, Inductors.

UNIT-II

Device Modelling -I

Prime importance of circuit and device simulations in VLSI; Nodal, mesh, modified nodal and hybrid analysis equations.

UNIT-III

Device Modelling -II

Solution of network equations: Sparse matrix techniques, solution of nonlinear networks through Newton-Raphson technique, convergence and stability.

UNIT-IV

Multistep Methods

Solution of stiff systems of equations, adaptation of multistep methods to the solution of electrical networks, general purpose circuit simulators.

UNIT-V

Mathematical Techniques For Device Simulations

Poisson equation, continuity equation, drift-diffusion equation, Schrodinger equation, hydrodynamic equations, trap rate, finite difference solutions to these equations in 1D and 2D space, grid generation.

UNIT-VI

Simulation Of Devices

Computation of characteristics of simple devices like p-n junction, MOS capacitor and MOSFET; Small-signal analysis.

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TEXT BOOKS:

1. Arora, N., "*MOSFET Models for VLSI Circuit Simulation*", Springer-Verlag, 1993
2. Selberherr, S., "*Analysis and Simulation of Semiconductor Devices*", Springer-Verlag., 1984
3. Fjeldly, T., Yetterdal, T. and Shur, M., "*Introduction to Device Modeling and Circuit Simulation*", Wiley-Interscience., 1997

REFERENCES :

1. Grasser, T., "*Advanced Device Modeling and Simulation*", World Scientific Publishing Company., 2003
2. Chua, L.O. and Lin, P.M., "*Computer-Aided Analysis of Electronic Circuits: Algorithms and Computational Techniques*", Prentice-Hall., 1975
3. Trond Ytterdal, Yuhua Cheng and Tor A. Fjeldly Wayne Wolf, "*Device Modeling for Analog and RF CMOS Circuit Design*", John Wiley & Sons Ltd.

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I M.TECH-II SEMESTER (ELECTIVE–III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
MOBILE COMPUTING TECHNOLOGIES							

Course Objectives:

- Student will learn the basic concepts of mobile computing architecture, and cellular technologies like GSM, GPS, GPRS, CDMA and 3G.
- Student will impart the knowledge in WAP Clint programming, Palm OS and windows CE architecture.
- Student will understand the voice over internet protocol and security issue in the mobile computing.

Course Outcomes:

Upon completion of this course, the student will be able to

- Acquire the knowledge of mobile computing and its applications and services.
- Understand the concepts of cellular technologies like GSM. GPS, CDMA, GPRS AND 3G.
- Understand the basics of wireless application protocol and fundamentals of intelligent networks.
- Acquire the fundament knowledge in client programming windows CE architecture programming for GUI.
- Understand the basics of voice over IP-H.23 frame work, real time protocols and IP multimedia systems.
- Discuss the security techniques and algorithms and security framework environment

UNIT–I

Introduction to Mobile Computing Architecture:

Mobile Computing – Dialog Control – Networks –Middleware and Gateways – Application and Services – Developing Mobile Computing Applications– Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture –Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

UNIT–II

Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G:

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) –Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS –Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G.

UNIT–III

Wireless Application Protocol (WAP) and Wireless LAN:

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN

Intelligent Networks and Interworking : Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

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UNIT–IV

Client Programming, Palm OS, Symbian OS, Win CE Architecture: Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development– Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture.

J2ME: JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2MicroEdition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues –Multimedia– Record Management System – Communication in MIDP – Security considerations in MIDP –Optional Packages

UNIT–V

Voice Over Internet Protocol and Convergence:

Voice over IP- H.323 Framework for Voice over IP– Session Initiation Protocol – Comparison between H.323 and SIP – Real Time protocols –Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP.

UNIT–VI

Security Issues in Mobile Computing:

Introduction – Information Security – Security Techniques and Algorithms – Security Protocols – Public Key Infrastructure – Trust – Security Models– Security frameworks for Mobile Environment.

TEXT BOOKS:

1. Asoke K Talukder, Roopa R Yavagal, "*Mobile Computing – Technology, Applications and Service Creation*", TATA McGraw Hill, 2009.
2. Jochen Schiller, "*Mobile Communications*", 2nd Edition, Pearson Education

REFERENCES:

1. Vieri Vaughi, Alexander Damn Jaonvic, "*The CDMA 2000 System for Mobile Communications*", Pearson.
2. Adalestein , "*Fundamentals of Mobile & Parvasive Computing*", TMH, 2008.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
EMBEDDED REAL TIME OPERATING SYSTEMS (ELECTIVE–III)							

Course Objectives:

- Describe what makes a system a real -time system
- Explaisn the presence of and describe the characteristics of latency in real-time systems.
- Summarize special concerns that real -time systems present and how these concerns are addressed.

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand and design embedded systems and real-time systems For real time systems.
- Identify the general structure and unique characteristics of real -time systems
- Evaluate the need for real-time operating system. Implement the real-time operating system principles
- Define the unique design problems and challenges of real-time systems
- Apply real-time systems design techniques to various software programs.
- Program an embedded system. Design, implement and test an embedded system.

UNIT-I

Introduction OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Systems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls.

UNIT-II

Real-Time Operating Systems: Basic Design Using an RTOS, RTOS Task Scheduling Models, Interrupt Latencyand Response of the Tasks as Performance Metrics, OS Security Issues.

UNIT-III

RTOS Programming Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-IV

Program Modeling – Case Studies Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, CaseStudy of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-V

Target Image Creation & Programming in Linux Off-The-Shelf Operating Systems, Operating System Software, Target Image Creation for Window XP Embedded, Porting RTOS on a Micro Controller based Development Board.

Overview and programming concepts of Unix/Linux Programming, Shell Programming, System Programming.

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UNIT-VI

Programming in RT Linux Overview of RT Linux, Core RT Linux API, Program to display a message periodically, semaphore management, Mutex, Management. Case Study of Appliance Control by RT Linux System.

TEXT BOOKS:

1. Dr. K.V.K.K. Prasad: "*Embedded/Real-Time Systems*" Dream Tech Publications, Black pad book.
2. Rajkamal: "*Embedded Systems-Architecture, Programming and Design*", Tata McGraw Hill Publications, Second Edition, 2008.

REFERENCE BOOKS:

1. Labrosse, "*Embedding system building blocks* ", CMP publishers.
2. Rob Williams," *Real time Systems Development*", Butterworth Heinemann Publications.

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I M.TECH-II SEMESTER (ELECTIVE–IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
INTERNET PROTOCOLS							

Course Objectives:

- Comprehend fundamental design principles of Internet Protocols, IP addressing, and IP networks, including routing and forwarding.
- Comprehend advanced Internet protocol technologies including network management, domain name system, network address translation, DHCP and multicasting.
- Apply understanding of Internet protocols by analyzing, evaluating, and improving actual network configurations of IP routers, switches and hosts.

Course Outcomes:

Upon completion of this course, the student will be able to

- Are able to describe the architecture of the Internet and able to describe IP addressing and are able to design an internetwork with assigned addresses.
- Are able to describe the Internet Protocol (IP) and Trans mission Control Protocol(TCP)
- Are able to describe the intra and inter routing protocols (Ex. RIP, OSPF and BGP)
- Are able to describe the Domain Name System (DNS), Network virtual terminal (NVT) and File transfer Protocol (FTP).
- Have a good understanding of multimedia concepts.
- An understanding of computer and networked system organization and architecture and knowledge of recent advances, current practices and trends in computer systems.

UNIT-I

Internetworking Concepts: Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of thee Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

IP Address: Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting, **Classless Addressing:** Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router. **ARP and RARP:** ARP, ARP Package, RARP.

UNIT–II

Internet Protocol (IP): Datagram, Fragmentation, Options, Checksum, IP V.6.

Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

UNIT–III

Stream Control Transmission Protocol (SCTP): SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.

Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT-IV

Unicast Routing Protocols (RIP, OSPF, and BGP): Intra and Interdomain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

Multicasting and Multicast Routing Protocols: Unicast – Multicast Broadcast, Multicast

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Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT –V

Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.

Remote Login TELNET: Concept, Network Virtual Terminal (NVT).

File Transfer FTP and TFTP: File Transfer Protocol (FTP).

Electronic Mail: SMTP and POP.

Network Management-SNMP: Concept, Management Components, World Wide Web- HTTP Architecture.

UNIT -VI

Multimedia: Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/

Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

TEXT BOOKS:

1. Behrouz A. Forouzan, "*TCP/IP Protocol Suite*", Third Edition, TMH.
2. Comer, "*Internetworking with TCP/IP*", 3rd edition PHI.

REFERENCES:

1. Mahbub Hassan, Raj Jain, "*High performance TCP/IP Networking*", PHI, 2005
2. B.A. Forouzan, "*Data Communications & Networking*", 2nd Edition, TMH
3. William Stallings, "*High Speed Networks and Internets*", Pearson Education, 2002.
4. William Stallings, "*Data and Computer Communications*", 7th Edition, PHI.
5. AdrinFarrel, "*The Internet and Its Protocols*", Elsevier, 2005.

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	4	-	-	40	60	100	3
HIGH SPEED NETWORKS							

Course Objectives:

- Learns about high speed networks
- To facilitates the students on the basis of ATM and Frame relay concepts and explain the various types of LANs and to know about their applications.
- Enable the students to know techniques involved to support real-time traffic and congestion control in ATM.

Course Outcomes:

Upon completion of this course, the student will be able to

- describe the ISDN and B-ISDN architecture and protocols.
- describe the ATM service categories, ATM cell header, ATM adaptation layer
- describe the various networks and routing algorithms
- understand of computer and networked system organization and architecture and knowledge of recent advances, current practices and trends in computer systems.
- understand of TCP/IP networks management
- understand of high speed networks.

UNIT-I

Network Services and Layered Architecture: Traffic characterization and quality of service, Network services, High performance networks, Network elements, Basic network mechanisms, layered architecture.

UNIT-II

ISDN & B-ISDN: Over view of ISDN, ISDN channels, User access, ISDN protocols, Brief history of B-ISDN and ATM, ATM based services and applications, principles and building block of B-ISDN, general architecture of B-ISDN, frame relay.

UNIT-III

ATM NETWORKS: Network layering, switching of virtual channels and virtual paths, applications of virtual channels and connections. QOS parameters, traffic descriptors, ATM service categories, ATM cell header, ATM layer, ATM adaptation layer.

UNIT-IV

INTERCONNECTION NETWORKS: Introduction, Banyan Networks, Routing algorithm & blocking phenomenon, Batcher-Banyan networks, crossbar switch, three stage class networks. REARRANGEABLE NETWORKS: Rearrangeable class networks, folding algorithm, bens network, looping algorithm.

UNIT-V

ATM SIGNALING, ROUTING AND TRAFFIC CONTROL: ATM addressing, UNI signalling, PNNI signalling, PNNI routing, ABR Traffic management.

UNIT-VI

TCP/IP NETWORKS: History of TCP/IP, TCP application and Services, Motivation, TCP, UDP, IP services and Header formats, Internetworking, TCP congestion control, Queue management: Passive & active, QOS in IP networks: differentiated and integrated services.

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TEXT BOOKS:

1. William Stallings, "*ISDN & B-ISDN with Frame Relay*", PHI.
2. Leon Garcia widjaja, "*Communication Networks*", TMH, 2000.

REFERENCES:

1. N. N. Biswas, "*ATM Fundamentals*", Adventure books publishers, 1998.

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	4	-	-	40	60	100	3
ADVANCED DIGITAL COMMUNICATION							

Course Objectives:

- To understand the digital passband transmission and different types of digital modulation techniques.
- To understand and analyze the different channel coding techniques and design considerations of a digital communication system.
- To understand concept of spread spectrum communication system.

Course Outcomes:

Upon completion of this course, the student will be able to

- Analyze the performance of a pass band digital communication system in terms of error rate and spectral efficiency.
- Analyze Performance of various digital modulation techniques.
- Analyze Performance of various channel coding techniques.
- Perform the time and frequency domain analysis of the signals in a digital communication system.
- Select the blocks in a design of digital communication system.
- Analyze Performance of spread spectrum communication system.

UNIT-I

Digital Passband Transmission

Introduction, Pass band Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of Bank of Correlators to Noisy Input, Coherent Detection of Signals in Noise, Probability of Error, Correlation Receiver, Detection of Signals with unknown Phase.

UNIT-II

Digital Modulation Techniques I

Hierarchy of Digital Modulation Techniques, Coherent Binary PSK, Coherent Binary FSK, Coherent Quadriphase-Shift Keying, Coherent Minimum Shift Keying, Noncoherent Orthogonal Modulation, Noncoherent Binary Frequency-Shift Keying.

UNIT-III

Digital Modulation Techniques II

Differential Phase-Shift Keying, Comparison of Binary and Quaternary Modulation Schemes, M-ary Modulation Techniques, Power Spectra, Band-width Efficiency, Synchronization.

UNIT-IV

Channel Coding

Introduction, Discrete Memory less Channels, Linear Block Codes, Cyclic Codes, Convolution Codes, Maximum Likelihood Decoding of Convolution codes, Trellis-Coded Modulation, Coding for Compounded-Error Channels.

UNIT-V

Design Considerations Of A Digital Communication System

Intersymbol Interference, Nyquist's Criterion for Distortionless Baseband Binary Transmission, Correlative-Level Coding, Error Probability Plane, Bandwidth Efficiency Plane, Modulation and

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coding tradeoffs, defining, designing, and evaluating digital communication system. Modulation and coding for band limited channels.

UNIT-VI

Spread Spectrum Techniques

Pseudo noise sequences, Direct sequence Spread Spectrum systems, Frequency hopping systems, Synchronization and Jamming Considerations.

TEXT BOOKS:

1. Simon Haykin, *"Digital communication"*, Third Edition, John Wiley and Sons. (Units I, III & IV)
2. B.Sklar, *"Digital Communications"*, Second Edition, Pearson Education Asia. (Units II & IV)

REFERENCES:

1. J.G. Proakis, "*Digital Communications*", Third Edition, McGraw Hill.

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I M.TECH-II SEMESTER (ELECTIVE–IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DATA COMMUNICATION AND NETWORKS							

Course Objectives:

- Introduces computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks.
- It is based around the OSI Reference Model that deals with the major issues in the bottom three (Physical, Data Link and Network) layers of the model.
- Introduces routers, gateways and application services.

Course Outcomes:

Upon completion of this course, the student will be able to

- have a good understanding of the OSI Reference Model and in particular have a good knowledge of Physical, Data Link and Network layers.
- analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- have a basic knowledge of the data link layer and HDLC and MAC protocols
- Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.
- have an understanding of the routers and gateways
- have a good understanding of simple mail transfer, file transfer, hypertext transfer protocols and multimedia applications.

UNIT-I

Introduction

Components of network - Topologies - WAN / LAN - OSI - ISO layered Architecture - Modulation and demodulation - Bit error rates - Line coding - Error correcting codes.

UNIT-II

Data Link Layer

Design issues - CRC technique and sliding window techniques - Performance analysis of sliding window techniques - Framing formats - Case Study.

UNIT-III

HDLC protocols - Medium access control - CSMA / CD - Token ring and token bus - FDDI - Wireless LAN - Performance analysis of MAC protocols - Bridges.

Network Layer

Circuit switching - packet switching - Design issues - IP addressing and IP diagram.

UNIT-IV

Routers and Gateways

Routing -Sub netting - CIDR - ICMP - ARP - RARP - IPv6 - QoS.

UNIT-V

Transport Layer TCP And UDP

Error handling and flow control - Congestion control – TCP Retransmission - Timeout - Socket Abstraction.

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UNIT-VI:

Application Services

Simple Mail Transfer Protocol (SMTP) - File Transfer Protocols (FTP), telnet, the World Wide Web (WWW).

Hypertext Transfer Protocol (HTTP), Domain name service (DNS), Security, Multimedia applications.

TEXT BOOKS:

1. William Stallings, "*Data and Computer Communications*", Seventh Edition, Prentice Hall, 2003.
2. Larry Peterson, Bruce S Davie, "*Computer Networks: A Systems Approach*", 2nd Edition, Morgan Kaufmann Publishers, 1999.

REFERENCES:

1. James F Kurose, "*Computer Networking: A Top - Down Approach Featuring the Internet*", 2nd Edition 2002, Addison Wesley.
2. W.Richard Stevens and Gary R Wright, "*TCP / IP Illustrated*", Addison Wesley, Volume 1 & 2, 2001.

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I M.TECH-II SEMESTER (ELECTIVE–IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
EMBEDDED NETWORKING							

Course Objectives:

- To learn embedded communication protocols and ISA/PCI parallel bus protocols and to learn
- USB and CAN bus protocols
- To learn basic of Ethernet and to learn the basics of embedded Ethernet
- To learn the basics of wireless embedded networking

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand different embedded communication protocol
- Understand USB bus
- understand CAN bus
- understand the basic concepts of Ethernet
- understand embedded Ethernet message exchange process
- understand embedded wireless embedded networking

UNIT–I

Embedded Communication Protocols: Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI Bus protocols – Firewire.

UNIT–II

USB and CAN BUS: USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs.

UNIT–III

CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN.

UNIT–IV

Ethernet Basics: Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components – Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

UNIT–V

Embedded Ethernet: Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure.

UNIT–VI

Wireless Embedded Networking: Wireless sensor networks – Introduction – Applications – Network Topology – Localization –Time Synchronization – Energy efficient MAC protocols – SMAC – Energy efficient and robust routing – Data Centric routing.

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TEXT BOOKS:

1. Frank Vahid, Tony Givargis, "*Embedded Systems Design: A Unified Hardware/Software Introduction*", John & Wiley Publications, 2002
2. Jan Axelson, "*Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port*", Penram Publications, 1996.

REFERENCES:

1. Dogan Ibrahim, "*Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series*", Elsevier 2008.
2. Jan Axelson, "*Embedded Ethernet and Internet Complete*", Penram publications, 2003.
3. Bhaskar Krishnamachari , "*Networking Wireless Sensors*", Cambridge press, 2005.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	6	40	60	100	3
EMBEDDED SYSTEMS LABORATORY							

Course Objectives:

- Experimenting on ARM-926 with perfect RTOS
- Experimenting on ARM-CORTEX processor using any open source RTOS. (Coo-Cox-Software- Platform)

Course Outcomes:

Upon completion of this course, the student will be able to write programs on

- register a command, create a new task, interrupt handling
- allocate resource using semaphore, share resource using MUTEX
- avoid deadlock using Banker's algorithm, synchronize two identical threads using Monitor program and readers/writers problem for concurrent tasks
- implementation of interfacing of display with the ARM- CORTEX processor
- interface ADC and DAC ports with the Input and Output sensitive devices
- Simulate the temperature DATA Logger with the SERIAL communication with PC
- Implementation of developer board as a modem for data communication using serial port communication between two PCs

✓ The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits and ARM-Cortex.

✓ The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.

✓ The students are required to perform at least SIX experiments from Part-I and TWO experiments from Part-II.

LIST OF EXPERIMENTS:

Part-I: Experiments using ARM-926 with PERFECT RTOS

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER'S algorithm.
7. Synchronize two identical threads using MONITOR.
8. Reader's Writer's Problem for concurrent Tasks.

Part-II: Experiments on ARM-CORTEX processor using any open source RTOS. (Coo-Cox-Software- Platform)

1. Implement the interfacing of display with the ARM- CORTEX processor.
2. Interface ADC and DAC ports with the Input and Output sensitive devices.
3. Simulate the temperature DATA Logger with the SERIAL communication with PC.
4. Implement the developer board as a modem for data communication using serial port communication between two PCs.

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LAB REQUIREMENTS:

Software:

(i) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library, COO-COX Software Platform, YAGARTO TOOLS, and TFTP SERVER.

(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

Hardware:

(i) The development kits of ARM-926 Developer Kits and ARM-Cortex Boards.

(ii) Serial Cables, Network Cables and recommended power supply for the board.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DIGITAL SYSTEM DESIGN							

Course Objectives:

- An ability to implement minimization of switching functions in different methods and implementation of CAMP Algorithm.
- An ability to synthesize logic and state machines using a PLA design and minimization and implementation of state machines using Field-Programmable Gate Arrays, CPLDs etc.
- An ability to design a computer to be fault-tolerant for combinational circuits and sequential circuits.

Course Outcomes:

Upon completion of this course, the student will be able to

- To understand the minimization of switching functions in different methods.
- To understand implementation CAMP Algorithm.
- To understand synthesize logic and state machines using a PLA design and minimization
- To understand state machines using Field-Programmable Gate Arrays.
- To understand design a computer to be fault-tolerant for combinational circuits.
- To understand design a computer to be fault-tolerant for sequential circuits.

UNIT-I

Introduction to Minimization Procedures:

Review on minimization of switching functions using tabular methods, K-map, QM algorithm,

UNIT-II

CAMP Algorithm:

CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs,, CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-III

PLA Design, Minimization and Folding Algorithms:

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm (IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT -IV

Design of Large Scale Digital Systems:

Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, and PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-V

Fault Diagnosis in Combinational Circuits:

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built-in-self-test.

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UNIT-VI

Fault Diagnosis in Sequential Circuits:

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Hamming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. N. N. Biswas, "*Logic Design Theory*", PHI.
2. Z. Kohavi, "*Switching and Finite Automata Theory*", 2nd Edition, TMH, 2001.
3. Parag K. Lala, "*Digital System Design using PLDs*", PHI, 1984.

REFERENCES:

1. Charles H. Roth, "*Fundamentals of Logic Design*", 5th Ed., Cengage Learning.
2. Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman, " *Digital Systems Testing and Testable Design*", John Wiley & Sons Inc.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
EMBEDDED REAL TIME OPERATING SYSTEMS							

Course Objectives:

- Describe what makes a system a real -time system
- Explain the presence of and describe the characteristics of latency in real-time systems.
- Summarize special concerns that real -time systems present and how these concerns are addressed.

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand and design embedded systems and real-time systems For real time systems.
- Identify the general structure and unique characteristics of real -time systems
- Evaluate the need for real-time operating system. Implement the real-time operating system principles
- Define the unique design problems and challenges of real-time systems
- Apply real-time systems design techniques to various software programs.
- Program an embedded system. Design, implement and test an embedded system.Ex: realtime + embedded : games on a Gameboy or arcade games Ex: realtime: Spore on a laptop

UNIT-I

Introduction: OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Systems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls.

UNIT-II

Real-Time Operating System: Basic Design Using an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

UNIT-III

RTOS Programming: Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-IV

Program Modeling – Case Studies: Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-V

Target Image Creation & Programming in Linux: Off-The-Shelf Operating Systems, Operating System Software, Target Image Creation for Window XP Embedded, Porting RTOS on a Micro Controller based Development Board. Overview and programming concepts of Unix/Linux Programming, Shell Programming, System Programming.

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UNIT-VI

Programming in RT Linux :Overview of RT Linux, Core RT Linux API, Program to display a message periodically, semaphore management, Mutex, Management, Case Study of Appliance Control by RT Linux System.

TEXT BOOKS:

1. Dr. K.V.K.K. Prasad, "*Embedded/Real-Time Systems*", Dream Tech Publications.
2. Rajkamal, "*Embedded Systems-Architecture, Programming and Design*", Second Edition, Tata McGraw Hill Publications, 2008.

REFERENCES:

1. Labrosse, "*Embedding system building blocks* ", CMP publishers.
2. Rob Williams," *Real time Systems Development*", Butterworth Heinemann Publications.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DIGITAL DATA COMMUNICATIONS							

Course Objectives:

- Introduce students to the evolution of digital modulation schemes and the concepts data communication.
- Awareness of different error correction codes, data link protocols.
- Introduction of different networks and multiple access techniques.

Course Outcomes:

Upon completion of this course, the student will be able to

- To understand the different digital modulation schemes.
- To understand the different concepts of data communication.
- To understand the different error correction codes.
- To understand the different data link protocols.
- To understand the different networks and multiple access techniques.

UNIT -I

Digital Modulation Schemes:

BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II

Basic Concepts of Data Communications, Interfaces and Modems:

Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/ IP Protocol suite and Comparison with OSI model.

UNIT -III

Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code

UNIT -IV

Data Link Control: Line Discipline, Flow Control, Error Control

Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

UNIT -V

Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.

Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.

Metropolitan Area Networks: IEEE 802.6, SMDS

Switching: Circuit Switching, Packet Switching, Message Switching.

Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -VI

Multiple Access Techniques:

Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), OFDM and OFDMA.

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TEXT BOOKS:

1. B. A.Forouzan, "*Data Communication and Computer Networking* ", 2nd Ed., TMH, 2003.
2. W. Tomasi, "*Advanced Electronic Communication Systems*", 5th Ed., PEI, 2008.

REFERENCES:

1. Prakash C. Gupta, "*Data Communications and Computer Networks*", PHI, 2006.
2. William Stallings, "*Data and Computer Communications*", 8th Ed., PHI, 2007.
3. T. Housely, "*Data Communication and Tele Processing Systems*", 2nd Ed., BSP, 2008.
4. Brijendra Singh, "*Data Communications and Computer Networks*", 2nd Ed., PHI, 2005.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
WIRELESS COMMUNICATIONS AND NETWORKS							

Course Objectives:

- To understand the concepts of basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference.
- To understand the Mobile radio propagation for small scale fading and multipath, large scale path loss.
- To study the different generations of mobile networks, WAN and IEEE 802.11.

Course Outcomes:

Upon completion of this course, the student will be able to

- Able to understand the concepts of spectrum allocation, basic cellular system, frequency reuse, channel assignment strategies, handoff strategies, interference, improving coverage and capacity, cell splitting.
- Able to understand the Mobile radio propagation large scale path loss.
- To understand the different outdoor propagation models.
- To understand Mobile radio propagation for small scale fading and multipath.
- Able to understand the different equalizers and diversity techniques.
- To understand the different wireless networks, development of wireless networks.

UNIT-I

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

UNIT–II

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction- Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering.

UNIT–III

Outdoor Propagation Models: Longley- Ryce Model, Okumura Model, Hata Model, PCS Extension to HataModel, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT–IV

Mobile Radio Propagation: Small –Scale Fading and Multipath Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel-Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of

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Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -V

Equalization and Diversity Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -VI

Wireless Networks Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a, b, g and n standards, IEEE 802.16and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Theodore, S. Rappaport, "*Wireless Communications, Principles, Practice*", 2nd Ed., PHI, 2002.
2. Andrea Goldsmith, "*Wireless Communications*", Cambridge University Press, 2005.
3. Gottapu Sasibhushana Rao, "*Mobile Cellular Communication*", Pearson Education, 2012.

REFERENCES:

1. Kaveh Pah Laven and P. Krishna Murthy, "*Principles of Wireless Networks*", PE, 2002.
2. Kamilo Feher, "*Wireless Digital Communications* ", PHI, 1999.
3. William Stallings, "*Wireless Communication and Networking*", PHI, 2003.
4. Upen Dalal, "*Wireless Communication*", Oxford Univ. Press.
5. Vijay K. Gary, "*Wireless Communications and Networking*", Elsevier.

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I M.TECH-I SEMESTER (ELECTIVE–I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
TRANSFORM TECHNIQUES							

Course Objectives:

- To study the different Fourier analysis and time frequency analysis techniques.
- To study the different Transform techniques.
- To study the different Multi Rate analysis.

Course Outcomes:

Upon completion of this course, the student will be able to

- To understand the concepts of different Fourier analysis techniques.
- To understand the concepts of different time frequency analysis techniques.
- To understand the different Transform techniques.
- To understand the Continuous Wavelet Transform (CWT).
- To understand the Multi Rate analysis.
- To understand the Wavelet packets and lifting.

UNIT-I

Fourier Analysis: Fourier series, Examples, Fourier Transform, Properties of Fourier Transform, Examples of Fourier transform, sampling theorem, Partial sum and Gibbs phenomenon, Fourier analysis of Discrete time Signals, Discrete Fourier Transform.

UNIT-II

Time – Frequency Analysis: Window function, Short Time Fourier Transform, Discrete Short Time Fourier Transform, Continuous wavelet transform, discrete wavelet transform, wavelet series, Interpretations of the Time-Frequency plot.

UNIT-III

Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, Singular value Decomposition – definition, properties and applications

UNIT-IV

Continuous Wavelet Transform (CWT): Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT-V

Multi Rate Analysis and DWT: Need for Scaling function – MultiResolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT-VI

Wavelet Packets and Lifting: Wavelet Packet Transform, Wavelet packet algorithms, Thresholding - Hard thresholding, Soft thresholding, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

1. Raghuveer M.Rao and Ajit S. Bopardikar, "*A Wavelet Tour of Signal Processing theory and applications*", Pearson Edu, Asia, New Delhi,2003.

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2. K.P.Soman and K.I Ramachandran, " *Insight into Wavelets – from theory to practice*" PHI, Second edition, 2008

REFERENCES:

1. Jaideva C.Goswami and Andrew K.Chan, "*Fundamentals of Wavelets*", Wiley publishers, 2006
2. Stephen G. Mallat, "*A Wavelet Tour of Signal Processing*", 2 Ed., Academic Press,
3. S.Jayaraman, S.Esakkirajan, T.Veera Kumar, "Digital *Image Processing*", TMH, 2009.

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I M.TECH-I SEMESTER (ELECTIVE–I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
VLSI TECHNOLOGY AND DESIGN							

Course Objectives:

- To examine the basic building blocks of large-scale digital integrated circuit.
- To introduce about Planar technology, electrical properties of MOS, CMOS and BiCMOS circuits.
- To familiarize with VLSI design steps and chip design methodologies.

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand about IC fabrication technology and various electrical properties of MOS, CMOS and BiCMOS circuits..
- Design various logic circuits using MOS and CMOS transistors..
- Understand chip design methods.
- Synthesize digital circuits using VHDL.
- Design logic circuit layouts for both static CMOS
- Compute the power consumption of a VLSI chip.

UNIT-I

VLSI Technology: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

VLSI Design: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II

CMOS VLSI Design: MOS Technology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

Building Blocks of a VLSI circuit: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

UNIT-III

VLSI Design Issues: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-IV

Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-V

Subsystem Design and Layout: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

Subsystem Design Processes: Some general considerations and an illustration of design processes, design of an ALU subsystem.

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UNIT-VI

Floor Planning: Introduction, Floor planning methods, off-chip connections.

Architecture Design: Introduction, Register-Transfer design, high level synthesis, architectures for low power, architecture testing.

Chip Design: Introduction and design methodologies.

TEXT BOOKS:

1. K. Eshraghian, Douglas A. Pucknell, Sholeh Eshraghian, "*Essentials of VLSI Circuits and Systems*", PHI Publications, 2005.
2. Wayne Wolf, "*Modern VLSI Design*", 3rd Ed., Pearson Education, 1997.
3. Dr.K.V.K.K.Prasad, KattulaShyamala, "*VLSI Design*", Kogent Learning Solutions Inc., 2012.

REFERENCES:

1. Randall L.Geiger, Phillip E.Allen, Noel R.Strader, "*VLSI Design Technologies for Analog and Digital Circuits*", TMH Publications, 2010.
2. Ming-BO Lin, "*Introduction to VLSI Systems: A Logic, Circuit and System Perspective*", CRC Press, 2011.
3. N.H.E Weste, K. Eshraghian, "*Principals of CMOS VLSI Design*", 2nd Edition, Addison Wesley.

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I M.TECH-I SEMESTER (ELECTIVE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY (EMI / EMC)							

Course Objectives:

- To familiarize with the fundamentals that are essential for electronics industry in the field of EMI / EMC.
- To understand EMI sources and its measurements.
- To understand the various techniques for electromagnetic compatibility.

Course Outcomes:

Upon completion of this course, the student will be able to

- Real-world EMC design constraints.
- Make appropriate tradeoffs to achieve the most cost-effective design that meets all requirements.
- Designing electronic systems that function without errors or problems related to electromagnetic compatibility.
- Diagnose and solve basic electromagnetic compatibility problems.
- Design high speed Printed Circuit board with minimum interference.
- Design a EMI free system.

UNIT-I

Introduction, Natural and Nuclear Sources of EMI / EMC:

Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT-II

EMI from Apparatus, Circuits and Open Area Test Sites:

Electromagnetic emissions, Noise from relays and switches, Nonlinearities in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT-III:

Radiated and Conducted Interference Measurements and ESD:

Anechoic Chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements.

UNIT-IV:

ESD, Grounding, Shielding, Bonding and EMI filters: Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design. ESD, Electrical fast transients / bursts, Electrical surges.

UNIT-V:

Cables, Connectors, Components

Introduction, EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, Opto isolators, Transients and surge suppression devices.

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UNIT–VI: EMC Standards - National / International

Introduction, Standards for EMI and EMC, MIL standards, IEEE/ANSI standards, CISPR/IEC standards, FCC regulations, EURO norms, British standards, EMI/EMC standards in Japan, Conclusions

TEXT BOOKS:

1. Dr. V.P. Kodali, "*Engineering Electromagnetic Compatibility*", IEEE Publication, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
2. "*Electromagnetic Interference and Compatibility*", IMPACT series, IIT–Delhi, Modules 1– 9.

REFERENCES:

1. C.R. Pal, "Introduction *to Electromagnetic Compatibility*", John Wiley, 1992.

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I M.TECH-I SEMESTER (ELECTIVE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADHOC NETWORKS							

Course Objectives:

- To understand the state-of-the-art in network protocols, architectures and applications.
- Analyze existing network protocols and networks.
- Develop new protocols in networking

Course Outcomes:

Upon completion of the course the student will be able to

- Describe the unique issues in ad-hoc/sensor networks.
- Describe current technology trends for the implementation and deployment of wireless Adhoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless Adhoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications.
- To understand the different network sensors and applications

UNIT-I

Introduction: Introduction of ad-hoc/sensor networks, Key definitions of adhoc/sensor networks - Advantages of ad-hoc/sensor networks - Unique constraints and challenges Driving Applications. Electromagnetic spectrum-Radio propagation mechanism characteristics of the wireless channel Adhoc Wireless Networks – Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Adhoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Adhoc Mobile Networks – Adhoc Wireless Internet.

UNIT-II

End To End Delivery And Security: Transport layer: Issues in designing- Transport layer classification, adhoc transport Protocols, Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols AdHoc wireless networks Introductions to local area networks, wide area networks, MAN, PAN architectures and applications.

UNIT-III

Media Access Control (Mac) Protocols: Media Access Control (MAC) Protocols Introduction-Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks – Classifications of MAC Protocol. MACAW – FAMA – BTMA – DPRMA – Real-Time MAC protocol – Multichannel Protocols – Power Aware MAC.

UNIT-IV

Routing Protocols: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols -Table-driven protocols – DSDV – WRP – CGSR – On-Demand protocols – DSR – AODV – TORA – LAR – ABR – Zone Routing Protocol – Power Aware Routing protocols.

UNIT-V

Networking Sensors And Applications: Unique features, Deployment of ad-hoc/sensor network –Sensor tasking and control Transport layer and security protocols.

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UNIT-VI

Sensor Network Platforms And Tools: Berkley Motes - Sensor network programming challenges - Embedded Operating System – Simulators, Applications: Applications of Ad-Hoc/Sensor Network and Future Directions. Ultra wide band radio communication- Wireless fidelity systems.

TEXT BOOKS:

1. Karl, Holger, and Andreas Willig. "*Protocols and architectures for wireless sensor networks*", John Wiley & Sons, 2007.
2. C. Siva Ram Murthy and B. S. Manoj, "*Ad Hoc Wireless Networks: Architectures and Protocols*", Prentice Hall, 2004.

REFERENCES:

1. Feng Zhao and Leonidas J. Guibas, "*Wireless Sensor Networks: An Information Processing Approach*" Morgan Kaufmann, 2004.
2. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, "*Mobile ad hoc Networking*", Wiley-IEEE press, 2004.
3. Mohammad Ilyas, "*The Handbook of Adhoc Wireless Networks*", CRC Press, 2002.

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I M.TECH-I SEMESTER (ELECTIVE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
EMBEDDED C							

Course Objectives:

- To learn the basic concepts of C programming and to learn the basic concepts of 8051 IO Interfacing
- To learn the objective oriented programming with C and to learn the hardware and software delay creations
- To learn with the example case study and to learn the applications of embedded c language

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand the basic c programming
- Understand the basic Embedded C programming
- Understand the 8051 IO Port programming
- Develop small embedded projects

UNIT–I

Programming Embedded Systems in C: Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions.

UNIT–II

Introducing the 8051 Microcontroller Family: Introduction, What's in a name, The external interface of the Standard 8051, Reset requirements ,Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption ,Conclusions

UNIT–III

Reading Switches: Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), the need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT–IV

Adding Structure to the Code: Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT–V

Meeting Real-Time Constraints: Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for 'timeout' mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT–VI

Case Study: Intruder Alarm System: Introduction, The software architecture, Key software Components used in this example, running the program, the software, Conclusions

TEXT BOOKS:

1. Michael J. Pont, "*Embedded C*", Pearson Education.

REFERENCES:

1. Nigel Gardner, *"PIC Micro MCU C - An Introduction to Programming, The Microchip PIC in CCS C"*.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
STATISTICAL SIGNAL PROCESSING							

Course Objectives:

- To introduce the basics of random signal processing.
- Concept wise introduction to estimation and prediction theory.
- To know about adaptive filtering and it's applications.
- A brief overview of the processing of speech signals.

Course Outcomes:

Upon completion of this course, the student will be able to

- Well equipped with the concepts of random signal processing
- Prediction and Estimation concepts are well understood
- Aware of adaptive filters and their applications
- Gather basic knowledge about speech signal processing
- Ability to understand Kalman Filter theory and design discrete Kalman filters
- Ability to use computer tools (such as MATLAB) in developing and testing stochastic DSP algorithms

UNIT-I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing, common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT-II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorrelation, cross-correlation, transfer functions, and coherence form finite signal samples.

UNIT-III

Review of signal processing: A review on random processes, A review on filtering random processes, Examples.

Statistical parameter estimation: Maximum likehood estimation, maximum a posterior estimation, Cramer-Rao bound.

UNIT-IV

Eigen structure based frequency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.

UNIT-V

Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), various non-parametric approaches.

UNIT-VI

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

TEXT BOOKS:

1. Steven M. Kay, "*Fundamentals of Statistical Signal Processing: Estimation Theory*", Prentice Hall,1993.
2. Monsoon H. Hayes, "*Statistical digital signal processing and modelling*", Wiley,1996.

REFERENCES:

1. Dimitris G. Manolakis, Vinay K. Ingle, and Stephen M. Kogon, "*Statistical and adaptive signal processing*", Artech House, Inc, 2005

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
OPTICAL COMMUNICATION TECHNOLOGY							

Course Objectives:

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes.
- To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to design a complete optical fiber communication system, to enable the design of data transmission optical systems.
- Ability to demonstrate an understanding of optical fiber propagation characteristics and transmission properties.
- Capacity to demonstrate an understanding of light sources including the principles of laser action in semiconductors.
- The characteristics of optical transmitters based on semiconductor and external modulation techniques, and the characteristics of optical amplifiers.
- Ability to describe the principles of photodetection and optical receiver sensitivity to the extent of the material presented.
- Ability to demonstrate an understanding of fiber devices and multiple wavelength division multiplexing techniques to the extent of the material presented.

UNIT–I

Signal propagation in Optical Fibers: Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non Linear effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation and Cross Phase Modulation, Four Wave Mixing, Principle of Solitons.

UNIT–II

Fiber Optic Components for Communication & Networking: Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT–III

Modulation: Signal formats for Modulation,Subcarrier Modulation and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes

UNIT-IV

Demodulation:

Ideal and Practical receivers for Demodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes for Error Detection and Correction.

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UNIT-V

Transmission System Engineering: System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT–VI

Fiber Non-linearities and System Design Considerations: Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

TEXT BOOKS:

1. Rajiv Ramaswami and Kumar N. Sivarajan, "*Optical Networks: A Practical Perspective*", 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. Gerd Keiser, "*Optical Fiber Communications*", 3rd Ed., McGraw Hill, 2000.

REFERENCES:

1. John. M. Senior, "*Optical Fiber Communications: Principles and Practice*", 2nd Ed., PEI, 2000.
2. Harold Kolimbris, "*Fiber Optics Communication*", 2nd Ed., PEI, 2004.
3. Uyless Black, "*Optical Networks: Third Generation Transport Systems*", 2nd Ed., PEI, 2009
4. Govind Agarwal, "*Optical Fiber Communications* ", 2nd Ed., TMH, 2004.
5. S.C. Gupta, "*Optical Fiber Communications and Its Applications*, PHI, 2004.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DATA COMPRESSION							

Course Objectives:

- To provide students with contemporary knowledge in Data Compression and Coding.
- To equip students with skills to analyze and evaluate different Data Compression and Coding methods.
- Distinguish between different text, image, video, and audio file formats.

Course Outcomes:

Upon completion of this course, the student will be able to

- Explain the evolution and fundamental concepts of Data Compression and Coding techniques.
- Analyze the operation of a range of commonly used Coding and Compression techniques
- Identify the basic software and hardware tools used for data compression.
- Identify what new trends and what new possibilities of data compression are available.
- Identify different image file formats.
- Analyze the image compression standards.

UNIT–I

Compression - Definition – lossless compression - lossy compression - modeling and coding. compression measure - Shannon's source coding and channel coding theorems – Types of redundancy - transform coding – predictive coding – simple applications.

UNIT–II

Text Compression - Information theory concepts – entropy - Shannon-Fano coding – Huffman coding – arithmetic coding – dictionary-based coding – LZ77 – LZ78 – LZW – BWT – context based coding.

UNIT–III

Audio Compression - Basics of digital audio – audio file formats (WAV, MIDI) - ADPCM in speech coding – vocoders – LPC – CELP – MELP – scalar quantization – vector quantization Linde-Buzo-Gray algorithm - DPCM – MPEG audio compression.

UNIT-IV

Video Compression - Basics of digital video – video file formats (AVI, YUV) – color models in video – motion estimation and compensation - Video compression standards: MPEG-1, MPEG- 2, MPEG-4, H.261, H.263 and H.264/AVC.

UNIT–V

Image Compression - Basics of digital image – image file formats (BMP, GIF, TIFF) – Color models in images.

UNIT–VI

Discrete Fourier Transform – Discrete Cosine Transform – Discrete Wavelet Transform – Sub band coding - EZW – SPIHT – EBCOT - Image compression standards: JBIG, JPEG and JPEG 2000.

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TEXT BOOKS:

1. David Salomon, "*Data Compression: The Complete Reference*", 3rd Edition New Delhi, Springer International Edition, 2005.
2. Khalid Sayood, "*Introduction to Data Compression*", 2nd edition New Delhi, Harcourt India Private Ltd., , 2000.
3. Ze-Nian Li and Mark S. Drew, "*Fundamentals of Multimedia*", Pearson Education, New Delhi, 2004.

REFERENCES:

1. Mark Nelson and Jean-Loup Gailly, "*The Data Compression Book*", 2nd Edition, M&T Books, New York, 1996.
2. K. R. Rao and J. J. Hwang, "*Techniques and standards for image, video and audio coding*", Prentice Hall Inc., New Jersey, 1996.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
RADAR SIGNAL PROCESSING							

Course Objectives:

- To provide operation of radar systems.
- To know different signal processing techniques.
- To provide pulse compression and coding techniques.

Course Outcomes:

Upon completion of this course, the student will be able to

- Describe operation of radar systems and discuss their main design parameters and components.
- Describe signals and waveforms used in radar systems.
- Discuss problems and design challenges in radar signaling and waveforms.
- Use various tools (or simulators) for signal and system level simulations in radar systems
- Discuss various signal processing techniques for various radar operations including MTI, pulse Doppler and SAR radars.
- Use various pulse Coding Techniques.

UNIT-I

Introduction: Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar.

UNIT-II

Matched Filter Receiver

Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT-III

Detection of Radar Signals in Noise: Detection Criteria – Neyman-Pearson Observer, Likelihood-RatioReceiver, Inverse Probability Receiver, Sequential Observer, Detectors – Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection - CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management – Schematics, Component Parts, Resources and Constraints.

UNIT-IV

Waveform Selection [3, 2]: Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT –V

Pulse Compression in Radar Signals: Introduction, Significance, Types, Linear FM Pulse Compression –Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.

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UNIT-VI

Phase Coding Techniques: Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar, Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:

1. M.I. Skolnik, "*Radar Handbook*", 2nd Ed., McGraw Hill, 1991.
2. Fred E. Nathanson, "*Radar Design Principles: Signal Processing and the Environment*", 2nd Ed., PHI, 1999.
3. M.I. Skolnik, "*Introduction to Radar Systems*", 3rd Ed., TMH, 2001.

REFERENCES:

1. Peyton Z. Peebles, Jr., "*Radar Principles*", John Wiley, 2004.
2. R. Nitzberg, "*Radar Signal Processing and Adaptive Systems* ", Artech House, 1999.
3. F.E. Nathanson, "*Radar Design Principles*", 1st Ed., McGraw Hill, 1969.

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I M.TECH-I SEMESTER (ELECTIVE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
SOFTWARE RADIO							

Course Objectives:

- Students able to design principles of software radio and poly phase filters.
- Students able to differentiate direct digital synthesis and analog signal synthesis &Analog to digital and digital to analog conversion.
- Student able to learn about DSP processors and Object oriented programming.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to implement radio frequency issues and design software radio.
- Ability to recover timing in digital receivers.
- Ability to generate digital signals.
- Ability to improve data conversion performance.
- Ability to design DSP processors.
- Ability to design software radio.

UNIT-I:

Introduction: The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT-II:

Multi Rate Signal Processing: Introduction- Sample Rate Conversion Principles- Polyphase Filters-Digital Filter Banks- Timing Recovery in Digital Receivers Using Multirate Digital Filters.

UNIT-III:

Digital Generation of Signals: Introduction- Comparison of Direct Digital Synthesis with Analog Signal Synthesis- Approaches to Direct Digital Synthesis- Analysis of Spurious Signals- Spurious Components due to Periodic jitter- Band Pass Signal Generation- Performance of Direct Digital Synthesis Systems- Hybrid DDS-PLL Systems- Applications of direct Digital Synthesis- Generation of Random Sequences- ROM Compression Techniques.

UNIT-IV:

Analog to Digital and Digital to Analog Conversion: Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance- Common ADC and DAC architectures.

UNIT-V:

Digital Hardware Choices: Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays- Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT-VI:

Object – Oriented Representation of Radios and Network Resources: Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

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Case Studies in Software Radio Design: Introduction and Historical Perspective. SPEAK easy-JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXTBOOKS:

1. Jeffrey H. Reed, "*Software Radio: A Modern Approach to Radio Engineering*", PEA Publication, 2002.
2. Walter Tuttle Bee, "*Software Defined Radio: Enabling Technologies*", Wiley Publications, 2002.

REFERENCES:

1. Paul Burns, "*Software Defined Radio for 3G*", Artech House, 2002.
2. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "*Software Defined Radio: Architectures, Systems and Functions*", Wiley, 2003.
3. Joseph Mitola, "*Software Radio Architecture: Object Oriented Approaches to wireless System Enginering*", 2000, John Wiley & Sons.
4. B.Razavi, "*R.F. Microelectronics*", PHI, 1998.
5. S.K.Mitra," *DSP – A Computer Based Approach*", McGraw-Hill,1998.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	6	40	60	100	3
DESIGN AND SIMULATION LABORATORY							

Course Objectives:

- Student able to design logic gates.
- Student able to learn about converters.
- Student able to understand the importance of embedded theory.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to design logic gates and ALU.
- Ability to design Finite State Machine logic Circuit.
- Ability to design Combinational circuits like Full Adder.
- Ability to design A to D & D to A converters.
- Ability to create a new task.
- Ability to implement BANKER'S algorithm.

PART-A:

VLSI Lab (Front-end Environment)

• The students are required to design the logic circuit to perform the following experiments using necessary simulator (Xilinx ISE Simulator/Mentor Graphics Questa Simulator) to verify the logical /functional operation and to perform the analysis with appropriate synthesizer (Xilinx ISE Synthesizer/Mentor Graphics Precision RTL) and then verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).

• The students are required to acquire the knowledge in both the Platforms (Xilinx and Mentor graphics) by perform at least FOUR experiments on each Platform.

LIST OF EXPERIMENTS:

1. Realization of Logic gates.
2. Parity Encoder.
3. Random Counter.
4. Synchronous RAM.
5. ALU.
6. UART Model.
7. Traffic Light Controller using Sequential Logic circuits
8. Finite State Machine (FSM) based logic circuit.

PART-B:

VLSI Lab (Back-end Environment)

• The students are required to design and implement the Layout of the following experiments of any THREE using CMOS 130nm Technology with Mentor Graphics Tool.

LIST OF EXPERIMENTS:

1. Inverter Characteristics.
2. Full Adder.
3. RS-Latch, D-Latch and Clock Divider.
4. Synchronous Counter and Asynchronous Counter.
5. Digital-to-Analog Converter.
6. Analog-to-Digital Converter.

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LAB REQUIREMENTS FOR PART-A AND PART-B:

Software: Xilinx ISE Suite 13.2 Version, Mentor Graphics-Questa Simulator, Mentor Graphics-Precision RTL, Mentor Graphics Back End/Tanner Software tool.

Hardware: Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.

PART-C: Embedded Systems Laboratory

• The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits.

• The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.

• The students are required to perform at least THREE experiments.

LIST OF EXPERIMENTS: (using ARM-926 with PERFECT RTOS)

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER'S algorithm.

Lab Requirements for PART-C:

Software:

(i) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library

(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

Hardware:

(i) The development kits of ARM-926 Developer Kits Boards.

(ii) Serial Cables, Network Cables and recommended power supply for the

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
CODING THEORY AND APPLICATIONS							

Course Objectives:

- Student able to differentiate the types of errors and error detection.
- Student able to compute and detect errors in cyclic and convolutional codes.
- Student able to compute Syndrome and iterative algorithms and error correcting codes.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to measure average and entropy.
- Ability to implement Design hamming code.
- Ability to compute cyclic hamming codes and shortened cyclic codes.
- Ability to compute conventional codes like encoding of conventional codes.
- Ability to decode single burst error correcting cyclic codes.
- Ability to compute iterative algorithms.

UNIT –I

Coding for Reliable Digital Transmission and Storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

UNIT–II

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT–III

Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT–IV

Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT–V

Burst –Error-Correcting Codes: Decoding of Single-Burst error Correcting Cyclic codes, Single-Burst-Error-Correcting Cyclic codes, Burst-Error-Correcting Convolutional Codes, Bounds on Burst Error- Correcting Capability, Interleaved Cyclic and Convolutional Codes, Phased-Burst –Error-Correcting Cyclic and Convolutional codes.

UNIT -VI

BCH – Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

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TEXT BOOKS:

1. Shu Lin, Daniel J. Costello, Jr, "*Error Control Coding- Fundamentals and Applications*", Prentice Hall, Inc.
2. Man Young Rhee, "Error *Correcting Coding Theory*", McGraw-Hill Publishing, 1989.

REFERENCES:

1. Bernard Sklar, "*Digital Communications-Fundamental and Application*", PE.
2. John G. Proakis, "*Digital Communications*", 5th Ed., TMH, 2008.
3. Salvatore Gravano, "*Introduction to Error Control Codes*", Oxford.
4. Todd K.Moon, "*Error Correction Coding – Mathematical Methods and Algorithms*", Wiley India, 2006.
5. Ranjan Bose, "*Information Theory, Coding and Cryptography*", 2nd Ed., TMH, 2009.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DETECTION AND ESTIMATION THEORY							

Course Objectives:

- Student able to understand about discrete linear models and detection problem.
- Student able to understand about importance of LMMSE Estimators and calculation of probability of error.
- Student able to measure non-parametric estimators and Model free estimation.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to understand priority of Gaussian processes.
- Ability to calculate probability of errors.
- Ability to understand the importance of minimum probability error with a priori probability.
- Ability to design Kalman filters.
- Ability to test hypotheses and linear regression.
- Ability to estimate ergodicity and autocorrelation function.

UNIT–I

Random Processes

Discrete Linear Models, Markov Sequences and Processes, Processes, and Gaussian Processes.

UNIT–II

Detection Theory

Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier.

UNIT–III

Detection Methods

Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal apriori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT–IV

Linear Minimum Mean-Square Error Filtering

Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –V

Statistics

Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT–VI

Estimating the Parameters of Random Processes from Data

Tests for Stationary and Ergodicity, Model-free Estimation, Model based Estimation of Autocorrelation Functions, Power Special Density Functions.

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TEXT BOOKS:

1. K. Sam Shanmugan & A.M. Breipohl, "*Random Signals: Detection, Estimation and Data Analysis*", Wiley India Pvt. Ltd, 2011.
2. Lonnie C. Ludeman, "*Random Processes: Filtering, Estimation and Detection*", Wiley India Pvt. Ltd., 2010.

REFERENCES:

1. Steven. M.Kay, "*Fundamentals of Statistical Signal Processing: Volume I Estimation Theory*", Prentice Hall, USA, 1998.
2. Steven.M.Kay, "*Fundamentals of Statistical Signal Processing: Volume I Detection Theory*", Prentice Hall, USA, 1998.
3. Srinath, Rajasekaran, Viswanathan, "*Introduction to Statistical Signal Processing with Applications*", PHI, 2003.
4. Louis L.Scharf, "*Statistical Signal Processing: Detection, Estimation and Time Series Analysis*", Addison Wesley, 1991.
5. Harry L. Van Trees, "*Detection, Estimation and Modulation Theory: Part – I*", John Wiley & Sons, USA, 2001.
6. Mischa Schwartz, Leonard Shaw, "*Signal Processing: Discrete Spectral Analysis – Detection & Estimation*", McGraw Hill, 1975.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
IMAGE AND VIDEO PROCESSING							

Course Objectives:

- Student able to learn about fundamentals of image processing and image enhancement.
- Student able to gain knowledge image segmentation and image compression
- Student able to learn fundamentals about video processing and able to estimate multi-resolution motion.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to design Fourier transform and two dimensional Fourier transform.
- Ability to differentiate image restoration techniques.
- Ability to differentiate segmentation techniques.
- Ability to understand importance of JPEG.
- Ability to differentiate analog video and digital video.
- Ability to estimate pixels in video

UNIT–I

Fundamentals of Image Processing and Image Transforms:

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform, Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II

Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration: Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT–III

Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation. Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge Based segmentation, Edge detection and linking, Hough transform, Active contour

UNIT-IV

Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon–Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.

UNIT-V

Basic Steps of Video Processing: Analog Video, Digital Video. Time- Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

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UNIT–VI

2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. Gonzaleze and Woods, "*Digital Image Processing*", 3rd Ed., Pearson.
2. Yao Wang, Joem Ostermann and Ya–quin Zhang, "*Video Processing and Communication*", 1st Ed., PH Int.
3. S. Jayaraman, S. Esakkirajan and T. VeeraKumar, "*Digital Image Processing*, Tata McGraw Hill publishers, 2009.

REFRENCES:

1. Scotte Umbaugh, "*Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools*", 2nd Ed, CRC Press, 2011.
2. M. Tekalp, "*Digital Video Processing* ", Prentice Hall International.
3. John Woods, "*Multidimentional Signal, Image and Video Processing and Coding*", 2nd Ed, Elsevier.
4. Vipula Singh, "*Digital Image Processing with MATLAB and Labview*", Elsevier.
5. Keith Jack, "*Video Demystified – A Hand Book for the Digital Engineer*", 5th Ed., Elsevier.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADVANCED DIGITAL COMMUNICATION							

Course Objectives:

- To understand the digital passband transmission and different types of digital modulation techniques.
- To understand and analyze the different channel coding techniques and design considerations of a digital communication system.
- To understand concept of spread spectrum communication system.

Course Outcomes:

After successfully completing the course students will be able to

- Analyze the performance of a pass band digital communication system in terms of error rate and spectral efficiency.
- Analyze Performance of various digital modulation techniques.
- Analyze Performance of various channel coding techniques.
- Perform the time and frequency domain analysis of the signals in a digital communication system.
- Select the blocks in a design of digital communication system.
- Analyze Performance of spread spectrum communication system.

UNIT-I

Digital Passband Transmission

Introduction, Pass band Transmission Model, Gram-Schmidt Orthogonalization Procedure, Geometric Interpretation of Signals, Response of Bank of Correlators to Noisy Input, Coherent Detection of Signals in Noise, Probability of Error, Correlation Receiver, Detection of Signals with unknown Phase.

UNIT-II

Digital Modulation Techniques I

Hierarchy of Digital Modulation Techniques, Coherent Binary PSK, Coherent Binary FSK, Coherent Quadriphase-Shift Keying, Coherent Minimum Shift Keying, Noncoherent Orthogonal Modulation, Noncoherent Binary Frequency-Shift Keying.

UNIT-III

Digital Modulation Techniques Ii

Differential Phase-Shift Keying, Comparison of Binary and Quaternary Modulation Schemes, M-ary Modulation Techniques, Power Spectra, Band-width Efficiency, Synchronization.

UNIT-IV

Channel Coding

Introduction, Discrete Memory less Channels, Linear Block Codes, Cyclic Codes, Convolution Codes, Maximum Likelihood Decoding of Convolution codes, Trellis-Coded Modulation, Coding for Compounded-Error Channels.

UNIT-V

Design Considerations Of A Digital Communication System

Intersymbol Interference, Nyquist's Criterion for Distortionless Baseband Binary Transmission, Correlative-Level Coding, Error Probability Plane, Bandwidth Efficiency Plane, Modulation and coding tradeoffs, defining, designing, and evaluating digital communication system, Modulation and coding for band limited channels.

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UNIT-VI

Spread Spectrum Techniques

Pseudo noise sequences, Direct sequence Spread Spectrum systems. Frequency hopping systems, Synchronization and Jamming Considerations.

TEXT BOOKS:

1. Simon Haykin, *"Digital communication"*, Third Edition, John Wiley and Sons. (Units I, III & IV)
2. B.Sklar, *"Digital Communications"*, Second Edition, Pearson Education Asia. (Units II & IV)

REFERENCES:

1. J.G. Proakis, "*Digital Communications*", Third Edition, McGraw Hill.

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I M.TECH-II SEMESTER (ELECTIVE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
CMOS ANALOG AND DIGITAL IC DESIGN							

Course Objectives:

- Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- Understand the design concepts of Combinational and Sequential MOS logic circuits.
- Understand the concepts of Sub circuits and CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.

Course Outcomes:

Upon completion of this course, the student will be able to

- Design MOS devices and estimate their Electrical behavior.
- Design Combinational MOS logic circuits.
- Design Sequential MOS logic circuits.
- Use the Dynamic logic circuits and Memories.
- Extend the Analog Circuit Design to Different Applications in Real Time.
- Measure characteristics of CMOS amplifiers.

UNIT-I

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

MOS Design Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II

Combinational MOS Logic Circuits

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT–III

Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT–IV

Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Semiconductor Memories Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash.

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UNIT–V

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-VI

CMOS Amplifiers

nverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

TEXT BOOKS:

1. Ken Martin, "*Digital Integrated Circuit Design*", Oxford University Press, 2011.
2. Sung-Mo Kang, Yusuf Leblebici, "*CMOS Digital Integrated Circuits Analysis and Design*", 3rd Ed., TMH, 2011.
3. Philip E. Allen and Douglas R. Holberg, "*CMOS Analog Circuit Design*", Oxford University Press, International Second Edition/Indian Edition, 2010.
4. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, "*Analysis and Design of Analog Integrated Circuits*", Fifth Edition, Wiley India, 2010.

REFERENCES:

1. David A. Johns, Ken Martin, "*Analog Integrated Circuit Design*", Wiley Student Edn, 2013.
2. Behzad Razavi, "*Design of Analog CMOS Integrated Circuits*", TMH Edition.
3. Baker, Li and Boyce, "*CMOS: Circuit Design, Layout and Simulation*", PHI.
4. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, *"Digital Integrated Circuits – A Design Perspective"*, 2nd Ed., PHI.

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I M.TECH-II SEMESTER (ELECTIVE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADVANCED COMPUTER ARCHITECTURE							

Course Objectives:

- The course focus on computer design, pipelining, RISC instruction set.
- To introduce dynamic scheduling, different ILP software Techniques.
- To understand the concept of memory architecture, interconnection and intel architecture.

Course Outcomes:

Upon completion of this course, the student will be able to

- Know the classes of computers and new trends and developments in computer design.
- Understand pipelining, RISC processor, cache memory performance.
- Understand the various techniques to enhance a processors ability to exploit instruction level parallelism(ILP) and its challenges.
- Understand the architecture of Very large instruction word(VLIW).
- Describe the concept of systematic and distributed shared memory architecture.
- Understand the performance of interconnection network and intel architecture.

UNIT -I

Fundamentals of Computer Design: Fundamentals of Computer design,Changing faces of computing and task of computer designer,Technology trends, Cost price and their trends, Measuring andreporting performance, Quantitative principles of computer design,Amdahl's law.Instruction set principles and examples- Introduction, Classifyinginstruction set- MEmory addressing- type and size of operands,Operations in the instruction set.

UNIT–II

Pipelines: Introduction, Basic RISC instruction set, Simpleimplementation of RISC instruction set, Classic five stage pipe linedRISC processor, Basic performance issues in pipelining, Pipelinehazards, Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, Review of ABC of cache,Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT-III

Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling usingTomasulo's approach, Branch prediction, high performance instructiondelivery- hardware based speculation.

UNIT–IV

ILP Software Approach Basic compiler level techniques, Static branchprediction, VLIW approach, Exploiting ILP, Parallelism at compile time,Cross cutting issues -Hardware verses Software.

UNIT –V

Multi Processors and Thread Level Parallelism: Multi Processorsand Thread level Parallelism-Introduction, Characteristics ofapplication domain, Systematic shared memory architecture, Distributedshared – memory architecture, Synchronization.

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UNIT–VI

Inter Connection and Networks: Introduction, Interconnection networkmedia, Practical issues in interconnecting networks, Examples of interconnection, Cluster, Designing of clusters.

Intel Architecture: Intel IA-64 ILP in embedded and mobile markets, Fallacies and pit falls.

TEXT BOOKS:

1. John L. Hennessy, David A. Patterson - Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

REFERENCES:

1. Kai Hwang, Faye A. Brigs., "*Computer Architecture and Parallel Processing*", MC Graw Hill.
2. Dezso Sima, Terence Fountain, Peter Kacsuk , "*Advanced Computer Architecture – A Design Space Approach*", Pearson Ed.

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I M.TECH-II SEMESTER (ELECTIVE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
RF CIRCUIT DESIGN							

Course Objectives:

- The course focus on RF behavior of passive components and transmission lines.
- To introduce active components and RF transistor amplifier design.
- To understand the concept of oscillators and RF mixers.

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand the concept of electromagnetic spectrum and microwave bands.
- Understand the transmission line equations and smith chart.
- Understand the various techniques to matching and biasing network.
- Understand the transistor amplifier design.
- Describe the concept of different types oscillators.
- Understand the performance of RF mixers.

UNIT-I

Introduction to RF Electronics: The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

UNIT-II

Transmission Line Analysis: Examples of transmission lines, Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. Single And Multiport Networks: The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT-III

Matching and Biasing Networks: Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks. RF Passive & Active Components: Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

UNIT-IV

RF Transistor Amplifier Design: Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT-V

Oscillators: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer.

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UNIT-VI

RF Mixers: Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers. Frequency domain considerations.

TEXT BOOKS:

1. Reinhold Ludwing, Pavel Bretchko, "*RF Circuit design: Theory and applications*", Pearson Education Asia Publication, New Delhi 2001.
2. Devendra K. Misra, "*Radio Frequency and Microwave Communication Circuits – Analysis and Design*" , Wiley Student Edition, John Wiley & Sons

REFERENCES:

1. Mathew M.Radmangh, "*Radio frequency and Microwave Electronics*", 2001, PE Asia Publ.
2. Christopher Bowick, Cheryl Aljuni and John Biyler, "*RF Circuit Design*", Elsevier Science, 2008.
3. Joseph Carr, "*Secrets of RF Design*", 3rd Edition, Tab Electronics.
4. Cotter W. Sawyer, "*Complete Wireless Design*", 2nd Edition, Mc-Graw Hill.

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I M.TECH-II SEMESTER (ELECTIVE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
NEURAL NETWORKS AND FUZZY LOGIC CONTROL							

Course Objectives:

- To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
- To introduce fuzzy classical sets, neural network and fuzzy logic applications.
- To introduce adaptive fuzzy systems and neuro fuzzy controller.

Course Outcomes:

Upon completion of this course, the student will be able to

- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.
- To understand fault diagnosis and load forecasting.
- To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
- To provide adequate knowledge of application of fuzzy logic control to real time systems.

UNIT-I

Architectures

Introduction –Biological neuron-Artificial neuron-Neuron modeling Learning rules-Single layer-Multi layer feed forward network-Backpropagation-Learning factors.

UNIT-II

Neural Networks For Control: Feedback networks-Discrete time hop field networks-Schemes of neuro –control, identification and control of dynamical systems-case studies (Inverted Pendulum, Articulation Control).

UNIT-III

Fuzzy Systems: Classical sets - Fuzzy sets - Fuzzy relations - Fuzzification - Defuzzification - Fuzzy rules.

UNIT-IV

Applications of Neural Networks And Fuzzy Logic

Neural network applications: Process identification, Fraction approximation, Control and Process monitoring, Fault diagnosis and load forecasting.

Fuzzy logic Applications: Fuzzy logic control and Fuzzy classification.

UNIT-V

Fuzzy Logic Control: Membership function – Knowledge base-Decision –making logic – Optimizations of membership function using neural networks Adaptive fuzzy systems-Introduction to generate genetic algorithm.

UNIT-VI

Application of FLC: Fuzzy logic control-Inverted pendulum-Image processing-Home Heating system-Blood pressure during anesthesia-Introduction to neuro fuzzy controller.

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TEXT BOOKS:

1. Kosko, B, "*Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence*", Prentice Hall, New Delhi, 2004.
2. Timothy J Ross, "*Fuzzy Logic with Engineering Applications*", John Willey and Sons, West Sussex, England, 2005.

REFERENCES:

1. Jack M. Zurada, "*Introduction to Artificial Neural Systems*", PWS Publishing Co., Boston, 2002.
2. Klir G.J. &Folger T.A., "*Fuzzy sets, Uncertainty and Information*", Prentice –Hall of India Pvt. Ltd., New Delhi, 2008.
3. Zimmerman H.J., "*Fuzzy set theory and its Applications*", Kluwer Academic Publishers Dordrecht, 2001.
4. Driankov, Hellendroonb, "*Introduction to fuzzy control*", Narosa Publishers,2001
5. Laurance Fausett, Englewood cliffs, N.J., "*Fundamentals of Neural Networks*", Pearson Education, New Delhi, 2008.

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I M.TECH-II SEMESTER (ELECTIVE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
VISUAL CRYPTOGRAPHY							

Course Objectives:

- The course focuses on traditional and extended visual cryptography.
- To introduce color visual cryptography and various problems.
- To understand the different applications of visual cryptography.

Course Outcomes:

Upon completion of this course, the student will be able to

- To expose the students to the concepts analysis in frequency domain of visual cryptography.
- To provide adequate knowledge about multiple secret sharing.
- To teach about the concept of image sharing using random masks.
- To understand alignment and flipping issues in VCS.
- To provide comprehensive knowledge of cheating prevention of visual cryptography.
- To provide adequate knowledge of real time applications of visual cryptography.

UNIT-I

Traditional Visual Cryptography

Secret Sharing, Visual Cryptography, Size Invariant Visual Cryptography, Recursive Visual Cryptography, Analysis of Visual Cryptography, Mathematical Background, Analysis in frequency domain.

UNIT-II

Extended Visual Cryptography

Extended Visual Cryptography, Halftone Visual Cryptography, Dot-Size Variant Visual Cryptography, Basic Multiple Secret Sharing, Embedded share of Visual Cryptography in Halftone image.

UNIT-III

Colour Visual Cryptography

Colour Visual Cryptography, Image Sharing using Random Masks, Quality Evaluation.

UNIT-IV

Various Problems in Visual Cryptography

Alignment problems, Flipping issues in VCS, Distortion problems.

UNIT-V

Cheating Prevention of Visual Cryptography

Attacks, 2D Barcode Authentication for Basic VC Shares, Braille for Authentication of Basic VC Shares

UNIT-VI

Applications of Visual Cryptography

Moire patterns, Watermarking, Criteria for Evaluation purposes.

TEXT BOOKS:

1. Jonathan Weir and WeiQi Yan, "*Visual Cryptography and its applications*", ISBN 978-87-403-0126-7, 2012, (Units – I, II, III, VI).
2. Feng Liu, WeiQi Yan, "*Visual Cryptography for Image Processing and Security - Theory, Methods and Applications*", Second Edition, Springer, 2015 (Units – IV, V).

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I M.TECH-II SEMESTER (ELECTIVE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DSP PROCESSORS AND ARCHITECTURES							

Course Objectives:

- Gain concepts of digital signal processing techniques, implementation of DSP, FFT and their computational accuracies in DSP implementation.
- Understand the concepts of DSP Processor and its architectures and program a DSP
- processor to filter signals.
- Understand the concepts of various DSP device families & Interfacing of P-DSPs with Memory and peripherals

Course Outcomes:

Upon completion of this course, the student will be able to

- Comprehends the knowledge & concepts of digital signal processing techniques, basic building blocks, implementation of DSP & FFT algorithms
- Estimate their computational accuracies in DSP implementation.
- Design Programmable DSP devices
- Use the DSP processors TMS 320C 54XX for implementation of DSP algorithms & its interfacing techniques with various I/O peripherals.
- Use various Analog Device Family of DSP Devices
- Interface Memory and I/O Peripherals to DSP processors.

UNIT–I

Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

UNIT–II

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT–III

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-IV

Programmable Digital Signal Processors: Commercial Digital signal processing devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

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UNIT–V

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –VI

Interfacing Memory and I/O Peripherals to Programmable DSP Devices:
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

1. Avtar Singh and S. Srinivasan, "*Digital Signal Processing*", Thomson Publications, 2004.
2. K Padmanabhan, R. Vijaya rajeswaran, Ananthi, "*A Practical Approach to Digital Signal Processing*", S, New Age International, 2006/2009
3. Woon- Seng Gan, Sen M. Kuo, "*Embedded Signal Processing with the Micro Signal Architecture* ", Wiley-IEEE Press, 2007

REFERENCES:

1. B.Venkataramani and M. Bhaskar, "*Digital Signal Processors, Architecture, Programming and Applications*", 2002, TMH.
2. Jonatham Stein, "*Digital Signal Processing*", John Wiley, 2005.
3. Lapsley et al., "*DSP Processor Fundamentals, Architectures & Features*", S. Chand & Co, 2000.
4. "*Digital Signal Processing Applications Using the ADSP-2100 Family*", The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5. Steven W. Smith, "*The Scientist and Engineer's Guide to Digital Signal Processing*", California Technical Publishing, ISBN 0- 9660176-3-3, 1997
6. David J. Katz and Rick Gentile, "*Embedded Media Processing*", Analog Devices, Newnes, ISBN 0750679123, 2005

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I M.TECH-II SEMESTER (ELECTIVE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
ADVANCED DIGITAL SIGNAL PROCESSING							

Course Objectives:

- Ability to understand Signal processing at Different rates and its applications.
- Students able to implement Digital filters and able to estimate non-parametric methods.
- Students able to implement filter structures and able to estimate power spectrum of
- parametric methods.

Course Outcomes:

Upon completion of this course, the student will be able to

- Ability to differentiate Decimation and interpolation.
- Ability to Design phase filters.
- Ability to implement Quadrature Mirror filters.
- Ability to Estimate Welch and Blackman-Tukey methods.
- Ability to implementation of structures of IIR filters.
- Ability to Estimate power spectrum of parametric methods like Yule-walker.

UNIT–I

Review of DFT, FFT, IIR Filters and FIR Filters:

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT–II

Applications of Multi Rate Signal Processing I:

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters.

UNIT–III

Applications of Multi Rate Signal Processing II:

Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Over Sampling A/D and D/A Conversion.

UNIT-IV

Non-Parametric Methods of Power Spectral Estimation:

Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT–V

Implementation of Digital Filters:

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT–VI

Parametric Methods of Power Spectrum Estimation:

Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

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TEXT BOOKS

1. J.G.Proakis and D. G. Manolakis, "*Digital Signal Processing: Principles, Algorithms and Applications*", 4th Ed., PHI.
2. Alan V Oppenheim & R. W Schaffer, "*Discrete Time Signal Processing*", PHI.
3. Emmanuel C. Ifeacher, Barrie. W. Jervis, "*DSP – A Practical Approach*", 2 Ed., Pearson Education.

REFERENCES:

1. S. M .Kay, "*Modern Spectral Estimation: Theory & Application*", PHI, 1988.
2. P.P.Vaidyanathan , "*Multi Rate Systems and Filter Banks*", Pearson Education.
3. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, "*Digital Signal Processing*", TMH, 2000.

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I M.TECH-II SEMESTER (ELECTIVE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
DATA COMMUNICATION AND NETWORKS							

Course Objectives:

- Introduces computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks.
- It is based around the OSI Reference Model that deals with the major issues in the bottom three (Physical, Data Link and Network) layers of the model.
- Introduces routers, gateways and application services.

Course Outcomes:

Upon completion of this course, the student will be able to

- Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Physical, Data Link and Network layers.
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- Have a basic knowledge of the data link layer and HDLC and MAC protocols
- Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.
- Have an understanding of the routers and gateways
- Have a good understanding of simple mail transfer, file transfer, hypertext transfer protocols and multimedia applications.

UNIT-I

Introduction

Components of network - Topologies - WAN / LAN - OSI - ISO layered Architecture - Modulation and demodulation - Bit error rates - Line coding - Error correcting codes.

UNIT-II

Data Link Layer

Design issues - CRC technique and sliding window techniques - Performance analysis of sliding window techniques - Framing formats - Case Study.

UNIT-III

HDLC protocols - Medium access control - CSMA / CD - Token ring and token bus - FDDI - Wireless LAN - Performance analysis of MAC protocols - Bridges.

Network Layer

Circuit switching - packet switching - Design issues - IP addressing and IP diagram.

UNIT-IV

Routers And Gateways

Routing -Sub netting - CIDR - ICMP - ARP - RARP - IPv6 - QoS.

UNIT-V

Transport Layer Tcp And Udp

Error handling and flow control - Congestion control – TCP Retransmission - Timeout - Socket Abstraction.

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UNIT-VI

Application Services

Simple Mail Transfer Protocol (SMTP) - File Transfer Protocols (FTP), telnet, the World Wide Web (WWW).

Hypertext Transfer Protocol (HTTP), Domain name service (DNS), Security, Multimedia applications.

TEXT BOOKS:

1. William Stallings, "*Data and Computer Communications*", Seventh Edition, Prentice Hall, 2003.
2. Larry Peterson, Bruce S Davie, "*Computer Networks: A Systems Approach*", 2nd Edition, Morgan Kaufmann Publishers, 1999.
3. James F Kurose, "*Computer Networking: A Top - Down Approach Featuring the Internet*", 2nd Edition, Addison Wesley, 2002.
4. W.Richard Stevens and Gary R Wright, "*TCP / IP Illustrated*", Addison Wesley, Volume 1 & 2, 2001.

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	4	-	-	40	60	100	3
ADVANCED OPTIMIZATION TECHNIQUES							

Course Objectives:

- Able to understanding of the key concepts, theory, and algorithms of linear optimization, integer optimization, and some modern convex optimization,
- To Learn about Genetic Algorithm and Genetic Programming.
- Describe different optimization techniques.

Course Outcomes:

Upon completion of this course, the student will be able to

- Understand the basic theory and some advanced topics in single variable optimization, variable optimization, and Linear programming.
- Identify the proper optimization technique(s) to attempt when problems are too large or too complicated to solve in a straightforward way.
- Use optimization software and implement solution algorithms involving large-scale optimization techniques..
- To Understand Genetic Algorithm
- To Understand Genetic Programming.
- To Learn different applications of optimization for engineering systems

UNIT– I

Linear programming-Two-phase simplex method, Big-M method, duality, interpretation, applications. Assignment problem- Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT–II

Classical optimization techniques-Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT–III

Numerical methods for Optimization-Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT–IV

Genetic algorithm (GA) -Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA.

UNIT–V

Genetic Programming (GP)-Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT–VI

Multi-Objective GA-Pareto's analysis, Non-dominated front, multi – objective GA, Nondominated sorted GA, convergence criterion, applications of multi-objective problems . Basic Problem solving using Genetic algorithm, Genetic Programming & Multi Objective GA and simple applications of optimization for engineering systems.

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TEXT BOOKS:

1. JasbirArora, "*Optimal design*", McGraw Hill (International) Publishers.
2. Kalyanmoy Deb, "*Optimization for Engineering Design*", PHI Publishers.
3. S.S.Rao, "*Engineering Optimization*", New Age Publishers.

REFERENCE BOOKS:

1. D.E. Goldberg, "*Genetic algorithms in Search, Optimization, and Machine learning*", Addison Wesley Publishers.
2. Kalyanmoy Deb, "*Multi objective Genetic algorithms*", PHI Publishers.

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I M.TECH-II SEMESTER (ELECTIVE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
WIRELESS LANS AND PANS							

Course Objectives:

- To learn different Cellular Systems in different generations and to learn different WLAN Topologies and WLAN Technologies.
- To learn Wireless LAN standard IEEE 802.11 and to learn wireless Personal area networks.
- To learn different IEEE 802.15 working Group technologies and Zigbee technology and to learn the differences between Wired and Wireless Networks.

Course Outcomes:

Upon completion of this course, the student will be able to

- Design Cellular Systems for Next generation.
- Design different WLAN topologies and technologies.
- Design different Security methods for Wireless LANs.
- Design different Personal Area Networks.

UNIT–I

Introduction to Wireless System: Introduction, First and Second Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G systems, The Wireless Spectrum.

UNIT–II

Random Access Protocols: Random Access Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).

UNIT–III

Wireless LANS: Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology

UNIT–IV

The IEEE 802.11 Standard for Wireless LANS: Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol

UNIT–V

Wireless PANS: Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconetsynchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconetscheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT–VI

The IEEE 802.15 Working Group for WPANS: The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.

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TEXT BOOKS:

1. Carlos de Morais Cordeiro and Dharma Prakash Agrawal, "*Ad Hoc and Sensor Networks*", World Scientific, 2011.
2. Vijay K.Garg, "*Wireless Communications and Networking*", Morgan Kaufmann Publishers, 2009.

REFERENCE BOOKS:

1. Kaveh Pahlaram, Prashant Krishnamurthy, "*Wireless Networks*", PHI, 2002.
2. Marks Ciampor, Jeorge Olenewa, "*Wireless Communication*", Cengage Learning, 2007.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	6	40	60	100	3
ADVANCED COMMUNICATIONS LABORATORY							

Course Objectives:

- To obtain the Bit error rate using binary data
- Verify the various transforms on a given image
- To implement the FIR and IIR filter using DSP trainer Kit
- To study the ISDN training system with protocol analyzer

Course Outcomes:

Upon completion of this course, the student will be able to

- obtain the Bit error rate using binary data.
- verify the FIR and IIR filter using DSP trainer Kit.
- study the ISDN training system with protocol analyzer.
- Determined the various losses present in o optical fiber.
- Determined the output of a convolution of encoder and decoder for a given sequence.

Note:

1. Minimum of 10 Experiments have to be conducted

2. All Experiments may be Simulated using MATLAB and to be verified using related training kits.

1. Measurement of Bit Error Rate using Binary Data
2. Verification of minimum distance in Hamming code
3. Determination of output of Convolutional Encoder for a given sequence
4. Determination of output of Convolutional Decoder for a given sequence
5. Efficiency of DS Spread- Spectrum Technique
6. Simulation of Frequency Hopping (FH) system
7. Effect of Sampling and Quantization of Digital Image
8. Verification of Various Transforms (FT / DCT/ Walsh /Hadamard) on a given Image (Finding Transform and Inverse Transform)
9. Point, Line and Edge detection techniques using derivative operators.
10. Implementation of FIR filter using DSP Trainer Kit (C-Code/Assembly code)
11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
12. Determination of Losses in Optical Fiber
13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
14. Study of Direct Sequence Spread Spectrum Modulation & Demodulation using CDMA-DSS BER Trainer
15. Study of ISDN Training System with Protocol Analyzer
16. Characteristics of LASER Diode.

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I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
BASIC COMMUNICSTION SKILLS LAB (Common to All Branches)							

COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication to enable them to interact with the people in various social situations.
- To enable the learners develop better pronunciation through emphasis on word accent, intonation and Rhythm

COURSE OUTCOMES:

Learners should be able to

CO1 : Improve their basic communication skills to interact with peers and others in various social situations

CO2 : Speak English effortlessly with good pronunciation

CO3 : Take part in various conversations/discourses using the formal and informal expressions they have learned.

Unit-1

a. Greeting, Introducing and Taking leave
b. Pure Vowels

Unit-2

a. Giving information and Asking for information
b. Diphthongs

Unit-3

a. Inviting, Accepting and Declining Invitations
b. Consonants

Unit-4

a. Commands, Instructions and Requests
b. Accent and Rhythm

Unit-5

a. Suggestions and Opinions
b. Intonation

Text Book:

Strengthen Your Communication Skills – Maruthi Publications, 2013

Reference Books:

1. *Personality Development and Soft Skills* (Oxford University Press, New Delhi)
2. J.D.O Conner, *Better English Pronunciation*, Cambridge University Press 1980
3. T.Balasubramanian, *A Text Book of English Phonetics for Indian Students*, Macmillan, 1981
4. Sanjay Kumar, Pusph Latha, *Communication skills,* Oxford University Press 2005

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I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	4	40	60	100	4
ENGINEERING GRAPHICS (Common to CSE, ECE & EEE)							

Course objectives:

The course is mainly intended to

- Impart basic knowledge and skills required to prepare engineering drawing which is an universal language of engineers for communication, designing and production
- Get enhanced imagination capacity, visualize and communicate geometrical elements
- Understand the fundamentals of geometry like engineering curves, planes, solids, sections, developments & isometric views and its applications in design and manufacturing of various engineering components

Course Outcomes:

At the end of this course student will acquire ability to

- Apply principles of drawing to represent dimensions of an object and use the different types of scales for drawing of various sizes of engineering curves
- Draw various polygons and Ellipse
- Draw Orthographic projections in 1st and 3rd angle projections
- Draw different orientations of points, lines, planes and solids with reference to principal planes.
- Draw orthographic views (2D) from the given isometric view (3D) and vice versa

UNIT-I

Introduction to engineering drawing: Importance, Drawing Instruments and their uses. Basics of Geometric construction.

Polygons: Construct the regular polygons using given length of a side, inscription of polygons and circumscription of polygons.

Ellipse- Arcs of circles Method and Oblong Method

Scales: Representation fraction-Construction of plain, diagonal and vernier scale.

UNIT-II

Orthographic projections: Principle of orthographic projections, first and third angle projections, projections of points.

Projection of Straight lines: parallel to both the planes, parallel to one plane and inclined to the other plane.

UNIT-III

Projection of Straight lines inclined to both the planes, determination of true length, angles of inclination and Traces.

UNIT-IV

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-V

Projections of solids-prisms, pyramids, cones and cylinders with the axis inclined to one of the planes

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UNIT-VI

Conversion of isometric views to orthographic views: Conversion orthographic views to isometric views

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers

REFERENCE BOOKS:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

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I B.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING							

COURSE OBJECTIVE:

The course provides knowledge on the basic computer architecture and problem solving techniques.

COURSE OUTCOMES:

After completion of this course, the students should be able to

C01: Explain the working of key components of a computer system, evaluation of computers and the working of various input-output devices.

C02: Find the working of the processor and the memory devices.

C03: Summarize the representation of numbers, alphabets and other character codes in computer system.

C04: Study the problem solving strategies and analyzing the algorithms and flow charts.

UNIT I

Introduction to Computers: What is a Computer? Characteristics of Computers, Generations of Computers, Classification of Computers, Basic Computer Organization, Applications of Computers.

Input and Output Devices: Input Devices, Output Devices.

UNIT II

Computer Memory and Processors: Introduction, Memory Hierarchy, Processor Registers, Cache Memory, Primary Memory, Secondary Storage Devices, Basic Processor Architecture.

UNIT III

Number Systems and Computer Codes: Binary Number System, Working with Binary Numbers, Octal Number System, Hexadecimal Number System, Working with Fractions, Signed Number Representation in Binary BCD Code, ASCII Code, Extended Binary Coded Decimal Interchange Code, Excess-3 Code, Gray Code, Unicode.

UNIT IV

Introduction to Computer Problem-Solving: Introduction, The Problem-Solving Aspect, Top-down Design, Implementation of Algorithms, Flow Charts, Programs Verification, The Efficiency of Algorithms, the Analysis of Algorithms.

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UNIT V

Fundamental Algorithms: Introduction, Exchanging the Values of Two Variables, Counting, Summation of a Set of Numbers, Factorial Computation, sine Function Computation, Generation of the Fibonacci sequence, Reversing the Digits of an Integer, Base Conversion, Character to Number Conversion.

UNIT VI

Factoring Methods: Introduction, Finding the Square Root of a Number, The Smallest Divisor of an Integer, The Greatest Common Divisor of Two Integers, Generating Prime Numbers, Computing the prime Factors of an Integer.

Arrays: Introduction, Array Order Reversal, Array Counting or Histogramming, Finding the Maximum Number in a set, searching an element in an array.

TEXT BOOKS:

1. Fundamentals of Computers, Reema Thareja, Oxford .

2. How to solve it by Computer, R.G. Dromey, PHI .

REFERENCE BOOKS:

1. How to Design Programs, Matthias Fellesen, Robert Bruce Findler, Matthew Flatt, Shriram Krishnamurthi, PHI .

2. Think like a Programmer, V.Anton Spraul, No Starch Press.

I B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	3
FUNCTIONAL ENGLISH (Common to All Branches)							

COURSE OBJECTIVES:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

COURSE OUTCOMES:

Learners are able to

CO1 : Speak clearly, effortlessly, confidently and appropriately.
CO2 : Write coherently with acceptable accuracy, organizing ideas logically.
CO3 : Listen and read to comprehend different discourses and different genres of texts.
CO4 : The learner will be able to read and infer, analyze, predict, interpret and draw conclusions any printed text.

Teaching Methodology:

The methodology of teaching will be chalk and talk, PPT, audio-visual and activity based

UNIT-I
Hours of Instruction per unit: 8

HUMOUR: An Astrologer's Day

Objective: To criticize the superstitious beliefs of the people in the contemporary society. To make the learners understand that an astrologer is not trustworthy as he deceives the people by bewitching them in order to get some money. So we should not believe anyone by means of outward appearance.

Outcome: To students will develop rational thinking instead of believing blindly everything without reason.

a. Vocabulary : Prefixes, Suffixes (www.englishhints.com, www.enchantedlearning.com, www.learnenglish.de/grammar/prefixtext.html)
b. Grammar : Nouns, Pronouns, Articles
c. Writing : Sentences structures

UNIT-II

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Hours of Instruction per unit: 8

INSPIRATION: Building a New State

Objective: To make the students know the value of natural resources that are abundantly available in our country.

Outcome: Learner will understand the importance of the natural resources that are valuable in nature in order to develop our nation.

a. Vocabulary : Homophones, Homographs, Homonyms Synonyms & Antonyms and Commonly confused words (http://www.magickeys.com/books/riddles/words.html)
b. Grammar : Finite verbs, Non-finite verbs & question tags
c. Listening : Main points & sub-points
d. Writing : Paragraphs, Note making, Expansion of Proverbs

UNIT-III

Hours of Instruction per unit: 8

SUSTAINABLE DEVELOPMENT: Water: The Elixir of Life

Objective: To inform the learner how precious the water is, as well as the advantages and the characteristics of water.

Outcome: The learner will understand that water is the elixir of life and it should not be wasted but should be utilized in a proper way.

a. Vocabulary : One Word Substitutes, (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
b. Grammar : Tenses
c. Listening : Listening for the theme and gist
d. Writing : Official letters, Curricula vitae, Covering Letters

UNIT-IV

Hours of Instruction per unit: 8

RELATIONSHIPS: The Wood rose

Objective: To enlighten the learner the value of human relationships as we are social animals and the need to maintain good relationship with elders and senior citizens.

Outcome: The learner will come to know that the old people are not to be ignored but it is the duty of the children to consider the wishes, feelings, emotions, ideas and thoughts of the older generation.

a. Vocabulary : Phrasal verbs & idioms
b. Grammar : Subject verb agreement, Active and Passive voice, Prepositions
c. Listening : Listening for specific detail and information.
d. Writing : Official reports (Fundamentals of technical communication Pg No. 119-153)

UNIT-V

Hours of Instruction per unit: 8

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SCIENCE AND HUMANISIM: Progress

Objective: to enable the learner grasp the negative aspect of scientific inventions which are responsible for the anti social activities of the present day.

Outcome: understand that Science and Technology is a double edged knife and must be used with discrimination

a. Vocabulary : collocations, Technical vocabulary, common errors in vocabulary
b. Grammar : conditional sentences, conjunctions, common errors in grammar
c. Listening : Listening for opinions and attitude.
d. Writing : Events and essays

UNIT-VI

Hours of Instruction per unit: 8

READING

Objective: To understand types and sub-skills of reading and apply techniques to improve reading speed.

Outcome: demonstrate reading speed and comprehend the gist of passage.

Intensive reading, Extensive reading, predicting the content, skimming, scanning, Inferring meanings: lexical and contextual.

TEXTBOOK:

1. Using English – Orient Black Swan Pvt.Ltd.Publishers

Reference Books:

2. Meenakshi raman, Sangeeta, Sharma *Fundamentals of technical communication*, Pg: 119-153 Oxford University Press, 2015
3. Rutherford, Andrea. J, *Basic Communication Skills for Technology.* Pearson, New Delhi. 2001
4. Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
5. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
6. Michael Swan, *Practical English Usage,* Oxford University Press, 1996

Online Sources:

1. www.englishhints.com, www.enchantedlearning.com,
2. www.learnenglish.de/grammar/prefixtext.html
3. http://www.magickeys.com/books/riddles/words.html

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I B.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	3
C PROGRAMMING							

COURSE OBJECTIVE:

This course is designed to provide a comprehensive study of the C programming language. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable, and portable code. The nature of C language is emphasized in the wide variety of examples and applications. To learn and acquire art of computer programming. To know about some popular programming languages and how to choose.

COURSE OUTCOMES:

After completion of this course, the students would be able to

C01: Describe and Summarize basic programming constructs required to write programs.

C02: Use control structures (if, if/else, switch, while, do/while, for), derived data types (arrays) and user defined data types.

C03: Implement modular programming using functions

C04: Interpret dynamic memory allocation using pointers and Organize data into files.

UNIT I

COMPUTER LANGUAGES: Machine, Symbolic and High-level languages.

BASICS OF C Programming: Structure of a C program, identifiers, data types and sizes. Constants, Variables, Operators, type conversion & casting, Expression evaluation, Program development steps, Creating and Running Programs.

UNIT II

SELECTION: If-else, nested if, Multi-way selection: switch.

ITERATIVE: Loops-while, do-while and for statements, break, continue, Looping applications: Summation, powers, smallest and largest.

ARRAYS: Arrays- concepts, declaration, definition, accessing elements, storing elements,1-D arrays, 2-D arrays & multidimensional arrays, array applications, Strings and Strings functions.

UNIT III

FUNCTIONS- MODULAR PROGRAMMINGS: functions, basics, categories, parameter passing, storage classes, user defined functions, standard library functions, recursive functions, header files, C Preprocessor directives, Passing arrays to functions.

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UNIT IV

POINTERS: Pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers and arrays, dynamic memory management functions, command line arguments.

UNIT V

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, unions, typedef, bit-fields.

UNIT VI

FILE HANDLING: Text files and binary files, Formatted I/O, File I/O operations, random files.

TEXT BOOKS:

1. Programming in C, Reema Thareja, OXFORD .
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

REFERENCE BOOKS:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.

2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.

3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.

4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

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I B.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
C PROGRAMMING LAB							

COURSE OBJECTIVE:

The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

After completion of this C Programming Lab, students should be able to:

CO1: Study, analyse and understand logical structure of computer programming and different constructs to develop programs in C Language.

CO2: Know how to write, compile and debug programs in C Language.

CO3: Understand and analyse data types, typecasting and operator precedence.

CO4: Analyse the use of conditional and looping statements to solve problems associated with conditions and repetitions.

CO5: Explain and analyse simple data structures, use of pointers and dynamic memory allocation techniques.

CO6: Summarize the role of functions involving the idea of modularity, know how to create files and apply file I/O operations.

Exercise 1

a) Write a C Program to calculate the area of triangle using the formula Area = (s (s-a) (s-b) (s-c)) 1/2 where s= (a+b+c)/2.

b) Write a C Program to find the largest of three numbers using ternary operator.

c) Write a C Program to swap two numbers without using a temporary variable.

Exercise 2

a) Write a C program to find the roots of a quadratic equation.

b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.

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b) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 4

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

Exercise 6

a) Write a C Program to find both the largest and smallest number of an array of integers

b) Write a C Program to find transpose of a matrix.

Exercise 7

Write C programs that use both recursive and non-recursive functions for the following

i) To find the factorial of a given integer.

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

Exercise 8

Write a C Program for the following.

i) To find Fibonacci sequence

ii) Write C programs illustrating call by value and call by reference concepts.

Exercise 9

Write C Programs for the following string operations without using the built in functions - to concatenate two strings

a) To append a string to another string

b) To compare two strings

Exercise 10

Write C Programs for the following string operations without using the built in functions

a) To find the length of a string

b) To find whether a given string is palindrome or not

Exercise 11

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

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

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

iii. To replace a character of string either from beginning or ending or at a specified location

Exercise 12

a) Write a C Program to Implement Taylor series method

b) Write a C Program to Implement Euler's method

c) Write a C Program to Implement Runge Kutta method

Exercise 13

a) Write a C program to implement a linear search.

b) Write a C program to implement binary search

c) Write a C program to implement sorting of an array of elements.

Exercise 14

a) Write C Program to reverse a string using pointers

b) Write a C Program to compare two arrays using pointers

c) Write a C program to swap two numbers using pointers

Exercise 15

Examples which explores the use of structures, union and other user defined variables

Exercise 16

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

b) Write a C program to count the number of characters and number of lines in a file.

c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

*** At the end of the semester the student has to submit a Mini-Project on Computer Programming. The list of Mini-Projects is available in the department.**

TEXT BOOKS:

1. Programming in C, Reema Thareja, OXFORD .
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

REFERENCE BOOKS:

1. Programming in ANSI C, Dr.E.Balaguruswamy, Tata McGraw-Hill Education.

2. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PEARSON.

3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.

4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

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I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ENHANCING COMMUNICATION SKILLS LAB (Common to All Braches)							

1. To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
2. To make the students understand the importance of body language.
3. To develop positive attitude and soft skills to improve their employability quotient.
4. To expose the students to variety of a self-instructional, learner friendly, electronic media and stimulate intellectual faculties/resources

Course Outcomes:

Learners are able to

1. Give presentations and attend job interviews confidently.
2. Speak confidently in challenging situations.
3. Know the importance of Non-verbal communication and interpret nonverbal symbols
4. Face computer based competitive exams like GRE, TOFEL, and IELTS.
5. **Unit-1:** Body Language
6. **Unit-2:** Dialogues
7. **Unit-3:** Presentation Skills
8. **Unit-4:** Group Discussion
9. **Unit-5:** Interviews and Telephonic Interviews
10. **Unit-6:** Debates

Text Book:

Strengthen your Communication Skills by Maruthi Publications, 2013

Reference Books:

1. *Personality Development and Soft Skills* (Oxford University Press, New Delhi)

2. M Ashraf Rizvi, *Effective Technical Communication skills*, McGraw-Hill, 2005

3. Barun K Mitra, *Personality Development and Soft Skills,* Oxford University Press, 2011

4. Konar N, *Communication Skills for Professionals,* PHI Learning Private Limited, 2011

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

COURSE OBJECTIVE:

The course provides with the basic mathematical implication for computer science, applications of mathematics in computer science.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Acquire knowledge on statements, inferences, predicates.

CO2 : Perform operations on discrete structures such as sets, functions and relations

CO3 : Understand graphs and trees and their representation, types and variants and understand the algebraic structures, group theory, and Binomial theorem.

CO4 : Solve problems involving recurrence relations and generating functions.

SYLLABUS:

UNIT - I

Mathematical Logic: Statements and Notation, Connectives and Truth Tables-Negation, Conjunction, Disjunction, Conditional Statements, BiConditional Statements, Well-formed Formulas, Tautologies, Equivalence Formulas, Duality Law, Tautological Implications, Functionally Complete Set of Connectives, Other Connectives; Normal Forms, Theory of Inference for Statement Calculus.

UNIT - II

Predicate calculus: Predicates and Quantifiers-Predicates, Statement Function, Variables and Quantifiers, Free Bound Variables; Inference Theory of Predicate Calculus, Exercises.

Mathematical Induction: Principle of Mathematical Induction, Exercises.

UNIT - III

Set Theory and Relations: Set Theory, Principle of Inclusion and Exclusion, Relations, Relation Matrix and Digraph, Equivalence Relations, Covering and Partition of a Set, Compatibility and Partial Ordering Relations.

Functions: Bijective Functions, Types of Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions.

UNIT - IV

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Graph Theory – I: Basic Concepts of Graphs, Sub graphs, Isomorphism, Paths and Circuits, Eulerian and Hamiltonian Graphs, Representation of graphs. (Problems and Theorems without proofs)

Graph Theory – II: Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number. (Problems and Theorems without proofs)

Trees: Trees and their Properties, Isomorphism of Trees, Directed trees, Binary Trees, Decision Trees, Spanning Trees-Properties, Algorithms for Spanning trees and Minimum Spanning Tree.

UNIT - V

Lattice: Lattices, Algebraic Systems, Properties of Binary operations, Semi groups and monoids, Groups.

Combinatorics: Basic Counting Principles, Permutations and Combinations- Permutations, Combinations, Pigeonhole Principle and its Application, Restricted Combinations.

Binomial Theorem: Binomial and Multinomial Coefficients, Generating Functions of Permutations and Combinations, Principle of Inclusion and Exclusion.

UNIT - VI

Recurrence Relation: Generating Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving linear homogeneous recurrence Relations by substitution, generating functions and The Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

TEXT BOOKS:

1. Mathematical Foundation for Computer Science, S.Santha, E.V. Prasad, T. U. Series First Edition, Cengage Learning, 2011 (Units: I, II, III, IV & V).
2. Discrete Mathematics for Computer Scientists & Mathematicians, 2/e, Mott, Kandel, Baker, PHI, 2003 (Units: IV, V & VI)

REFERENCE BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, Tremblay, Manohar, 1/e, TMH, 1997.
2. Discrete Mathematics and its Applications with combinatorics and graph theory, 7/e, Rosen, TMH, 2012.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106094
2. nptel.ac.in/courses/106108054 (Graph Theory)

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	3	1	0	40	60	100	3
JAVA PROGRAMMING							

COURSE OBJECTIVE:

The course provides fundamentals of object-oriented programming in Java and development of user interface.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Demonstrate his or her ability to understand the concept and underlying principles of Object-Oriented Programming.

CO2 : Problem-solving and programming skills using OOP concept.

CO3 : Solve real-world problems through software development in high-level programming language like Java.

CO4 : Creation of user interface with the help of AWT and Swings.

SYLLABUS:

UNIT - I

Introduction to OOP: Introduction, Need of Object Oriented Programming, Principles of Object-Oriented Languages - Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism; Procedural languages Vs. OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features ,Program structures, Installation of JDK1.8.

UNIT - II

Programming Constructs: Variables, Primitive Data types, Identifiers - Naming Conventions, Keywords; Literals, Operators - Binary, Unary and ternary; Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control - Branching, Conditional, loops.

Classes and Objects: Classes, Objects, Creating Objects, Methods - method types, method overloading; constructors - Parameterized Constructors, Constructor overloading; Cleaning up unused objects - Garbage collector, Finalization; Static keyword - static variables, methods, blocks; this keyword, Arrays, Recursion, Command line arguments and String handling.

UNIT - III

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overriding, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface - Variables in interface, Extending interface; Interface vs. Abstract classes, Packages - Creating packages, using Packages, Access protection;

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Understanding CLASSPATH, java.lang package - Object class, Wrapper class, String class, String Buffer class ,String Builder class.

Exceptions & Assertions: Introduction, Exception handling techniques - try...catch, throw, throws, finally block; user defined exception

UNIT - IV

Multi-Threading: java.lang.Thread, Thread life cycle, The main Thread, Creation of new threads - by inheriting Thread class, Implementing the Runnable interface; Thread priority, Multithreading using isAlive() and join(), Synchronization - Synchronizing Methods, Statements; Suspending and Resuming threads, Communication between Threads.

Input/Output: reading and writing data - Byte Stream, Console, Character Stream, Buffered Byte Stream, Buffered Character Stream; java.io package.

UNIT - V

Applets: Applet class, Applet structure, An Example Applet Program, Applet Life Cycle , paint(),update() and repaint(), passing parameters to the Applet.

Event Handling: Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes

UNIT - VI

Abstract Window Toolkit: Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

Swings: Introduction, JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList, JScrollPane, SplitPane, JTabbedPane, Dialog box, Pluggable look and Feel.

TEXT BOOKS:

1. The Complete Reference Java, 8/e, Herbert Schildt, TMH, 2011 (UNITS : I, IV, V & VI)
2. Programming in JAVA, 2/e, Sachin Malhotra, Saurabh Choudhary, Oxford, 2014, (UNITS: I, II & III)

REFERENCE BOOKS:

1. JAVA Programming, K. Rajkumar,1/e, Pearson,2013.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, 1/e, Dream Tech,2012.

ADDITIONAL RESOURCES: https://www.tutorialspoint.com/java/index.htm

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
DATA STRUCTURES							

COURSE OBJECTIVES:

1. Comprehensive knowledge of data structures and exposure to algorithmic complexities, recursive algorithms, searching , sorting and hashing techniques
2. Applying Stack and Queue techniques for logical operations
3. Understand Linked-list representation models in various types of applications
4. Implementation of tree in various forms, orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs

COURSE OUTCOMES:

After the completion of this course the student should be able to understand,

CO1 : Analyze algorithms, Searching, Sorting and hashing Techniques

CO2 : Explain elementary data structures such as Stacks, Queues and linked lists

CO3 : Implement Trees and Advanced concepts of trees in various

CO4 : Design a variety of graph data structures and used in practical Applications

SYLLABUS:

UNIT - I

Introduction to Data Structures and Algorithms: Basic Terminology - Elementary Data Structure Organization, Classification of Data structures, Operations on Data structures, Abstract Data Type, Time and Space Complexity (worst-case, average-case, best-case). **Recursion**: Pseudocode, Factorial-A case study, Designing recursive algorithms, recursive examples, GCD implementation, Fibonacci numbers, Towers of Hanoi, Tail recursion.

UNIT - II

Searching and Sorting: Introduction to Searching, Linear Search, Binary Search, Introduction to Sorting, Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort, Heap sort.

Heaps: Binary Heaps-Inserting a new element in a Binary Heap, Deleting an element from a Binary Heap.

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions, Collisions;

UNIT - III

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Linked

representation of Stacks, operations on a linked Stack, Applications of Stacks.

Queues: Introduction to Queues, Array Representation of Queues, Linked representation of Queues, Types of Queues (Circular Queues, Deques, Priority Queues), Applications of Queues.

UNIT - IV

Linked Lists: Introduction, Single linked list, Circular linked list, Doubly linked list.

UNIT - V

Trees: Introduction, Types of Trees (General Trees, Forests, Binary Trees, Expression Trees), Traversing a Binary Tree,

Efficient Binary Trees: Binary Search Trees, operations on Binary Search Trees (Searching for a node in Binary Search Tree, Inserting a new node in Binary Search Tree, Deleting a node from a Binary Search Tree), AVL Trees.

UNIT - VI

Graphs: Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, (Adjacency Matrix Representation, Adjacency List Representation), Graph Traversal algorithms.

TEXT BOOKS:

1. Data Structures using C,Reema Thareja, Oxford, Second Edition, 2014.
   (UNITS: I, II, III, IV, V & VI)
2. Data Structures, Richard F, Gilberg , Forouzan, 2/e, Cengage, 2005. (UNIT: I)

REFERENCE BOOKS:

1. Data Structures and Algorithms, G.A.V.Pai, TMH, 2008.
2. Data structures and algorithm analysis in C, mark allen Weiss, 2/e, Pearson, 2002.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106102064/1
2. nptel.ac.in/courses/106103069

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	4	0	0	40	60	100	3
COMPUTER ORGANIZATION							

COURSE OBJECTIVES:

1. Comprehensive knowledge of computer system including the analysis and design of components of the system.
2. Gives an overview of representation of data.
3. Describes different parameters of a memory system, organization and mapping of various types of memories.
4. Illustrates algorithms for basic arithmetic operations using binary and decimal representation.
5. Describes the means of interaction of devices with CPU, their characteristics and operating modes.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Understand the computer system from user's perspective.

CO2 : Design of basic components of the system and illustrate data paths and control flow for sequencing in CPUs. Application of Micro operations and Microprogramming for design of control unit of CPU.

CO3 : Apply algorithms to perform arithmetic operations on binary representation of fixed and floating point data.

CO4 : Identify various types of memories, I/O interface devices.

SYLLABUS:

UNIT - I

Introduction: Types of Computers, Functional units of Basic Computer (Block diagram of Micro Computer).

Register Transfer and Micro-operations: Register Transfer language, Register Transfer, Bus and memory transfers - Three-State Bus Buffers, Memory Transfer; Arithmetic micro operations- Binary Adder, Binary Adder _Subtractor, Binary Incrementer, Arithmetic Circuit; Logical micro operations- List of Logic Microoperations, Hardware Implementation, Some Applications; Shift micro operations-Hardware Implementation, Arithmetic logic shift unit.

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UNIT - II

Basic Computer Organization and Design: Instruction codes – Stored Program Organization, Indirect Address, Computer Registers – Common Bus Systems, Computer instructions – Instruction Set Completeness, Timing and control, Instruction cycle – Fetch and Decode, Determine the Type of Instruction, Register Reference Instructions, Memory – Reference Instructions – AND to AC, ADD to AC, LDA :Load to AC,STA: Store AC, BUN: Branch Unconditionally, BSA: Branch and Save Return Address, ISZ: Increment and Skip if Zero, Control Flow Chart, Input – Output Instructions and Interrupt – Input – Output Configuration, Input-Output Instructions, Program Interrupt, Interrupt Cycle.

UNIT - III

Central Processing Unit: General Register Organization- Control Word, Examples of Micro-operations, STACK organization – Register Stack, Memory Stack, Reverse Polish Notation, Evaluation of Arithmetic Expressions, Instruction formats – Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions, RISC Instructions, Addressing modes – Numerical Example, Data Transfer and manipulation – Data Transfer Instructions, Data Manipulation Instructions, Arithmetic Instructions, Logical and Bit Manipulation Instructions, Shift Instructions, Program control – Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupts, Reduced Instruction Set Computer – CISC Characteristics, RISC Characteristics.

Micro Programmed Control Unit: Control memory, Address sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Micro program example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Microprogram, Design of control unit – Microprogram Sequencer.

UNIT - IV

The Memory System: Memory Hierarchy, Main memory - RAM and ROM Chips, Memory Address Maps, Memory Connection to CPU, Auxiliary memory – Magnetic Disks, Magnetic Tape, Associative Memory – Hardware Organization, Match Logic, Cache Memory – Associative Mapping, Direct Mapping, Set- Associative Mapping, Writing into Cache, Virtual Memory – Address Space and Memory Space, Address Mapping using Pages, Associative Memory Page Table, Page Replacement.

UNIT – V

Input-Output Organization: Peripheral Devices – ASCII Alphanumeric Characters, Input-Output Interface – I/O Bus and Interface Modules, I/O vs Memory Bus, Isolated vs Memory Mapped I/O, Example of I/O Interface, Asynchronous data transfer – Strobe Control, Handshaking, Asynchronous Serial Transfer, Modes of Transfer – Example of Programmed I/O, Interrupt Initiated I/O, Priority Interrupts – Daisy Chaining Priority, Parallel Priority Interrupt, Priority Encoder, Interrupt Cycle, Direct memory Access – DMA Controller, DMA Transfer.

UNIT – VI

Computer Arithmetic: Addition and subtraction – Addition and Subtraction with Signed Magnitude Data, Hardware Implementation, Hardware Algorithm, Addition and Subtraction with

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Signed 2's Complement Data. Multiplication Algorithms – Hardware Implementation for Signed Magnitude Data. Hardware Algorithm. Booth Multiplication Algorithm. Array Multiplier. Division Algorithms - Hardware Implementation for Signed Magnitude Data. Divide Overflow. Hardware Algorithm. Floating – point Arithmetic operations – Basic Considerations. Register Configuration. Addition and Subtraction. Multiplication. Division.

TEXT BOOKS:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson.2008 (UNITS: I, II, III, IV, V & VI).

REFERENCE BOOKS:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.
2. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
3. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
4. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106092
2. nptel.ac.in/courses/106103068

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
FORMAL LANGUAGES AND AUTOMATA THEORY							

COURSE OBJECTIVES:

1. Introduce concepts in automata theory and theory of computation.
2. Identify different formal language classes and their relationships.
3. Design grammars and recognizers for different formal languages.
4. Prove or disprove theorems in automata theory using its properties.
5. Determine the decidability and intractability of computational problems.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Acquire a fundamental understanding of the core concepts relating to the theory of computation, formal languages, computational models including (but not limited to) decidability and intractability.

CO2 : Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata Pushdown Automata and Turing Machines.

CO3 : To design grammars and automata (recognizers) for different language classes and able to prove and disprove theorems establishing key properties of formal languages and automata.

CO4 : To identify formal language classes and proves language membership properties.

SYLLABUS:

UNIT - I

Fundamentals of Automata: Computation, Finite State Machine, Examples Finite State Automata, Components of Finite State Automata, Elements of Finite State System, Mathematical representation of Finite State Machine, Automata Classification, Automata in Real World - Advantages of FSM, Disadvantages of FSM, Applications of FSM.

UNIT - II

Formal Language Theory: Symbols, Alphabets and Strings, Operations on Strings, Formal Languages, Operations on Languages.

Formal Languages / Grammar Hierarchy: Formal Grammar, Generative Grammars, Types of Generative Grammar, Formal Languages, Regular Language, Context-Free Language, Context-Sensitive Language, Recursive Language, Recursively Enumerable Language, Relationship between Grammars and Languages.

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
DATA STRUCTURES LAB							

COURSE OUTCOMES:

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

CO1 : Analyze algorithms, Searching, Sorting and hashing Techniques

CO2 : Explain elementary data structures such as Stacks, Queues and linked lists

CO3 : Implement Trees and graphs and used in practical Applications

LIST OF PROGRAMS:

Week - 1

a) Write a recursive C program which computes the nth Fibonacci number, for appropriate values of n.
b) Write recursive C programs for the following
   i) Factorial of a given number
   ii) GCD Computation
   iii) Towers of Hanoi

Week - 2

a) Write a C program that use both recursive and non-recursive functions to perform linear search.
b) Write a C program that use both recursive and non-recursive functions to perform binary search.

Week - 3

a) Write a C program to implement Bubble sort.
b) Write a C program to implement Insertion sort.
c) Write a C program to implement Selection sort.

Week - 4

a) Write a C program to implement Quick sort.
b) Write a C program to implement Merge sort.
c) Write a C program to implement Heap sort.

Week - 5

a) Write a C program to implement Stack operations using arrays
b) Write a C program to implement Queue operation using arrays.
c) Write a C program to convert infix expression into postfix expression using Stack.

Week - 6

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a) Write a C program to implement Stack operation using Linked list.
b) Write a C program to implement Queue operations using Linked lists.

Week - 7

Write a C program to implement the following operations on a singly linked using functions
i) Insertion
ii) Deletion
iii) Displaying
iv) Reversing

Week - 8

a) Write a C program to store a polynomial expression in memory using linked list
b) Write a C program to representation the given sparse matrix using arrays.

Week - 9

a) Write a C program to implement following Operations on a Binary Tree
   i) Create
   ii) In-order traversal
   iii) Pre-order traversal
   iv) Post-order traversal

b) Write a C program to implement following Operations a Binary Search Tree
   i) Create
   ii) Insert
   iii) Delete

Week - 10

a) Write a C program to compute the shortest path of a graph using Dijkstra's algorithm
b) Write a C program to find the minimum spanning tree using Warshall's Algorithm

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II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2

JAVA PROGRAMMING LAB

COURSE OBJECTIVE:

The course provides user interface and application development program implementation using core java principles.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : After the completion of this course the student must be able to demonstrate his or her ability to write, compile & execute basic java program and also the use of OOP concept i.e. data abstraction & data hiding, encapsulation, inheritance, polymorphism.

CO2 : Create and use interfaces, threads, handle exceptions and write applets.

CO3 : Knowledge of GUI for developing java components.

LIST OF PROGRAMS:

1. Write a JAVA program to display default value of all primitive data types of JAVA.
2. Write a JAVA program to display the Fibonacci sequence
3. Write a JAVA program give example for command line arguments.
4. Write a JAVA program to sort given list of numbers.
5. Write a JAVA program to search for an element in a given list of elements (linear search).
6. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
7. Write a JAVA program to determine multiplication of two matrices.
8. Write a JAVA program to sort an array of strings
9. Write a JAVA program to check whether given string is palindrome or not.
10. Write a JAVA program for call by value and call by reference.
11. Write a JAVA program to give the example for 'this' operator. And also use the 'this' keyword as return statement.
12. Write a JAVA program to demonstrate static variables, methods, and blocks.
13. Write a JAVA program using StringTokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.

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14. Write a JAVA program to give the example for 'super' keyword.

15. Write a JAVA program that illustrates simple inheritance.

16. Write a JAVA program to maintain Student Grading Database using multilevel inheritance. Student is Super class, which contains roll no, name, address. Marks derived from Student class, which contains subject names and respective marks. Result is derived from Marks class, which contains total, grade.

17. Write a JAVA program demonstrating the difference between method overloading and method overriding.

18. Write a JAVA program demonstrating the difference between method overloading and constructor overloading.

19. Write a JAVA program that describes exception handling mechanism.

20. Write a JAVA program for example of try and catch block. In this check whether the given array size is negative or not.

21. Write a JAVA program to illustrate sub class exception precedence over base class.

22. Write a JAVA program for creation of user defined exception.

23. Write a JAVA program to illustrate creation of threads using runnable interface (start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).

24. Write a JAVA program to create a class MyThread in this class a constructor, call the base class constructor, using super and starts the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently.

25. Write a JAVA program illustrating multiple inheritance using interfaces.

26. Write a JAVA program to create a package named pl, and implement this package in Ex class.

27. Write a JAVA program to create a package named mypack and import it in Circle class.

28. Write a JAVA program to create an abstract class named Shape, that contains an empty method named numberOfSides ().Provide three classes named Trapezoid, Triangle and Hexagon, such that each one of the classes contains only the method numberOfSides (), that contains the number of sides in the given geometrical figure.

29. Write a JAVA program that describes the life cycle of an applet.

30. Write a JAVA program to create a border layout control.

31. Write a JAVA program to create a grid layout control.

32. Write a JAVA program to create a simple calculator.

33. Write a JAVA program that displays the x and y position of the cursor movement using Mouse.

34. Write a JAVA program that displays number of characters, lines and words in a text file.

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35. Write a JAVA program that allows user to draw lines, rectangles and ovals.

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COURSE OBJECTIVES:

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	3	0	0	0	0	0	0

QUANTITATIVE APTITUDE AND REASONING

- To train students in analyzing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

CO1 : Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements

CO2 : Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.

CO3 : Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

CO4 : Will be able solve complex mathematical problems in the shortest time possible by applying shortcuts.

SYLLABUS

UNIT - I

Simple equations : Definition of Linear Equations, Formation of simple equations, Problems on Ages, Fractions and Digits, Indeterminate system of equations, Special cases in indeterminate system of equations

Ratio and proportion: Definition of Ratio, Properties of Ratios, Comparison of Ratios, Problems on Ratios Compound Ratio, Problems on Proportion, Mean proportional and Continued Proportion

Variation: Direct variation, Inverse variation, Joint variation, Problems on Variations

UNIT - II

Percentages: Introduction, Converting a percentage into decimals, Converting a Decimal into a percentage Percentage equivalent of fractions, Problems on percentages

Profit And Loss: Problems on Profit and Loss percentage, Relation between Cost Price and Selling price, Discount and Marked Price, Two different articles sold at same Cost Price, Two different articles sold at same Selling Price, Gain% / Loss% on Selling Price

Partnership: Introduction, Relation between capitals, Period of investments and Shares,

Simple Interest: Definitions, Problems on interest and amount, Problems when rate of interest and time period are numerically equal.

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Compound Interest: Definition and formula for amount in compound interest. Difference between simple interest and compound interest for 2 years on the same, principle and time period

Quadratic equations: General form of Quadratic equations. Finding the roots of Quadratic equations. Nature of the roots. Relation between the roots. Maximum and minimum value of Quadratic Expression.

Progressions: Arithmetic Progression, Geometric Progression, Harmonic Progression, Arithmetic Mean, Geometric Mean and Harmonic Mean and their relation.

UNIT - III

Deductions: Finding the conclusions using Venn diagram method, Finding the conclusions using syllogism method

Connectives: Definition of a simple statement, Definition of compound statement, Finding the Implications for compound statements, Finding the Negations for compound statements

UNIT - IV

Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on Comparisons

UNIT - V

Clocks: Finding the angle when the time is given, Finding the time when the angle is known, Relation between Angle, Minutes and Hours, Exceptional cases in clocks

Calendars: Definition of a Leap Year, Finding the number of Odd days, framing the year code for centuries, Finding the day of any random calendar date.

Blood relations: Defining the various relations among the members of a family, Solving Blood Relation puzzles, solving the problems on Blood Relations using symbols and notations

TEXT BOOKS:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

REFERENCES:

1. www.careerbless.com/**aptitude**/qa/home.php
2. www.affairscloud.com/**quantitative-aptitude**-questions
3. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
4. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practiceaptitudetests.com/numerical-**reasoning**-tests

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STATISTICAL PROGRAMMING WITH R

COURSE OBJECTIVE:

To acquaint students with the fundamental concepts of probability and statistics and to develop and implement the statistical programs using R.

COURSE OUTCOMES:

Upon Successful completion of the course, the students are able to

CO1 : Understand random variable, probability distributions and sampling theory.

CO2 : Acquire fundamental concepts of R programs.

CO3 : Understand and apply R programming structures and I/O.

CO4 : Calculating Statistical data using t-test and ANOVA one-way and two-way classifications.

SYLLABUS:

UNIT - I

Introduction of probability, Random variables – Discrete Random variables; Probability mass function; Binomial Distribution – The Mean and the variance of a Probability Distribution; Poisson Distribution, Continuous Random variables - Probability density function; The Normal Distribution - Calculating Normal Probabilities; Exponential Distribution, Uniform Distribution.

UNIT - II

Population and sample, Sampling distribution of the mean (σ known), Central Limit theorem (without Proof) and Problems , Sampling distribution of the mean(σ unknown), confidence Intervals(both Large and Samples).

Tests of Hypotheses (Introduction), Null hypotheses , Alternative hypotheses, Type –I and II errors, Level of significance.

UNIT - III

Introduction, how to run R, First R Sessions, Functions, and Data Types, Vectors.

Matrices& Arrays: Creating Matrices, General Matrix Operations, Adding and Deleting Matrix Rows and Columns, Naming Matrix Rows and Columns.

Lists: Creating Lists, General List Operations, Accessing List Components and Values, Applying Functions to Lists.

UNIT - IV

R Programming Structures: Control Statements, Loops - Looping Over Non vector Sets; If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, functions with objects, No Pointers in R, Recursion, Replacement functions.

UNIT - V

Hypotheses concerning one mean (Small samples) - Inference concerning two means (Small samples) - Paired t-test; Hypotheses concerning two variance (F – test) - ANOVA one-way and two-way classifications.

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UNIT - VI

Doing Math and Simulation in R: Math Function, Functions for Statistical Distributions. Sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation, Simulation Programming in R.

Input /output: Accessing the Keyboard and Monitor, Reading and writer Files.

TEXT BOOKS:

1. The Art of R Programming, Norman Matloff, Cengage Learning, 2011. (UNITS :
2. B. S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2015. (UNITS : I, II, V)
3. Miller and John E. Freund's, "Probability and Statistics for Engineers", 7th edition, Pearson education, Prentice Hall of India, 2005.(UNITS : I, II, V)

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly, 2011
2. R in Action, Rob Kabacoff, Manning, 2011
3. Probability, Statistics and Random Processes, Murugesan, Anuradha Publishers, Chennai, 2009.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106102064/1
2. nptel.ac.in/courses/106103069

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
OPERATING SYSTEMS							

COURSE OBJECTIVE:

To gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, Deadlocks, CPU and disk scheduling etc.,

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Understand and identify operating system structure and generations.

CO2 : Understand process management concepts, process synchronization and distinguish process scheduling algorithms.

CO3 : Distinguish various memory management techniques and know about the deadlock and recovery techniques.

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CO4 : Compare and contrast various disk scheduling algorithms and recognize file system implementations.

SYLLABUS:

UNIT - I

Computer System and Operating System Overview: Overview of Operating System - What operating systems do, User view, System view, defining operating systems; Operating Systems functions- Process Management, Memory Management, Storage Management, File-System Management, Mass-Storage Management, Caching, Protection and security; Distributed systems, Special purpose systems, Real-Time Embedded Systems, Multimedia Systems, Handheld Systems, Operating Systems Structures, Simple Structure, Layered Approach, Micro Kernels, Modules; Systems Calls- Process control, File management, Device management, Information maintenance, Communication; Operating systems generation.

UNIT - II

Process Management: Process, Process States, Process Control Block, Process Scheduling- Scheduling Queues, Schedulers; Operations- Process Creation, Process termination; Inter process communication- Shared-Memory Systems, Message-Passing Systems, Naming, Synchronization, Buffering; Multi Thread programming models- Many to one, One to one, Many to Many model; Process Scheduling Criteria- CPU scheduler, Preemptive scheduling, Dispatcher, Scheduling Criteria; CPU Scheduling Algorithms- First Come First Serve, Shortest job first, Priority Scheduling, Round robin scheduling.

UNIT - III

Concurrency: Process Synchronization, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware. Semaphores- Usage, Implementation, Deadlock and Starvation; Classic Problems of Synchronization- Bounded buffer problem, Readers writers' problem, Dining-Philosophers problem; Monitors- Usage, Dining-Philosophers solution using monitors.

UNIT - IV

Memory Management: Swapping, Contiguous Memory Allocation- Memory Allocation, Fragmentation; Paging- Basic Method, Hardware Method, Protection, shared pages; Structure of the Page table- Hierarchical Paging, Hashed Page Tables. Segmentation- Basic Method, hardware. **Virtual Memory Management:** Virtual Memory. Demand Paging- Basic concept, copy on write; Page-Replacement Algorithms- Basic page replacement, FIFO page replacement, optimal page replacement, LRU page replacement, LFU page replacement; Thrashing- Cause of Thrashing, Working set model, Page fault frequency

UNIT - V

Principles of Deadlock: Deadlock System Model. Deadlock Characterization- Necessary Conditions, Resource allocation graph; Deadlock Prevention- Mutual exclusion, Hold and wait, No preemption, Circular wait; Deadlock Detection and Avoidance- Resource allocation Graph algorithm, Banker's algorithm, Single instance of each resource type, several instances of each resource type, Recovery From Deadlock- Process termination, Resource preemption.

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UNIT - VI

File System: The Concept of a File- file attributes, file operations, file types, file structures; Access Methods- sequential access, direct access, other access methods: Directory Structure- single level directory, two level directories, tree structured directory, general graph directory; File Sharing- multiple users, remote file systems; Protection- types of access, access control.

Implementing File System: File System Structure. File System Implementation- overview, partitions and mounting, virtual file systems; Allocation Methods- contiguous allocation, linked allocation, indexed allocation; Free-Space Management- linked list, grouping, counting. **Disk Scheduling-** FCFS scheduling, SSTF scheduling, SCAN scheduling, C-SCAN scheduling, LOOK scheduling.

TEXT BOOK:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7/e, John Wiley, 2016.

REFERENCE BOOKS:

1. Operating Systems – Internal and Design Principles Stallings, 6/e, Pearson Education, 2005.
2. Operating Systems – A Concept based Approach – D.M.Dhamdhere, 2/e, TMH, 2005.
3. Operating System a Design Approach-Crowley, 1/e, TMH, 2005.
4. Modern Operating Systems, Andrew S Tanenbaum 3/e, PHI, 2013.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106108101
2. nptel.ac.in/courses/106106144

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	4	0	0	40	60	100	3
FRONT END WEB TECHNOLOGIES							

COURSE OBJECTIVE:

This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Analyze a web page and identify its elements and attributes.

CO2 : Create interactive web pages using Cascading Styles sheets and java script.

CO3 : Design webpages using XML, XSLT, and HTML.

CO4 : Build dynamic web pages with JQuery.

SYLLABUS:

UNIT I:

HTML5: Fundamentals of Html, Working With Text, Organizing Text in Html, Working With Links and URLs, Creating Tables, Working With Images, Colors, and Canvas, Working With Forms, Interactive Elements, Working With Multimedia

UNIT II:

Cascading Style Sheets: Overview of Css3, Backgrounds and Color Gradients in CSS, Fonts And Text Styles, Creating Boxes and Columns Using CSS, Displaying, Positioning, And Floating An Element, List Styles, Table Layouts, Pseudo-Classes and Pseudo-Elements, Effects, Frames, and Controls in CSS, Implementing The Advanced Features of Html5

UNIT - III

Introduction to Java Script: General Syntactic Characteristics, Primitives, Operations and Expressions, Control Statements, **Objects in Java Script:** Object creation and modification, Arrays, Functions. **Dynamic HTML with Java Script:** Positioning elements, Moving Elements, Element Visibility, Changing colors and fonts, Dynamic Content, **Regular Expressions in Java Script:** Pattern matching using regular expressions, **Working with Events:** onload, onclick, onsubmit, onmouseover, onmouseout, onkeydown, onkeyup, onkeypress.

UNIT - IV

Working with XML:

Document type Definition: DTD Types, DTD Components, Built-in Entities, **XML schemas:** Type, Attributes, Restrictions, XSD complex types, XSD Complex indicators, **Document Object**

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Model: Navigation. Accessing. XSLT: Template. value-of. for-each. sort. if. choose. key. DOM and SAX.

UNIT - V

JQuery API:

Introduction: What jQuery can Do, Who Develops jQuery? Obtaining jQuery Installing jQuery, Programming Conventions, Markup and CSS Conventions, JavaScript Conventions, **Selecting and Filtering Elements:** Using the Selectors API, Filtering a Selection, Working within the Context of a Selection, Working with an Element's Relatives, Slicing a Selection, Adding to a Selection, **Events:** The Various Event Wrapper Methods, Attaching Other Events, Attaching Persistent Event Handlers, Removing Event Handlers, Creating Custom Events, **Manipulating Content and Attributes:** Setting, Retrieving, and Removing Attributes, Setting Multiple Attributes, Manipulating Class Names, Manipulating HTML and Text Content, Replacing Elements, Removing Content, Cloning Content, **Iteration of Arrays and objects:** Enumerating Arrays, Filtering Selections and Arrays, Mapping a Selection or an Array, Array Utility Methods.

UNIT - VI

JQuery UI:

Animations and Effects: Showing and Hiding Elements, Sliding Elements, Fading Elements, Custom Animation, Animation Options, **HTML5 Drag and Drop:** Implementing Drag and Drop, Implementing Drag-and-Drop File Uploads, **Sortable:** Making a List Sortable, Customizing Sortable, Saving the State of Sorted Lists, **Selectable, Accordion:** Building an Accordion UI, Changing the Default Pane, Changing the Accordion Event, Setting the Header Elements, **Date picker:** Implementing a Date picker, Localizing the Date picker, **Dialogue:** Implementing a Dialog, Styling a Dialog, Making a Modal Dialog, Auto-Opening the Dialog, Controlling Dynamic Interaction, Animating the Dialog, Working with Dialog Events.

TEXT BOOKS:

1. HTML 5 Black book, Dream Tech.,2011, (Unit I,II,III).
2. Web Technologies, Uttam K Roy, Oxford,2010 (Unit IV).
3. Web Development with JQuery, Richard York, Wiley publications, 2/e ,2015(Unit V,VI)

REFERENCE BOOKS:

1. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson, 2012
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage, 2003.

ADDITIONAL RESOURCES:

1. https://www.w3schools.com/
2. nptel.ac.in/courses/106105084/13
3. https://www.coursera.org
4. Learning Management System.

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COURSE OBJECTIVE:

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	3	1	0	40	60	100	3

DATABASE MANAGEMENT SYSTEMS

Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Acquire knowledge in fundamentals of DBMS and identify the differences between traditional file system and DB systems.

CO2 : Understand various DBMS models and how queries are being processed and executed in RDBMS.

CO3 : Analyse DB design methodology and normalization process.

CO4 : Discuss the various transaction and concurrency management techniques and various files indexing techniques.

SYLLABUS:

UNIT - I

Introduction: Database system, Characteristics - Database vs. File System; Database Users - Actors on Scene, Workers behind the scene; Advantages of Data base systems, and Database applications. Brief introduction of different Data Models Hierarchical, Network and Relational; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system Environment, Centralized and Client Server architecture for the database.

UNIT - II

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, Key constraints - Key constraints for Ternary Relationships, participation constraints, class hierarchies, Aggregation; sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Basic SQL: Form of a basic SQL Query, Examples of Basic SQL Queries, Expressions and Strings in the SELECT Command, Simple Database schema, data types, table definitions, different DML operations, basic SQL querying using where clause, arithmetic & logical operations, SQL functions - Date and Time, Numeric, String conversion.

UNIT - III

SQL : Creating tables with relationship, implementation of key and integrity constraints, nested queries, correlated Nested Queries, set-Comparison Operators, sub queries, grouping, aggregate operators, ordering, implementation of different types of joins, view - updatable and non-updatable; relational set operations, SQL constructs that grant access or revoke access from user or user groups.

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Introduction to PL/SQL: Data types, Control Structures-if, while, for; functions, Exceptions –user defined and System defined; and Cursors implicit cursors and explicit cursors.

Advanced PL / SQL: Functions, Procedures, Packages and Triggers- before and after triggers.

UNIT - IV

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values - Comparisons Using Null Values, Logical Connectives AND, OR, and NOT, Impact on SQL Constructs, Disallowing Null Values; Integrity constraints in SQL - Domain constraints, Entity constraints, Referential integrity constraints, Assertions.

Schema Refinement (Normalization): Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Functional dependency, Properties of Functional dependency, Normal forms based on functional dependency - 1NF, 2NF and 3NF, concept of surrogate key, Boyce-Codd normal form(BCNF), 4NF; Properties of Decompositions - Lossless join decomposition and dependency preserving decomposition.

UNIT - V

Transaction Management and Concurrency Control: Transaction - Single-User versus Multiuser Systems; Transactions, Database Items, Read and Write Operations, and DBMS Buffers, Why Concurrency Control Is Needed, Why Recovery Is Needed, Transaction States and Additional Operations, The System Log, Commit Point of a Transaction, properties of transactions, Characterizing Schedules Based on Serializability - Serial, Nonserial, and Conflict-Serializable Schedules; Testing for Conflict Serializability of a Schedule, How Serializability Is Used for Concurrency Control, Two-Phase Locking Techniques for Concurrency Control - Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking, Dealing with Deadlock and Starvation; Concurrency Control Based on Timestamp Ordering - Timestamps, The Timestamp Ordering Algorithm.

UNIT - VI

Indexing Files: Operations on Files, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Hashing Techniques - Internal Hashing, External Hashing for Disk Files; Types of Single-Level Ordered Indexes - Primary Indexes, Clustering Indexes, Secondary Indexes; Multilevel Indexes, Dynamic Multilevel Indexes Using and B+-Trees.

TEXT BOOKS:

1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH, 2003.
   (Unit II – Chapter 1, IV)
2. Fundamentals of Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA, 2010,
   (Unit I,II- Chapter2,III,V,VI)

REFERENCE BOOKS:

1. Database System Concepts. 5/e Silberschatz, Korth, TMH, 2006.
2. Introduction to Database Systems, 8/e C J Date, PEA, 2006.
3. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press; 2006.

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	4	0	0	40	60	100	3

SOFTWARE ENGINEERING

COURSE OBJECTIVE:

The student will have a broad understanding of the discipline of software engineering and its application to the development of and management of software systems.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Understanding basic software engineering methods and practices, and their appropriate application.

CO2 : Identify the role of project management including planning, scheduling, risk management etc.

CO3 : Understanding of software process models such as the waterfall and evolutionary models.

CO4 : Understand the knowledge of software testing approaches and quality control and how to ensure good quality software.

SYLLABUS:

UNIT - I

Introduction to Software Engineering: Software-Software classification, Engineering Discipline; Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies - exploratory, structured, data structure, object oriented, component based development; Software Engineering Challenges- problem understanding, quality and product, cycle time and cost, reliability, change and maintenance, usability and reusability, repeatability and process maturity, estimation and planning.

Software Processes: Software Process- software process model, elements of software process, characteristics of software process; Phased development life cycle- phased life cycle activity; Software Development Process Models- classical waterfall model, iterative waterfall, prototyping, incremental, spiral, agile process, RUP process model.

UNIT - II

Requirements Engineering: Software Requirements- business, user, system, functional and nonfunctional; Requirements engineering Process, Requirements elicitation-fact finding techniques; Requirements Analysis, Structured Analysis - data flow diagram, data dictionary, Structured analysis, pros and cons of structured analysis; Data Oriented Analysis- entity relationship modelling, data oriented analysis; Object Oriented Analysis- object oriented analysis, object, dynamic ,function; Prototyping Analysis- throwaway, evolutionary; Requirements Specification- characteristics, components, structure, requirement specification methods; Requirements Validation- review, inspection, test case generation, reading, prototyping; Requirements Management.

UNIT - III

Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles- abstraction, information hiding, functional decomposition, design strategies, modularity; Modular Design- coupling, cohesion; Design Methodologies- function oriented design, object oriented design; Structured Design- structure chart, structure vs flow chart; Structured Design Methodology- review and refine data flow diagram, identify boundaries between input process and output segments, apply design principles modularization criteria.

UNIT - IV

Implementation: Coding Principles- information hiding, structure programming, max cohesion and min coupling, code reusability, kiss, simplicity extensibility , code verification, code documentation; Coding Process- traditional coding process, test driven development.

Software Testing: Testing Fundamentals- errors, faults, failures, cost of defects, testing process, role of software testers; Test Planning- create a test plan, design test cases, test stubs and test drivers, test case execution, test summary report, defect tracking and statistics; Black Box Testing- equivalence class partitioning, boundary value analysis, cause effect graphing, error guessing; White Box Testing- control flow based, path, data flow based, mutation; Levels of Testing- unit, integration, system, acceptance.

UNIT - V

Software Project Management: Project Management Essentials- project, people, process, product; What is Project management- why do project failure occurs, keys to project success; Software Configuration Management- configuration identification, change control, status accounting, auditing.

Project Planning and Estimation: Project Planning activities, Software Metrics and measurements, Project Size Estimation - lines of code, functional point analysis; Effort Estimation Techniques- COCOMO cost models, analytical estimation.

UNIT - VI

Software Quality: software quality concept, Software Quality Factors, Verification & Validation, Software Quality Assurance- SQA activities, SQA plan; Capability Maturity Model (CMM) - SEI-CMM vs ISO standard.

Software Maintenance: Software maintenance- categories; Maintenance Process Models- quick fix, interactive-enhanced, IEEE 1219 model, ISO-12207 model; Maintenance Cost, Reengineering- reengineering process.

TEXT BOOKS:

1. Software Engineering, concepts and practices, Ugrasen Suman, 1/e, Cengage learning, 2015.

REFERENCE BOOKS:

1. Software Engineering principles and practice, W S Jawadekar, TMH, 2006
2. Software Engineering, 8/e, Sommerville, Pearson.
3. Software Engineering, 7/e, Roger S. Pressman, TMH

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106101061

II B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS

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COURSE OUTCOMES:

After Completion of this course student must be able to

CO1 : Practice and generate static html pages.

CO2 : Design html pages with different styles and develop interactive web pages with client side validations.

CO3 : Understand and experiment JQuery programming with html.

LIST OF PROGRAMS:

1) HOME PAGE:

The static home page must contain three frames.
Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "MCA" the catalogue for MCA Books should be displayed in the Right frame.
Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.

2) LOGIN PAGE

This page contains a form with two text boxes to enter userid & password. It also has submit and cancel buttons.

3) CATOLOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

i. Snap shot of Cover Page.
ii. Author Name.
iii. Publisher.
iv. Price.
v. Add to cart button.

4) REGISTRATION PAGE:

Create a *registration form* with the following fields

i. Name (Text field)
ii. Password (password field)
iii. E-mail id (text field)
iv. Phone number (text field)
v. Sex (radio button)
vi. Date of birth (3 select boxes)
vii. Languages known (check boxes – English, Telugu, Hindi, Tamil)
viii. Address (text area)

5) Design a web page using CSS (Cascading Style Sheets) which includes the following:
Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

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6) Write JavaScript code to perform client side from validation of HTML5 Registration page.

7) Design HTML5 web page by embedding Video element with custom controllers.

8) Design HTML5 web page by embedding Audio element with custom controllers.

9) Write HTML5 and JavaScript code to draw Circle Using Canvas.

10) Write HTML5 and JavaScript code to draw Rectangles Using Canvas.

11) Write HTML5 and JavaScript code to draw Arc Using Canvas.

12) Write HTML5 and JavaScript code to draw Triangle Using Canvas.

13) Write HTML5 and JavaScript code to draw a circle. Then double its size using canvas scaling.

14) Create an animation that moves a single rectangle horizontally across the canvas.

15) Write an XML file which will display the Book information which includes the following:

i. Title of the book
ii. Author Name
iii. ISBN number
iv. Publisher name
v. Edition
vi. Price

Write a Document Type Definition (DTD) to validate the above XML file.

16) Write a jQuery code to make draggable Rectangle.

17) Write jQuery code to demonstrate the usage of important options disabled, delay, distance and clone in the drag function of jQuery UI.

18) Write jQuery code to demonstrate three options addClass, disable and tolerance in the drop function of jQuery UI.

19) Write jQuery code to demonstrates the use of two options delay and distance of selectable() method.

20) Write jQuery code to demonstrate Accordion.

21) Write jQuery code to demonstrate DatePicker.

II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2

DATABASE MANAGEMENT SYSTEMS LAB

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COURSE OUTCOMES:

After Completion of this course student must be able to

CO1 : Understand, analyse and apply SQL commands like DDL,DML,DCL to perform different Database operations

CO2 : Understand and practice PL/SQL block, control statements and cursors.

CO3 : Develop PL/SQL programs using, functions, procedures, packages and Triggers

PROGRAMS LIST:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
   Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5. i)Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii)Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

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10. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

TEXT BOOKS:

1. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc-Graw Hill.

REFERENCES:

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.
3. Data Base Management System, Oracle SQL and PL/SQL, Pranab kumar Das Gupta, P Radha Krishna, PHI

II B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	0	0	0	0

VERBAL ABILITY

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COURSE OBJECTIVES:

1. To make students understand the usage of words, relationships; the alternatives and their meanings.
2. To give fair idea about understanding and comprehension skills
3. To make students understand arguments, draw conclusions and to deal in critical manner
4. To teach students-ways to overcome the confusions related to Grammar and Vocabulary

COURSE OUTCOMES:

At the end of the course Students will be able to

CO1 : Use appropriate words effectively in their communication

CO2 : Identify and correct Grammar and vocabulary related errors

CO3 : Construct the sentences effectively using appropriate verbal reasoning abilities

CO4 : Demonstrate understanding and comprehensive skills

SYLLABUS

UNIT - I

Synonyms1, Synonyms2, Antonyms1, Antonyms2, One-Word Substitution, Phrasal Verbs, Idioms & Phrases, Word Family Operation, Commonly Confused words, Odd man out

UNIT - II

Tenses, Voice, Parts of speech, Direct & Indirect Speech, Sentence Completion & Correction, Reconstruction of Sentences, Sentence Improvement, Choosing the Incorrect Sentences, Transformation

UNIT - III

Common Errors1, Common Errors2, Common Errors3, Common Errors4, Common Errors5, Indianisms1, Indianisms2

UNIT - IV

Direct / simple Analogy, Completing the analogous pair, choosing the Analogous pair, Double Analogy, Choosing a similar word, Detecting Analogies, Multiple-word Analogy

UNIT - V

Reading Comprehension1, Reading Comprehension2, Reading Comprehension3, Reading Comprehension4, Cloze Passage1, Cloze Passage2, Cloze Passage3, Cloze Passage4

UNIT - VI

Hidden Assumptions, Fallacies, Induction & Deduction Methods, Arguments, Truth, Validity, Soundness

TEXT BOOKS:

1. 30 Days to a More Powerful Vocabulary by Funk.

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2. Practical English Usage by Michael Swan
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman
4. Kaplan MCAT Verbal Reasoning and Writing Review
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon
6. Understanding and Using English Grammar by Betty Schrampfer Azar

REFERENCES:

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

III B. Tech. - I SEMESTER

S. NO	SUBJECT	Cat. Code	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS

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DESIGN AND ANALYSIS OF ALGORITHMS

COURSE OBJECTIVES:

- To analyze the asymptotic performance of algorithms.
- To write rigorous correctness proofs for algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To apply important algorithmic design paradigms and methods of analysis.
- To synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply asymptotic notations to analyze and compare performance of algorithms.

CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it.

CO 3: Solve problems using greedy approach and whenever it is needed.

CO 4: Apply dynamic-programming, approach to solve suitable problems efficiently.

CO 5: Analyze backtracking and branch and bound paradigms.

SYLLABUS:

UNIT-I

Introduction: Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation).

UNIT-II

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.

UNIT-III

Greedy method: General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.

UNIT-IV

Dynamic Programming: The General method, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack, Reliability design, The Travelling sales person problem, Matrix-chain multiplication.

UNIT-V

Backtracking: The General method, N-Queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

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UNIT-VI

Branch and Bound: The method, 0/1 knapsack problem, Travelling sales person problem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Universities Press.

REFERENCE BOOKS:

1. Design and Analysis of Algorithms, First Edition – S. Sridhar, Oxford.
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt.Ltd.
3. Design and Analysis of Algorithms, Second Edition – Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education.
4. Design and Analysis of Computer Algorithms – Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education.
5. Introduction to the Design and Analysis of Algorithms, Third Edition – Anany Levitin, Pearson Education.

ONLINE REFERENCES:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. https://www.coursera.org/learn/algorithms-divide-conquer
3. http://nptel.ac.in/courses/106101060/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.htm

III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3

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OOAD through UML

COURSE OBJECTIVES:

- Importance of modeling in Software Development Life Cycle.
- Different diagrams and relationships.
- Unified application for a system.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Illustrate the conceptual model of UML in software development life cycle.

CO 2: Outline Common Modeling Techniques of Structural Modeling.
CO 3: Analyze, design and document the requirements through use case driven approach.
CO 4: Identify, analyze and model the behavioral concepts of a system and Apply Unified Modeling Language (UML) towards analysis and design.
CO 5: Apply the concepts of architectural design for deploying the code for software.

SYLLABUS:

UNIT I

Introduction to UML: Importance of Modeling, Principles of Modeling, Object Oriented Modeling, Conceptual Model of the UML, Architecture, Software Development Life Cycle.

UNIT II

Basic Structural Modeling : Classes-Terms and Concepts, Common Modeling Techniques-Modeling the Vocabulary of a system, Modeling the Distribution of Responsibilities in a System, Modeling the Non-Software things, Modeling the Primitive Types, **Relationships**- Terms and Concepts, Common Modeling Techniques-Modeling Simple Dependencies, Modeling Single Inheritance, Modeling Structural Relationships, common Mechanisms-Modeling New Building Blocks, Modeling Comments, Modeling New Semantics, Modeling New Properties, and **Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling Different Views of a System, Modeling Different Levels of Abstractions, Modeling Complex Views.

Advanced Structural Modeling : Advanced Classes- Terms and Concepts, Modeling the Semantics of a Class, Advanced relationships- Terms and Concepts, Common Modeling Techniques-Modeling the advanced web of relationships, **Interfaces, Types and Roles** - Terms and Concepts, Modeling the Seams in a System, Modeling static and dynamic types, **Packages**-Terms and Concepts, Common Modeling Techniques-Modeling Group of elements, Modeling Architectural Views.

UNIT III

Class & Object Diagrams : Class Diagrams-Terms and Concepts, Common Modeling Techniques-Modeling Simple Collaborations, Modeling Logical Database Schema, Forward and

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Reverse Engineering. **Object Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling Object Structures, Forward and Reverse Engineering.

Basic Behavioral Modeling-I : Interactions- Terms and Concepts, Common Modeling Techniques-Modeling a Flow of Control, **Interaction Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering.

UNIT IV

Basic Behavioral Modeling-II : Use cases- Terms and Concepts, Common Modeling Techniques-Modeling the Behavior of an Element, **Use case Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling the Context of a System, Modeling the Requirements of a System, Forward and Reverse Engineering, **Activity Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering.

UNIT V

Advanced Behavioral Modeling : Events and Signals-Terms and Concepts, Common Modeling Techniques-Modeling a Family of Signals, Modeling Exceptions, State Machines-Terms and Concepts, Common Modeling Techniques-Modeling Lifetime of an object, **Processes and Threads**-Terms and Concepts, Common Modeling Techniques-Modeling Multiple Flows of Control, Modeling Inter Process Communication, **Time and Space**-Terms and Concepts, Common Modeling Techniques- Modeling Timing Constraints, Modeling the Distribution of Objects, Modeling Objects that Migrate, **State Chart Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Reactive Objects, Forward and Reverse Engineering.

UNIT VI

Architectural Modeling : **Component**-Terms and Concepts, Common Modeling Techniques-Modeling Executables and libraries, Modeling Tables, Files and Documents, Modeling an API, Modeling Source Code, **Deployment**- Terms and Concepts, Common Modeling Techniques-Modeling Processors and Devices, Modeling the Distribution of Components, **Component Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Executable Release, Modeling a Physical Database, Modeling Adaptable Systems, Forward and Reverse Engineering and **Deployment Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System, Forward and Reverse Engineering. **Case Study:** The Unified Student Database application.

TEXT BOOK:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.

REFERENCE BOOKS:

1. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Pearson Education.

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2. Pascal Roques: Modeling Software Systems Using UML2, WILEYDreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML,TATA McGrawHill
5. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design in interactive Development. Craig Larman
6. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

ONLINE REFERENCES:

1. https://www.uml-diagrams.org/uml-object-oriented-concepts.html
2. https://www.lucidchart.com/blog/uml-diagram-templates
3. https://www.smartdraw.com/uml-diagram/
4. https://www.ibm.com/developerworks/rational/library/769.html

COURSE OBJECTIVES:

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III B.TECH. I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3

COMPILER DESIGN

- Understand the process involved in a Compiler.
- Create an overall view of various types of translators, linkers, loaders, and phases of a compiler.
- Understand the Syntax Analysis, Various types of Parsers, like the Top-Down approach, and the Bottom- Up approach parsers.
- Gives a view of Intermediate Code Generation, Type Checking,
- Understand the role of Symbol Table and its organization.
- Describe Code Generation, Machine Independent Code Optimization and Instruction Scheduling.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO 1. Summarize different phases and passes of a compiler.
CO 2. Compare and Contrast various Top-Down and Bottom-Up Parsing techniques.
CO 3. Interpret different types of Intermediate Code representations.
CO 4. Illustrate the effective usage of register allocation and various Code-generation techniques.
CO 5. Apply different code-optimization techniques to optimize the target code.

SYLLABUS:

UNIT–I

Overview of Language Processing: Pre-processor, compiler, assembler, interpreter, linker & loader and phases of a compiler.

Lexical Analysis: Role of the lexical analysis, lexical analysis vs. parsing, token, patterns and lexemes, lexical errors. Regular expressions: Regular definitions for the language constructs, strings, sequences, transition diagram for recognition of tokens, reserved words and identifiers with examples.

UNIT–II

Syntax Analysis: Discussion on CFG, LMD, RMD, ambiguity, parse tree, role of the parser, Classification of Parsing Techniques: Brute Force approach, left recursion, left factoring. Top-down parsing: FIRST and FOLLOW, LL(1) grammars, non-recursive predictive parsing and error recovery in predictive parsing.

UNIT–III

Types of Bottom-Up Approaches: Introduction to bottom-up parser, Why LR Parsers, Model of an LR parsers, operator precedence parser, shift- reduce parser, difference between LR and LL Parsers.

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COURSE OBJECTIVES:

- To understand the principles of network management, different standards and protocols used in managing complex networks.
- To understand the Automation of network management operations and making use of readily available network management systems.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret different Network Management standards.
CO 2: Compare and contrast Network Management in different SNMP Models.
CO 3: Outline Network Management architecture and Protocols.
CO 4: Summarize the functions of different remote monitoring protocols.
CO 5: Outline the knowledge about various Network Management tools and Systems.

SYLLABUS:

UNIT - I

Data communications and Network Management Overview : Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT - II

SNMPV1 Network Management: Organization and Information and Information Models, Managed Network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.

UNIT - III

SNMPv1 Network Management: Communication and Functional Models. The SNMP Communication Model, Functional model.

UNIT - IV

SNMP Management: SNMPv2: Major Changes in SNMPv2, SNMPv2 System Architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility With SNMPv1.

UNIT - V

SNMP Management: RMON: What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT - VI

Network Management Tools and Systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management

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Construction of SLR Table. More Powerful LR parsers: Construction of CLR (1). LALR parsing table. dangling ELSE ambiguity. and error recovery in LR parsing and comparison of all bottom-up approaches with all top-down approaches.

UNIT–IV

Semantic analysis: SDT schemes. evaluation of semantic rules. intermediate codes. three address codes - quadruples. triples. abstract syntax trees. types and declarations. type checking.

UNIT–V

Symbol Table: Use and need of symbol tables, runtime environment storage organization, stack allocation, access to non-local data, heap management.

Code Generation: Issues, target machine, basic blocks and flow graphs, simple code generator, peep-hole optimization.

UNIT–VI

Machine Independent Code Optimization: Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization, instruction scheduling and inter procedural optimization.

TEXT BOOKS:

1. Compilers – Principles, Techniques, & Tools by Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Second edition, Pearson, 2007.
2. Compiler Design by K. Muneeswaran, Oxford University Press, 2013.

REFERENCE BOOKS:

1. Engineering a Compiler by Keith D. Cooper, & Linda Torczon, Second edition, Morgan Kaufman publications, 2011.
2. Principles of Compiler Design by V. Raghavan, Second edition, TMH, 2011.
3. Compiler Construction - Principles and Practice by Kenneth C. Louden, First edition, Cengage Learning publications, 1997.
4. Implementations of Compiler - A new approach to Compilers including the Algebraic Methods by Yunlin Su, Song Y. Yan, Springer publications, 2011.

ONLINE REFERENCES:

1. http://www.diku.dk/hjemmesider/ansatte/torbenm/Basics/
2. http://nptel.ac.in/courses/106108052/1
3. https://www.geeksforgeeks.org/compiler-design-tutorials/
4. https://link.springer.com/article/10.1007/s10766-005-3590-6

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III B.TECH I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS

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	3	1	0	40	60	100	3

COMPUTER NETWORKS

COURSE OBJECTIVES:

- To provide knowledge on the fundamental concepts of the Computer Networks and problem solving techniques on Networks.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Summarize basic concepts of Data Communication and Networking.

CO 2: Compare and Contrast OSI and TCP/IP reference models.

CO 3: Interpret data link layer services and multiple access protocols.

CO 4: Analyze different routing protocols.

CO 5: Illustrate the essential principles of different transport layer protocols.

CO 6: Summarize various application layer protocols.

SYLLABUS:

UNIT – I

Introduction: OSI Overview, TCP/IP and Other Network Models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies: WAN, LAN, MAN.

UNIT – II

Data Link Layer: Design Issues- Framing, Services Provided to Network Layer, Flow Control, Error Control, Error Detection and Correction-CRC, Checksum-Idea, One's Complement, Hamming code. **IEEE Standards:** 802.3, 802.11.

UNIT – III

Elementary Data Link Layer Protocols: Simplex Protocol, Simplex Stop and Wait, Simplex Protocol for Noisy Channel.

Sliding Window Protocol: One Bit, Go Back N, Selective Repeat-Stop And Wait Protocol, Examples Of Data Link Protocols- HDLC, PPP.

Medium Access Control Sub Layer: Chanel Allocation Problem, ALOHA, Carrier Sense Multiple Access (CSMA), CSMA With Collision Detection, CSMA With Collision Avoidance, Collision Free Protocols: Limited Contention Protocols, Wave Length Division Multiple Access Protocol, Bridges.

UNIT – IV

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Network Layer: Network Layer Design Issues- Store And Forward Packet Switching, Service Provided to Transport Layer, Connection Oriented and Connection Less Service, Comparison of Virtual Circuit and Datagram Subnets.

Routing Algorithms: Optimality Principle, Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast, Multi Cast, Distance Vector Routing, Link State Routing.

Network Layer in Internet: IP Protocol, IP Address, IPv4 frame format.

UNIT –V

Transport Layer: The Transport Services- Services Provided to the Upper Layer, Transport Service Primitives, Berkeley Sockets, Elements of Transport Protocol-Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Crash Recovery.

The Internet Transport Protocols: TCP and UDP.

UNIT –VI

Application Layer: DNS(Domain Naming System)-DNS Namespace, Name Servers., Electronic Mail- Architecture And Services, The User Agent, Message Format-MIME, Sending and Receiving E-mail, Message Transfer- SMTP, Final Delivery-POP3, IMAP.

The World Wide Web- Architecture Overview, URL, HTTP.

TEXT BOOKS:

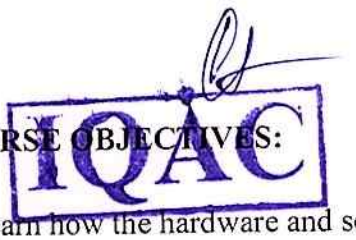
1. Computer Networks — Andrew S Tanenbaum, 4th Edition, Pearson Education/PHI
2. Data Communications and Networks – Behrouz A.Forouzan, Third Edition, TMH

REFERENCES:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding Communications and Networks, 3rd Edition, W.A. Shay, Thomson.

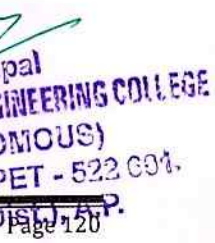
ONLINE REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs38
2. https://in.udacity.com/course/computer-networking--ud436
3. https://www.class-central.com/subject/computer-networking
4. https://www.youtube.com/watch?v=3DZLItfbqtQ&list=PL32DBC269EF768F74



COURSE OBJECTIVES:

- Learn how the hardware and software components of a microprocessor-based system



systems, Commercial Network management Systems, System Management, Enterprise Management Solutions.

TEXT BOOK:

1. Network Management, Principles and Practice, Mani Subramanian, Pearson Education.

REFERENCES:

1. Network management, Morris, Pearson Education.
2. Principles of Network System Administration, Mark Burges, Wiley Dreamtech.
3. Distributed Network Management, Paul, John Wiley.

ONLINE REFERENCES:

1. https://www.youtube.com/watch?v=spbZmJaoitY
2. https://www.youtube.com/watch?v=PLjzgYyTQOs
3. http://nptel.ac.in/courses/106105081/2
4. https://www.youtube.com/watch?v=VbXqPH1AHLs

COURSE OBJECTIVES:

III B.TECH. I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2
OPERATING SYSTEMS & COMPILER DESIGN LAB							

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- To enlighten the student with knowledge base in Operating Systems and Compiler Design Applications.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply various scheduling, page replacement and Deadlock avoidance algorithms for effective utilization of the CPU.

CO 2: Demonstrate various Memory Management Techniques.

CO 3: Develop a Lexical Analyzer for a given language.

CO 4: Develop LALR bottom up Parser for a given language by using YACC tool.

LIST OF EXPERIMENTS

1. Simulate the following CPU scheduling algorithms.
   a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate all file allocation strategies.
   a) Sequential b) Indexed c) Linked.
3. Simulate Bankers Algorithm for Dead Lock Avoidance and Prevention
4. Simulate all page replacement algorithms
   a) FIFO b) LRU c) LFU
5. Simulate Paging Technique of memory management.
6. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs, new lines and comments.
7. Implement the lexical analyzer using lex lexical analyzer generating tool.
8. Develop an operator precedence parser for a given language.
9. Implementation of shift reduce parsing algorithm.
10. Design a LALR bottom up parser for the given language.

REFERENCE BOOKS:

1. Compilers – Principles, Techniques, & Tools by Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Second edition, Pearson, 2007.
2. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.

III B.TECH-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2

UML LAB

COURSE OBJECTIVES:

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- To learn importance of modelling in Software Development Life Cycle.
- To know about different diagrams and relationships.
- To develop a unified application for a system.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to :

CO 1: Build use case diagrams that specify requirements for a software system.

CO 2: Develop class diagrams that demonstrate design model of a software system.

CO 3: Make use of interaction diagrams to model the dynamic aspects of a software system.

CO 4: Develop various applications using unified modeling language.

LIST OF EXPERIMENTS

1. Learning the usage of Rational Rose Software and different tools that are helpful to implement UML.
2. Create UML for Library Management system
3. Create UML for ATM system
4. Create UML for Online Book Shop system
5. Create UML for Online Railway Reservation system.
6. Create UML for Banking System.
7. Create UML for Airlines System.
8. Create UML for Student Information System.

ONLINE REFERENCES:

1. https://www.udemy.com/uml-fundamentals/
2. https://www.youtube.com/watch?v=OkC7HKtiZC0&list=PLGLfVvz_LVvQ5G-LdJ8RLqe-ndo7QITYc
3. https://www.youtube.com/watch?v=RRXe1omEGWQ&list=PLD4EF3E3AD055F3C7

III B.TECH. I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	25	50	75	2

NETWORK & UNIX PROGRAMMING LAB

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COURSE OBJECTIVES:

- To teach students practical orientation of networking concepts.
- To teach students various UNIX utilities and shell scripting.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Demonstrate different network layer routing protocols.

CO 2: Implement different Services offered by Data Link Layer.

CO 3: Experiment with the fundamental UNIX utilities.

CO 4: Develop shell scripts to perform complex tasks.

LIST OF EXPERIMENTS

PART – A

1. Implement the data link layer framing methods such as character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path through a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.

PART – B

1. a)
   i. Log into the system
   ii. Use Vi editor to create a file called myfile.txt which contain some text.
   iii. Correct typing errors during creation
   iv. Save the file
   v. Logout of the file

   b)
   i. Log into the system
   ii. Open the file created in session 1
   iii. Add some text
   iv. Change some text
   v. Delete some text
   vi. Save the changes
   vii. Logout of the system
2. a) Log into the system
   b) Use the cat command to create a file containing the following data. Call it mutable use tabs to separate the fields

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i. 1425	ravi	15.65
ii. 4320	ramu	26.27
iii. 6830	sita	36.15
iv. 1450	raju	21.86

c) Use the cat command to display the file, my table
d) Use the vi command to correct any errors in the file, my table
e) Use the sort command to sort the file my table according to the first field. Call the sorted file my table(same name)
f) Print the file my table
g) Use the cut & paste commands to swap fields 2 and 3 my table. Call it mytable (same name)
h) Print the new file, my table
i) Logout of the system

3.

a) log in the system
b) use the appropriate commands to determine ur login shell
c) use the /etc/passwd file to verify the result of step b.
d) use the who command redirect the result to a file called myfile1.Use the more command to see the contents of myfile1.
e) use the date and who commands in sequence ?(in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called my file2.Use the more command to check the contents of myfile2.
f) write a sed command that deletes the first character in each line in a file
g) write a sed command that deletes the character before the last character in each line in a file.
h) write a sed command that swaps the files and second words in each line in a file

4.

a) Write A shell script that takes a command –line argument and reports on whether it is directory ,a file, or something else
b) Write a shell script that accepts one or more file name as a arguments and converts all of them to uppercase, provided they exits in the current directory
c) Write a shell script that determines the period for which a specified user is working on the system

5.

a) Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers
b) Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

6.

a) Write a shell script that computes the gross salary of a employee according to the following
    1) if basic salary is <1500 then HRA 10% of the basic and DA =90% of the basic
    2) if basic salary is >1500 then HRA 500 and DA =98% of the basic
b) The basic salary is entered interactively through the key board
c) Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number

7.

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a) Write an interactive file handling shell program. Let it offer the user the choice of copying, removing, renaming or linking files. Once the use has made a choice, have the program ask the user for necessary information, such as the file name, new name and so on.

b) Write a shell script that takes a login name as command –line argument and reports when that person logs in

c) Write a shell script which receives two files names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

8.

a) Write a shell script that displays a list of all files in the current directory to which the user has read write and execute permissions

b) Develop an interactive script that asks for a word and file name and then tells how many times that word occurred in the file.

c) Write a shell script to perform the following string operations.
   1. To extract a sub string from a given string
   2. To find the length of a given string

9.

a) Write a C program that takes one or more files or directory names as command line input and reports the following information on the file:
i)File type ii)Number of links iii)Read, write and execute permissions iv)Time of last access
(Note : Use stat/fstat system calls)

b) Write C programs that simulate the following unix commands:
a)mv b)cp (Use system calls)

10. Write a C program that illustrates the creation of child process using fork system call.

ONLINE REFERENCES:

1. https://www.learnshell.org
2. https://www.udemy.com/shellprogramming/
3. https://www.edureka.co/unix

III B.TECH. I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	0	25	50	75	2
MINI PROJECT - I							

COURSE OBJECTIVES:

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- To offer students a glimpse into real world problems and challenges that need IT based solutions.
- To enable students to create very precise specifications of the IT solution to be designed.
- To enable students to use concepts of IT in creating a solution for a problem
- To improve the team building, communication and management skills of the students.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Acquire practical knowledge within the chosen area of technology for project development.

CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach.

CO3: Contribute as an individual or in a team in development of technical projects.

CO4: Develop effective communication skills for presentation of project related activities.

The student will do Mini Project - II during inter semester break of III B.Tech first semester and III B.Tech second semester. It will be evaluated at the end of III B.Tech Second semester as per academic regulation. The main intention of Mini Project is to make student enable to apply the knowledge and skills learned out of courses studied and any other technology whatever he/she is interested to solve problem. The Mini Project may be beyond the scope of curriculum of courses taken or may be based on the courses but thrust should be on

- Learning additional skills
- Development of ability to define and design the problem and lead to its accomplishment with proper planning.
- Learn the behavioral science by working in a group

1. Batch Formation:

For the purpose of project work, II CSE students are divided into 3 groups namely A,B,C as per their total marks obtained up to II Year I Sem in descending order .Now from group A first student (say A1), from group B last student (say B1), from group C last student (say C1) are formed as one batch. This procedure is adopted for batch formation.

2. Guide Allotment:

Once batches are formed, Students can select their guide from list of faculty available depending on the domain of their project and interest. After guide accepted the project then abstract will be submitted to the coordinator and Head of Department.

3. Internal Evaluation of the Mini project-I

PRC will organize project seminar and final execution of the project. Out of 25 internal marks, 15 marks for execution of the project and 10 marks for project Presentation.

4. External Evaluation of Mini Project - I:

For external viva the evaluation committee consists of external examiner, guide & HOD. This viva is conducted for 50 marks.

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III B.TECH. I - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	0	0	0	0
QUANTITATIVE APTITUDE AND REASONING - II							

COURSE OBJECTIVES:

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- To train students in analysing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

CO 1: Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements

CO 2: Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.

CO 3: Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

UNIT - I

Numbers: Classification of numbers, Divisibility rules, Finding the units digit, Finding remainders in divisions involving higher powers, LCM and HCF Models

Time and Distance: Relation between speed, distance and time, Converting km/h into m/s and vice versa, Problems on average speed, Problems on relative speed, Problems on trains, Problems on boats and streams, Problems on circular tracks, Problems on races

Time and Work: Problems on Unitary method, Relation between Men, Days, Hours and Work , Problems on Man-Day-Hours method, Problems on alternate days, Problems on Pipes and Cisterns

.

Averages, Mixtures and Allegations: Definition of Average, Rules of Average, Problems on Average, Problems on Weighted Average, Finding average using assumed mean method, Problems on mixtures, Allegation rule, Problems on Allegation.

UNIT - II

Data Interpretation: Problems on tabular form, Problems on Line Graphs, Problems on Bar Graphs, Problems on Pie Charts

Data Sufficiency: Different models in Data Sufficiency, Problems on data redundancy

Mensuration: Formulas for Areas, Formulas for Volumes of different solids, Problems on Areas, Problems on Volumes, and Problems on Surface Areas

Permutation and Combinations: Definition of permutation, Problems on Permutations, Definition of Combinations, Problems on Combinations

Probability: Definition of Probability, Problems on coins, Problems on dice, Problems on Deck of cards, Problems on Years

UNIT - III

Cubes: Basics of a cube, Formulae for finding volume and surface area of a cube, Finding the minimum number of cuts when the number of identical pieces are given, Finding the maximum number of pieces when cuts are given, Problems on painted cubes of same and different colors, Problems on cuboids, Problems on painted cuboids, Problems on diagonal cuts

Venn diagrams: Representing the given data in the form of a Venn diagram, Problems on Venn diagrams with two sets, Problems on Venn diagrams with three sets, Problems on Venn diagrams with four sets

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Binary Logic: Definition of a truth-teller, Definition of a liar, Definition of an alternator, Solving problems using method of assumptions, Solving analytical puzzles using binary logic

UNIT - IV

Number and letter series: Difference series, Product series, Squares series, Cubes series, Alternate series, Combination series, miscellaneous series, Place values of letters.

Number and Letter Analogies: Definition of Analogy, Problems on number analogy, Problems on letter analogy, Problems on verbal analogy,

Odd man out: Problems on number Odd man out, Problems on letter Odd man out, Problems on verbal Odd man out

UNIT – V

Coding and decoding: Coding using same set of letters, Coding using different set of letters, Coding into a number, Problems on R-model

Direction sense: Solving problems by drawing the paths, finding the net distance travelled, finding the direction, Problems on clocks, Problems on shadows, Problems on damaged compass, Problems on direction sense using symbols and notations

Critical Reasoning: Problems on assumption, Problems on conclusions, Problems on inferences, Problems on strengthening and weakening of arguments, Problems on principle, Problems on paradox.

Lateral reasoning puzzle: Problems on common balance, Problems on digital balance, Problems on coins, Problems on lockers, Problems on heights, Digit puzzles using basic arithmetic operations.

TEXT BOOKS:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials

2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'

3. R S Agarwal, S Chand, 'Quantitative Aptitude'

4. Quantitative Aptitude - G. L BARRONS

5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

ONLINE REFERENCES:

1. www.careerbless.com/aptitude/qa/home.php
2. www.affairscloud.com/quantitative-aptitude-questions
3. www.careerafter.com/rs-aggarwal-quantitative-aptitude-pdf/
4. www.amazon.in/Quantitative-Aptitude-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practiceaptitudetests.com/numerical-reasoning-tests

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III B.TECH. II - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
DATA WAREHOUSING AND DATA MINING							

COURSE OBJECTIVES:

- Identify the scope and necessity of Data Mining & Warehousing for the society.
- Describe the design of Data Warehousing so that it can be able to solve the root problems.

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- Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent pattern, association, correlation, classification, prediction, and cluster analysis.
- Evaluate the performance of different data mining algorithms.
- To develop further interest in research and design of new Data Mining Techniques.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the data mining terminology and types of data to be mined.

CO 2: Outline the need and importance of preprocessing techniques.

CO 3: Interpret data warehousing concepts and operations.

CO 4: Compare and contrast different dominant Data Mining Algorithms.

CO 5: Analyze the performance Association Rules.

SYLLABUS:

UNIT-I

Introduction to data mining: -What Is Data Mining, -Motivating Challenges, -The Origins of Data Mining, -Data Mining Tasks, -Types of Data: Attributes and Measurement, Types of Data Sets, -Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.

UNIT-II

Data:- Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation, -Measures of similarity and dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures.

Exploring data: -The Iris Data set, -Summary Statistics: Frequencies and the Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Multivariate Summary Statistics, Other Ways to Summarize the Data.

UNIT-III

Data Warehouse and OLAP Technology for Data Mining: -What is a Data Warehouse, -A Multidimensional Data Model: From tables to data cubes, Stars, snowflake, and fact constellations(schemas for multidimensional databases), Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation), Introducing concept hierarchies, OLAP operations in the multidimensional data model, A starnet query model for querying multidimensional databases, -Data Warehouse Architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, OLAP server architectures: ROLAP vs. MOLAP vs. HOLAP, SQL extensions to support OLAP operations, -Data Warehouse implementation: Efficient computation of data cubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository, Data warehouse back-end tools and

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utilities. -Further development of data cube technology: Discovery-driven exploration of data cubes. Complex aggregation at multiple granularities (Multifeature cubes). -From data warehousing to data mining: Data warehouse usage, From online analytical processing to online analytical mining.

UNIT-IV

Classification: Basic Concepts, Decision Trees, and Model Evaluation: -Preliminaries, - General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, -Model Overfitting: Overfitting Due to Presence of Noise, Overfitting Due to Lack of Representative Samples, -Evaluating the Performance of a Classifier: Holdout Method, Random Subsampling, Cross-Validation, Bootstrap.

Classification: alternative techniques: -Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier.

UNIT-V

Association Analysis: Basic Concepts and Algorithms: -Problem Definition, -Frequent Itemset Generation: The Apriori principle, Frequent Itemset Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support Counting, -Rule Generation: Confidence-Based Pruning, -Compact Representation of Frequent Itemsets: Maximal Frequent Itemsets, Closed Frequent Itemsets, -FP-Growth algorithms: FP-Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.

Association Analysis: Advanced Concepts: -Handling Categorical Attributes, -Handling Continuous Attributes: Discretization-Based Methods, Statistics-Based Methods, Non-discretization Methods.

UNIT-VI

Cluster Analysis: Basic Concepts and Algorithms: -Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, -K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, -Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, -DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses.

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipin kumar, Addision-Wesley.
2. Data Mining, Concepts and Techniques, 2/e, Jiawei Han, Micheline Kamber, Elsevier, 2006.

REFERENCE BOOKS:

1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2008.
2. Introduction to Data Mining with Case Studies: GK Gupta; Prentice Hall.
3. Fundamentals of data warehouses, 2/e , Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.

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4. Data Mining Theory and Practice. Soman, Diwakar, Ajay. PHI. 2006.

ONLINE REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs14
2. www.oracle.com/Data/Warehousing
3. www.databaseanswers.org/data_warehousing.htm
4. https://www.wileyindia.com/data-warehousing-data-mining.html

III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ADVANCED JAVA AND WEB TECHNOLOGIES							

COURSE OBJECTIVES:

- To gain the knowledge of Server side programming languages and techniques associated with the World Wide Web.
- To make the students get acquainted the skill for developing web apps.
- Understand how to use web-based media-rich programming tools for creating dynamic web pages.

COURSE OUTCOMES:

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After the successful completion of this course, the students will be able to:

CO5 : Interpret Servlet Life Cycle and web servers.

CO6 : Illustrate JSP Life cycle.

CO7 : Apply Session Management for JSP applications.

CO8 : Analyze the usage of JDBC in JSP applications.

CO9 : Analyze the web based applications in PHP.

SYLLABUS:

UNIT-I

Web Servers and Servlets: Tomcat web server, Introducing java Servlet, Introducing the servlet API, Lifecycle of a Servlet, Working with Initialization Parameters, Describing the HttpServlet Request & HttpServlet Response interfaces, Cookies, Session Tracking, Security Issues.

UNIT-II

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC.JSP Application Development: Generating Dynamic Content: directive elements, what is template text, action elements. Using Scripting Elements, Implicit JSP Objects. Conditional Processing: Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods.

UNIT-III

JSP: Error Handling and Debugging, Implicit JSP Objects, Sharing Data between JSP pages, Requests, and Users Passing Control and Data between Pages: passing the control between the pages, passing the data between JSP pages passing the data between JSP pages using session object, Memory Usage Considerations.

UNIT-IV

JDBC: Introduction, Database Programming Using JDBC: How JDBC Works, JDBC Architecture, JDBC Driver Types; Studying javax.sql.*package, Accessing Database From JSP page: Use of Prepared Statement, ResultSet.

UNIT-V

PHP: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants, Data types, Operators. Controlling program flow, Working with Arrays, Built-in functions in PHP, user-defined functions in PHP, recursive, variable, and callback functions.

UNIT-VI

User and Database Interface: Database programming, Working with forms, validating a form, Working with Databases such as MySQL, Oracle, SQL Server.

TEXTBOOKS:

1. Web technologies –A.A. Puntambekar , Technical Publications, Pune.
2. WebTechnologies-Black Book , Kognent Learning Solutions Inc Sol. DreamtTech Press

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TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2nd edition, 2004.
2. Rajkamal, "Mobile computing" Second Edition ,Oxford University Press

REFERENCE BOOKS:

1. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden ,Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw- Hill Professional, 2005.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
3. MartynMallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003

ONLINE REFERENCES:

1. https://www.youtube.com/watch?v=bdKZQ2mUzlY
2. https://www.youtube.com/watch?v=WtRpFLx34BY
3. https://www.youtube.com/watch?v=AyvnhiB0-Bw
4. https://www.youtube.com/watch?v=f7jULYEC9IE
5. https://www.youtube.com/watch?v=MFdQvlnptsM

III B.TECH. II - SEMESTER (Professional Elective-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
.NET TECHNOLOGIES							

COURSE OBJECTIVES:

- To enlighten the student with knowledge base in .NET Applications Development.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

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CO 1: Interpret the basic concepts of object oriented programming through C#.

CO 2: Apply components of .NET framework in C# programming.

CO 3: Make use of various .NET controls in application development.

CO 4: Apply data binding methods and deployment procedures in application development.

CO 5: Outline the web services and MVC concepts.

SYLLABUS:

UNIT - I

An Overview of .NET Framework: Architecture of .NET framework 4.5, Common Language Runtime (CLR), .NET Framework Class Library, ASP.NET support to Internet development, ADO.NET to support database application, Language supported by .NET

UNIT - II

An Introduction to c#: Basic Program Structure, Control Structures, Arrays, ArrayList, Collection, OOP features-Classes, Object, Data members, Data Methods, Abstraction, Encapsulation, Inheritance, Polymorphism, Abstract class, sealed class, class instances.

UNIT - III

Interfaces, Namespaces, Attributes, AttributeList, Assemblers, types of assemblers, Generics, Indexers, delegates and Exception handling, Properties.

UNIT - IV

ASP.NET: Introduction to asp.Net, Standard Controls, Validation Controls, Data Controls, Debugging, Master Page, Styles, Themes, Skin Files, site navigation

UNIT – V

ADO.NET: ADO.NET Architecture, using objects of Connection, Command, DataReader, DataAdapter, DataSet, DataTable, Data Source and Data Bound Controls, State Management

UNIT - VI

Extensible Markup Language(XML), LINQ, Lambda expressions, LINQ to SQL, LINQ to Object, Entity Framework, Files and streams, AJAX Controls. Deploying ASP.NET Application, Working with Web Services, Introduction to MVC.

TEXT BOOKS:

1. Introduction to C# using .NET – ROBERT J. OBERG
2. Professional ASP.NET 4.5 in C# and VB.

REFERENCES:

1. C# 4.0: The Complete Reference
2. Beginning ASP.NET 4.5 in C#

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ONLINE REFERENCES:

1. https://www.edx.org/course/programming-e-microsoft-dev204x-3
2. https://www.youtube.com/watch?v=5Zgj7X7l_Dk&list=PL6n9fhu94yhWjzB2ss5SPaEUboyJAx-XM
3. https://www.youtube.com/watch?v=3AYoipyqOkQ&list=PL6n9fhu94yhXQS_p1i-HLIftB9Y7Vnxlo

III B.TECH. II - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
FREE OPEN SOURCE SOFTWARE (FOSS) PYTHON LAB							

COURSE OBJECTIVES:

- To introduce students the open source software.
- To understand why Python is a useful scripting language for developers.
- To learn how to design and program Python applications.

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COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Develop python applications using strings, functions and Files.

CO 2: Demonstrate the use of Python lists and dictionaries.

CO 3: Make use of Object Oriented Programing concepts to develop python programs.

CO 4: Experiment with GUI based python programs.

LIST OF EXPERIMENTS

1. BASICS

a) Running instructions in Interactive interpreter and a Python Script.

b) Write a program to purposefully raise Indentation Error and Correct it.

2. OPERATIONS

a) Write a program to compute distance between two points taking input from the user

(Pythagorean Theorem)

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

3. CONTROL FLOW

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, ...

……..,1/10

c) Write a program using a for loop that loops over a sequence. What is sequence ?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

4. CONTROL FLOW - CONTINUED

a) Find the sum of all the primes below two million.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

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

5. DS

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a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b)Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

6. DS - CONTINUED

a) Write a program combine_lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

7. FILES

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

8. FUNCTIONS

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

9. FUNCTIONS - CONTINUED

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

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

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

10. FUNCTIONS - PROBLEM SOLVING

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

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

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

11. MULTI-D LISTS

a) Write a program that defines a matrix and prints

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

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

12. MODULES

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a) Install packages requests. flask and explore them. using (pip)

b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)

c) Write a simple script that serves a simple HTTPResponse and a simple HTML Page

13. OOP

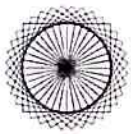
a) Class variables and instance variable

i) Robot

ii) ATM Machine

14. GUI, GRAPHICS

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



15. Testing

a) Write a test-case to check the function even_numbers which return True on passing a list of all even numbers

b) Write a test-case to check the function reverse_string which returns the reversed string

16. Advanced

a) Build any one classical data

b) Write a program to solve knapsack problem.

c) Write a program using django web application framework.

ONLINE REFERENCES:

1. https://www.edx.org/course/subject/computer-science/python
2. https://www.edureka.co/python

III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
ADVANCED JAVA AND WEB TECHNOLOGIES LAB							

COURSE OBJECTIVES:

- Gain the knowledge of Server side programming languages and techniques associated with the World Wide Web.
- Understand how to use Server side scripting for creating dynamic web pages.

COURSE OUTCOMES:

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After the successful completion of this course, the students will be able to:

CO1 : Experiment with the installation of Web Servers.

CO2 : Make use of servlets in dynamic web pages.

CO3 : Develop web applications using JSP for effective data management.

CO4 : Construct the web based applications in PHP using effective data base access with rich client interaction.

LIST OF EXPERIMENTS

1. Install TOMCAT webserver and Apache- MySQL.
2. Write a servlet program which receives data from HTML forms and respond it.
3. Create one Servlet to retrieve "ServletContext Initialization Parameters " which you have given in the web.xml file.
4. Write a servlet program to authenticate four users using cookies.
5. Write a servlet that, on entry of a *student rollno*, displays the full details of that students details(Using student table with rollno,Name,Address,date of birth, course fields).
6. Write JSP program to register a student using registration form using student table.
7. Write JSP program for authenticating user by his password using login form. Create suitable tables.
8. Create table to store the details of book(book name, price, author, publisher) and extract data from table and display all books using JSP and JDBC.
9. Write PHP programs that uses arrays and functions in PHP.
10. Write example PHP program for creating login form and validate users.
11. Write example PHP program for to display all students in cse using student table.
12. Create tables in database which contains the details of book .Extract data from tables and display them using PHP.

ONLINE REFERENCES:

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers
2. https://www.coursera.org/learn/web-applications-php
3. https://www.udemy.com/javawebtut/
4. https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-java-servlets.

III B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	25	50	75	2
DATA MINING LAB							

COURSE OBJECTIVES:

- Exposure to real life data sets for analysis and prediction.
- Practical exposure on implementation of well-known data mining tasks.
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.
- Handling a small data mining project for a given practical domain.

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COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply data preprocessing techniques on the given data.

CO 2: Construct classification model for the given data.

CO 3: Identify Association Rules for the given data.

CO 4: Apply the clustering techniques on the given data.

LIST OF EXPERIMENTS

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple k- means

ONLINE REFERENCES:

1. https://weka.waikato.ac.nz/dataminingwithweka/preview
2. https://www.class-central.com/tag/weka

III B.TECH. II - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	0	25	50	75	2
MINI PROJECT - II							

COURSE OBJECTIVES:

- To offer students a glimpse into real world problems and challenges that need IT based solutions.
- To enable students to create very precise specifications of the IT solution to be designed.
- To enable students to use concepts of IT in creating a solution for a problem
- To improve the team building, communication and management skills of the students.

COURSE OUTCOMES:

After successful completion of this course student will be able to:

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CO1: Acquire practical knowledge within the chosen area of technology for project development.
CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach.
CO3: Contribute as an individual or in a team in development of technical projects.
CO4: Develop effective communication skills for presentation of project related activities.

The student will do Mini Project - II during inter semester break of III B.Tech first semester and III B.Tech second semester. It will be evaluated at the end of III B.Tech Second semester as per academic regulation. The main intention of Mini Project is to make student enable to apply the knowledge and skills learned out of courses studied and any other technology whatever he/she is interested to solve problem. The Mini Project may be beyond the scope of curriculum of courses taken or may be based on the courses but thrust should be on

- Learning additional skills
- Development of ability to define and design the problem and lead to its accomplishment with proper planning.
- Learn the behavioral science by working in a group

1. Batch Formation:
   The same batch of Mini Project – I will continue for the Mini Project – II also. If any student wants to change the batch he/she can request project review committee (PRC). If possible project review committee can take required action.
2. Guide Allotment:
   If any guide who was allotted for Mini Project-I is not available, the batch can select a new guide with the consent of HOD.
3. Internal Evaluation of the Mini project-II
   PRC will organize project seminar and final execution of the project. Out of 25 internal marks, 15 marks for execution of the project and 10 marks for project Presentation.
4. External Evaluation of Mini Project - II:
   For external viva the evaluation committee consists of external examiner, guide & HOD. This viva is conducted for 50 marks.

III B.TECH. II - SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	0	0	0	0
ADVANCED COMMUNICATION SKILLS							

COURSE OBJECTIVES:

- To make the students understand the importance of Non-Verbal communication
- Train the students to use the language effectively to face interviews, Group Discussions.
- To develop effective written communication in academic, technical and professional contexts.
- Develop critical thinking skills necessary to become employable.

COURSE OUTCOMES:

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After successful completion of this course student will be able to:

CO 1: Use English language fluently, accurately and appropriately.
CO 2: Know how body language is used in communication and interpret non-verbal symbols
CO 3: Understand the nuances of the written language and write technical reports effectively.
CO 4: Participate in Group discussions and interviews.

SYLLABUS:

UNIT – I

Non-Verbal Communication

UNIT – II

Resume Preparation

UNIT – III

E-mail writing & Professional Letter writing

UNIT – IV

Essay Writing & Paragraph writing

UNIT - V

Group discussion

UNIT – VI

Interview skills

REFERENCES:

1. Essentials of Business Communication, Rajendra Pal, J S KorlahaHi, Sultan Chand & Sons
2. Basic Communication Skills for Technology, Andrea J. Rutherford, Pearson Education Asia
3. Advanced Communication Skills, V. Prasad, Atma Ram Publications
4. Business Communication, Theory & Application. Raymond. Lesikav, John D. Pettir Jr. All India Traveller Bookseller
5. Business Communication, RK Madhukar, Vikas Publishing House Pvt Ltd.
6. The Human Touch: Personal Skills for Professional Success- By Debra Paul.
7. Personality Development and Soft Skills, Barun K. Mitra, Oxford University Press
8. Technical Communication Principles and Practice, Meenakshi Raman, Sangeeta Sharma, Oxford University Press
9. Communication Skills, Sanjay Kumar, Pushp Lata, Oxford University Press
10. Fundamentals of Technical Communication, Meenakshi Raman, Sangeeta Sharma, Oxford University Press

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IV Year – I SEMESTER

T	P	C
4	0	3

Cryptography and Network Security

Course objectives:

The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment. During this course the students will gain knowledge (both theoretical and practical) in various kinds of software security problems, and techniques that could be used to protect the software from security threats. The students will also learn to understand the "modus operandi" of adversaries; which could be used for increasing software dependability.

Course outcomes:

1. be able to individually reason about software security problems and protection techniques on both an abstract and a more technically advanced level.
2. be able to individually explain how software exploitation techniques, used by adversaries, function and how to protect against them.

Syllabus:

UNIT I : Classical Encryption Techniques
Objectives: *The Objectives of this unit is to present an overview of the main concepts of cryptography, understand the threats & attacks, understand ethical hacking.*

Introduction: Security attacks, services & mechanisms, Symmetric Cipher Model, Substitution Techniques, Transportation Techniques, Cyber threats and their defense(Phishing Defensive measures, web based attacks, SQL injection & Defense techniques)(TEXT BOOK 2), Buffer overflow & format string vulnerabilities, TCP session hijacking(ARP attacks, route table modification) UDP hijacking (man-in-the-middle attacks)(TEXT BOOK 3).

UNIT II: Block Ciphers & Symmetric Key Cryptography
Objectives: *The Objectives of this unit is to understand the difference between stream ciphers & block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA.*

Traditional Block Cipher Structure, DES, Block Cipher Design Principles, AES-Structure, Transformation functions, Key Expansion, Blowfish, CAST-128, IDEA, Block Cipher Modes of Operations

UNIT III: Number Theory & Asymmetric Key Cryptography
Objectives: *Presents the basic principles of public key cryptography, Distinct uses of public key cryptosystems*

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms.
Public Key Cryptography: Principles, public key cryptography algorithms, RSA Algorithms, Diffie Hellman Key Exchange, Elgamal encryption & decryption, Elliptic Curve Cryptography.

UNIT IV : Cryptographic Hash Functions & Digital Signatures
Objectives: *Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature*

Application of Cryptographic hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures, NIST Digital Signature Algorithm. Key management & distribution.

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UNIT V: User Authentication, Transport Layer Security & Email Security

Objectives: *Present an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches, overview of SSL & TLS. Present an overview of electronic mail security.*

User Authentication: Remote user authentication principles, Kerberos

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell(SSH)

Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT VI: IP Security & Intrusion Detection Systems

Objectives: *Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques*

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Intrusion detection: Overview, Approaches for IDS/IPS, Signature based IDS, Host based IDS/IPS. (TEXT BOOK 2)

TEXT BOOKS:

1. Cryptography & Network Security: Principles and Practices, William Stallings, PEA, Sixth edition.
2. Introduction to Computer Networks & Cyber Security, Chwan Hwa Wu, J.David Irwin, CRC press
3. Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech.

REFERENCE BOOKS:

1.Everyday Cryptography, Fundamental Principles & Applications, Keith Martin, Oxford
2. Network Security & Cryptography, Bernard Menezes, Cengage,2010

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IV Year – I SEMESTER

T	P	C
4	0	3

UML & Design Patterns

Course Objectives:

The focus of this course is on design rather than implementation.

1. Introducing the Unified Process and showing how UML can be used within the process.
2. Presenting a comparison of the major UML tools for industrial-strength development.
3. introduction to design patterns, practical experience with a selection of central patterns.

Course Outcomes:

Students successfully completing this course will be able to:

1. identify the purpose and methods of use of common object-oriented design patterns
2. select and apply these patterns in their own designs for simple programs
3. represent the data dependencies of a simple program using UML
4. represent user and programmatic interactions using UML
5. create design documentation outlining the testable and complete design of a simple program
6. produce and present documents for the purpose of capturing software requirements and specification
7. produce plans to limit risks specific to software designed for use in a particular social context

Syllabus:

Unit I: Introduction : Introduction to OOAD; typical activities / workflows / disciplines in OOAD, Introduction to iterative development and the Unified Process, Introduction to UML; mapping disciplines to UML artifacts, Introduction to Design Patterns - goals of a good design, Introducing a case study & MVC architecture

Unit II: Inception: Artifacts in inception, Understanding requirements - the FURPS model, Understanding Use case model - introduction, use case types and formats, Writing use cases - goals and scope of a use case, elements / sections of a use case, Use case diagrams, Use cases in the UP context and UP artifacts, Identifying additional requirements, Writing requirements for the case study in the use case model

Unit III: Elaboration: System sequence diagrams for use case model, Domain model : identifying concepts, adding associations, adding attributes, Interaction Diagrams, Introduction to GRASP design Patterns ,Design Model: Use case realizations with GRASP patterns, Design Class diagrams in each MVC layer
Mapping Design to Code, Design class diagrams for case study and skeleton code

Unit 4: More Design Patterns: Fabrication, Indirection, Singleton, Factory, Facade, Publish-Subscribe

Unit 5: More UML diagrams : State-Chart diagrams, Activity diagrams, Component Diagrams, Deployment diagrams, Object diagrams

Unit 6: Advanced concepts in OOAD : Use case relationships, Generalizations
Domain Model refinements, Architecture, Packaging model elements

Textbooks:

1. 'Applying UML and patterns' by Craig Larman, Pearson
2. Object-Oriented Analysis & Design with the Unified Process by Satzinger, Jackson & Burd Cengage Learning
3. 'UML distilled' by Martin Fowler , Addison Wesley, 2003

Reference:

1. O'reilly ' s 'Head-First Design Patterns' by Eric Freeman et al, Oreillly
2. UML 2 Toolkit by Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: WILEY-Dreamtech India Pvt. Ltd.

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Artificial Intelligence

Course Objectives:

1. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
2. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.
3. To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes:

After completing this course, students should be able to:

1. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
3. Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
4. Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.

Syllabus:

UNIT-I:

Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of ai languages, current trends in AI

UNIT-II:

Problem solving: state-space search and control strategies : Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games

UNIT-III:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic

UNIT-IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames **advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web

UNIT-V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

UNIT-VI:

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory

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Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

REFERNCE BOOKS:

1. Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

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Machine Learning

Course objectives:

The main objective of this course is for the students to achieve basic knowledge of artificial intelligence, a deepened technical understanding of machine learning research and theories, as well as practical experience of the use and design of machine learning and data mining algorithms for applications and experiments. The course has a strong focus towards applied IT. The student not only learns how to critically review and compare different algorithms and methods, but how to plan, design, and implement learning components and applications and how to conduct machine learning experiments.

Course outcomes:

- The student will be able evaluate and compare the performance or, other qualities, of algorithms for typical learning problems.
- The student will be able to design a supervised or unsupervised learning system.

Syllabus:

UNIT I: Introduction :

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning. Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT II: Linear Regression & Logistic Regression:

Predicting numeric values: regression - Finding the best fit lines with linear regression, Locally weighted linear regression, Shrinking Coefficients, The bias / Variance tradeoff.

Logistic Regression: Classification with logistic regression and the sigmoid function, Using optimization to find the best regression coefficients.

UNIT III: Artificial Neural Networks:

Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks

UNIT IV: Evaluation Hypotheses: Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT V: Support vector machines & Dimensionality Reduction techniques:

Separating data with the maximum margin, finding the maximum margin, efficient optimization with SMO algorithm, speeding up optimization with full platt SMO, Using Kernels for more Complex data.

Dimensionality Reduction techniques: Principal Component analysis, Example.

UNIT VI:

Instance-Based Learning- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

Genetic Algorithms: Representing Hypotheses, Genetic Operators, Fitness Function and Selection, Illustrative Example.

TEXT BOOKS:

1. Machine Learning ,Tom M. Mitchell, MGH
2. Machine Learning in Action, Peter Harington, 2012, Cengage.`

REFERENCE BOOKS:

1. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004

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IV Year – I SEMESTER

T	P	C
0	3	2

UML & Design Patterns Lab

(Textbook no.2 i.e. Object-Oriented Analysis & Design with the Unified Process by Satzinger, Jackson & Burd Cengage Learning will be the primary source for finding templates for developing different artifacts / diagrams)

Take three case studies:

- **Customer Support System (in the** Object-Oriented Analysis & Design with the Unified Process by Satzinger, Jackson & Burd Cengage Learning)
- **Point-Of-Sale Terminal (in Larman textbook)**
- **Library Management System (in the reference book no. 2 i.e. UML toolkit)**

Week 1:

Familiarization with Rational Rose or Umbrello

For each case study:

Week 2, 3 & 4:

For each case study:

a) Identify and analyze events
b) Identify Use cases
c) Develop event table
d) Identify & analyze domain classes
e) Represent use cases and a domain class diagram using Rational Rose
f) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Week 5 & 6:

For each case study:

a) Develop Use case diagrams
b) Develop elaborate Use case descriptions & scenarios
c) Develop prototypes (without functionality)
d) Develop system sequence diagrams

Week 7, 8, 9 & 10:

For each case study:

a) Develop high-level sequence diagrams for each use case
b) Identify MVC classes / objects for each use case
c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects
d) Develop detailed design class model (use GRASP patterns for responsibility assignment)
e) Develop three-layer package diagrams for each case study

Week 11 & 12:

For each case study:

a) Develop Use case Packages
b) Develop component diagrams
c) Identify relationships between use cases and represent them
d) Refine domain class model by showing all the associations among classes

Week 13 onwards:

For each case study:

a) Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

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IV Year – I SEMESTER

T	P	C
0	3	2

Mobile Application Development Lab

1. Write a J2ME program to show how to change the font size and colour.
2. Write a J2ME program which creates the following kind of menu.
   * cut
   * copy
   * past
   * delete
   * select all
   * unselect all
3. Create a J2ME menu which has the following options (Event Handling):
   - cut - can be on/off
   - copy - can be on/off
   - paste - can be on/off
   - delete - can be on/off
   - select all - put all 4 options on
   - unselect all - put all

4. Create a MIDP application, which draws a bar graph to the display. Data values can be given at int[] array. You can enter four data (integer) values to the input text field.

5. Create an MIDP application which examine, that a phone number, which a user has entered is in the given format (Input checking):
* Area code should be one of the following: 040, 041, 050, 0400, 044
* There should 6-8 numbers in telephone number (+ area code)

6. Write a sample program to show how to make a SOCKET Connection from J2ME phone. This J2ME sample program shows how to how to make a SOCKET Connection from a J2ME Phone. Many a times there is a need to connect backend HTTP server from the J2ME application. Show how to make a SOCKET connection from the phone to port 80.

7. Login to HTTP Server from a J2ME Program. This J2ME sample program shows how to display a simple LOGIN SCREEN on the J2ME phone and how to authenticate to a HTTP server. Many J2ME applications for security reasons require the authentication of the user. This free J2ME sample program, shows how a J2ME application can do authentication to the backend server. Note: Use Apache Tomcat Server as Web Server and MySQL as Database Server.
8. The following should be carried out with respect to the given set of application domains: (Assume that the Server is connected to the well-maintained database of the given domain. Mobile Client is to be connected to the Server and fetch the required data value/information)
   - Students Marks Enquiry
   - Town/City Movie Enquiry
   - Railway/Road/Air (For example PNR) Enquiry/Status
   - Sports (say, Cricket) Update
   - Town/City Weather Update
   - Public Exams (say Intermediate or SSC)/ Entrance (Say EAMCET) Results Enquiry

Divide Student into Batches and suggest them to design database according to their domains and render information according the requests.

9. Write an Android application program that displays Hello World using Terminal.

10. Write an Android application program that displays Hello World using Eclipse.

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11. Write an Android application program that accepts a name from the user and displays the hello name to the user in response as output using Eclipse.

12. Write an Android application program that demonstrates the following:
    (i) LinearLayout
    (ii) RelativeLayout
    (iii) TableLayout
    (iv) GridView layout

13. Write an Android application program that converts the temperature in Celsius to Fahrenheit.

14. Write an Android application program that demonstrates intent in mobile application development.

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Software Testing Lab

Lab Assignments

Problem Statement 01
Consider an automated banking application. The user can dial the bank from a personal computer, provide a six-digit password, and follow with a series of keyword commands that activate the banking function. The software for the application accepts data in the following form:

Area Code	Blank or three-digit number
Prefix	Three-digit number, not beginning with 0 or 1
Suffix	Four-digit number
Password	Six-character alphanumeric
Commands	"Check status", "Deposit", "Withdrawal"

Design adhoc test cases to test the system

Problem Statement 02
Consider an automated banking application. The user can dial the bank from a personal computer, provide a six-digit password, and follow with a series of keyword commands that activate the banking function. The software for the application accepts data in the following form:

Area Code	Blank or three-digit number
Prefix	Three-digit number, not beginning with 0 or 1
Suffix	Four-digit number
Password	Six-character alphanumeric
Commands	"Check status", "Deposit", "Withdrawal"

Design the test cases to test the system using following Black Box testing technique:
BVA, Worst BVA, Robust BVA, Robust Worst BVA
Equivalence class testing (Input/Output domain)

Problem Statement 03
Consider an application that is required to validate a number according to the following simple rules:
1. A number can start with an optional sign.
2. The optional sign can be followed by any number of digits.
3. The digits can be optionally followed by a decimal point, represented by a period.
4. If there is a decimal point, then there should be two digits after the decimal.
5. Any number-whether or not it has a decimal point, should be terminated a blank.
6. A number can start with an optional sign.
7. The optional sign can be followed by any number of digits.
8. The digits can be optionally followed by a decimal point, represented by a period.
9. If there is a decimal point, then there should be two digits after the decimal.
10. Any number-whether or not it has a decimal point, should be terminated a blank. Generate test cases to test valid and invalid numbers.

(HINT) Use Decision table and cause-effect graph to generate test cases.

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Problem Statement 04

Generate test cases using Black box testing technique to Calculate Standard Deduction on Taxable Income. The standard deduction is higher for tax payers who are 65 or older or blind. Use the method given below to calculate tax.

1. The first factor that determines the standard deduction is the filing status. The basic standard deduction for the various filing status are:

Single	$4,750
Married, filing a joint return	$9,500
Married, filing a separate return	$7,000

2. If a married couple is filing separate returns and one spouse is not taking standard Deduction, the other spouse also is not eligible for standard deduction.

3. An additional $1,000 is allowed as standard deduction, if either the filer is 65 yrs or the spouse is 65 yrs or older (the latter case applicable when the filing status is "Married" and filing "joint").

4. An additional $1,000 is allowed as standard deduction, if either the filer is blind or the spouse is blind (the latter case applicable when the filing status is "married" and filing "joint").

(HINT):

From the above description, it is clear that the calculation of standard deduction depends on the following 3 factors:

1. Status of filing of the filer
2. Age of the filer
3. Whether the filer is blind or not

In addition, in certain cases, the following additional factors also come into play in calculating the standard deduction.

1. Whether spouse has claimed standard deduction
2. Whether spouse is blind
3. Whether the spouse is more than 65 years old

Problem Statement 05

Consider the following program segment:

1. int max (int i, int j, int k)
2. {
3. int max;
4. if (i>j) then
5. if (i>k) then max=i;
6. else max=k;
7. else if (j > k) max=j
8. else max=k
9. return (max);
10. }

a) Draw the control flow graph for this program segment
b) Determine the cyclomatic complexity for this program
c) Determine the independent paths

Problem Statement 06

Source code of simple insertion sort implementation using array in ascending order in c programming language

```
#include<stdio.h>
int main(){
int i,j,s,temp,a[20];
```

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```
Printf ("Enter total elements: "); Scanf ("%d",&s);
printf("Enter %d elements: ",s); for(i=0;i<s;i++) scanf("%d",&a[i]); for(i=1;i<s;i++){
temp=a[i]; j=i-1; while((temp<a[j])&&(j>=0)){ a[j+1]=a[j];
j=j-1;
}
a[j+1]=temp;
}
printf("After sorting: ");
for(i=0;i<s;i++)
printf(" %d",a[i]);
return 0;
}
```

HINT: for loop is represented as while loop

a) Draw the program graph for given program segment b) Determine the DD path graph
c) Determine the independent paths
d) Generate the test cases for each independent path

Problem Statement 07

Consider a system having an FSM for a stack having the following states and transitions:

States

Initial: Before creation
Empty: Number of elements = 0
Holding: Number of elements > 0, but less than the maximum capacity
Full: Number elements = maximum
Final: After destruction
Initial to Empty: Create
Empty to Holding, Empty to Full, Holding to Holding, Holding to Full: Add
Empty to Final, Full to Final, Holding to Final: Destroy
Holding to Empty, Full to Holding, Full to Empty: Delete

Design test cases for this FSM using state table-based testing.

Problem Statement 08

Given the following fragment of code, how many tests are required for 100% decision coverage? Give the test cases.

```
if width > length
then biggest_dimension = width if height > width
then biggest dimension = height end_if
else if biggest dimension = length then if height > length
then biggest_dimension = height end_if
end_if end_if
```

Hint 04 test cases

Problem Statement 09

Given the following code, how much minimum number of test cases is required for full statement and branch coverage?

```
read p read q
if p+q> 100
then print "Large" endif
if p > 50
then print "p Large" endif
```

Hint 1 test for statement coverage, 2 for branch coverage

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Problem Statement 10

Consider a program to input two numbers and print them in ascending order given below. Find all du paths and identify those du-paths that are not feasible. Also find all dc paths and generate the test cases for all paths (dc paths and non dc paths).

```
#include<stdio.h>
#include<conio.h>
1. void main ()
2. {
3 int a, b, t;
4. Clrscr ();
5. Printf ("Enter first number");
6. scanf ("%d",&a);
7. printf("Enter second number");
8. scanf("%d",&b);
9. if (a<b){
10. t=a;
11a=b;
12 b=t;
13}
14. printf ("%d %d", a, b);
15 getch ();
}
```

Problem Statement 11

Consider the above program and generate possible program slices for all variables. Design at least one test case from every slice.

Problem Statement 12

Consider the code to arrange the nos. in ascending order. Generate the test cases for relational coverage, loop coverage and path testing. Check the adequacy of the test cases through mutation testing and also compute the mutation score for each.

```
i = 0;
n=4; //N-Number of nodes present in the graph
While (i<n-1) do j = i + 1;
While (j<n) do
if A[i]<A[j] then swap (A[i], A[j]); end do;
i=i+1;
end do
```

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IV Year – I SEMESTER

T	P	C
0	3	2

Hadoop & BigData Lab

Week 1,2:

1. **Implement the following Data structures in Java**

   a)Linked Lists b) Stacks c) Queues d) Set e) Map

Week 3, 4:

2. **(i)Perform setting up and Installing Hadoop in its three operating modes:**
   Standalone,
   Pseudo distributed,
   Fully distributed

   (ii)Use web based tools to monitor your Hadoop setup.

Week 5:

3. **Implement the following file management tasks in Hadoop:**
   - **Adding files and directories**
   - **Retrieving files**
   - **Deleting files**

   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Week 6:

4. **Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.**

Week 7:

5. **Write a Map Reduce program that mines weather data.**

   Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

Week 8:

6. **Implement Matrix Multiplication with Hadoop Map Reduce**

Week 9,10:

7. **Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.**

Week 11,12:

8. **Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes**

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
ADVANCED DATA STRUCTURES AND ALGORITHM ANALYSIS							

COURSE OBJECTIVES:

- This course provides a comprehensive knowledge of data structures like Linked List, Priority Queues, Tree, Graph and ability to implement the same in software applications.

COURSE OUTCOMES:

After completion of this course, the students would be able to

- Understand basic concepts of data structures and general algorithmic problem types like sorting, searching and basic operations on Tree & Graph.
- Familiar with a variety of advanced Abstract Data Type (ADT) & Hashing technique and their Implementations.
- Distinguish among AVL tree, splay tree, B tree and B+ trees.
- Implement fundamental algorithms and data structures to real-world problems.

UNIT-I

Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists Algorithms. Stacks and Queues: Algorithm Implementation using Linked Lists.

UNIT-II

Searching-Linear and Binary Search Methods. Sorting-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort. Trees- Binary trees, Properties, Representation and Traversals (DFT, BFT), Expression Trees (Infix, prefix, postfix). Graphs-Basic Concepts, Storage Structures and Traversals.

UNIT-III

Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing-Linear Probing, Double Hashing.

UNIT-IV

Priority queues- Definition, ADT, Realising a Priority Queue Using Heaps, Definition, Insertion and Deletion.

UNIT-V

Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations-Searching, Insertion, Deletion.

UNIT-VI

Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations, Insertion, Deletion and Searching.

Search Trees- Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.

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TEXT BOOKS:

1. Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press.

REFERENCE BOOKS:

1. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures and Algorithms, 3/e, Adam Drozdek, Cengage.
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E. V. Prasad, S Chand & Co, 2009.
4. Data Structures, Algorithm and OOP, Heilman, TMH.
5. Introductions to Algorithms, 2/e, Cormen, PHI, 2001.
6. Fundamentals of Computer Algorithms, 2/e, Horowitz, Sahni, Rajasekaran, University Press.
7. Design and Analysis, Dave, Pearson, 2008.
8. Design and Analysis Algorithms, Panneerselvam, PHI,2007.
9. Data Structures, Seymour Lipschutz, Schaum's Outlines, TMH.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
COMPUTER ORGANIZATION AND ARCHITECTURE							

COURSE OBJECTIVES:

- Comprehensive knowledge of computer system including the analysis and design of components of the system.
- Gives an overview of representation of data.
- Gives an overview of different digital electronic circuits.
- Describes different parameters of a memory system, organization and mapping of various types of memories.
- Illustrates algorithms for basic arithmetic operations using binary and decimal representation.
- Describes the means of interaction of devices with CPU, their characteristics and operating modes.
- Gives an introductory knowledge of architecture of 8086 microprocessor.

COURSE OUTCOMES:

After completion of this course, the students would be able to

- Number Systems and Arithmetic operations on all the number systems
- The organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
- Basic structure of a digital computer.
- Architecture of 8086 microprocessor.

UNIT I:

Basic Structure of Computers: Computer Types, Functional unit, Basic Operational concepts, Bus structures, Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation, Other Binary Codes and Error Detection Codes.

UNIT II:

Register Transfer Language and Micro-operations: Register Transfer language, Register Transfer Bus and memory transfers, Arithmetic micro operations, Logical micro operations, Shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and control, Instruction cycle, Memory – Reference Instructions, Input – Output Instructions and Interrupts.

UNIT III:

Central Processing Unit: General Register Organization, STACK organization. Instruction formats, Addressing modes, Data Transfer and manipulation, Program control, Reduced Instruction Set Computer.

Micro Programmed Control Unit: Control memory, Address sequencing, Micro program example, Design of control unit

UNIT IV:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations, Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT V:

The Memory System: Memory Hierarchy, Main memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory.

UNIT-VI:

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct memory Access.

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter processor Arbitration.

TEXT BOOKS:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson.
2. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Fifth Edition, McGraw Hill.
3. Computer Architecture: A Quantitative Approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.

REFERENCE BOOKS:

1. Computer Organization and Architecture, William Stallings, Sixth Edition, Pearson/PHI.
2. Structured Computer Organization, Andrew S. Tanenbaum, Fourth Edition, PHI/Pearson.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
DATABASE MANAGEMENT SYSTEMS							

COURSE OBJECTIVES:

- Provides students with theoretical knowledge of databases.
- Develop practical skills in the use of databases and database management systems for information technology applications.
- Incorporate the required knowledge to design and implement relational databases.

COURSE OUTCOMES:

After completion of this course, the students would be able to

- Define a Database Management System and give a description of the Database Management structure.
- Understand the applications of Databases and know the advantages and disadvantages Of the different models.
- Compare relational model with the Structured Query Language (SQL) and know the
- Constraints associated with relational database model.
- Know the rules guiding transaction and identify the various functions of Database Administrator.

UNIT–I:

Introduction: Database system, Characteristics (Database vs. File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Data base systems, and Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT–II:

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Basic SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).

UNIT–III:

SQL : Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.SQL constructs that grant access or revoke access from user or user groups.

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Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance

UNIT–IV:
Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT–V:
Transaction Management and Concurrency Control: Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point. Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods: lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering:Wait/Die and Wound/Wait Schemes.

UNIT–VI:
Storage And Indexing: Database file organization, file organization on disk, heap files and sorted files, hashing, single and multi-level indexes, dynamic multilevel indexing using B-Tree and B+ tree, index on multiple keys.

TEXT BOOKS:
1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, StevenMorris, Peter Robb, Cengage Learning.

REFERENCE BOOKS:
1. Database System Concepts. 5/e Silberschatz, Korth, TMH.
2. Introduction to Database Systems, 8/e C J Date, PEA.
3. The Database book principles & practice using Oracle/MySql Narain Gehani, University Press.

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I M.TECH-I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
OPERATING SYSTEMS							

COURSE OBJECTIVES:

- To gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, CPU and disk scheduling etc.

COURSE OUTCOMES:

After completion of this course, the students would be able to

- Describe the general architecture of computers.
- Describe, contrast and compare differing structures for operating Systems.
- Understand various process management concepts including scheduling, synchronization and deadlocks.
- Understand and analysis and implementation of: processes, physical and virtual memory, scheduling, I/O and files.

UNIT-I

Overview of Operating System Introduction, Computer System Organization, Computer System Architecture, Operating Systems Services, Systems Calls and Types, Evolution of Operating Systems.

UNIT-II

Process Management

Process, Process States , Process Control Block ,Process Scheduling, Operations On Processes, Threads Concepts, Process Scheduling Concepts, CPU Scheduling Algorithms, Multiple Processor Scheduling.

UNIT-III

Synchronization

Importance of Synchronization, The Critical-Section Problem, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples.

PRINCIPLES OF DEADLOCK

Deadlock System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Detection and Avoidance, Recovery Form Deadlock.

UNIT-IV

Memory Management Strategies & Virtual Memory Management

Concepts, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

Secondary-storage structures & I/O systems

Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, Disk Management, RAID Structure, I/O Hardware, Application Interface, Kernel I/O Subsystem.

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UNIT-V

File System Interface And Implementation

The Concept of a File, Access Methods, Directory Structure, File System Structure, File System Implementation, File Sharing, Protection, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

UNIT-VI

Protection And Security

Principles of Protection, Security Problem, System and Network Threats, Denial Lock Service, Importance of Cryptography.

TEXT BOOKS:

1. Operating System Principles,7/E, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, WILEY INDIA publications.
2. Operating Systems, 6/e, William Stallings, PHI/Pearson.

REFERENCES BOOK:

3. Operating Systems, 2/e, Dhamdhre.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
SOFTWARE ENGINEERING							

COURSE OBJECTIVES:

- This course is intended to provide the students with an overall view over Software Engineering discipline and with insight into the processes of software development.

COURSE OUTCOMES:

After completion of this course the students are able to:

- Learn about generic models of software development process.
- Understand fundamental concepts of requirements engineering and Analysis Modeling.
- Comparing different design techniques and their implementation.
- Learn various testing and maintenance measures

UNIT-I

Introduction to Software Engineering : The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of process : Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

Process models : The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

UNIT-II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT-III

Design Engineering: Design process and Design quality, Design concepts, the design model.

Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design.

UNIT-IV

Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution.

Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

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UNIT-V

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

UNIT-VI

Metrics for Process and Products: Software Measurement, Metrics for software quality.

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Quality Management : Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.
3. Software Engineering, A Precise approach, Pankaj Jalote, Wiley.

REFERENCES BOOKS:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

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I M.TECH-II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
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DATA WAREHOUSING AND DATA MINING

COURSE OBJECTIVES:

- How to analyze the data, identify the problems and choose the relevant models and algorithms in Data Warehousing and Data Mining.

COURSE OUTCOMES:

After completion of this course, the students would be able to

- To examine the types of data to be mined and extract knowledge using Data Mining Techniques.
- Identify components in typical Data Warehouse architectures.
- Analyze the different operations and techniques involved in Data Warehouse.
- Compare and contrast different dominant Data Mining Algorithms.

UNIT-I

Introduction to data mining: What is data mining, motivating challenges, origins of data mining, data mining tasks, types of data attributes and measurements, types of data sets, data quality.

UNIT-II

Data Pre-processing: Why Pre-process the data, Measures of similarity and dissimilarity: Basics, similarity and dissimilarity between simple attributes, dissimilarities between data objects, similarities between data objects, Examples of proximity measures: Similarity measures for binary data, Jaccard Coefficient, Cosine similarity, Extended Jaccard Coefficient, Correlation, Exploring data: Data set, Summary Statistics.

UNIT-III

Data Warehouse: Basic concepts, Data warehousing modelling: Data cube and OLAP, Data Warehouse Architecture, Data Warehouse implementation: Efficient data cube computation, partial materialization, indexing OLAP data, Efficient processing of OLAP queries.

UNIT-IV

Classification: Basic concepts, general approach for solving a classification problem, decision tree induction: working of decision tree, building a decision tree, methods for expressing attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

Classification alternative techniques: Bayesian classifier, Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier.

Model over fitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: hold out method, random subsampling, cross validation, bootstrap.

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UNIT-V

Association analysis: Problem definition, frequent itemset generation: The Apriori principle, frequent item set generation in the Apriori algorithm, candidate generation and pruning, support counting, rule generation, compact representation of frequent item sets, FP-Growth algorithms. Handling categorical and continuous attributes.

UNIT-VI

Cluster Analysis: Basic concepts and Algorithms: What is Cluster Analysis? Different types of clustering, Different types of clusters, K-means, The Basic K-means Algorithm, K-means: Additional Issues, Bisecting K-means, K-means and different types of clusters, Strengths and weaknesses, Agglomerative hierarchical clustering, Basic Agglomerative hierarchical clustering algorithm, Specific techniques, DBSCAN, Traditional density, center based approach, Strengths and weaknesses.

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipin kumar, Addision- Wesley.
2. Data Mining: Concepts and Techniques, 2/e, Jiawei Han, Micheline Kamber, Elsevier, 2006.

REFERENCE BOOKS:

1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2006.
2. Introduction to Data Mining with Case Studies: GK Gupta, PHI.
3. Fundamentals of Data Warehouses, 2/e , Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
4. Insight into Data Mining: Theory and Practice Soman, Diwakar, Shyam, Ajay, PHI, 2006.

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I MBA-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
PRINCIPLES AND PRACTICE OF MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Know the Management concepts and functions.
CO2: Apply the concepts of planning, decision making.
CO3: Define organisation and discuss the delegation of authority, decentralisation and departmentation in real life situations.
CO4: Evaluate the global context for taking managerial actions of staffing.
CO5: Analyse the various functions under the concept of staffing.
CO6: Understand the application of controlling principles and practices, Ethics and corporate social responsibility.

SYLLABUS:

UNIT-I

Management : Definition, Nature, Scope and Importance, Science, Art, Profession, Managerial roles and functions, Management skills, Evolution of management thought, early contributions, modern approaches, levels of management, challenges of manage, management Vs Administration.

UNIT-II

Planning : Nature and Importance of planning, - Principles – Steps in planning – Types of planning, Barriers to effective planning – Planning premises, - Forecasting techniques-Decision making role – Significance – Process of Decision making – techniques – MBO.

UNIT-III

Organizing: Concept, Nature, Principles, Theories of organization, Organisational structure basis, Departmentation, Span of management, power, Authority and Responsibility Relationship, Delegation, Centralization and decentralization of Authority.

UNIT-IV

Staffing: Concept, Factors of Staffing, Man power planning, process, Concept of job Analysis, Job rotation and Evaluation recruitment and Selection, Training and Development, Performance Appraisal.

UNIT-V

Directing: Fundamentals, Principles, Motivation and its theories, Leadership and theories, Styles, Communication, Concept, Process and types, Barriers, Essentials of Effective communication.

UNIT-VI

Controlling : Concepts, Steps, Design of effective control System, Types of Controlling Techniques, Co-ordination types and principles, Ethical Issues in Management, corporate Social Responsibility.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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Text Books:

1. Dr.P.SubbaRao and Prof. N.SambasivaRao:"**Management and organizational Behaviour- (Text and Cases)**", HimalayaPublishing House, Mumbai.
2. J S Chandan: "***Management Theory and Practice***", Vikas Publishing House Limited, 2009.
3. Gupta R S, Sharma B D Bhalla N S: "**Principles and Practice ofManagement**", Kalyani Publications, Hyderabad, 2008.

REFERENCES:

1. Koonz, Weihrich and Aryasri: "***Principles of Management***", Tata McGraw Hill, 2004.
2. William, Tripathy: "**MGMT (including instructor recourses)**", Cengage Learning, New Delhi, 2013.
3. Griffin, Moorhead: "Managing OrganisationalBehaviour", Cengage Learning, New Delhi.2013.
4. Jerald Greenberg and Robert A Baron: "***Behavior inOrganizations***", PHI Learning Private Limited, New Delhi, 2009.
5. Mullins, Laurie: "**Management and OrganisationalBehaviour**", Pearson Education, New Delhi, 2013
6. Jennifer M.George and Gareth R. Jones: "***Understanding andManaging Organizational Behavior***", Pearson Education, NewDelhi, 2009.
7. Meenakshi Gupta: "***Principles of Management***", PHI Private Limited, New Delhi, 2009.
8. Anil Bhat, Arya Kumar: "***Management***", Oxford University, New Delhi, 2008.
9. Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limited, New Delhi, 2008.
10. K.Aswathappa: "**Organizational Behavior-Text, Cases andGames**", Himalaya Publishing House, New Delhi, 2008,
11. PareekUdai: "*Understanding Organizational Behavior*", Oxford University Press, New Delhi, 2007.

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I MBA-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
MANAGERIAL ECONOMICS							

COURSE OUTCOMES: The student is able to

CO1: Describe the importance of managerial economics and its contribution to decision making in different types of business organizations by the managerial economist.

CO2: Understand the basic principles of managerial economics.

CO3: Apply demand analysis concept in the real life business situations.

CO4: Understand the meaning and usefulness of the production function and cost function in analysing the firm's production activity.

CO5: Understand the importance of cost function in analysing the profitability of business.

CO6: Appraise the market structure and different types of markets and pricing policies.

SYLLABUS:

UNIT -I

Introduction to Managerial Economics: Types of Business Organizations-Definition, Approaches to Managerial Economics- wealth, welfare and scarcity approaches-Nature and Scope of Managerial Economics, Relationship with other areas of Economics, Role of managerial economist.

UNIT –II

Fundamentals of Economic Principles: Managerial theories of firm, basic economic principles- the opportunity cost, incremental concept, scarcity, marginalism, Equi-marginalism, time Perspective, Discounting Principle, Risk & uncertainty.

UNIT –III

Demand Analysis: Elasticity of demand, types and significance of Elasticity of Demand - Measurement of price Elasticity of Demand – Need for Demand forecasting, forecasting techniques, Law of Supply, Elasticity of Supply.

UNIT -IV

Production Analysis: Production function, Marginal Rate of Technical Substitution, Production functions with one/two variables, Cobb-Douglas Production Function, Returns to Scale and Laws of returns.

UNIT-V

Cost theory and estimation: Cost concepts, determinants of cost, cost – output relationship in the short run and long run – Modern development in cost theory – Saucer shaped short – run Average cost curves – Average total cost curve – Cost - Volume – Profit analysis

UNIT-VI

Market Structure and Pricing practices: Features and Types of different Markets – Price-Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly both in the long run and short run. Pricing methods in practice.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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Text Books:

1. Mithani D M: ''**Managerial Economics**", Himalaya Publishing House, Mumbai, 2008.
2. Varshney, R.L and Maheswari, K L: ''**Managerial Economics**", Sultan Chand and Sons, New Delhi, 2002.

REFERENCES:

1. Paul, Koushil: "**Managerial Economics**", Cengage Learning, New Delhi,
2. Siddiqui S A,Siddiqui A S: "**Managerial Economics**", and Financial Analysis", New Age International Publishers, New Delhi, 2008.
3. VanitaAgarwal: "**Managerial Economics**", Pearson, New Delhi, 2013.
4. Dominick Salvatore: "**Managerial Economics**", Oxford University Press, New Delhi,2010.
5. D.L. Ahuja: "**Managerial Economics**", S. Chand & Company ltd,New Delhi-55.
6. O'Sullivan, Sheffrin, Perez "Micro Economics: Principles, Applications and Tools", Pearson Education.
7. Dwivedi D N: ''**Managerial Economics**", Vikas Publishing House Private Limited, New Delhi, 2009.
8. S.B. Srivastava: "**Engineering and Managerial Economics**", SCITECH Publication, New Delhi.
9. Atmanand: "**Managerial Economics**", Excel Publications. New Delhi, 2012.
10. Narayanan Nadar E, Vijayan S: ''**Managerial Economics**", PHI Private Limited, New Delhi,2009.
11. Hirscgey: "**Managerial Economics**", Cengage Learning, New Delhi, 2013.
12. P.N.Chopra: "**Managerial Economics**", Kalyani Publications, New Delhi, 2011.

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I MBA-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ACCOUNTING FOR MANAGERS							

COURSE OUTCOMES: The student is able to

CO1: Understand the basic knowledge of accounting, bookkeeping, accounting Principles, accounting cycle.

CO2: Apply the concepts of journal, ledger and final accounts in preparation of financial statements of business.

CO3: Identify the nature of expenditure and revenue; evaluate the role of accounting policies like depreciation, inventory valuation and accounting standards.

CO4: Understand financial analysis and apply technique of ratio analysis.

CO5: Evaluate the concepts of funds flow analysis and cash flow analysis in estimating financial position of the business.

CO6: Analyse the various contemporary issues in accounting.

SYLLABUS:

UNIT-I

Introduction to Accounting: Definition Of Accounting, Accounting Cycle, Significance Of Accounting, Objectives Of Accounting, Accounting Equation, Users Of Accounting Information, Accounting Principles, Accounting Concept And Conventions (GAAP)

UNIT-II

Books of original entry: Journal- Ledger- Final Accounts with Simple Adjustments

UNIT-III

Measuring Business Income, Distinctions Between Capital And Revenue, Matching Revenue And Expenditure, Role Of Accounting Policies Like Depreciation And Inventory Valuation. Accounting standards –IAS- IFRS.

UNIT-IV

Financial Statement Analysis- Scope and Preparation of Financial Statement Analysis- ratio analysis-liquidity, activity, structural and leverage and profitability ratios. Significance and limitations of ration analysis (problems)

UNIT-V

Funds flow analysis- concepts of funds, ascertaining funds from operations , sources of funds, uses of funds- preparation and analysis of funds flow statement and cash flow statements (problems).

UNIT-VI

Contemporary Issues In Accounting: Inflation Accounting, Human Resource Accounting, Computerized Accounting, Responsibility Accounting, Zero Based Budgeting.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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Text Books:

1. VijayaKumar.P, Ravindra P.S., Kiran Kumar V: "**Accountingfor Managers**", Himalaya Publishing House, New Delhi, 2013
2. Dr.JawaharLal: "**Accounting for management**", Himalaya Publishing house, NewDelhi, 2012.
3. G. Prasad, "Accounting for Manager", Jai Bharat Publications, Guntur, 2013.

REFERENCES:

1. Shankarnarayana, Ramanath: "**Finanacial Accounting forManagement**", Cengage Learning, New Delhi.
2. Ramachandran N, RamKumarKakani: **Financial Accountingfor Management**", McGraw Hill – 2013.
3. Maheshwari, Maheashwari and Maheshwari, "**FinancialAccounting**", Vikas publishing House, New Delhi,2013
4. AmberishGupta:"**Financial Accounting for Management**", Pearson Education, 2012.
5. Paresh Shah: "**Financial accounting for management**", Oxford University press, New Delhi, 2013.
6. Asish K. Bhattacharyya: "**Essentials of FinancialAccounting**", PHI Learning, New Delhi, 2012.
7. Dr.V.R.Palanivelu: "**Accounting for Management**". University Science Press, New Delhi, 2009.
8. Ashok Banerjee: "**Financial Accounting**", a managerial Emphasis, Excel books, New Delhi, 2012.

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I MBA-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
MANAGERIAL COMMUNICATIONS & SOFT SKILLS							

COURSE OUTCOMES: The student is able to

CO1: Understand the basic concepts, scope, process and challenges of communication.
CO2: Distinguish between different types of communication and its importance and implication strategies.
CO3: Interpret different forms of effective internal and external business correspondence.
CO4: Develop presentation skills.
CO5: Adapt report writing skills of different types on need basis.
CO6: Analyse the emerging issues in communication with respect to the impact of technology and soft skills etc.

SYLLABUS:

UNIT-I

Communication- definition- objectives-nature and scope- process of communication- media of communication, written, oral, audio-visual communication-Silence-developing LSR communication- problems and challenges of communication.

UNIT-II

Formal and informal communication- models of inter personal communication- Intra personal communication, Exchange theory- verbal and non-verbal communication.

UNIT-III

Significance of business correspondence- essentials of business correspondence- business letters and forms- telephone communication- uses of technology in communication.

UNIT-IV

Presentation skills- techniques of presentation- types of presentation- formal and informal presentation- Interview techniques- communication etiquettes.

UNIT-V

Report writing- meaning and significance- structure of reports- types of reports-formal and informal reports-essentials of good report writing.

UNIT-VI

Emerging issues in communication- yesterday, today and tomorrow,-Impact of technology-BPO- call centers-soft skills- ethical dimension- communication policies- communication change management.

Relevant cases have to be discussed in each UNIT and in examination case is compulsory from any UNIT.

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Text Books:

1. Kuberudu B and Srinivasa Krishna K: "***Business Communicationand Soft Skills***", Excel Books, 2008.
2. Urmilarai, ***"Business Communications"***, *Himalya Publications, 2011.*

REFERENCES:

1. MallikaNawal: "Business Communication", Cengage Learning, New Delhi, 2012.
2. Meenakshi Rama: "***Business Communication***", Oxford University Press, New Delhi
3. C.S.G. Krishnamacharyulu and Dr.LalithaRamakrishnan, Business Communication, Himalaya Publishing House, Mumbai
4. Paul Turner: "***Organisational Communication***", JAICO Publishing House, New Delhi.
5. SathyaSwaroopDebasish, Bhagaban Das" "***BusinessCommunication***", PHI Private Limited, New Delhi, 2009.
6. R.K.Madhukar: "**Business Communication**", Vikas Publishing House, New Delhi, 2012.
7. Kelly M Quintanilla, Shawn T.Wahl:"**Business and ProfessionalCommunication**", SAGE, New Delhi, 2012.
8. Sangita Mehta, NeetyKaushish: "**Business Communication**", University Science Press, New Delhi, 2010.
9. Anjali Ghanekar: "**Business Communication Skills**", Everest Publishing House, New Delhi, 2011.

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I MBA-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
BUSINESS ENVIRONMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the nature and basic concepts of business environment and its components.
CO2: Analyse the structure of Indian economy.
CO3: List the components of fiscal policy and analyse balance of payments.
CO4: Evaluate different trade related policies like WTO, GATS, TRIMS and TRIPS.
CO5: Understand the environmental laws and consumer protection act 1985.
CO6: Analyse the codes and laws relating to corporate governance.

SYLLABUS:

UNIT – I

Business Environment: Importance at national and international level – problem and challenges – factors both internal and external influencing business environment. Industrial policies since independence and their significance – regulatory and promotional framework – Five – year plans and their importance.

UNIT – II

Structure of Indian economy – Nature and Significance – Economic Systems – Structure of Indian industry – Economic reforms in various sectors – nature – Challenges – Social justice – Disinvestment mechanism –Problems and procedures – Sickness in Indian industry, Competition Act 2002.

UNIT – III

Fiscal Policy: nature and significance – public revenues – expenditure – Debt, development activities allocation of funds – critical analysis of the recent fiscal policy of Government of India. Balance of payments: Nature – structure – major components – causes for disequilibrium in balance of payments – correction measures.

UNIT – IV

India's Trade policy: Nature – Magnitude and direction of Indian international trade – problems – bilateral and multilateral trade agreements. International business environment: Nature – significance – challenges and mechanisms. WTO: Agreements in the Uruguay round including TRIPS, TRIMS and GATS – disputes settlement mechanism – dumping and antidumping measures.

UNIT – V

Legal Frame work: Special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control and prevention of Air and Water pollution) and the Essential Commodities Act 1955.

UNIT –VI

Corporate Governance – Codes and laws – Sarbanes-Oxley Act- committees on corporate governance- Role and functions of Chairman and Managing Director –m Audit committee – remuneration committee – Business ethics – objectives – nature – Relationship between business ethics and business.

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Text Books:

1. Aswathappa K: "**Essentials of Business Environment**", Himalaya Publishing House, New Delhi, 2011.
2. Francis Cherunilam: "***Business Environment-Text and Cases***", Himalaya Publishing House, Mumbai.

REFERENCES:

1. ShaikhSaleem: "**Business Environment**", Pearsons, New Delhi,
2. VeenaKeshavPailwar: "**Economic Environment of Business**", PHI Learning, New Delhi, 2012
3. Rosy Joshi, SangamKapoor: "**Business Environment**", Kalyani Publishers, New Delhi, 2011.
4. Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011.
5. Sundaram and Black: "***International Business Environment Text and Cases***", PHI Private Limited, New Delhi.
6. Avid W Conklin: "***Cases in Environment of Business***", Sage Publication India Private Ltd, New Delhi.
7. Raj Kumar: "**International Business Environment**", Excel Publication, New Delhi, 2012.
8. Palle Krishna Rao: "***WTO-Text and Cases***", Excel Publication, New Delhi.
9. Government of India, ***Latest Economic Survey Report.***

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I MBA-I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS							

COURSE OUTCOMES: The student is able to

CO1: Apply Mathematical techniques like elementary operations on matrices, regression analysis, and probability distribution in problem solving.
CO2: Identify and apply linear programming techniques in finding optimal solutions.
CO3: Apply Game theory in finding solutions with saddle point and without saddle point.
CO4: Apply different techniques like least cost, matrix minima Vogel's method in finding the optimal solutions of transportation and assignment problems.
CO5: Solve replacement problem and identify the replacement of items with time.
CO6: Select PERT and CPM models for Network analysis, resources analysis and allocations.

SYLLABUS:

UNIT-I

BASIC MATHEMATICAL TECHNIQUES: Matrices, Elementary operations of matrices. Measures of Central Tendency, Measures of Dispersion, Simple Correlations and Regression Analysis. Permutations and combinations, Probability Rules, Conditional probability, Baye's theorem, probability Distributions, Binomial, Poisson, Normal Probability Distributions.

UNIT-II

LINEAR PROGRAMMING: Introduction, Linear Programming, General statement of Linear Programming Problems, Solution to linear programming problems- Graphic Method, Some special cases. Simplex Method, Solution of Maximisation Problems, Solution to Minimisation Problems. Big-M Method.

UNIT-III

GAME THOERY: Introduction, Two Person Zero-Sum Games, Pure Strategies, Games with Saddle point, mixed strategies, Rules of dominance, Solution Methods of Games without Saddle point, Algebraic, Matrix and arithmetic methods.

UNIT-IV

TRANSPORTATION MODELS: Introduction, Mathematical formulation, Definitions, Optimal solutions: North-West Corner Rule, Least Cost or Matrix Minima method, Vogel's approximation Method (VAM), Optimality Test: MODI method.

ASSIGNMENT PROBLEMS: Definition, Mathematical Formulation of an Assignment Problem, Difference between Transportation and Assignment problems, Hungarian Method Procedure, Unbalanced Assignment Problem, Travelling Salesman Problem.

UNIT-V

REPLACEMENT MODELS: Introduction, Replacement of items that deteriorate with time, Replacement of items that fail suddenly, Staff Replacement.

UNIT-VI

& C.P.M Models: Introduction, PERT & CPM Network, Networks analysis, Resource analysis and allocation, Programme Evaluation and review Technique(PERT) Difference between PERT AND CPM.

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TEXT BOOKS:

1. N.D. Vohra, "Quantitative techniques in management", TataMcGraw Hill private Limited, New Delhi, 2011.
2. Sancheti, Dc and VK Kapoor, "Business Mathematics", S. Chand and Sons, New Delhi.
3. Anand Sharma, "Quantitative Techniques for Decision Making", Himalaya Publishers, New Delhi, 2012.

REFERENCES

1. N.D.Vohra: "***Quantitative Techniques in Management***", Tata-McGraw Hill Private Limited, New Delhi, 2011.
2. J. K. Sharma, "***Operations Research: Theory and Applications***", Macmillan Gupta S.P: "***Statistical Methods***", S. Chand and Sons, New Delhi,
3. Anand Sharma: "**Quantitative Techniques for Business decisionMaking**", Himalaya Publishers, New Delhi,2012;
4. D P Apte: "***Operation Research and Quantitative Techniques***", Excel Publication, New Delhi, 2013
5. Hamdy, A.Taha: "***Operations Research: An Introduction***", Prentice-Hall of India, New Delhi 2003.
6. Anderson: "**Quantitative Methods for Business**", Cengage Learning, New Delhi 2013
7. Sancheti, Dc & VK Kapoor, "**Business Mathematics**", S Chand and Sons, New Delhi
8. R.B.Khanna: "**Quantitative Techniques for Managerial Decision**", PHI Learning, New Delhi, 2012.
9. Keller, G, "**Statistics for Management**", 2009, 1st Ed, Cengage Learning.
10. Amir D. Aczel and JayavelSounderpandian, "**Complete BusinessStatistics**", TMH,
11 C.R.Kothari: "**Quantitative Techniques**", Vikas Publishing House, New Delhi, 2010
11. 12 L.C.Jhamb: "**Cases and Problems in Quantitative Techniques**", Everest Publishing House, New Delhi,

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IT-WORKSHOP							

COURSE OUTCOMES: The student is able to

CO1: Design and perform documentation.
CO2: Understand the basics of hardware, software and components of computer system.
CO3: Apply the knowledge of computer in social networking.
CO4: Create and use spread sheets with macros, charts and filters.
CO5: Create presentations with animations, auto slide transition.
CO6: Configure Wi-Fi of laptop/tab/mobile to access.

Exercise-I

Introduction to Computer Concepts – Elements of computer – Characteristics of a Computer – Classification of Computers – Basic Computer Architecture – Input-output Devices, Types of software – Software: its nature and qualities — Windows Operating System Functions .

Exercise-II

Hardware, Software, Operating Systems, Printer, Scanner, Pen drive, DVD, Web cam. File Sharing, Device Sharing, Blue Tooth, WI-FI, Internet, Web site, Domain, Search- Engine. Dos commands.

Exercise-III

Electronic mail, Outlook Configuration, Skype, Hangouts, Facebook, Twitter Twitter, (Social Networks), Cloud Storage (Google drive, one drive), Mobile Tablets, Laptops, Mobile Apps.

Exercise-IV

MS Office- Applications of MS Word in Business Correspondence: letters, tables, mail merge, labels.

Exercise-V

Applications of MS Excel: Graphs and Charts – Calculation of various financial functions - Ms Access: Tables and Queries.

Exercise-VI

MS Power Point: Introduction – Toolbar, their Icons and Commands – Navigating in Power point - Creation of slides, animation, and templates - Designing Presentations – Slide show controls – Making notes on Pages and Handouts – Printing Presentations – Customizing Presentations - Auto content Wizard.

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TEXT BOOKS:

1. Sanjay Saxena and Prathpreet Chopra, Computer Applications in Management, Vikas, New Delhi.
2. The Compact guide to Microsoft office, Mansfield Rom, BPB Publications, Delhi.

REFERENCES:

1. Aksoy, Introduction to Information Technology, Cengage, ND.
2. Parameswaran: Computer Application in Business – S Chand, New Delhi.
3. Management Information Systems by MahadeoJaiswal, Monika Mittal, Oxford University Press.
4. PS Gill, Database Management Stystems, IK Int Pub House, New Delhi.
5. Management Information Systems by D.P. Goyal, MacMillan Publishers.
6. Sudalaimuthu& Anthony Raj, Computer Applications in Business, Himalaya, Mumbai.

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	3	1	0	40	60	100	3
FINANCIAL MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the basic concepts of Financial Management

CO2: Comprehend the various methods of Investment Analysis and apply various techniques of capital budgeting.

CO3: Assimilate the concepts of leverage, capital structure and its effect on the long term survival of the firm.

CO4: Appraise various methods of computation of cost of capital.

CO5: Understand the valuation methods of dividends and the dividend policies of Indian corporates.

CO6: Assess the working capital requirement of a firm and comprehend the nitty-gritty of current assets management.

SYLLABUS:

UNIT -I

The Finance function: Nature -Scope and objective, Profit or Wealth Maximization and EPS Maximization, Evolution of finance function, Role of finance manager, Time value of money, future value of money and the basic valuation models- Risk-return trade off.

UNIT-II

Investment Decision: Investment decision process – Project generation, project evaluation, project selection and project implementation-Project Evaluation techniques-traditional and modern methods, analysis of project evaluation techniques, concept of capital budgeting decision under conditions of risk and uncertainty.

UNIT-III

Capital structure Decisions: Sources of finance - a brief survey of financial instruments. Capital structure vs. financial structure - Capitalisation, financial leverage, operating leverage and composite leverage. EBIT-EPS Analysis, Indifference Point/Break even analysis of financial leverage, Capital structure theories (relevant theories)-case study.

UNIT-IV

Cost of Capital: Concept and measurement of cost of capital, Debt vs. Equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginal cost of capital. Importance of cost of capital in capital budgeting decisions.

UNIT-V

Dividend Decisions: Dividends and value of the firm - Relevance of dividend theory, Factors determining Dividend Policy-dividends and valuation of the firm-the basic models. Declaration and payment of dividends. Bonus shares. Rights issue, share-splits, Walter Model and Gordon Model.

UNIT-VI

Working Capital Management, components of working capital, gross vs. net working capital, determinants of working capital needs, and the operating cycle approach. Planning of working capital, .Financing of working capital through Bank finance and Trade Credit. Management of current assets – Cash, Receivables and Inventory.

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TEXT BOOKS:

1. P.Vijaya Kumar, P.S.Ravindra, V. Kirankumar "**FinancialManagement",** Himalaya Publishing House, New Delhi,2013.
2. G. Sudarshan Reddy, **"Financial Management"**, Himalaya Publishing House, New Delhi,2012.
3. D. Chandra Bose, **"Fundamentals of Financial Management"**, PHI Publications, New Delhi,2012.

REFERENCES:

1. Rajiv Srivastava, Anil Misra: "**Financial Management**", Oxford University Press, New Delhi,2012
2. Brigham,E.F: "**Financial Management Theory and Practice**", Cengae Learning, New Delhi, 2013
3. Prasanna Chandra: "**Financial Management Theory and Practice**", Tata McGrawHill 2011.
4. I.M. Pandey: "**Financial Management",**Vikas Publishers, New Delhi, 2013.
5. RM Srivastava, Financial Management, Himalaya Publishing house, 4 edition.
6. Khan and Jain: Financial Management, Tata McGraw Hill, New Delhi,
7. Pradip Kumar Sinha: "**Financial Management**", Excel Books, New Delhi, 2009.
8. A.P.Rao: "**Fundamentals of Financial Management**". Everest Publishing House, New Delhi.
9. VyuptakeshSharan: "**Fundamentals Financial Management**", Pearson, New Delhi, 2012.
10. ShashiK.Gupta: "**Financial Services**", Kalyani Publishers, New Delhi, 2012.

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	3	1	0	40	60	100	3
HUMAN RESOURCE MANAGEMENT							

COURSE OBJECTIVES: The student is able to

CO1: Outline the principles of HRM and also understand the principles of HRM.
CO2: Understand different functions of HR manager.
CO3: Apply the uses of job analysis, job description, job specification, ergonomics in industry and the methods of job evaluation.
CO4: Utilize the various methods of performance appraisal.
CO5: Develop a sound compensation mechanism at global level, determinants of payment of wages and incentive plans.
CO6: Examine the role of trade unions, Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms and stress management at work place.

SYLLABUS:

UNIT -1

Introduction to HRM– Definition & functions – Evolution of HRM – Principles of HRM – Ethical aspects of HRM – Role of Position of HRM. – HRM at global perspective – differences between PM & HRM- Challenges of HRM.

UNIT-2

Investment Perspectives of HRM- HR Planning – Recruitment & Selection – Sources of Recruitment, Selection Procedure – Selection tests – Interview Techniques – Training Methods – Executive development methods. Introduction and placement.

UNIT-3

Job Analysis & Design- Job Analysis- Process of Job analysis – Job description and Job Specification – Flexible Job Enrichment – Job Sharing – Tele Community – Ergonomics – Job Design and Job Evaluation.

UNIT-4

Mechanisms- Importance of Performance Appraisal – Traditional and Modern methods of PA – Latest trends in PA – Compensation concepts – Influence factors – current trends – methods of payment – Compensation mechanisms at Global level.

UNIT-5

Wage and Salary System & Welfare Management- Concept of Wage – Wage Structure – Wage and Salary policies – legal Frame work – determinants of payments of wages – Wage differentials – Incentive payment systems. Welfare Management: Nature and Concepts – Statutory and Non-statutory welfare measures.

UNIT-6

Industrial Relations & Contemporary issues in HRM- Trade Unions – Employee Participation schemes – Grievance handling- Collective bargaining –Industrial Disputes Resolution Mechanisms – Statutory provisions of Industrial safety – Stress Management at Work place – HR Auditing – HRIS methods.

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TEXT BOOKS:

1. K Aswathappa: "*Human Resource and Personnel Management*", Tata McGraw Hill, New Delhi, 2013

2. SubbaRao P: "*Personnel and Human Resource Management-Text and Cases*", Himalaya Publications, Mumbai, 2013.

REFERENCES:

1. N.SambasivaRao and Dr.Nirmal Kumar: "**Human ResourceManagement and Industrial Relations**", Himalaya PublishingHouse, Mumbai

2. Mathis, Jackson,Tripathy:"*Human Resource Management:Asouth-Asin Perspective*", Cengage Learning, New Delhi, 2013

3. MadhurimaLall, SakinaQasimZasidi: "**Human ResourceManagement**", Excel Books, New Delhi, 2010

4. Muller_Camen. Croucher and Leigh: "*Human ResourceManagement- A Case Study Approach*", JAICO Publishing, Delhi.

5. S.Seetharaman, B.VenkateswaraPrased: "*Human ResourceManagement*", SCITECH Publication (India) Limited, Hyderabad,2009.

6. Gary Dessler, BijuVrkkey: "*Human Resource Management*", Pearson Education, New Delhi, 2011

7. Uday Kumar Haldar: "*Human Resource Development*", Oxford University Press,New Delhi, 2012.

8. NarendarSingh:"*Human Resource Management*", Universities Press (India) Private Limited, Hyderabad, 2011.

9. B.B.Mahapatro:"*Human Resource Management*", New Age International Publishers, New Delhi, 2011

10.R.S.Dwivedi: "*Human Relations and OrganisationalBehaviour",* MacMillan Business Books, New Delhi, 2013.

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	3	1	0	40	60	100	3
MARKETING MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the concepts of marketing and importance of marketing information system.
CO2: Know the segmentation, targeting and positioning in marketing.
CO3: Analyse various phases of product life cycle.
CO4: Evaluate various methods of pricing and identify the best pricing strategy.
CO5: Define and evaluate marketing communication strategies.
CO6: Formulate the controlling techniques of marketing.

SYLLABUS:

UNIT –I

Introduction to Marketing: Needs, Wants, Demands, Products, Exchange, Transactions, Market, Marketing, Production Concept, Product Concept, Sales Concept, Marketing Concept, Societal Marketing Concept, Indian Marketing Environment. Marketing Information System- Internal reporting – Marketing Intelligence, MR and Decision Support System.

UNIT -II

Market Segmentation and Targeting: Identification of Market Segments, - Consumer and Institutional/corporate Clientele - Segmenting Consumer Markets, Segmentation Basis, Selecting Target Markets, Segmentation and Targeting as a Basis for Strategy Formulation. Developing and Communicating a Positioning Strategy. Consumer and organizational behavior.

UNIT -III

Product Strategy: Product Classification – Consumer, Industrial, services, Organisational ideas, places- Levels of product – Core, augmented, actual, New Product Development – Process – Branding –n Strategies, Importance, packaging – Strategies- Importance. PLC – stages& strategies.

UNIT –IV

Pricing Strategy: Objectives of pricing, Methods of pricing, Selecting the final price, Adopting price, initiating the price cuts, imitating price increases, Responding to Competitor's price changes.

UNIT-V

Marketing Communication: the communication process , Communication mix, Managing advertising sales promotion , Public relations and Direct Marketing. Sales force Objectives, Sales force structure and size, Sales force Compensation. Managing Advertising, Objectives, Budgets, Messages, Media, Evaluation.

UNIT-VI

Marketing Organization and Control: Evolution of Marketing Department, Organizing the Marketing Department, Marketing Implementation, Control of Marketing Performance, Annual Plan Control, Profitability Control, Efficiency Control, Strategic Control.

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TEXT BOOKS:

1. RajanSexena: "**Marketing Management**", Tata McGraw Hill, New Delhi, 2012.
2. Sontakki C.N.: "**Marketing Management**", Kalyani Publishers, New Delhi, 2012.

REFERENCES:

1. Lamb, Hair, Sharma: "**MKTG**" Cengage Learning , New Delhi, 2013
2. Phillip Kotler: "**Marketing Management** ", Pearson Publishers, New Delhi, 2013.
3. R.Srinivasan: "**Case Studies in Marketing**", PHI Learning, New Delhi, 2012
4. Tapan K Pand: "**Marketing Management**", Excel Books, New Delhi, 2012
5. Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: "**Marketing**", Oxford University Press, Chenni, 2013.
6. Arun Kumar, Meenakshi N: "**Marketing Management**", Vikas Publishing House, New Delhi, 2012.
7. Kenneth E, Clow, Donald Baack: "**Cases in Marketing**", SAGE ,New Delhi, 2012.
8. Dilip M, Sarwate: "**Indian Cases in MarketingManagement**", Everest Publishing House, New Delhi,

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	3	1	0	40	60	100	3
PRODUCTION AND OPERATIONS MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the basic concepts of production and operations management and identify types of manufacturing processes.
CO2: Define and explain concept of production planning and control.
CO3: Decide effective plant location and plant layout.
CO4: Define strategies to improve productivity.
CO5: Evaluate purchasing function and inventory management function.
CO6: Evaluate the quality control system and develop the quality control strategies.

SYLLABUS:

UNIT -I

Introduction: Overview & Definition of production and operations management. Nature and Scope of Production and Operations Management, functions of POM–Role & responsibilities of the production manager,types of manufacturing processes, recent trends and challenges of POM.

UNIT -II

Production Planning and Control: Stages in PPC-functions of PPC – PPC in Mass, Batch, and Job Order Manufacturing- Aggregate planning and Master Scheduling, MRP, CRP, Capacity planning. Maintenance management & Industrial Safety (problems on scheduling).

UNIT –III

Plant Location & Layout Planning- Factors influencing location - types of layouts. Work Design: Method Study and Work Measurement - Work Sampling.

UNIT -IV

Productivity Management: Factors affecting productivity and their measurements- total productivity, tools and techniques for improving productivity - Modern productivity Management Tools: JIT, FMS, CIM, TQM, Kaizen, BRP (Business process reengineering).

UNIT –V

Purchasing & Inventory Management: Purchase function, procedures, economic order quantity, Wilson lot size formula, assumptions in the equation- Inventory Control Methods: ABC, VED, XYZ methods-Inventory valuation methods: periodic and perceptual systems, FIFO, LIFO, Average cost and weighted average cost methods.

UNIT -VI

Quality Management: Basic concepts, dimensions of quality, inspection, deming, juran concepts, quality as cost and quality as profit. Total quality management- Statistical Quality Control: Control charts- exercises- Concept of Quality Assurance: principles of ISO and BIS, ISO standard and certification process 9000-2000, six sigma.

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1. PannerSelvem: "**Production and Operation Management**", Prentice Hall of India, NewDelhi, 2012.
2. K.Aswathappa, K. Shridhara: "**Production &OperationManagement**", Himalaya Publishing House, New Delhi, 2012.

REFERENCES:

1. Ajay K Garg: "**Production and Operation Management**", TMH, New Delhi,2012
2. Deepak Kumar Battacharya: "**Production & Operation Management**", University Press, New Delhi, 2012
3. AlanMuhlemann,JohnOakland,jastiKatyayani: "**Production and Operation Management**", Pearson, New Delhi,2013
4. Gagan Deep &Mandeep : "**Production and operations Management**", Kalyani publishers, New Delhi, 2010
5. UpendraKachru: "**Production and Operations Management**", Excel Books, New Delhi, 2013.
6. L.C. Jhamb: "**Production and Operations Management**", Everest Publishing House, New Delhi, 2013.
7. Kaushal: "**Case Studies solutions in Production and Operations Management**", MacMillan, New Delhi, 2012.
8. P.Ram Murthy: "**Production and Operations Management**", New Age International Publishers, New Delhi, 2009.

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	3	1	0	40	60	100	3
ORGANISATIONAL BEHAVIOUR							

COURSE OUTCOMES: The student is able to

CO1: Summarize fundamentals of organization and its basic behavioural elements.
CO2. Identify different organisational structures.
CO3: Understand factors of organisational behaviour.
CO4: Measure and evaluate personality with respect to organisational behaviour.
CO5: Awareness on groups and teams and its behaviour.
CO6: Understand and analyses organisational conflicts and create suitable solutions for organisational conflicts.

SYLLABUS:

UNIT-1

OrganisationalBehaviour : Definition, Nature, Scope, Importance, Linkages with other social sciences – Foundations perspectives of OB- Models of OB – Individual roles &Organisational Goals.

UNIT-2

Organisational Structure: Concept, Elements, Determinants – Forms of OS, Principles – Organisational climate –concept – Developing a sound climate – Organisational Culture – Implications of OC.

UNIT-3

Individual factors: Individual Differences – Models of Man- Perception -Process – Applications – Learning – Factors – Theories – Applications – Motivation concept – Important elements of a sound Motivation system – Attitudes – concept- Theories – Factors-values.

UNIT-4

Personality – concept- Theories – Determinants – Stages- Johari window- transactional Analysis – Organisational applications of personality – Creativity & Creative Thinking – Interpersonal Conflicts.

UNIT-5

Group Dynamics: Concept of Group, Types of Groups, Theories of Group formation, Group Behaviour, Group norms, Group cohesiveness, Group DM, Group conflicts.

UNIT-6

Organisational conflicts: Goal conflict- Role- Organisational level of conflict – Group level – Conflict Management – Organisational effectiveness – concept – Approaches – Factors – Organisational change,-Nature – Factors – Process- Organisational growth & Change Agents-OD- concept, Process and Techniques.

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1. K.Aswathappa: "**Organizational Behavior-Text, Cases and Games**". Himalaya Publishing House, New Delhi, 2008.
2. Luthans: "**Organizational Behavior-Text, Cases and Games**" **REFERENCES:**
3. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "***Organizational***
4. ***Behavior***", Tata McGraw Hill Education, New Delhi, 2008.
5. Jerald Greenberg and Robert A Baron: "***Behavior in Organizations***", PHI Learning Private Limited, New Delhi, 2009.
6. PareekUdai: "***Understanding Organizational Behavior***", Oxford University Press, New Delhi, 2007.
7. Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limted, New Delhi, 2008.
8. Sharma VS, Veluri: "***Organizational Behavior***", JAICO Publishing House, New Delhi, 2009.
9. Slocum,nHelireigel: "***Fundamentals of Organizational Behavior***", Cengage Learning India, New Delhi, 2009.
10. Jennifer M.George and Gareth R. Jones: "***Understanding and Managing Organizational Behavior***", Pearson Education, New Delhi, 2009.
11. Schermerhorn, Hunt and Osborn: "***Organizational Behavior***", Wiley India Limted, New Delhi, 2007.
12. GregoryMoor head, Ricky W.Grif fin: "***Organizational Behavior***", Biztantra, New Delhi, 2009.

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	0	0	4	40	60	100	2
E-BUSINESS							

COURSE OUTCOMES: The student is able to

CO1: Understand the overview of ERP and systematically plan the mechanisms in an enterprise.
CO2: Develop the relationship among the components in an ERP
CO3: Identify the ERP vendors in the market.
CO4: Understand the overview of E-commerce
CO5: Design the model of E-commerce.
CO6: Analyse security issues and develop technologies to secure transactions.

SYLLABUS:

UNIT-I

Introduction to ERP: Defining ERP, Origin and Need for an ERP System, Benefits of an ERP System, Reasons for the Growth of ERP Market, ERP life cycle – ERP implementation Life Cycle.

UNIT-II

ERP Vendors & Consultants: Vendors- Role of the Vendor – Products and technology R/3 overview: SAP advantage, Baan Company, Oracle Application, Vertical solutions, Microsoft Corporation, Ramco System, System software Associates Inc.-QAD-Consultants: Types of consultants – Role of a consultant.

UNIT III

ERP BUSINESS MODULES– Business Modules – Finance: Features of ERP financial module, Benefits of ERP financial module– Human Resources: Functions, features & benefits of human resource management module– Sales &Distribution: Functions, features & benefits of sales & distribution.

UNIT IV

Introduction to E-commerce : Introduction, E-commerce or Electronic Commerce- An overview, Electronic Commerce – History of Electronic Commerce, Advantages and disadvantages of E-commerce, Roadmap of E-commerce in India.

UNIT-V

E-commerce Models: Business-to-Business-Hubs, Market Places, Business-to-Business Exchange, Business-to-Consumer, Consumer-to-consumer, Business-to-Government, Government-to-Government.

UNIT-VI

Electronic Payment Systems: Electronic Payment Systems, Electronic cash, Smart cards and Electronic Payment Systems, Credit card based electronic payment systems, Risks and electronic payment systems

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TEXT BOOKS:

1. "Enterprise Resource Planning", Alexleon.TMH, New Delhi, 2011.
2. E-Commerce, A Managerial Perspective, Turba E, Lee J, King, Chung H.M. PEA, 2001

REFERENCES

3. Singla: "Enterprise Resource Planning", Cengage Learning, New Delhi, 2013
4. MahadeoJaiswal, Ganesh Vanapalli: "Enterprise Resource Planning", MacMillon, New Delhi, 2013
5. N.Venkateswaran: "Enterprise Resource Planning", SCITECH Publiscation, NewDelhi, 2009
6. S.Kesharwani, SBodduluri, M Ashok Kumar: "Enterprise Resource Planning", Paramount Publishing House, New Delhi, 2012.
7. E-Commerce An Indian Perspective, 3/e, P.T. Joseph, PHI, 2009.
8. E-Commerce, S.Jaiswal ,Galgotia.
9. Electronic Commerce, Gary P.Schneider, Thomson.

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I MBA-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	-	50	50	3
BUSINESS LAB							

COURSE OUTCOMES: The student is able to

CO1: Know the basic of SQL.
CO2: Apply different types of functions on tables.
CO3: Know the basics of PL/SQL.
CO4: Understand the ERP modules and E-payments.
CO5: Apply the cursors and trigger on various business decisions.
CO6: Understand the online trading system and develop the real time applications.

SYLLABUS:

Exercise-I: Introduction to SQL, DDL, DML, DCL, TCL, Constraints-Not null, Unique, Primary key, Foreign key, Check.

Exercise-II: Functions-Single row, Group, Sub queries, Operators, Joins, Views

Exercise-III: Introduction to PL/SQL, Cursors-Implicit cursors, explicit cursors

Exercise-IV: Exception Handling, Introduction to Triggers-Row-level trigger, Statement-level trigger.

Exercise-V: Financial modelling like present value of cash flows, valuations, financial ratio analysis, forecasting, trend analysis of data, random input generations- ERP Modules – E-payments.

Exercise-VI: Introduction of online financial services example online trading systems.

References:

1. Scott Urman, "*Oracle 8i-PL SQL Programming*", TMH, 2000.
2. Loney, "*Oracle 8i—The Complete Reference*", TMH, 2000.
3. Loney, "*Oracle 9i—The Complete Reference*", TMH, 2002.
4. Bayross, "*Oracle Teach Yourself SQL / PL SQL using Oracle 8i and 9i with SQLj*", BPB, 2002.
5. Abbey, "*Oracle 8i—A beginner's Guide*", TMH, 2000.
6. Courter, "*Mastering Microsoft Project*", BPB, 2002.
7. Pyron, "*Using MS Projec"t,* Techmedia, 2002.
8. Bayross, "*PL SQL the Programming Language of Oracle*", BPB, 2002.
9. Mansfield, MS Office, TMH, New Delhi 1999.
10. Prowess- Corporate Database, Centre for Monitoring Indian Economy(CMIE), Ph.No.040- 55466091-6,email-cmie.hyd@cmie.com www.cmie.com/products.

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I MBA-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
CORPORATE LAWS							

COURSE OBJECTIVES: The student is able to

CO1: Understand and analyze The Indian Contract Act.

CO2: Understand and analyze Sales of Goods Act and the machinery for redressal of consumer grievances.

CO3: Understand and analyze the rights and duties of agent and principal, Principal's liability for the acts of agent and the procedure for termination of agency.

CO4: Understand and analyze the rights and duties of partners, dissolution of partnership firm.

CO5: Understand and analyze the formation of company, amendments act in 2013.

CO6: Understand and analyze the kinds of Negotiable Instruments and Goods and Services Act.

SYLLABUS:

UNIT –I: THE INDIAN CONTRACT ACT, 1872

Nature of the Act - – Essentials of a Valid Contract – Classification of Contracts- Capacity – Free Consent –Legality of Object –Performance of a Contract – Discharge of a Contract – Remedies for Breach of a Contract

UNIT –II: SALES OF GOODS ACT, 1979

Distinction between Sales and Agreement to Sell –Conditions and Warranties – Performance of Contract of Sale – Rights of an Unpaid Seller.

Consumer Protection Act, 1986: Consumer Rights –Machinery for Redressal of Consumer Grievances. District Consumer Forum – State Level Commission – National Commission.

UNIT –III: CONTRACT OF AGENCY ACT

Kinds of Agents –Creation of Agency-Rights and Duties of Principal – Rights and Duties of Agent - Principal's Liability for the Acts of the Agent-Liability of Agent –Termination of Agency.

UNIT-IV: INDIAN PARTNERSHIP ACT, 1932

Meaning and Essentials of Partnership-Registration – Tests of Partnership- Rights and Duties of Partners –Dissolution of Partnership.

UNIT –V: COMPANIES ACT 1956

Nature and Types of Companies – Formation –Memorandum of Association-Articles of Association

–Kinds of Shares – Company Act as amended in 2013 - Duties of Directors-Winding up Procedure.

UNIT-VI: NEGOTIABLE INSTRUMENTS ACT, 1881

Kinds of a Negotiable Instruments and Endorsement- Presentation of a Negotiable Instrument - Discharge of a Negotiable Instrument – Goods and Services Act

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "Legal Aspects of Business" Ravindra Kumar:, Cengage Learning, New Delhi, 2011
2. "Business Legislation for Management", Kuchhal M C, Deepa Prakash: Vikas Publishing House, New Delhi, 2012

REFERENCES:

1. "Legal Aspects of Business", Pathak: Tata McGraw Hill, New Delhi, 2010
2. "A Manual of Business Laws", S.N.Maheshwari, S.K.Maheshwari: Himalaya Publishing House, 2013.
3. "Legal Aspects of Business", P.K.Padhi: PHI Learnings, New Delhi, 2013
4. "Business Law", S.S Gulshan: Excel Books, New Delhi, 2012.

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II MBA - I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
STRATEGIC MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the concept of strategic management and develop vision, mission and objectives of the organization.
CO2: Know the industry analysis and develop techniques of competitive analysis.
CO3: Appraise strategic leadership styles and actions.
CO4: Formulate effective strategies in business.
CO5: Develop a frame work for the implementation strategies in business.
CO6: Explain strategy controls and evaluate the strategy by measuring performance of organization.

SYLLABUS:

UNIT-I: INTRODUCTION

Concepts in Strategic Management, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies– Factors that shape a company's strategy – Crafting a strategy.

UNIT–II: INDUSTRY ANALYSIS

Process, Techniques of industry analysis, Competitive Analysis: Process, Techniques of Techniques of competitive analysis, Environmental Scanning Methods and process, SWOT Analysis –Strategies and competitive advantages in diversified companies and its evaluation.

UNIT–III: STRATEGIC ANALYSIS AND CHOICE

Tools and techniques- Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

UNIT –IV: STRATEGY FORMULATION

Strategy Framework For Analysing Competition Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

UNIT –V: STRATEGY IMPLEMENTATION

Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

UNIT-VI: STRATEGY EVALUATION AND CONTROL

Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic informaion systems – problems in measuring performance – Strategic surveillance - strategic audit.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "Strategic Management" :Vijaya Kumar P.. Hitt A: Cengage learning. New Delhi.2010.
2. "Cases Studies in Strategic Management" : Sanjay Mohapatra :. Pearson. New Delhi.2012.

REFERENCES:

1. "Strategic Management" : Adrian Haberberg&Alison, Oxford University Press, New Delhi, 2010 4.
2. "Business Policy and Strategic Management": P.Subba Rao: Text and Cases, Himalaya Publishing House, New Delhi, 2011.

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II MBA - I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
BUSINESS RESEARCH METHODOLOGY							

COURSE OUTCOMES: The student is able to

CO1: Explain fundamentals of Business research methodology and its significance.
CO2: Define and Develop research problem.
CO3: Understand sample and census survey and measuring techniques.
CO4: Design data collection techniques.
CO5: Develop data processing procedures and apply tools.
CO6: Draft thesis/report writing.

SYLLABUS:

UNIT-I: INTRODUCTION TO RESEARCH

Meaning, purpose, Characteristics, motivation in research, Research approaches, types, Research methods and methodology, Research process, Defining research problem, research design, evaluative criteria for good research design.

UNIT-II: SAMPLING DESIGN

Census and sample survey, characteristics, Types of sample design, Random and non-random sampling, errors in sampling, advantages and limitations of sampling

UNIT-III: MEASUREMENT AND SCALING TECHNIQUES

Measurement in research, scales, Techniques of developing measurement tools, scale classification, Likert's scale, semantic scale, Thurstone Scale, Interval Scale and multi-dimensional scaling.

UNIT-IV: DATA COLLECTION-METHODS

collection of primary data, observation method, Interview method, collection of data through Questionnaire and schedules- Collection of secondary data- selection of appropriate method for Data collection-Guidelines for developing Questionnaire, successful interviews, Reliability and Validation of data.

UNIT-V: PROCESSING AND ANALYSIS OF DATA

Editing, Coding, classification, Tabulation of data; and data validation- methods of data presentation- types of data analysis: Quantitative and Qualitative – Statistics in Research; Descriptive and inferential Statistics-Descriptive statistics: measures in central tendency, Dispersion, Asymmetry, and Cross-tabulations, Limited problems on testing of hypotheses like parametric and non-parametric t-test, z-test, Anova, Sign test.

UNIT-VI: RESEARCH REPORT WRITING

Purpose, Types, Steps, Format of research report, Criteria of good research report, Pre-writing considerations-Final presentations of the Research Report-Idea of referencing, Bibliography, Footnotes and end notes, Formats of publications in Research journals.

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TEXT BOOKS:

1. Business Research Methods, William G. Zikmund; Cengage publications, 2006.
2. Research methodology Methods & Techniques, C.R. Kothari; 2/e, New Age international, 2004.

REFERENCES:

1. Business Research Methodology, J.K. Sachdeva; Himalaya, 2009.
2. An introduction to statistical Methods, C.B.Gupta &Vijay Gupta; Vikas, 2009.

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FINANCE

	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
II MBA - I SEM	3	1	0	40	60	100	3
INVESTMENT AND PORTFOLIO MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Identify various investment alternatives and measure risk and returns of various investment avenues.
CO2: Understand the importance of security analysis in investment decision process.
CO3: Develop and evaluate bond management strategies.
CO4: Identify different equity valuation methods.
CO5: Construct and evaluate portfolio.
CO6: Understand concept of mutual funds and analyse different schemes of mutual funds.

SYLLABUS:

UNIT –I: INVESTMENTS

Definition of investment, Investment Decision Process; Sources of investment information; Real investment vs. financial investment, Investment vs. Speculation; Factors to be considered in investment decision: Liquidity, Return, Risk, Maturity, Safety, Tax and Inflation. The concept and measurement of realized return and expected return. Ex-ante and ex-post returns. Measurement of risk-range. Risk-return trade-off. Risk premium and risk aversion.

UNIT II: SECURITY ANALYSIS

Definition and objectives of Securities Analysis – Types of Securities, Analysis -Fundamental Analysis, Objectives and believes of Fundamental Analysis – Industry Analysis: Key Characteristics – Industry Life Cycle – Company Analysis – Technical Analysis – Meaning – Types – Features of Technical Analysis - Dow Theory, Efficient Market Hypothesis.

UNIT –III: FIXED INCOME SECURITIES

Bond basics, Features and types of debt instruments, Bond risk, factors affecting bond yield: coupon rate, maturity period, Bond yield measurement-Current yield, holding period return, YTM, AYTM and YTC. Bond valuation: Capitalization of income method, BoJnd-price theorems, Bond duration, Macaulay's duration and modified Macaulay's duration. Bond immunization, active and passive bond portfolio management strategies.

UNIT-IV: COMMON STOCKS

Basic Features of Common Stock, Approaches to valuation–Balance sheet model: Book value method, liquidation value method, replacement cost, Dividend capitalization models: single period, multi period & constant growth model, Earnings capitalization models; P/E ratio, Intrinsic value & Value earnings ratio.

UNIT –V: PORTFOLIO THEORY

Concept of portfolio. Portfolio return and risk. Harry Markowitz's Portfolio theory, construction of minimum risk portfolio, the single-index model. Capital market theory: Introduction of risk-free asset, Capital Market Line (CML), Security Market line (SML). Capital asset pricing model (CAPM): over- pricing and under-pricing securities. Arbitrage pricing theory (APT): The Law of one price, two factor arbitrage pricing.

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UNIT –VI: MUTUAL FUNDS AND PORTFOLIO EVALUATION

Mutual funds - genesis, features, types and schemes. NAVs, costs, loads and return of mutual funds. Problems and prospects in India. Regulation of mutual funds and investor's protection in India. Performance measures- Sharpe's reward to variability index, Treynor's reward to volatility index, Jensen's differential index, Fama's decomposition of returns.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Security Analysis and Portfolio Management, S. Kevin, PHI, New Delhi, 5th Edition 2015.
2. Investment Analysis and Portfolio Management, Prasanna Chandra, TMH, New Delhi, 6th Edition, 2013.

REFERENCES:

1. Security Analysis and Portfolio Management, Punithavathy Pandian, Vikas Publishing House, New Delhi, 2nd Edition, 2013.
2. Investment Management
3. , Preeti Singh, Himalaya Publishing House, New Delhi, 18th Edition, 2013.
4. Security Analysis and Portfolio Management", Sudhindra Bhat, Excel Books.32, 2nd Edition, 2013.
5. Fundamentals of Investment Management, V.K.Bhalla, S. Chand, New Delhi, 15th Edition, 2013.
6. ***Investment Management - Security Analysis and Portfolio Management***, Bhalla.V.K., S. Chand, 16th edition, 2010.

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II MBA - I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
CORPORATE TAXATION							

COURSE OUTCOMES: The student is able to

CO1: Understand fundamentals of Taxation.
CO2: Discuss taxation of companies
CO3: Understand and develop income sources from business through taxation.
CO4: Determine taxation techniques.
CO5: Evaluate Tax management.
CO6: Develop filing the tax for individuals and corporates.

SYLLABUS:

UNIT I: BASIC CONCEPTS

Sources of Tax Laws, Act & Rules, Administrative Instructions issued by CBDT, Annual Finance Acts. Introductory: Definitions, Residential status, Heads of Income, Computation of Taxable Income.

UNIT II: TAXATION OF COMPANIES

Residential Status & Tax Liability, Scope of total income, concept of Permanent Establishment, Business Connection in India, taxability of BPO units.

UNIT III: INCOME FROM BUSINESS & PROFESSION

Express allowances and disallowances, tax incentives on R & D expenses, Depreciation allowance, method of accounting. Income from Capital Gains –Concept of Capital Asset and Transfer, short term and long term capital assets, exemptions, Set off and carry forward of losses, Tax planning.

UNIT IV: DEDUCTIONS UNDER CHAPTER VIA

Incentives to infrastructure sector, hotels, etc. Taxation of companies – MAT, calculation of book profits, credit for MAT Assessment of Income including reassessment, appeals, rectification and revisions, ITAT. Tax Deduction at Source, International Taxation, Transfer Pricing, Double Taxation Avoidance Agreements.

UNIT V: TAX PLANNING

Meaning and Scope of Tax Planning and Location of Undertaking, Tax Planning regarding Dividends Policy, Inter Corporate Dividends and Transfers; Tax Considerations in Respect of Specific Managerial Decision like Make of & my, Own or Lease, Clone or Continue, Sale in Domestic Markets or Exports; Replacements aid Capital Budgeting Decisions, etc.; Tax Planning in respect of Managerial Remuneration.

UNIT VI: TAX MANAGEMENT

Filing of Returns and Assessments, Penalties and Prosecutions, Appeals and Revisions, Advance Tax, TDS, Advance Rulings, Avoidance of Double Taxation Agreements.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "Direct Taxes Law & Practice", Singhania, V.K. and Singhania, Kapil Taxmann Publications
2. "Direct Taxes Law & Practice", Bhagwati Prasad, Wishwa Prakashan

REFERENCE:

1. "Direct Taxes Ready Reckoner(with tax planning)", Ahuja, Girish K. and Gupta, Ravi, Bharat Law House Pvt.Ltd., Delhi.
2. "Practical Problems In Income Tax",Mehrotra, H.C., Sahitya Bhawan Publications.
3. "Handbook of Corporate Tax Planning", Srinivas E. A., Tata McGraw Hill, New Delhi.
4. "Income Tax Act- Pocket Edition", Taxmann Publications, New Delhi.

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II MBA - I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
BANKING AND INSURANCE							

COURSE OUTCOMES: The student is able to

CO1: Understand overview of Indian financial system and role of commercial banks
CO2: Classify different bank funds.
CO3: Know the regulations in banking system.
CO4: Adapt the new banking innovations.
CO5: Understand about insurance sector and its related trends.
CO6: Explain the concept of general insurance and its types.

SYLLABUS:

UNIT-I: INTRODUCTION TO BANKING

Introduction to Indian Financial System - Meaning of a Bank, Role of commercial banks in Economic Development - Evolution of Banking in India– origin, nationalization, Banking sector reforms, CAMEL Approach, Sources of Bank Funds.

UNIT –II USES OF BANK FUNDS

Features of Bank Credit - types of lending - assessment of credit worthiness of a prospective borrower - management of credit process - different types of loans and their features - Non Performing Assets: - Concept of NPAs, causes, implications & recovery of NPAs.

UNIT –III: REGULATION IN BANKING SYSTEM

Regulation of Bank Capital: The need to regulate Bank Capital - Concept of Economic Model - Concept of Regulatory Capital, Basel Accords I,II and III.

UNIT –IV: BANKING INNOVATIONS

Core Banking Solution - Retail Banking - Products & Services: Nature, Scope, Future and Strategies - Plastic Money - National Electronic Funds Transfer - ATM - Mobile Phone Banking - Net Banking- Customer service quality in Indian banking industry.

UNIT –V: INTRODUCTION TO INSURANCE

Insurance as a Risk Management Tool- Principles of Insurance - Characteristics of Insurance contract - Functions of Insurers - Types of Insurers- Concept of Reinsurance, uses and advantages - Marketing channels: Agents & brokers – professionalism, remuneration, responsibilities, classification, criteria for appointment and capital adequacy norms for broker - an overview of IRDA.

UNIT –VI: LIFE INSURANCE AND GENERAL INSURANCE

The concept of Life Insurance - Life Insurance Products- Classification of Life Insurance - Provisions of Life Insurance contracts - Special Life Insurance forms - Health and General insurance– Overview, Types, - Micro Insurance in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "Banking & Insurance",Vijayakumar P., Srinivasa Subbarao P., Himalaya Publication, New Delhi.
2. "Bank Management & Financial Services",Peter.S.Rose & Sylvia. C. Hudgins: Tata McGrawHill New Delhi, 2010,
3. "Risk Management & Insurance",James S. Trieschmann, Robert E. Hoyt & David. W. Sommer B:, Cengage Learning, New Delhi
4. "Banking & Insurance", Reddy K S and Rao R N: Paramount Publishing House 2013.

REFERENCES:

1. "Banks & Institutional Management", Vasant Desai: Himalaya Publishing House 2010.
2. "Banking and Insurance", R.K.Sharma, Shashi and Jagwant: , Kalyani Publishers, 16th edition.
3. "Fundamentals of Risk & Insurance", Emmett J. Vaughan & Therese M. Vaughan: Wiley, India Edition.
4. "Indian Insurance – A Profile", H. Narayanan: Jaico Publishing House, New Delhi.

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II MBA - I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
PERSONAL FINANCIAL PLANNING							

COURSE OUTCOMES: The student is able to

CO1: Understand financial planning process and analyse determinants of personal income.
CO2: Know the preparation and filing of tax returns.
CO3: Evaluate investment decisions in capital goods.
CO4: Analyse and evaluate various insurance policies.
CO5: Develop and apply effective investment strategies related to various financial securities.
CO6: Evaluate alternate investment options.

SYLLABUS:

UNIT-I: UNDERSTANDING THE FINANCIAL PLANNING PROCESS

The rewards of sound financial planning – planning for a life time- the planning environment – determinants of personal income-financial statements and plans –mapping the financial future-time value of money- preparing personal income statement and balance sheet-making cash budgets.

UNIT-II: MANAGING TAXES

Principals of income taxes- computation of salary, Rental income& Capital Gains, Other Income filing returns-tax planning-other forms of personal taxes-provisions Of Wealth Tax Act& Computations of Net Wealth & Wealth Tax.

UNIT-III: MAKING DECISIONS REGARDING PURCHASE OF AUTOMOBILES AND HOUSES

Deciding whether to lease or buy-finding an affordable house-the house buying process-housing finance. Managing credit- opening an overdraft account-using credit carefully-consumer loans.

UNIT-IV: MANAGING INSURANCE NEEDS

Basic insurance concepts-deciding on the amount of life insurance required-key features of life insurance policies-buying life insurance –types and sources of health insurance plans-principles of property insurance-automobile insurance- other types of insurance;

UNIT-V: MANAGING INVESTMENTS

Investments planning –securities markets- transacting in the securities markets- online advertising- mutual funds Financial Planner's Advice, Stock brokers Research and advice , portfolio management Services Sharpe's Ratio, Treynor's ratio, Jensen's measure, Information Ratio.

UNIT-VI: ALTERNATIVE INVESTMENT OPTIONS

Art, Gold, Antiques, commodities, real Estate, REITS, Real Estate Related Mutual Funds, Charity, Investments outside India. Retirement Planning- Estimating need at retirement – Social Security- pension plans and retirement plans –annuities, Reserve Mortgage.

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TEXT BOOKS:

1. Personal Financial Planning, ICFAI Publications
2. Personal Financial Planning, 11th e Gitman, Lawrence J/Joehnk, Michael D. South Western CollegePub2007.
3. Personal Financial Planning Guide, 5th e Ernst and Young's Wiley 2004.

REFERENCE:

1. Personal Financial Planning.7th e Hallman, G Victor/ Rosenbloom, Jerry S. McGraw Hill 2010.
2. Personal Investment and Tax Planning Year Book Yasasway,N J Vision Publication Edition 2010-11
3. Income Tax Law & Practice, 35th e Gaur,V.P / Narang, D.B Kalyani Publishers 2011

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HRM

II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
MANAGEMENT OF INDUSTRIAL RELATIONS							

COURSE OUTCOMES: The student is able to

CO1: Define and explain the basic concepts and importance of industrial relations management.
CO2: Understand the concept of Trade Unions
CO3: Appraise the collective bargaining power.
CO4: Evaluate the benefits of quality of work life.
CO5: Analyse the concepts of labour safety measures.
CO6: Understand the grievance management procedures followed by the industry.

SYLLABUS:

UNIT-I: INDUSTRIAL RELATIONS

Concept- evolution- present scenario in India-Factors-Approaches to IR- Labour market.

UNIT-II: TRADE UNIONS

Introduction- nature and objectives of TU's- Trade union act, 1926- problems- registration of union- employer association.

UNIT-III: COLLECTIVE BARGAINING

Nature, objectives- process of collective bargaining- changes in labour- management relations in post- liberalized India- Public sector bargaining in India. Bipartism, Tripartism bodies

UNIT-IV: QUALITY OF WORK LIFE

Workers' participation in Management-different levels of participation-quality circles-parameters of QWL- Nature of wages and types-Incentives and fringe benefits-Issues in wage determination in India.

UNIT-V: SOCIAL SECURITY

Nature, types of security- health and occupational safety measures in India- Employees state insurance act, workmen compensation act its implications.

UNIT-VI: EMPLOYEE GRIEVANCE

Causes of grievance- conciliation-Arbitration-and adjudication-process of settlement of employee grievance-Standing orders- code of conduct-Industrial dispute nature and scope of industrial disputes- prevention and settlement of industrial disputes in India, Id act.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Industrial Relations Oxford university : C.S Venkata Ratnam: press, New Delhi, 2011
2. Industrial Relations: Arun Monappa, TMH, New Delhi.2012

REFERENCES:

1. Dynamics of Industrial Relations : Mamoria, Himalaya publishing house, New Delhi, 2010
2. "Industrial Relations, Trade unions and Labor Legislation"Sinha:, pearson education, New Delhi, 2013.

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II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
EMPLOYEE ENGAGEMENT & RETENTION MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Know about fundamentals of Employee engagement practices.
CO2: Measuring and identify strategies of employee engagement.
CO3: Idea on employee turnover.
CO4: Understand retention and related concepts.
CO5: Develop retention management.
CO6: Develop practices to retain talent/skilled employee.

SYLLABUS:

UNIT-I: EMPLOYEE ENGAGEMENT

Definitions & origin. Employee Engagement drivers. Types & attributes of Employee Engagement. Employee Engagement activities. Managing employee satisfaction.

UNIT-II: MEASURING ENGAGEMENT & STRATEGIES OF EMPLOYEE ENGAGEMENT

Handling non-engaged employees. Employees Scheduling. Creating culture of Employee Engagement. Models of Employee Engagement & Trends in Global.

UNIT-III: EMPLOYEE TURNOVER

Meaning & Nature. Negative impact of turnover to the organization & individuals. Attrition rate, Turnover cost calculation, Attrition rate in different sector of India.

UNIT-IV: RETENTION

Definitions, Nature & Importance of employee retention. Retention as critical issue. Key elements of retention: compensation, growth, environment, relationship & support. Challenges of employee retention & retention success mantras.

UNIT-V: MANAGING RETENTION

Key drivers to attract & retain employee, Retention strategies, Mangers roles in Retention & Developing retention plan.

UNIT-VI: EMPLOYEE RETENTION

Motivation and engagement-Engaging talent through mentoring and coaching. Employee satisfaction. Determining strategies for coaching employees belonging to different generations and cultures.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Employee Engagement: Debashish Sengupta, s. Ramadoss, Biztantra, Dreamtech Press, 2011.

2. Talent Management Systems: Best Practices in technology solutions for Recruitment, Retention and work force planning Allan Schreyer,I st Edition

REFERENCES:

1. The Talent Management Handbook: Lance A Berger and Dorothy R. Berger, Tata McGraw Hill (2008). New York.

2. Managing Employee Retention: A Strategic Accountability Approach (Improving Human Performance): Jack J. Philips & Adele O. Connell, Elsevier ,2004

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II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
COMPENSATION AND REWARD MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand basic concepts, framework and theories of compensation.
CO2: Define a strategic plan for making compensation as a competitive advantage to the organization.
CO3: Contrast different types of incentive plans and determine which plan suit best to organization.
CO4: List the different types of employee benefits.
CO5: Design different methods of wage determination applicable to different cadres of employees.
CO6: Evaluate the mechanism of wage boards and its role in fixation of wage.

SYLLABUS:

UNIT I: INTRODUCTION TO COMPENSATION

Types of compensations, Conceptual Framework of Compensation Management, Theories of wages: Subsistence theory, Wage Fund Theory, Marginal Productivity theory, Bargaining theory, Criteria of wage fixation.

UNIT II: STRATEGIC COMPENSATION PLANNING

Strategic perspectives towards compensation – Developing a total compensation strategy, Source of competitive advantage: Three tests, designing pay levels, Mix and pay structures.

UNIT III: VARIABLE PAY

Strategic reasons for Incentive plans, Administering incentive plans, Individual incentive plans- Piecework, Standard hour plan, Bonuses, Merit Pay, Group incentive plans- Team compensation, Gain sharing incentive Plans, Enterprise incentive plans- Profit Sharing plans, Stock Options, ESOPs.

UNIT IV: MANAGING EMPLOYEE BENEFITS

Nature and types of benefits, Employee benefits programs- security benefits, retirement security benefits, health care benefits, time-off benefits, benefits administration, employee benefits required by law, discretionary major employee benefits, employee services- Designing a benefits package.

UNIT V: WAGE DETERMINATION

Principles of wage and salary administration, Methods of wage determination in India; Internal and External Equity in Compensation Systems, Wage Administration in India: Wage Policy in India.

UNIT VI: WAGE BOARDS AND THEIR COMPENSATION PRACTICES

Structure, Scope and functions, Compensation practices in different industries, Compensation practices of multinational and global organizations.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. Compensation Management in a Knowledge based world.: ichard I. Anderson. . Pearson Education. 10th edition
2. Compensation Management in a Knowledge based world: Richard I. Anderson. Pearson Education. 10th edition,.

REFERENCE BOOKS:

1. Compensation: Milkovich & Newman, TMH, 2008.
2. Compensation & Reward Management : BD Singh, Excel Books, 2008
3. Strategic Compensation, : Joseph J. Martocchio, , Pearson Education, 3rd Edition

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II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
PERFORMANCE MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the basics of performance management system.
CO2: Define performance system best fit to organization.
CO3: Plan and develop a mechanism to meet the performance expectations set by the organization.
CO4: Know how to track and monitor the performance and procedure for conducting periodic reviews.
CO5: Emphasize and Measuring and performance audit system for all types of jobs existed in different organization
CO6: Analyze performance appraisal system and determining the best system of appraisal for the needs of the organization.

SYLLABUS:

UNIT-I: INTRODUCTION

Definition, concerns and scope – Historical developments in performance Management – Performance Appraisal Vs. Performance Management - Performance Management Vs. Human Resource Management – Implications of Performance Management.

UNIT-II: PERFORMANCE THEATRE

Performance System – Performance Theatre - planning Managee performance and Development, Monitoring Managee performance & Mentoring Managee Development.

UNIT-III: PLANNING FOR MANAGEE'S PERFORMANCE AND DEVELOPMENT

Setting Objectives – Organizational and Individual Performance plans – Components of Managee Performance and development plan – Setting mutual expectations and performance criteria.

UNIT-IV: MONITORING AND MENTORING

Introduction – Supervision – Objectives and Principles of Monitoring – Monitoring Process – Periodic reviews – Problem solving – Engendering trust.

UNIT-V: ANNUAL STOCK TAKING

Stock Tacking Performance – Process of Judgement Vs. Process of analysis – Stock Taking discussions – Delivering efficient feedback – 360 degrees feedback – stock taking potential.

UNIT-VI: APPRAISING FOR RECOGNITION AND REWARD

Purpose of Appraising – Methods of Appraisal – Appraisal system design – Implementing the Appraisal system – Appraisals and HR decisions.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Performance Management: Prem Chadha: Macmillan India, New Delhi,2006.

REFERENCES:

1. Counselling and guidance:T.V.Rao: TMH.
2. Managing Employee Performance :Williams:, Thomson,2 006.

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MARKETING

II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
CUSTOMER RELATIONSHIP MANAGEMENT & CONSUMER BEHAVIOUR							

COURSE OUTCOMES: The student is able to

CO1: Define and understand the concepts of CRM, significance and strategies in business.
CO2: Know the customer profile and perception of customer behaviour in relationship perspectives.
CO3: Analyse strategies for customer acquisition, models of CRM.
CO4: Evaluate the consumer behaviour and business strategies.
CO5: Classify the various consumer behaviour models.
CO6: Identify the psychological process and develop the effective strategy in terms of impact on consumer behaviour.

SYLLABUS:

UNIT I: INTRODUCTION

Definitions - Concepts and Context of relationship Management – Evolution - Transactional Vs Relationship Approach – CRM as a strategic marketing tool – CRM significance to the stakeholders.

UNIT II: UNDERSTANDING CUSTOMERS

Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behavior in relationship perspectives; individual and group customer's - Customer life time value – Selection of Profitable customer segments.

UNIT III: CRM STRUCTURES

Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications.

UNIT –IV: INTRODUCTION TO CONSUMER BEHAVIOUR

Understanding consumers and market Segments. Evolution of consumer behaviour, consumer analysis and Business strategy.

UNIT-V CONSUMER BEHAVIOR MODELS

Models of Buyer Behaviour, Howard Model, Howard- Sheth Model, EKB Model, Webster and Wind Model and Sheth Industrial Buyer Behaviour Model. Social and Cultural Environment Economic, Demographic, Cross Cultural and Socio–Cultural Influences, Social Stratification, Reference Groups and Family, Personal influence.

UNIT –VI: PSYCHOLOGICAL FOUNDATIONS OF CONSUMER BEHAVIOR

Consumer Motivation, Perception, Personality and Behavior, Learning and Behavior Modification, Information Processing, Memory Organization and Function, Attitude Formation and Attitude Change.

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TEXT BOOKS:

1. Customer Relation Management, H.Peeru Mohamed and A.Sahadevan, Vikas Publishing 2005.
2. The Eight Competencies of Relatioship selling, Jim Catheart, Macmillan India, 2005.
3. Consumer Behavior, Assel, Cengage Learning, 6th Edition.

REFERENCES:

1. Consumer Behaviour, David L Loudon and Albert J Della Bitta, 4/e, TMH, New Delhi, 2002.
2. Consumer Behaviour, Schiffman, L.G and Kanuk L.L, 8/e, Pearson Education, New Delhi, 2003.
3. Consumer Behaviour, Roger D. Black Well et al, 9/e Cengage,New Delhi, 2012.

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II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
EVENT MARKETING							

COURSE OUTCOMES: The student is able to

CO1: Understand and analyse the SWOT analysis and principles of event management.
CO2: Formulate the event planning and develop team management.
CO3: Explain event marketing and its advertising.
CO4: Know the event leadership skills and develop communication strategies in event marketing.
CO5: Identify event safety and security measures
CO6: Apply the basic accounting principles in event management.

SYLLABUS:

UNIT-I: PRINCIPLES OF EVENT MANAGEMENT

Historical Perspective, Introduction to event Management, Size & type of event, Principles of event Management, concept & designing. Analysis of concept, Logistics of concept, Feasibility, Keys to success, SWOT Analysis.

UNIT-II: EVENT PLANNING & TEAM MANAGEMENT

Aim of event, Develop a mission, Establish Objectives Preparing event proposal, Use of planning tools, Protocols, Dress codes, staging, staffing, Leadership, Traits and characteristics

UNIT-III: EVENT MARKETING AND ADVERTISING

Nature of Marketing, Process of marketing Marketing mix, Sponsorship, Image, Branding, Advertising, Publicity and Public relations.

UNIT-IV: EVENT LEADERSHIP & COMMUNICATION

Leadership skills, Managing team, Group development, Managing meetings, Written communications, (Official, demi-official, Invoice). Verbal communications

UNIT-V: EVENT SAFETY AND SECURITY

Security, Occupational safety, Crowed management, Major risks and emergency planning, Incident reporting, emergency procedures

UNIT-VI: BASIC EVENT ACCOUNTING

Budget, break-even point, cash flow analysis, Profit & loss statement, balance sheet, panic payments, financial control system.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Event management, an integrated & practical approach By Razaq Raj, Paul Walters & Tahir Rashid.
2. Event management, a professional approach By Ashutosh Chaturvedi.
3. Event Management By Lynn Van Der Wagen & Brenda R Carlos.

REFERENCE:

1. Successful Event Management By Anton Shone & Bryn Parry.

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II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
RETAIL MARKETING							

COURSE OUTCOMES: The student is able to

CO1: Understand fundamentals of Retailing.
CO2: Know the general strategies of retailing.
CO3: Define location strategies of retailing.
CO4: Define and develop layout designs.
CO5: Analyse various pricing strategies and develop location strategies.
CO6: Design and develop franchising.

SYLLABUS:

UNIT-I: BASIC CONCEPT OF RETAILING

Retail development-types and functions of retailers-multi channel retailing-organized retailing in India-special characteristics of retailing-services retailing-legislation for retailing in India.

UNIT-II: RETAILING STRATEGY

Market strategy-retail format and target market-building sustainable competitive advantage-growth strategies-strategic retail planning process.

UNIT-III: RETAIL LOCATION

Types, location opportunities-selection of location and site analysis-financial strategy-strategic profit model-setting and measuring performance objectives.

UNIT-IV: STORE LAYOUT AND DESIGN

Store operations and inventory management-merchandise planning and control, buying merchandise- developing assortment plan.

UNIT-V: RETAIL PRICING STRATEGY

Category management, customer services-retail branding-internationalretailing-promotional strategies-advertising, sales promotion, store atmosphere.

UNIT-VI: CONCEPT OF FRANCHISING

Evolution of franchising-types-franchising in India-introduction to E- marketing-meaning and scope of E-marketing.

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TEXT BOOKS:

1. "Retail Management", Sheikh and Kaneez Fatima, Himalaya Publishing House, Mumbai, 2012
2. "The Art of Retailing", A.J. Lamba: Tata McGraw Hill Education Pvt. Ltd. New Delhi.2011
3. "Retail Marketing", Siva Kumar, A, Excel Books, New Delhi, 2007

REFERENCES:

1. "Retail management", Swapna Pradhan, Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2012
2. "Retail Management", Chetan Bajaj RajnishTuli, Nidhivarma Srivastava: Oxford University Press, New Delhi, 2012.

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II MBA – I SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
BRAND MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Know the importance of brand image in marketing.
CO2: Understand brand vision
CO3: Explain brand promotion methods in brand communication.
CO4: Define the concept of brand extension and analyse factors influencing brand extension decisions.
CO5: Design brand marketing programmes and Evaluate brand performance.
CO6: Identify emerging trends in brand management.

SYLLABUS:

UNIT –I: BASIC CONCEPTS OF BRANDS

Concepts and process- significance of brand-brand mark and trade mark-different types of brand family brand, individual brand, private brand-selecting a brand name- functions of a brand-branding decisions-influencing factors.

UNIT-II: BRAND VISION

Brand ambassadors-brand as a personality, as a trading asset, brand extension-brand positioning-brand image building.

UNIT-III: BRAND COMMUNICATIONS

Brand image Building – Brand Loyalty programmes – Brand Promotion Methods – Role of Brand ambassadors, celebrities – On line Brand Promotions.

UNIT-IV: BRAND EXTENSION

Brand Adoption Practices – Different type of brand extension – Factors influencing Decision for extension – Re-branding and re-launching.

UNIT-V: BRAND MANAGEMENT

Brand building and positioning-measuring brand performance-designing brand marketing programmes-evaluating brand performance-brand in retail business-role of own label.

UNIT-VI: EMERGING BRANDS IN MARKETING

Importance of trends in brand management-trends in brand – theories and practices in brand management.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Strategic Brand Management: Building, Measuring and Managing, Kevin Lane Keller, Prentice Hall, 3rd Edition, 2007.
2. Brand Management – I edition,Moorthi YLR, Vikas Publishing House 2012

REFERENCES:

1. Managing Indian Brands, Ramesh Kumar, Vikas Publication, India, 2002.
2. Brand Management Mahim Sagar, Deepali Singh, D.P.Agarwal, Achintya Gupta.– Ane Books Pvt.Ltd – (2009)

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I MBA-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
CORPORATE LAWS							

COURSE OBJECTIVES: The student is able to

CO1: Understand and analyze The Indian Contract Act.

CO2: Understand and analyze Sales of Goods Act and the machinery for redressal of consumer grievances.

CO3: Understand and analyze the rights and duties of agent and principal, Principal's liability for the acts of agent and the procedure for termination of agency.

CO4: Understand and analyze the rights and duties of partners, dissolution of partnership firm.

CO5: Understand and analyze the formation of company, amendments act in 2013.

CO6: Understand and analyze the kinds of Negotiable Instruments and Goods and Services Act.

SYLLABUS:

UNIT –I: THE INDIAN CONTRACT ACT, 1872

Nature of the Act - – Essentials of a Valid Contract – Classification of Contracts- Capacity – Free Consent –Legality of Object –Performance of a Contract – Discharge of a Contract – Remedies for Breach of a Contract

UNIT –II: SALES OF GOODS ACT, 1979

Distinction between Sales and Agreement to Sell –Conditions and Warranties – Performance of Contract of Sale – Rights of an Unpaid Seller.

Consumer Protection Act, 1986: Consumer Rights –Machinery for Redressal of Consumer Grievances. District Consumer Forum – State Level Commission – National Commission.

UNIT –III: CONTRACT OF AGENCY ACT

Kinds of Agents –Creation of Agency-Rights and Duties of Principal – Rights and Duties of Agent - Principal's Liability for the Acts of the Agent-Liability of Agent –Termination of Agency.

UNIT-IV: INDIAN PARTNERSHIP ACT, 1932

Meaning and Essentials of Partnership-Registration – Tests of Partnership- Rights and Duties of Partners –Dissolution of Partnership.

UNIT –V: COMPANIES ACT 1956

Nature and Types of Companies – Formation –Memorandum of Association-Articles of Association

–Kinds of Shares – Company Act as amended in 2013 - Duties of Directors-Winding up Procedure.

UNIT-VI: NEGOTIABLE INSTRUMENTS ACT, 1881

Kinds of a Negotiable Instruments and Endorsement- Presentation of a Negotiable Instrument - Discharge of a Negotiable Instrument – Goods and Services Act

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "Legal Aspects of Business" Ravindra Kumar:, Cengage Learning, New Delhi, 2011
2. "Business Legislation for Management", Kuchhal M C, Deepa Prakash: Vikas Publishing House, New Delhi, 2012

REFERENCES:

1. "Legal Aspects of Business", Pathak: Tata McGraw Hill, New Delhi, 2010
2. "A Manual of Business Laws", S.N.Maheshwari, S.K.Maheshwari: Himalaya Publishing House, 2013.
3. "Legal Aspects of Business", P.K.Padhi: PHI Learnings, New Delhi, 2013
4. "Business Law", S.S Gulshan: Excel Books, New Delhi, 2012.

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II MBA-II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
COST AND MANAGEMENT ACCOUNTING							

COURSE OUTCOMES: The student is able to

CO1: Understand cost concepts & Elements and how effective the cost information in planning and control.

CO2: Classify and apportion different types of overheads to various departments and preparation cost sheets and also estimate the machine and labour hour rate.

CO3: Apply different marginal costing concepts under various situations.

CO4: Analyse profitability margin of different regimes with the help of a limiting factor.

CO5: Determine and Estimate different types of budgets on need basis in monetary and quantitative bases.

CO6: Measure the variances between the expected costs and actual costs for better cost control.

SYLLABUS:

UNIT-I: INTRODUCTION TO MANAGEMENT ACCOUNTING

Management accounting vs Cost accounting vs. financial accounting, role of accounting information in planning and control, cost concepts and managerial use of classification of costs.

UNIT-II: COST ANALYSIS AND CONTROL

Direct and Indirect expenses, allocation and apportionment of overheads, calculation of machine hour rate and labour hour rate, Preparation of cost sheet.

UNIT-III: MARGINAL COSTING

Introduction, Application of Marginal costing in terms of cost control- Income determinants under marginal cost- Absorption Cost Vs Marginal Cost. Key or Limiting Factor.

UNIT-IV: BREAK-EVEN-ANALYSIS

Concept of cost-volume-profit analysis- desired level of Profits Determination of Break even point, Break-even-graph and assumptions of BEP, importance, Application of BEP for various business problems.

UNIT-V: BUDGETARY CONTROL

Budget, budgetary control, steps in budgetary control, Fixed vs Flexible budgets, different types of budgets: sales budget, cash budget, production budget, master budget, Zero based budgeting – simple problems.

UNIT-VI: STANDARD COSTING

Standard Cost and Standard Costing, standard costing vs. estimated cost, analysis of variance, material variance and labour variances – simple problems.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. Cost and Management Accounting, M.N.Arora: Vikas Publication, New Delhi, 2009.
2. Cost and Management Accouning, S.P.Jain, K.L.Narang: Kalyani Publications, New Delhi, 2009.
3. Cost and Management Accounting, M.P.Pandi Kumar: Excel Books, New Delhi,2008

REFERENCES:

1. Management and Cost Accounting, Colling Drury; Cengage learning, Hyderabad, 2009.
2. Management Accounting,Khan and Jain: Tata MCGraw-Hill Publishing Co. New. Delhi, 2010
3. Cost Accounting, Bhabatosh Banerjee: PHI Learning Private Ltd., New Delhi, 2009.

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II MBA-II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
ENTREPRENEURSHIP DEVELOPMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the concepts, role and importance of entrepreneurship.
CO2: Outline women entrepreneurship and qualities.
CO3: Define entrepreneurship development programs in India and contents for training for entrepreneurial competencies.
CO4: Create appropriate business models and develop well-presented business plan that is feasible for the student.
CO5: Understand the concept of small and micro enterprises.
CO6: Create awareness about the institutional support to small and medium enterprises.

SYLLABUS:

UNIT –I: ENTREPRENEURSHIP

Importance and growth - Characteristics and Qualities of Entrepreneur- Role of Entrepreneurship, Ethics and Social Responsibilities. Women Entrepreneurship: Role & Importance, Problems. Mobility of entrepreneur.

UNIT-II: WOMEN ENTREPRENEURS

Characteristics and Qualities - Role of Women Entrepreneurship in India & Importance, Problems corporate entrepreneurship — entrepreneurial motivation.

UNIT –III: TRAINING

Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit - Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning and Development of Programmes E- business Ventures; New Venture Management – Emerging Trends.

UNIT –IV: PLANNING AND EVALUATION OF PROJECTS

Growth of Firm – Project identification and selection - Factors inducing growth- - Project Feasibility Study – Post Planning of Project-Project Planning and Control.

UNIT –V: SMALL AND MICRO ENTERPRISES

Importance, definitions – policies and their support to MSMEs - growth and growth strategies – sickness in small business and remedies – small entrepreneurs in international business.

UNIT –VI: INSTITUTIONAL SUPPORT TO ENTREPRENEUR AND MSMES

Role of Government - Role of IDBI, NIESBUD, SISI, DIC - Financial Institutions-Commercial Banks, Entrepreneurial Development Institutes, Universities and other Educational Institutions offering Entrepreneurial Development Programme.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "Entrepreneurship", Arya Kumar: Pearson, Publishing House, New Delhi, 2012.
2. "Entrepreneurship', VSP Rao, Kuratko: Cengage Learning, New Delhi,2012
3. "Entrepreneurship Development", K.Ramachandran: TMH, New Delhi, 2012

REFERENCES:

1. "Entrepreneurship Development"B.Janakiram, M Rizwana: Excel Books, New Delhi, 2011
2. "Entrepreneurship Development", P.C.Shejwalkar: Everest Publishing House, New Delhi, 2011

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II MBA-II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
BUSINESS ETHICS AND VALUES							

COURSE OUTCOMES: The student is able to

CO1: Understand fundamentals of Values and ethics.
CO2: Apply various ethical theories
CO3: Analyse manager's responsibilities in business ethics.
CO4: Understand clearly about ethical marketing
CO5: Distinguish ethical concepts of finance, and HRM.
CO6: Evaluate the global issues with respect to business ethics.

SYLLABUS:

UNIT –I: VALUES AND ETHICS

Business Ethics, Personal Ethics vs. Business Ethics , Work Ethics; Integrity- Service Learning- Civic Virtue - Respect for Others- Living Peacefully-Honesty- Courage- Value time- Co- Operation- Commitment- Empathy-Self –confidence.

UNIT-II: THEORIES OF BUSINESS ETHICS

Business Ethics and Law - Management and Ethics- Indian Ethical Traditions. Various studies on Ethical Attitudes of Managers -Major Indian Scams.

UNIT –III: MANAGER'S RESPONSIBILITY

Collegiality- Techniques for Achieving Collegiality- Two Senses of Loyalty- Misguided Loyalty- Professionalism and Loyalty- Professional Rights- Professional Responsibilities- Bribes/Gifts-Occupational crimes.

UNIT-IV: ETHICS IN MARKETING

Product safety and Pricing-Ethical responsibility in Product- Advertising and Target Marketing Ethics of sales, advertising and product placement and Consumer Autonomy.

UNIT–V: ETHICS IN HRM & FINANCE

Worker rights and duties -Institutional Culture –Privacy, Safety, Whistle-blowing, Fair hiring practices, Affirmative Action and Comparable Worth, Diversity in the workplace, Frauds in Banks - Measures against Bank Frauds – Frauds in Insurance sector, Reasons for Unethical Practices among Indian companies.

UNIT-VI: GLOBAL ISSUES

Globalization- Impact of Globalization on Indian business ethics. Cross Culture- Environmental Ethics-Computer Ethics-Ethics and research- Analysing Ethical problems in Research.

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TEXT BOOKS:

1. "Professional Ethics and Morals", Prof.A.R.Aryasri, Dharanikota Suyodhana: Maruthi Publication.2009
2. "Ethics in Business and Corporate Governance", S.K.Mandal: TMH, New Delhi. 2012.

REFERENCES:

1. "Business Ethics and Value Systems", H.C.Mruthyunjaya, PHI Learning, New Delhi, 2013.
2. "Values and Ethics in Profession"Sisir Mazumder: Everest Publishing House, New Delhi, 2013.

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FINANCE

II MBA-II-SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
FINANCIAL RISK MANAGEMENT & DERIVATIVES							

COURSE OUTCOMES: The student is able to

CO1: Understand the concept of risk management and various types of risk.
CO2: Measure different type's risks by applying various tools and techniques.
CO3: Appraise the role and importance of derivatives and players in the derivatives market.
CO4: Understand the forward and future contracts and its pricing.
CO5: Develop swap strategies in order to minimise the risk.
CO6: Build the option strategies in order to minimise the risk.

SYLLABUS:

UNIT –I: INTRODUCTION TO RISK MANAGEMENT

Concept, nature and scope of risk. Risk Management Process: risk identification, risk measurement & evaluation, risk control, risk finance. Types of risk: interest rate risk, credit risk, market risk and capital market risk. An integrated approach to corporate risk management and methods. Comprehensive view of Risk in Financial Institutions. Risk reporting process–internal and external.

UNIT-II: MEASUREMENT AND MANAGEMENT OF RISK

Value at risk (VaR), Cash flow at risk (CaR): VaR and CaR to make investment decisions. Non- Insurance methods of Risk management vs. Risk avoidance, Loss Control, Risk retention and Risk transfer. Asset-Liability Management (ALM).

UNIT-III: TECHNIQUES AND TOOLS OF RISK MANAGEMENT

The concept and importance of Derivatives and types of Derivatives. The role of Derivative securities to manage risk and to exploit opportunities to enhance returns. Players in the stock/ derivative market: Individuals, speculators, hedgers, arbitrageurs and other participants in Derivatives Market.

UNIT-IV: FORWARD CONTRACTS

Definition, features and pay-off profile of Forward contract, Valuation of forward contracts. Forward Contracts to manage Commodity price risk, Interest rate risk and exchange rate risk-limitations of Forward contract. Futures contracts: Definition of future contracts. clearing house, margin requirements, marking to the market. Valuation of futures contracts. Risk management with Futures contracts.

UNIT-V: TECHNIQUES AND TOOLS OF RISK MANAGEMENT

SWAPS; Definition and features. Types of swaps:. Interest rate swaps, Currency swaps, equity swap, credit default swap & commodity swap. Valuation & Pricing of interest rate Swaps. Currency Swaps: Types of Currency Swaps. Valuation & Pricing of currency swaps.

UNIT –VI: TECHNIQUES AND TOOLS OF RISK MANAGEMENT

Options; Definition of an option. Types of options: call option, put option, style of option: American option and European option. Options in the money, at the money and out of the money. Pay-off option positions, Pricing of call and put options at expiration and before expiration. The Binominal option pricing model (BOPM): assumptions - single and two period models

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Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Financial Risk Management, Vijayakumar P., Naidu.BVR, Venkateswarlu.Ch. Himalaya Publication, New Edition, 1st Edition, 2015.
2. Fundamentals of Financial Derivatives, Prafulla Kumar Swain., Himalaya Publishing House, 1st Edition, 2012.
3. Derivatives and Risk Management, Dhanesh Kumar Khatri , MacMillon,2nd Edition, 2012

REFERENCES:

1. Options, Futures and Other Derivatives ,John C. Hull & Sankarshan Basu, 7th Edition, Pearson Education.
2. Bank Management & Financial Services : Peter S. Rose & Sylvia C. Hudgins, , 7th Edition, Tata McGraw-Hill.
3. Derivatives Valuation and Risk Management, Rajiv Srivastava , Oxford University Press.2nd Edition, 2012.
4. Financial Risk Management, Dun and Bradstreet TMH, Delhi, 2nd Edition, 2011.

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II MBA-II-SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
FINANCIAL INSTITUTIONS AND SERVICES							

COURSE OUTCOMES: The student is able to

CO1: Understand overview of financial system.
CO2: Define about various financial institutions.
CO3: Know the commercial banks and its roles.
CO4: Appraise the activities of various non-banking financial institutions.
CO5: Know about insurance industry & its regulations.
CO6: Classify different financial services.

SYLLABUS:

UNIT –I: THE BASIC THEORETICAL FRAMEWORK

The financial system and its technology; The factors affecting the stability of the financial system; Development finance vs. universal banking; Financial intermediaries and Financial Innovation; RBI-Central Banking.

UNIT –II: THE FINANCIAL INSTITUTIONS

A brief historical perspective. An update on the performance of IDBI, ICICI, IFCI and SFCs, LIC & GIC.

UNIT –III: THE BANKING INSTITUTIONS

Commercial banks – the public and the private sectors – structure and comparative performance. The problems of competition; interest rates, spreads, and NPAs. Bank capital – adequacy norms and capital market support.

UNIT –IV: THE NON-BANKING FINANCIAL INSTITUTIONS

Evolution, control by RBI and SEBI. A perspective on future role. Unit Trust of India and Mutual Funds. Reserve bank of India Framework for/Regulation of Bank Credit. Commercial paper: Features and advantages, Framework of Indian CP Market, effective cost/interest yield.

UNIT –V: INSURANCE

The Economics of Insurance; Life Insurance; Reinsurance; The Insurance Industry and its regulation. Efficiency and the Structure of the Insurance Industry; Pension funds; Pension plans today.

UNIT –VI: FINANCIAL SERVICES

Asset/fund based Financial services – lease finance, consumer credit and hire purchase finance, factoring definition, functions, advantages, evaluation and forfeiting, bills discounting, housing finance, venture capital financing. Fee-based / Advisory services: Stock broking, credit rating.

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TEXT BOOKS:

1. Financial Services,R.Shanmugham: Wiley India, New Delhi, 2010
2. Financial Services, M.Y.Khan, Tata McGraw-Hill, New Delhi, 2004.
3. Marketing of Services, Harsh V.Verma, Global Business Press, 2002

REFERENCES:

1. Financial Institutions and Markets,Bhole : TMH, New Delhi, 2009
2. Financial Institutions and Markets,Meir Kohn: Oxford University Press, New Delhi,2009.

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II MBA – II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	Credits
	3	1	0	40	60	100	3
INTERNATIONAL FINANCIAL MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Understand the functioning of international financial system and monetary system.
CO2: Identify the international financial markets and analyse the various international financial instruments.
CO3: Define and explain the foreign exchange market.
CO4: Identify and evaluate foreign direct investments.
CO5: Develop strategies to deal with types of risks associated with MNC's.
CO6: Develop strategies to deal with international tax environment.

SYLLABUS:

UNIT –I: INTRODUCTION TO INTERNATIONAL FINANCIAL MANAGEMENT

Nature and scope and importance of international financial management, International Financial System, functions and components, international monetary system: Evolution of international monetary system: gold standard, interwar period, Bretton woods system, fixed vs floating exchange rate system, currency board, monetary union.

UNIT –II: INTERNATIONAL FINANCIAL MARKETS

Eurocurrency market, international bond market, international equity market, international money market; global financial institutions–IMF, Bank for International Settlements; international banking- euro bank. International financial instruments–euro CP, Eurobonds, foreign bonds, global bonds, euro equity, ADR, GDRs.

UNIT –III: FOREIGN EXCHANGE MARKET

Participants in foreign exchange market, structure of foreign exchange market in India; quotes in spot market and forward market, triangular arbitrage; nominal effective exchange rate (NEER), real effective exchange rate (REER); Foreign Exchange Management Act ; BOP, BOP trends in India; current account deficit, capital account convertibility, Tara pore Committee Report; Parity Conditions- Purchasing Power Parity, Interest Rate Parity, International Fisher Effect, International debt crises and currency crises-Asian currency crisis, Greek debt crisis.

UNIT-IV: MULTINATIONAL CORPORATE DECISIONS IN GLOBAL MARKETS

Foreign direct investment (FDI) and motives, FDI theories-theory of comparative advantage, OLI paradigm of FDI in India, modes of foreign investment– licensing, management contracts, joint venture, Greenfield investment, acquisition, strategic alliance, international capital budgeting , evaluation of overseas investment proposal using APV; international cash management, multinational capital structure decision, cost of capital.

UNIT-V: RISK MANAGEMENT IN MULTINATIONAL CORPORATIONS

Types of risk-currency risk, transaction exposure, translation exposure, accounting standard for translation exposure in India, economic exposure and assessment; interest rate risk, country risk assessment–political risk, financial risk; risk management through hedging-natural hedges, hedges with currency derivatives–forward market hedge, options market hedge, money market hedge, hedging recurrent exposure through swaps, hedging contingent exposure through invoice currency.

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UNIT –VI: INTERNATIONAL TAX ENVIRONMENT

Types of tax–income tax, withholding tax, value added tax, Tobin tax; taxation methods–worldwide approach, territorial approach; tax havens, offshore financial centers, re invoicing centre; Tax treaties- Double taxation Avoidance agreement, multilateral tax treaties; foreign tax credit, tax neutrality tax equity, taxes and the location of foreign operations, tax implications of dividend remittance by overseas affiliate, taxes and organizational form–controlled foreign corporation; Taxation of foreign source income in India; Transfer pricing (TP) and tax planning–TP methods, TP rules in India

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. International Financial Management, Eun C.S., Resnick B.G: Tata McGraw Hill Education Pvt. New Delhi 2010.
2. International Financial Management, Ephraim Clark: Cengage Learning. 2010.
3. International Financial Management, Sharan V., PHI Learnings, New Delhi, 2012.

REFERENCES:

1. International Financial Management, V.A.Avadhani: Himalaya Publication, 2013.
2. International Financial Mangement, P.K.Jain, Surendra S Yadav, Peyrard: MacMillon, 2013.
3. International Financial Management, Madhu Vij: Excel Books, New Delhi, 2011.

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II MBA – II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
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STRATEGIC INVESTMENT AND FINANCING DECISION							

COURSE OUTCOMES: The student is able to

CO1: understand the concept of investment decisions & its process.
CO2: Know how to take investment decisions under different situations.
CO3: Understand the different types of investment & decisions.
CO4: Analyse different investment decisions.
CO5: Understand the motives for financial implications like mergers & acquisitions and lease financing.
CO6: Understand different types of international capital structure.

SYLLABUS:

UNIT-I: INVESTMENT DECISIONS

Introduction, features, investment decision process, selection of profitable projects. Evaluation of investment opportunities, basic issues, replacement decisions, traditional methods of appraisal and discounted cash flow techniques, equivalence of NPV and IRR, The case of intangible benefits and costs. Profitability Index and Excess present value Index.

UNIT-II: INVESTMENT DECISIONS UNDER CONDITIONS OF RISK AND UNCERTAINTY

Concepts of risk and uncertainty. Risk Analysis in Investment Decisions. Risk adjusted rate of return, certainty equivalents, probability distribution of cash flows, decision trees, sensitivity analysis and Monte Carlo Approach to Simulation. Investment Decisions under capital constraints: Capital Rationing Vs. Portfolio. Portfolio Risk and diversified projects.

UNIT-III: TYPES OF INVESTMENTS AND DISINVESTMENTS

Project abandonment decisions, Evidence of IRR. Multiple IRR, Modified IRR, Techroin, Robicheck and Mordalbasso(TRM) solution in dealing with Pure, simple and mixed investments.

UNIT-IV: CRITICAL ANALYSIS OF APPRAISAL TECHNIQUES

Discounted pay back, post pay back, surplus life and surplus pay back, Bail-out pay back, Return on Investment, Equivalent Annual Cost, Terminal Value, single period constraints, multi-period capital constraint and an unresolved problem, NPV mean variance analysis,

UNIT-V: STRATEGIC ANALYSIS OF SELECTED INVESTMENT DECISIONS

Lease Financing, Leasing Vs. Operating Risk, borrowing vs. procuring. Hire purchase and Instalment decisions. Lease Risk Management, Leasing as a Financing Decision, Advantages of Leasing, and Leasing Decision in practice.

UNIT-VI: FINANCING DECISIONS

International Capital Structure: Modigliani Miller Model: Hamada Model of Market Risk: The Miller Model: The Trade-Off Models and Agency Costs: Capital Structure Theory –the Signaling Model. Financial Distress: Consequences, Issues, bankruptcy, settlements, reorganization and Liquidation in Bankruptcy.

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TEXT BOOKS:

1. Strategic Financial Management, R.P. Rustagi, Sultan Chand & Sons, 1st Edition, 2007.
2. Strategic Financial Management, Ravi M Kishore ,Taxman, 2nd Edition, 2012.
3. Planning, Analysis, Financing Implementation and Review, Prasannad Chandra, TMH, 6th Edition, 2012.

REFRENCES:

1. Financial Management, I.M. Pandey, Vikas, 6th Edition, 2012.
2. Financial Management Text and Cases, Brigham & Ehrhardt, Cengage, 2nd Edition, 2012.
3. Financial Management: Text, Problems & Cases, MY Khan and PK Jain, TMH, 5th Edition, 2012.

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	3	1	0	40	60	100	3
LEADERSHIP MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Identifies the leadership qualities to run an organization successfully.
CO2: Understand various behavioural concepts.
CO3: Explain the organisational structures in decision making.
CO4: Analyse the interpersonal behaviour and barriers of communication in leadership styles.
CO5: Understand the group conflicts in business.
CO6: Develop team building resources and know a profile of inspirational leadership in business.

SYLLABUS:

UNIT –I: ORGANISATION

Management – Leadership Traits – Skills and styles of a leader – Meaning and Significance- Qualities of a good leader - Trait Theory- Blake and Mountan Theory – Other functions of Management.

UNIT –II: BEHAVIOURAL CONCEPTS

Individual Behaviour – Perception – Learning – Attitude Formation and Change – Motivation Theories – Personality Development.

UNIT – III: DECISION MAKING

Leadership for sustainability – Power – Influence Impact – Leadership Practices - Organisational Structures – Organisational Culture – Leadership In Business Organisations.

UNIT – IV: INTERPERSONAL BEHAVIOUR

Communication Process – Contents of Communicaion - Barriers of Communication Leadership Styles – Influencing Relations- Transactional Analysis.

UNIT – V: GROUP DYNAMICS

Roles – Morale – Conflicts – Groups – Inter Group Behaviour – Inter Group Collaboration and Conflict Management.

UNIT – VI: TEAM BUILDING AND MANAGEMENT

Developing Team Resources – Designing Team – Participation and repercussion – Team Building Activities- Profiles of a few Inspirational Leaders in Business – Jemshedji Tata- NR Narayana Murthy – LN Mittal – Aditya Birla – Karson Bhai Patel – Indra Noui- Chanda Kochar.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. "The many facets of leadership" Goldsmith, Pearson-2004.
2. "Effective Leadership" , Lussier, Thomson Publication, 2007.
3. "A dairy on Leadership", Neil Thomas, Pearson, 2004.

REFERENCES:

1. "Leadership for Innovation" John Adair, Kogan Page Private Ltd.
2. "A Handbook of Management and Leadership, Michael Armstrong, Kogan Page Ltd.
3. "Leadership Development:, Rescuay C Rayon, Elsvier Publishers.

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HUMAN RESOURCE DEVELOPMENT

COURSE OUTCOMES: The student is able to

CO1: Interpret fundamental concepts of HRM and HRD.
CO2: Understand perspectives of HRD.
CO3: Understand and develop sub-systems of HRD.
CO4: Apply training and development practices.
CO5: Define and development of human capacity.
CO6: Evaluate recent trends of HRD.

SYLLABUS:

UNIT–I: BASICS OF HRD

Definition, Concept, Evolution of HRD, Objectives, Functions of HRD Professionals, Challenges,

UNIT–II: DEVELOPMENTAL PERSPECTIVE OF HRD

Outcomes of HRD, and Importance of HRD.HRD System Design Principles. HRD interventions; HRD trends and practices in various sectors in India

UNIT–III: SUBSYSTEMS OF HRD

HRP, Process of HRP, Potential Appraisal, Assessment Center,HR Accounting, Organizational Culture and Climate,HR Audit and Bench Marking.

UNIT–IV: TRAINING AND DEVELOPMENT

Meaning and Scope of Training, Training Need Analysis, Developing Training modules. Types of Training: Outbound, Attitudinal. Competency based Training, Training evaluation. Training effectiveness,

UNIT -V: DEVELOPMENT OF HUMAN CAPACITY

Aptitude, Knowledge, Values, Skills of Human Relations, Responsiveness, Loyalty and Commitment, transparency.

UNIT- VI: RECENT TRENDS

Training for trainees and HRD professionals, Promoting Research in HRD, Impacts of developing in the other fields such as Psychology.., career planning & Succession Planning. Learning, importance of experimental learning.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Human Resource Planning: Bhattacharya D.K, Excel Books, 2006.
2. HRD in Indian Entrepreneurs: Dwivedi.R.S, Galgotia Publications, 2005.

REFERENCE:

1. Human Resource Development: Randy L Desimore, Jon M Werner & Harris, Cenage Learning India Pvt.Ltd.,Delhi, 2006.
2. Human Resource Development: Srividhya S & Balakrishnan L.Dr, Himalaya Publishing House, 2007.
3. Human Resource Development: Tripathi P.C., Sultan Chand, 1999.

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INDUSTRIAL JURISPRUDENCE AND LABOUR LEGISLATIONS

COURSE OUTCOMES: The student is able to

CO1: Define the basic concepts and importance of employee legislations in India.
CO2: Understand the concept of industrial disputes Act
CO3: Explain the importance of payment of bonus Act.
CO4: Evaluate the benefits provided by the payment of Gratuity Act to the employees.
CO5: Analyse the legal formalities under minimum wages Act.
CO6: Understand the various provisions of the Factories Act.

SYLLABUS:

UNIT-I: INTRODUCTION

Employee Legislation-Historical Dimensions of Labour and Employee legislation in India – Industrial Relations in India - Determinants of Industrial relations.

UNIT-II: THE INDUSTRIAL DISPUTES ACT, 1947

Provisions of Act - Strikes and Lockouts – Lay-Offs and Retrenchment –Compensation to workmen – Unfair Labour Practices –Penalty for Strikes and Lockouts –Penalty for Instigation – Penalty for breach of settlement.

UNIT – III: PAYMENT OF BONUS ACT, 1965

Concept of Bonus – Constitutional validity of the act and provisions – Eligibility for bonus – Payment of minimum and maximum bonus- Calculation of bonus with respect to certain employees- Reference of the disputes under the act.

UNIT – IV: PAYMENT OF GRATUITY ACT, 1972

Historical background of the Act –Provisions of the Act – Condition for Gratuity- Quantum of Gratuity- Forfeiture of Gratuity- Compulsory Insurance – Determination of the amount of Gratuity- Exemption of employer from liability in certain cases- Cognizance of offences.

UNIT – V: THE MINIMUM WAGES ACT, 1948

Concept of wages- Procedure for fixing and revising minimum wages- payment of minimum rates of wages- Fixing hours for a normal working day- penalties for certain offences- Exemption of employer in certain cases-cognizance of offences.

UNIT-VI: THE FACTORIES ACT, 1948

Objects of the Act- Approval , licencing and registration of factories- The Inspecting Staff- Health Measures- Safety Measures- Provisions relating to hazardous process- Welfare conditions- Annual leave with wages- penalties and procedure.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Labour and Industrial Laws, P.K.Padhi, PHI, 2007

REFERENCE:

1. Industrial Relations, Trade Unions and Labour Legislation, Sinha: Pearson,2007
2. Liberalisation and Restructing in India, C.S.Venkataratnam: Response Books, 2003

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INTERNATIONAL HUMAN RESOURCE MANAGEMENT

COURSE OBJECTIVES: The student is able to

CO1: Find the challenges of global HRM & strategic role of Global HRM.
CO2: Adapt different methods of selection and process of Expatriate and Repatriate.
CO3: Compare the cross-cultural management problems, skill building methods, cross cultural communication and cross culture teams.
CO4: Make use of factors affecting on compensation and method of compensation.
CO5: Measure the Global HRD climate and frame strategies to overcome challenges.
CO6: Compare the international standards, problems and solutions of MNCs and international contract laws related to International Human Resource Management.

SYLLABUS:

UNIT –I: INTERNATIONAL HRM

Introduction, The differences between domestic and international human resources. A Global HR Perspective in New Economy – Challenges of Globalization – Implications of Managing People and Leveraging Human Resource – Conflicts – Strategic role of International HRM.

UNIT –II: MANAGING INTERNATIONAL ASSIGNMENTS

Significance – Selection methods – Expatriate – Repatriate – Process of expatriation and repatriation, Approaches to training, integrating business strategy with international training and development.

UNIT –III: CROSS CULTURE MANAGEMENT

Importance – Concepts and issues – Theories considerations – Problems – Skill building methods – Cross Culture Communication and Negotiation – Cross Culture Teams.

UNIT –IV: COMPENSATION MANAGEMENT

Importance - Concepts – Trends - issues – Methods – Factors affecting on Compensation – Models – Incentive methods – global compensation implications on Indian systems – Performance Management. Benefits, The adjustments and incentives

UNIT –V: GLOBALIZATION STRATEGIC ADVANTAGES THOROUGH HRD

Measures for creating global HRD Climate – Strategic Frame Work of HRD and Challenges – Globalization and Quality of Working Life and Productivity – Challenges in Creation of New Jobs through Globalization – HR INternentions in Y2K - New Corporate Culture.

UNIT –VI: GLOBAL LABOUR RELATIONS

Key issues, international standards, problems and solutions of MNC's, International contract Laws related to HR.

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TEXT BOOKS:

1. "International Human Resource Management": Peter Dowling:, Cengage Learning, 2012.
2. "International Human Resource Management"Subbarao P:, Himalaya Publishing House, Hyderabad, 2011.
3. "International Human Resource Management" NilanjanSen Guptha:, Excel Books, New Delhi.

REFERENCES:

1. "International Human Resource Management"Tony Edwards:, Person Education, New Delhi, 2012.
2. "International Human Resource Management",Aswathappa K, Sadhana Dash: TMH, New Delhi.
3. "Managing a Global Work Force"Chrles M Vance:, PHI Learning, New Delhi, 2009.
4. "International Human Resource Management"Monir H Tayeb:, Oxford University Press, Hyderabad, 2012.

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RURAL MARKETING

COURSE OUTCOMES: The student is able to

CO1: Know the knowledge about rural marketing and understand the problems in rural marketing.
CO2: Analyse the lifestyle, personality and rural marketing strategies.
CO3: Summarize brand building strategies in rural India.
CO4: Categorize the various channels of distribution in rural marketing.
CO5: Understand the marketing communication in rural marketing.
CO6: Evaluate the recent trends in rural marketing.

SYLLABUS:

UNIT-I: INTRODUCTION

Definition, scope of rural marketing, concepts, and components of rural markets-classification of rural markets. Rural marketing environment: Socio Economic Profile of Rural customer, rural retail outlets, problems in rural marketing, rural demand, rural market index.

UNIT-II: RURAL CONSUMER BEHAVIOUR

Factors affecting Consumer Behaviour, Characteristics of Rural consumer-Lifestyle, Personality and Brand Belief, Information Search and pre purchase Evaluation, Consumer Buying Process, Opinion Leadership, Diffusion of Innovation, Rural Marketing Strategies.

UNIT-III: PRODUCT STRATEGY

Introduction, Product concepts classification, Rural Product Categories-Agriculture Goods and Services, New Product Development Consumer Adoption Process, Product life cycle, Product Mix, Marketing Mix Challenges, Brand building in Rural India, Brand Loyalty Vs Stickiness -Fake Brands- the Fakes Market, Strategy to counter fakes.

UNIT-IV: CHANNELS OF DISTRIBUTION

Distribution pattern and methods in rural markets - Special characteristics of rural channels - Channel management in rural markets - Storage, warehousing and transportation in rural markets.

UNIT-V: MARKETING COMMUNICATION IN RURAL MARKETS

Advertising and sales promotion for rural markets - Major challenges in Media planning - Sales force management in rural markets - Selecting the Media Mix.

UNIT-VI: RECENT TRENDS IN RURAL MARKETING

Challenges for rural marketing:4 A's, Consumer finance, Rural vertical, Retail & IT Models,E-Rural Marketing, Public Private partnerships.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. Rural Marketing, T.P. Gopal Swamy, Vikas Publishing House,2/e ,1997.
2. Rural Marketing, Balaram Dogra & Karminder Ghuman, TMH,1/e, 2008.

REFERENCES:

1. Rural Marketing, Sanal Kumar Velayudhan,2/e, Response, SAGE Publication ,2007.
2. Rural Marketing: Indian Perspective By Awadhesh Kumar Singh, New Age International Limited.2007.

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II MBA – II SEM	L	T	P	INTERNAL	EXTERNAL	TOTAL	Credits
	3	1	0	40	60	100	3
PRODUCT MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Know the basic concept of product and product management
CO2: Understanding the product planning process and develop marketing strategies for various stages in product life cycle
CO3: Analyze categories of new product and discuss the concept of new product development and management
CO4: Estimate market potential and sales and evaluate methods of market potential and sales potential
CO5: Identify need for market testing and develop strategies for channel management, brand repositioning and CRM
CO6: Analyze the advantages of packing and design strategies for effective packing.

SYLLABUS:

UNIT-I: INTRODUCTION TO PRODUCT MANAGEMENT

Introduction – Define Product & Product Management - Concept of Product, Service, Ideas, Business to Business Products – New Product Management – Careers in Product Management.

UNIT-II: PRODUCT PLANNING

Definition of Product Planning and Product Planning Process - Defining Market strategies for leaders, challengers, Followers. Product life Cycle and market evaluation – product differentiation and deletions. Product Portfolio Analysis.

UNIT –III: NEW PRODUCT DEVELOPMENT

Categories of New Product – New product Development - New Product Launch – product modification – pricing decision – customer and competitor analysis – product forecasting and financial analysis.

UNIT –IV: MARKET POTENTIAL & SALES FORECASTING

Forecasting target market potential and sales, Methods of estimating market and sales potential, Sales forecasting, planning for involvement in international market.

UNIT –V: MARKETING ORGANISATION

Market Testing – Launch Management – Marketing Metrics – Public policy Issues – Product liability- Environmental needs – Sale methods- Brand Repositioning - Channel Management – Customer Relationship Management

UNIT –VI: PACKAGING

Introduction – Advantages and Importance of Packaging - Packaging design – Consumer protection. Product Piracy, Worthy Products - Personal ethics and Residual Issues - Packaging trends in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

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TEXT BOOKS:

1. Product Management-Text, Applications and Cases : K.S.Chandrasekar:, Himalaya Publishing House, New Delhi.
2. Product Management : Donald R. Lehmann, Russell S.Winer:, TaTa McGraw-Hill, New Delhi.
3. Product Management: S .A. Chunawalla:, New Delhi. Himalaya Publishing House

REFERENCES:

1. New Product Management : Merle Crawford, Anthony Di Benedetto, , TaTa McGraw-Hill,
New Delhi.

2. "Product Management in India": Ramanuj Majumdar:, PHI Learning, New Delhi.
3. Strategic Brand Management.: Kapferer, J.N. New York, Free Press, 1992.

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II MBA – II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
SERVICES MARKETING							

COURSE OUTCOMES: The student is able to

CO1: Know the basic concepts and classification of services.
CO2: Understand customer needs and expectations.
CO3: Explain the process of market segmentation in services marketing.
CO4: Understand the pricing strategies of services marketing.
CO5: Explain role of marketing communication in service promotion.
CO6: Evaluate the consumer grievance recovery strategies.

SYLLABUS:

UNIT–I: INTRODUCTION TO SERVICES MARKETING

Nature, Importance and characteristics of Services: Growth of Services Sector; Services in the Indian Economy; Classification of services, marketing services Vs. Physical services, Services Strategy.

UNIT–II: CONSUMER BEHAVIOR IN SERVICES

Customer Relationship Marketing: Relationship Marketing, the nature of service consumption, understanding customer needs and expectations, creating and maintaining valued relations, customer loyalty.

UNIT-III: SERVICES MARKET SEGMENTATIONS

The process of market segmentation, selecting the appropriate customer portfolio, positioning a service in the market, value addition to the service product, planning and branding service products, new service development.

UNIT-IV: PRICING STRATEGIES FOR SERVICES

Service pricing, establishing monetary pricing objectives, foundations of pricing objectives, pricing and demand, putting service pricing strategies into practice. Service quality Management: Service Quality Audit – GAP Model of Service Quality – Total quality Services Marketing – Service Excellence.

UNIT-V: SERVICE PROMOTION

The role of marketing communication. Setting communication objectives, marketing communication mix. Planning and managing service delivery- Creating delivery systems in price, cyberspace and time. The role of intermediaries.

UNIT–VI: EXTERNAL MARKETING

Word of Mouth Communication. Interactive Marketing: Management of Moments of Truth - Service Deficiencies - consumer Grievance Recovery Strategies. Managing Physical Evidence – Internal Marketing.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. "Services Marketing": C.Bhattacharjee:, Excel Books, New Delhi, 2010
2. "Service Management and Marketing" :Christian Gronroos, Wiley India, New Delhi,2010

REFERENCES:

1. "Services Marketing "GovindApte:, Oxford University Press, New Delhi, 2010
2. S.L.Gupta, Marketing of Services, Wisdom Publication.2003

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II MBA – II SEM	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	0	40	60	100	3
ADVERTISING MANAGEMENT							

COURSE OUTCOMES: The student is able to

CO1: Know the basic concepts of advertising and analyse challenges and opportunities in advertising.
CO2: Explain relations of advertising with segmentation and budget decision.
CO3: Understand the importance of the advertising strategies.
CO4: Classify media options and evaluate media options.
CO5: Develop effective advertising campaign.
CO6: Evaluate the role of AD agencies and explain the structure of AD agencies.

SYLLABUS:

UNTI-I: CONCEPTS OF ADVERTISING

The Field of Advertising, Introduction, Integrated Marketing Communication, Advertising and its types, Comparative Advertising, Communication Models in Advertising.– Challenges and Opportunities in Advertising – Economic, Social and Ethical Aspects of Advertising.

UNIT-II: INTEGRATED ADVERTISING PROGRAM

Analysis of Mission & Market Objective Setting & Determining Target Audience, Understanding Segmentation, Positioning, Budget Decision, case study on Budgets.

UNIT-III: UNDERSTANDING MESSAGE STRATEGY

Message & Copy in Advertising, Headlines in Print & TV Advertising, Visualization & Layout, AD Appeals, Testimonials & Celebrity Endorsement

UNIT-IV: MEDIA

Types & Decision Types of Media, Media Selection, Media Planning: New Perspective, Media Decision. Media Mix Decisions – Developing Media Strategy – Creative Strategy and Copy Writing – Different Types of Appeals.

UNIT -V: CAMPAIGN MAKING

Three Phases of Campaign Creation, Steps of Effective Advertising, Upsetting the applecart in the scooterette category In Style! Case study, Understanding Campaigns.

UNIT -VI: ADVERTISING AGENCY

Advertising Stake Holders – Advertising Organization, Evolution & History of advertising Agency, The working of AD agencies, Organization Structure of Advertising Department, Interface with other Departments, Functions of Advertising Agency.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

TEXT BOOKS:

1. Advertising Management, Dr. Varma & Aggarwal, King Books, 1998.
2. Advertising Principles and Practice, Wells Burnett Moriarty, PHI, 2005.

REFERENCES:

1. Foundations of Advertising, S.A. Chunawalla, KC Sethia, HPH, 2010.
2. Compendium of Brand Management, Chunnawala, S.A., HPH, 2004.

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I MCA I SEMESTER SYLLABUS

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
C PROGRAMMING AND DATA STRUCTURES							

Course Objectives

1. Formulating algorithmic solutions to problems and implementing algorithms.
2. To understand the various steps in Program development.
3. To understand the basic concepts in Program.
4. Comprehensive knowledge of data structures and ability to implement the same in software applications.

Course Outcomes

1. Demonstrate the basic knowledge of computer hardware and software.
2. Ability to problem solving and logical skills in programming.

UNIT I

Introduction to Computers, HW and SW concepts, Algorithm, pseudo code, flowchart, program development steps, Introduction to various IDE's and their use in C program development, structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation. Control structures such as if, goto, labels, and switch statements.

UNIT II

Loops- while, do-while and for statements, break, continue, Arrays – concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1- D arrays other than strings, 2-D character arrays – 2-D arrays other than character arrays – Multidimensional arrays.

UNIT III

Functions: basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C pre-processor. Passing 1-D arrays, 2-D arrays , and functions.

Pointers: concepts, initialization of pointer variables, pointers and function arguments, passing by address –dangling memory, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

UNIT IV

Derived types: structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to

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structures, self-referential structures, unions, typedef, bit-fields, Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations

UNIT V

Data Structures: Introduction to Data Structures – Time Complexity – Space Complexity – Pattern matching – naive method – Robin Karp Algorithm - Searching – Linear and binary search methods, sorting – Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

UNIT VI

Single linked lists, doubly linked lists, circular list, representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation. Trees-Binary tress, terminology, representation, traversals, Graphs - terminology, representation, graph traversals (dfs & bfs) – Warshalls – Dijkstra – Kruskal – Prims Algorithms.

TEXT BOOKS

1. Computer science, A structured programming approach using C, B.A.Forouzan and R.F. Gilberg, Third edition, Thomson.

REFERENCE BOOKS

1. Fundamentals of Data Structures in C , Horowitz, Sahni, Anderson-Freed, 2nd ed, Universities Press, 2008.
2. Classic Data Structures, Samanta, 2nd ed, PHI, 2009.
3. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/ Pearson.
4. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
5. DataStructures Using C , A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson.
6. Programming in C , Stephen G. Kochan, III Edition, Pearson .
7. Data Structures and Program Design in C, R.Kruse, Tondo, Leung, Shashi M, 2nd Edition, Pearson.
8. Data Structures and Algorithms, Aho, Hopcroft, Ullman, Pearson ,2006
9. C and Data Structures, Ashok N. Kamthane, Pearson.
10. C Programming and Data Structures, E Balaguruswamy, TMH, 2008.

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
COMPUTER ORGANIZATION							

Course Objective

Comprehensive knowledge of computer system including the analysis and design of components of the system.

Course Outcomes

At the end of the course student will be able to

1. The basic components of a computer, including CPU, memories, and input/output, and their organization representation of data, addressing modes, instructions sets.
2. Discriminate different register transfer micro operations, Principles of hardwired and micro programmed control.
3. Demonstrate various fixed and floating point arithmetic operations, performing the Arithmetic operations of binary number systems and formulating the arithmetic functions and solve scientific problems by means of a numerical analysis method.
4. Extrapolate memory organization and input, output organizations.
5. Generalize pipe line and vector processing, multi processors and its applications.

UNIT I

Objective: Gives a view of computer system from user's perspective, representation of numbers employed in arithmetic operations and design of digital systems constructed with individual gates and maps.

BASIC STURCTURE OF COMPUTERS: Computer Types, Functional Units, Basic Operational concepts, Bus Structures.

NUMBER SYSTEM AND COMPUTER ARITHMATIC:

Signed, Unsigned numbers, Addition and Subtraction, Multiplication, Division, Floating point representation, Logic operations, Gray Code, BCD Codes, Error Detecting Codes, Boolean Algebra, Simplification of Boolean Expressions, K-Maps.

UNIT II

Objective: Describes the necessary background for understanding the digital circuits with the help of gates and flip flops.

COMBINATION AND SEQUENTIAL CIRCUITS:

Decoders, Encoders, Multiplexers, Half and Full Adders, Sequential Circuits, Flip flops, Registers.

UNIT III

Objective: Understanding type of instructions, designing the basic components of the system and designing of hardwired control and illustration of data path using flow for sequencing.

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BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory – Reference Instruction, Input – Output and Interrupt.

CENTRAL PROCESSING UNIT: General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and manipulation, Program control.

UNIT IV

Objective: Register transfer language , how it is used to express micro operations in a symbolic form, Symbols are defined for arithmetic, logic and shift micro operations, hardware design of micro operations with the help of arithmetic logic shift unit.

REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS: Register transfer language, Register transfer, Bus and Memory transfers, Arithmetic Micro operations, Logical Micro operations, Shift Micro operations, Arithmetic logic shift unit.

UNIT V

Objective: Understanding of Microprogramming of control unit of CPU.

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, Micro program example, design of control unit.

UNIT VI

Objective: Description of different parameters of a memory system, organization and mapping of various types of memories and Describe the means of interaction devices with CPU, their characteristics and modes of data transmission.

THE MEMORY SYSTEM: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Objective: Describe the means of interaction devices with CPU, their characteristics and modes of data transmission.

INPUT-OUTPUT ORGANIZATION: Peripheral devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

TEXT BOOKS

1. Computer System Architecture, M.Moris Mano, 3rd Edition, Pearson/PHI
2. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006
3. Digital Logic Design, Moriss Mano, PHI

REFERENCES

1. Computer Organization, 5 th ed., Hamacher, Vranesic and Zaky, TMH, 2002.
2. Computer System Organization & Architecture, John D. Carpinelli, Pearson, 2008.
3. Computer System Organization, Naresh Jotwani, TMH, 2009.
4. Computer Organization & Architecture: Designing for Performance, 7th edition

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	4
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE							

Course Objective

This course will discuss fundamental concepts and tools in discrete mathematics with emphasis on their applications to computer science.

Course Outcomes

1. Student will be able to demonstrate skills in solving mathematical problems.
2. Student will be able to comprehend mathematical principles and logic.
3. Student will be able to demonstrate knowledge of mathematical modelling.
4. Student will be able to formulate logic expressions for a variety of applications.

UNIT I

Objective: Ability to solve limitations of Mathematical & Predicate logic.

Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus, Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving.

Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus

Outcome: After completion of this unit, student will be able to know the Foundations of Mathematical logic and Automatic theorem, Predicate formulas, Universal and Existential quantifiers.

UNIT II

Objective: Ability to solve the problems of sets, functions and relations.

Set theory & Relations: Introduction, Relations and ordering, Properties of binary Relations, Equivalence, Compatibility Relations, Partial ordering, Hasse diagram.

Functions: composition of functions, Inverse Function, Recursive Functions, Lattice and its Properties, Pigeon hole Principles and its application.

Outcome: After completion of this unit, student will be able to solve Set theory, Relations, Functions and related problems.

UNIT III

Objective: Ability to solve the problems of group theory.

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Algebraic structures: Algebraic systems, Examples and general properties, Semi groups and monoids, groups, sub groups, Definitions, Examples, homomorphism, Isomorphism and related problems.

Outcome: After completion of this unit, student will get the knowledge of Groups, Subgroups, Monoids, Isomorphism & Homomorphism.

UNIT IV

Objective: Ability to solve permutations and combinations problems in computer applications.

Elementary Combinatorics: Basis of counting, Enumeration of Combinations & Permutations, Enumerating of Combinations & Permutations with repetitions and constrained repetitions, Binomial Coefficients, Binomial, Multinomial theorems, principles of Inclusion – Exclusion.

Outcome: After completion of this unit, student will be able to know the basics of permutations and combinations, binomial and multinomial theorems.

UNIT V

Objective: Ability to solve different recurrence relations in computer applications.

Recurrence Relations: Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, The method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

Outcome: After completion of this unit, student will be able to understand first, second and higher order homogeneous and inhomogeneous recurrence relations.

UNIT VI

Objective: Ability to represent and Apply Graph theory in solving computer science problems related to trees and graphs.

Graph Theory: Representation of Graph, Spanning Trees, BFS, DFS, Prim's, Kruskals Algorithm, Binary trees, Planar Graphs.

Graph Theory and Applications: Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

Outcome: After completion of this unit, student will be able to solve the basic problems of graph theory like finding shortest paths.

TEXT BOOKS

1. Discrete Mathematical Structures with Applications to computer science J.P Tremblery, R. Manohar, TMH.
2. Discrete Mathematical structures for computer Scientists & Mathematicians " L. Molt, A. Andel, T.P.Baker, PHI.

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REFERENCE TEXT BOOKS

1. Discrete Mathematics, J K Sharma, 2nd ed., Macmillan, 2005.
2. Discrete Mathematics for computer science, Bogart, Stein and Drysdale, Springer, 2005.
3. Discrete Mathematics and its Applications, Rosen, 5th ed, T M Graw-Hill ed, 2006.
4. Discrete Mathematics for Computer Science, Gary Haggard, John Schlipf, Sue Whitesides, Cengage.,2006.
5. Discrete Mathematical Structures, Jayant Ganguly, Sanguine, 2007.
6. Discrete Mathematics and Combinatorics, Sengadir, Pearson, 2009.
7. Discrete Mathematical Structures, Kolman, Busby, Ross, 6th ed., PHI, 2009.
8. Discrete Mathematics with Combinatorics and Graph Theory, Santha, Cengage Learning, 2009.
9. Mathematical Foundations of Computer Science, Rajendra Prasad, Rama Rao et al., USP, 2009.
10. Discrete structures and Graph theory, GSS Bhisma Rao.
11. Mathematical Foundations of Computer Science, Dr.D.S. Chandrasekhar.

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	1	-	40	60	100	4
PROBABILITY AND STATISTICAL APPLICATIONS							

Course Outcomes

At the end of the course student will be able to

1. Examine, analyze, and compare probability distributions.
2. Construct confidence intervals for population parameters.
3. Formulate null and alternative hypothesis and test its validity based on random sample.

UNIT I

Objective: To know the fundamental concepts in Probability.

Probability Theory: Motivation, Probability models, Sample space, Events, Probability models; Probability Axioms, Union, Intersection and compliments of events; independent events, Conditional Probability; Baye's theorem.

UNIT II

Objective: To assign a numerical value to sample points in a Sample space

Random variables, Functions of Random variables; Probability mass function, Probability distributive function; cumulative distributive function; Discrete Probability Distributions, Binomial ,Poisson

Continuous Probability distribution: Normal

UNIT III

Objective: focus on sampling from populations

Sampling Distributions: Populations and samples-Sampling distribution of mean (known and unknown), Proportions, Sums and differences.

Point and Interval estimators for means and proportions, Bayesian Estimation

UNIT IV

Objective: To accept or reject a statement about the parameter (Large Samples).

Introduction, Type I and Type II errors, one tail, two tail tests-Test concerning one mean and proportion, Two means, Proportions and their differences using Z-Test

UNIT V

Objective: To accept or reject a statement about the parameter (Small Samples).

Student t test, F-test and Chi-square test-ANOVA-for one way and two way classifications

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UNIT VI

Objective: The objective of a queuing model is to find out the optimum service rate and the number of servers so that the average cost of being in queuing system and the cost of service are minimised

Queuing theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: α Model, M/M/1 ; N Model

TEXT BOOKS

1. Probability, Statistics and Random Process: Dr. K. Murugesan & P. Gurusamy by Anuradha Agencies, Deepthi Publications.
2. Probability, Statistics and Random Process: T. Veerarajan, TMH, India.

REFERENCE BOOKS

1. Probability & Statistics for Engineers: Miller and Freund, PHI
2. "Fundamentals of Mathematical Statistics", 9th Edition, S.C. Guptha and V.K. Kapoor, Sultan Chand & Sons Educational Publishers, 2007.

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
ACCOUNTS AND FINANCIAL MANAGEMENT							

Course Objective

To provide familiarity with the accounting concepts which will help in preparation of various accounting records

Course Outcome

By this subject student gets the knowledge on how to make the accounts in any organization &how to record the transactions in order to evaluate the profit or loss accounts.

UNIT I

Introduction to Accounting- Single Entry System- Objectives- Generally Accepted Accounting Principles- Systems of Accounting- Single Entry- Double Entry- Introduction to Basic Books of Accounts- Journal- Ledger.

UNIT II

Preparation of Trail Balance – Final Accounts with Simple Adjustments – Users of Accounting Information – Role of Accountant in Modern Business Organizations.

UNIT III

Introductions to Financial Management - Meaning – Scope – Role – Objectives – Time Value of Money – Over Capitalization – Under Capitalization – Profit Maximization – Wealth Maximization – EPS Maximization – Ratio Analysis – Different Types of Ratios – Advantages – Disadvantages.

UNIT IV

Costing – Nature – Importance – Basic Principles – Elements of Cost – Absorption Costing Vs Marginal Costing – Financial Accounting Vs Cost Accounting Vs Management Accounting – Marginal Costing and Break Even Analysis – Nature – Importance – Scope – CBP Analysis – Simple Problems.

UNIT V

Standard Costing and Budgeting – Nature – Scope – Computation Analysis – Material Variances – Labour Variances – Budgeting – Definition – Types of Budgets – Cash Budget – Flexible Budget – Sales Budget – Simple Problems.

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UNIT VI

Introduction to Computerized Accounting System – Coding – Logic and Codes – Master Files – Transaction Files - Introduction to Documents Used for Data Collection – Process of Document Files and Outputs Obtained.

REFERENCE BOOKS

1. Accounting for Managers, G. Prasad, Himalaya Publications.
2. Accounting for Management, Vijay Kumar, Tata McGraw Hill.
3. Financial Accounting, S. N. Maheswari and S. K. Maheswari, Vikas Publications.
4. Cost and Management Accountancy, M.N. Arora, Himalaya Publishing House.
5. Financial Analysis and Accounting, P. Premchand Babu and M. Madan Mohan, Himalaya Publishing House.
6. Essentials of Financial Accounting, Ashish. K and Ballacharya, Prentice Hall of India.

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
VERBAL ABILITY							

Course Objectives

1. To make students understand the usage of words, relationships; the alternatives and their Meanings.
2. To give fair idea about understanding and comprehension skills.
3. To make students understand arguments, draw conclusions and to deal in critical manner.
4. To teach students-ways to overcome the confusions related to Grammar and Vocabulary.

Course Outcomes

At the end of the course Students will be able to

1. Use appropriate words effectively in their communication
2. Identify and correct Grammar and vocabulary related errors
3. Construct the sentences effectively using appropriate verbal reasoning abilities
4. Demonstrate understanding and comprehensive skills
5. To clear written test in campus placements as well as various competitive

Unit-I : Vocabulary Building
Unit-II : Sentence construction, correction and Jumbled Paragraphs
Unit-III : English Usage, Grammar & Meaning Usage match
Unit-IV : Analogies, Reverse Analogies, Cloze Passage & Fill in the blanks
Unit-V : Reading Comprehension, Summary Questions
Unit-VI : Fact, Inferences & Judgments

TEXT BOOKS

1. 30 Days to a More Powerful Vocabulary by Funk.
2. Practical English Usage by Michael Swan.
3. Practice & Pass Professional: Verbal Reasoning Tests: Practice Questions and Expert Coaching to Help You Pass by Alan Redman.
4. Kaplan MCAT Verbal Reasoning and Writing Review.
5. The Verbal Reasoning Test Workbook: Unbeatable Practice for Verbal Ability by Mike Bryon.
6. Understanding and Using English Grammar by Betty Schrampfer Azar.

REFERENCE BOOKS

1. http://www.verbalreasoningtest.org/
2. https://www.bond11plus.co.uk/verbal-reasoning
3. http://www.studyguidezone.com/mcat_verbalreasoning.htm
4. http://www.varsitytutors.com/mcat_verbal-practice-tests
5. https://www.khanacademy.org/test-prep/mcat

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
C PROGRAMMING AND DATA STRUCTURES LAB							

Course Objectives

1. To learn/strengthen a programming language like C, To learn problem solving techniques
2. To introduce the student to simple linear and nonlinear data structures such as lists, stacks, queues etc.,

Exercise 1

a) Write a C program to find the sum of individual digits of a positive integer.
b) 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.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
d) Write a program which checks a given integer is Fibonacci number or not.

Exercise 2

a) Write a C program to calculate the following Sum: Sum=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program to implement Newton Raphson method for a quadratic equation
d) Write a C program to implement Newton Raphson method for a general purpose algebriac equation

Exercise 3

a) Write C programs that use both recursive and non-recursive functions
   i) To find the factorial of a given integer.
   ii) To find the GCD (greatest common divisor) of two given integers.
   iii) To solve Towers of Hanoi problem.
   iv) Write program to calculate probability of head/tail by generating random numbers using random() function.

Exercise 4

a) The total distance travelled by vehicle in 't' seconds is given by distance = ut+1/2at2 where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec2). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 5

a) Write a C program to find both the larges and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
   i) Addition of Two Matrices
   ii) Multiplication of Two Matrices
   iii) Checking symmetricity of a square matrix.
   iv) Calculating transpose of a matrix in-place manner.

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Exercise 6

a) Write a C program that uses functions to perform the following operations:
i) To insert a sub-string in to given main string from a given position.
ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not

Exercise 7

a) Write a C program that displays the position/ index in the string S where the string T begins, or –1 if S doesn't contain T.
b) Write a C program to count the lines, words and characters in a given text.

Exercise 8

a) Write a C program to generate Pascal's triangle.
b) Write a C program to construct a pyramid of numbers.

Exercise 9

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x2+x3+.....+xn
For example: if n is 3 and x is 5, then the program computes 1+5+25+125. Print x, n, the sum Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

Exercise 10

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
b) Write a C program to convert a Roman numeral to its decimal equivalent.

Exercise 11

Write a C program that uses functions to perform the following operations using Structure:
i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers

Exercise 12

a) Write a C program which copies one file to another.
b) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)

Exercise 13

a) Write a C program that uses functions to perform the following operations on singly linked list.:
i) Creation ii) Insertion iii) Deletion iv) Traversal
b) Adding two large integers which are represented in linked list fashion.

Exercise 14

Write a C program that uses functions to perform the following operations on doubly linked list.
i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways

Exercise 15

a.) Write C programs that implement stack (its operations) using
i) Arrays ii) Pointers iii) linked list.

Exercise 16

a. Write C programs that implement Queue (its operations) using
i) Arrays ii) Pointers iii) linked lists.

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Exercise 17

Write a C program that uses Stack operations to perform the following:
i) Converting infix expression into postfix expression ii) Evaluating the postfix expression

Exercise 18

a. Write a C program that uses functions to perform the following:
   i) Creating a Binary Tree of integers
   ii) Traversing the above binary tree in preorder, inorder and postorder.
b. Program to check balance property of a tree.
c. Program to check for its strictness.

Exercise 19

Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers : i) Linear search ii) Binary search

Exercise 20

Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
i) Bubble sort ii) Quick sort

Exercise 21

a. Write C programs that implement the following sorting methods to sort a given list of Integers in ascending order:
   i) Insertion sort ii) Bubble sort
b. Recursive implementation of sorting algorithms.

Exercise 22

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

Exercise 23

a. Program to calculate mean and standard deviation of a population.
b. Write C programs to implement the linear regression and polynomial regression algorithms.

Exercise 24

a. Write C programs to implement Trapezoidal and Simpson methods.
b. Program for Calculating pi value.

REFERENCE BOOKS

1. Digital Fundamentals, Floyd, Jain, 8th ed , Pearson
2. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006

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I MCA I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
INFORMATION TECHNOLOGY WORKSHOP							

Course Objective

The objective of this course is to provide an insight into basic features of Computer Systems and their Applications in day to day professional work.

Course Outcomes

1. The student will be able to perform documentation.
2. The student will be able to create and use spread sheets with macros, charts, filters etc.
3. The student will be able to create presentations with animations, auto slide transition etc.
4. The student will be able to configure Wi-Fi of laptop/tab/mobile to access internet.
5. The student will be able to configure laptop/tab/mobile e-mail clients (SMTP& POP3/IMAP).
6. The student will be able to share files and printers over LAN.

Exercise - I

Introduction to Computer Concepts – Elements of computer – Characteristics of a Computer – Classification of Computers – Basic Computer Architecture – Input-output Devices, Types of software – Software: its nature and qualities — Windows and Linux Operating System Functions .

Exercise - II

Hardware, Software, Operating Systems, Printer, Scanner, Pen drive, DVD, Web cam, LAN File Sharing, Device Sharing, Blue Tooth, WI-FI, Internet, Web site, Domain, Search-Engine, Windows and Linux commands.

Exercise- III

Electronic mail, Outlook Configuration, Skype, Hangouts, Facebook, Twitter,(Social Networks), Cloud Storage(Google drive, One drive), Mobile, Tablets, Laptops, Mobile Apps.

Exercise - IV

MS Office- Applications of MS Word in Business Correspondence: letters, tables, mail merge, labels.

Exercise - V

Applications of MS Excel: Graphs and Charts – Calculation of various financial functions - Ms Access: Tables and Queries

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Exercise - VI

MS Power Point: Introduction – Toolbar, their Icons and Commands – Navigating in Power point - Creation of slides, animation, and templates - Designing Presentations – Slide show controls – Making notes on Pages and Handouts – Printing Presentations – Customizing Presentations - Auto content Wizard.

REFERENCE BOOKS

1. Sanjay Saxena and Prathpreet Chopra, Computer Applications in Management, Vikas, New Delhi
2. Aksoy, Introduction to Information Technology, Cengage, ND
3. Parameswaran: Computer Application in Business – S Chand, New Delhi.
4. Management Information Systems by Mahadeo Jaiswal, Monika Mittal, Oxford University Press.
5. PS Gill, Database Management Stystems, IK Int Pub House, New Delhi
6. Management Information Systems by D.P. Goyal, MacMillan Publishers.
7. The Compact guide to Microsoft office, Mansfield Rom, BPB Publications, Delhi.
8. Sudalaimuthu&Anthony Raj, Computer Applications in Business, Himalaya, Mumbai

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I MCA II SEMESTER SYLLABUS

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
DATABASE MANAGEMENT SYSTEM							

Course Objective

The objective of the course is to enable students to understand and use a relational database system. Introduction to Databases, Conceptual design using ERD, Functional dependencies and Normalization, Relational Algebra are covered in detail. Students learn how to design and create a good database and use various SQL operations. The course concludes with an overview of transaction management and introduction to advanced and non-relational databases.

Course Outcomes

1. Able to master the basic concepts and understand the applications of database systems.
2. Able to construct an Entity-Relationship (E-R) model from specifications and to transform to relational model.
3. Able to construct unary/binary/set/aggregate queries in Relational Algebra.
4. Understand and apply database normalization principles.
5. Able to construct SQL queries to perform CRUD operations on database. (Create, Retrieve, Update, Delete)
6. Understand principles of database transaction management, database recovery, security.
7. Be aware of non-relational databases and applications.

UNIT I

Database System Applications, Purpose of Database Systems, View of Data – Data Abstraction, Instances and Schemas, Data Models – the ER Model, Relational Model, Other Models – Database Languages – DDL, DML, Database Access from Applications Programs, Transaction Management, Data Storage and Querying, Database Architecture, Database Users and Administrators, History of Data base Systems. Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model – Integrity Constraints Over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views – Destroying /altering Tables and Views.

UNIT II

Relational Algebra and Calculus: Relational Algebra – Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set – Comparison Operators, Aggregate Operators, NULL values – Comparison using Null values – Logical connectives

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Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT III

Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST, SECOND,THIRD Normal forms – BCNF –Properties of Decompositions- Loss less-join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT IV

Overview of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks – Performance of Locking – Transaction Support in SQL.

Concurrency Control: Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

Crash recovery: Introduction to Crash recovery, Introduction to ARIES, the Log, Other Recovery related Structures, the Write-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery

UNIT V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.

UNIT VI

Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM)

B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3 rd Edition,2003.
2. Data base System Concepts, A.Silberschatz,H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.
3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant B.Navathe,Pearson Education,2008.

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REFERENCE BOOKS

1. Database Management System Oracle SQL and PL/SQL,P.K.DasGupta,PHI.
2. Database System Concepts,Peter Rob & Carlos Coronel,Cengage Learning,2008.
3. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg,Pearson education.
4. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2 nd ed.,ELSEVIER
5. Fundamentals of Relational Database Management Systems,S.Sumathi,S.Esakkirajan, Springer.
6. Introduction to Database Management,M.L.Gillenson and others,Wiley Student Edition.
7. Database Development and Management,Lee Chao,Auerbach publications,Taylor & Francis Group.
8. Introduction to Database Systems,C.J.Date,Pearson Education.

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	4	-	-	40	60	100	4
OOPS THROUGH JAVA							

Course Objectives

1. To understand the difference between Procedure Oriented Programming and Object Oriented Programming.
2. Understand the importance of Exception Handling and create robust programs in Java which can withstand runtime errors.
3. To learn how to create Graphical User Interface applications in Java.
4. To learn how to create lightweight multithreaded applications with synchronization.
5. To learn how to develop web applications using java Applets.

Course Outcomes

1. To be able to analyses the real world problems in an Object Oriented way.
2. Apply Encapsulation, Inheritance and Polymorphism features of Java appropriately to solve problems.
3. To be able to create Java console, GUI and Web applications in Java.

UNIT I

Basics of Object Oriented Programming(OOP): Problems with Procedure Oriented Programming and Need for OO paradigm. A way of viewing world-Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overridding and exceptions, summary of oops concepts, coping with complexity, abstraction mechanisms.

UNIT II

Java Basics: Data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects - concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing , recursion, string handling.

UNIT III

Packages, Interfaces and Inheritance: Defining, creating and accessing a package, understanding CLASSPATH, importing packages. Differences between classes and interface. Defining an interface, applying interfaces, variables in interface and extending interfaces. Hierarchical abstraction, base class objects, Subclass, sub type, substitutability, forms of inheritance, Specialization, specification, construction extension,limitation,combination, benefits of inheritance, costs of inheritance. Member access rules, Super uses, using final with inheritance, polymorphism, abstract classes.

UNIT IV

Exception handling and Multithreading: Concept of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, Usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

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Differences between multithreading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

UNIT V

Event Handling, AWT and Swings: Events, Event sources, Event classes, Event listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components – labels, button, canvas, scrollbars, text components, checkbox, checkbox groups, choice, lists, panels-scroll pane, dialogs, menu bar, graphics, layout manager - layout manager types - border, grid, flow, card and grid bag.

UNIT VI

Applets and Swings: Concepts of applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameter to applets. Limitation of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and Component, Icons and Labels, text fields, buttons - The JButton class, Check boxes,Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Java-The complete reference,7/e, Herbert schildt, TMH.

REFERENCE BOOKS

1. JAVA:How to program, 8/e, Dietal , Dietal,PHI.
2. Introduction of programming with JAVA,S.Dean,TMH.
3. Introduction to Java programming, 6/e, Y.Daniel Liang, Pearson.
4. Core Java 2, Vol 1(Vol 2) Fundamentals(Advanced), 7/e, Cay.S.Horstmann,Gary Cornell,Pearson.
5. Big Java2,3/e, Cay.S. Horstmann,Wiley.
6. Object Oriented Programming through Java, P.Radha Krishna, University Press.
7. JAVA&Object Orientation an Introduction, 2/e, John Hunt, Springer.
8. Introduction to JAVA Programming, 7/e, Y.Daniel Liang, Pearson.
9. AVA Programming and OO Application Development , Johnson, Cengage Learning.
10. First Encounter with JAVA, S.P.Bhuta, SPD
11. JAVA for Professionals , B.M.Harwani, SPD.
12. Program with JAVA, Mahesh Bhave, Palekan, Pearson.
13. Programming with JAVA, 3/e, E.Balaguruswamy, TMH.

Web Links:

1. http://www.w3schools.in/java/
2. https://docs.oracle.com/javase/tutorial/
3. https://docs.oracle.com/javase/tutorial/java/

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
OPERATING SYSTEMS							

Course Objective

Operating systems are an essential part of any computer system. It provides a clear description of the concepts that underlie operating systems.

Course Outcomes

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

1. Classify different types of systems like distributed system, special purpose system and the working principle of system calls.
2. Compute the waiting time and turnaround time of different CPU scheduling algorithms and comparison among all the CPU scheduling algorithms.
3. Examine the page faults for different Page Replacement algorithms and comparison among all the Page Replacement algorithms, and methods to handle deadlocks.
4. Differentiate among different File System implementation and directory implementation.
5. Assess different types of disk scheduling algorithms, distinguish different protection and security mechanisms

UNIT I

Objective: Gives a view of what operating systems are, what they do, how they are designed and constructed.

INTRODUCTION: Operating system structures – simple batch, Multi programmed, Time shared, Personal computer, Parallel, Distributed systems, Real time systems, system components, Operating System services, System calls, Virtual machines, System Design and Implementation.

UNIT II

Objective: It describes the process concept, communication between processes and concurrency are heart of the modern operating systems.

PROCESS SCHEDULING:

Process Concept: Overview – Process Scheduling – Operations on Processes – co-operating processes, Inter process Communication – Examples of IPC Systems – Communication in Client and Server Systems. Threads: Overview, Multi-threading models, Threaded Libraries, Java Threads, Threading issues, case studies of UNIX, LINUX, Windows.

UNIT III

Objective: Illustration of scheduling algorithms with preemptive and non-preemptive nature and various algorithms for handling deadlock problems.

CPU SCHEDULING: Basic concepts, Scheduling criteria, Scheduling algorithms: FCFS scheduling, SJF, SRTF, Priority Scheduling, Round Robin scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling, Multiprocessor scheduling.

DEADLOCKS: System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

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UNIT IV

Objective: Description of process coordination and Concurrent access to shared data may result in data inconsistency. There are various mechanisms to ensure the orderly execution processes that share a logical address space, so data consistency is maintained.

PROCESS MANAGEMENT AND SYNCHRONIZATION: The critical - section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of Synchronization, Monitors, Synchronization examples.

UNIT V

Objective: Describe the main memory management during the execution of a process. To improve the utilization of CPU and the speed of its response to its users, the computer must keep several processes in memory. So, illustration of various algorithms for managing memory effectively. Introduction to how the file system and Directories are handled in computer system.

MEMORY MANAGEMENT AND VIRTUAL MEMORY: Logical versus Physical Address space, Swapping, Contiguous Allocation, paging, Segmentation, Segmentation with Paging, Demand Paging, Copy-on-Write, Page replacement algorithms, Allocation of Frames, Thrashing.

FILE SYSTEM INTERFACE AND IMPLEMENTATION: File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Directory Implementation, Efficiency and Performance, Recovery, Log structured File System.

UNIT VI

Objective: Introduction to how the Secondary storage is handled in a modern computer system. And discuss the processes in an operating system that must be protected from one another's activities. Security protects the information stored in system, physical resources of the computer system, and from unauthorized access.

MASS STORAGE STRUCTURE: Disk structure, Disk Scheduling, Disk and Swap Space Management, RAID Structure, Stable Storage structure.

PROTECTION : Goals of protection, Principles of protection, Domain of protection, Implementation of Access Matrix, Revocation of Access Rights, Capability Based Systems.

SECURITY: Introduction part of Security problem, Program Threats, System and Network Threats, Cryptography.

TEXT BOOKS

1. Operating System Concepts, 7/e, Abraham Silberschatz, Peter Galvin, Greg Gagne.

REFERENCE BOOKS

1. Operating Systems, 6/e , William Stalling s, PHI/ pearson.
2. Operating Systems Design and Implementation, 3/e, Tanenbaum, Woodhull.

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	3	1	-	40	60	100	4
OPTIMIZATION TECHNIQUES							

UNIT I

Objective: To solve a problem by using scientific approach, OT techniques.

The origin of OR, the nature of OR, the impact of OR, Definition, Characteristics and Phrases, scientific method. Types of models, general methods for solving, operations research models.

UNIT II

Objective: To learn how to convert the data into mathematical form and solution by LPP.

Allocation, Introduction, linear programming formulation graphical solution, simplex methods, artificial variable technique, duality principle.

UNIT III

Objective: To transport various quantities in such a way that the total transportation cost is minimum.

Transportation problem: Formulation, optimal solution, unbalanced transportation, assignment problem: formulation , optimal solution, variations problem, degeneracy i.e. non square (MXN) matrix, restrictions.

UNIT IV

Objective: To understand the study of need of replacement due to deteriorating efficiency, failure or breakdown.

Replacement: Introduction, replacement of items that deteriorate when money value is not counted and replacement of items that fail completely (i.e.) group replacements.

UNIT V

Objective: To learn decision making in a competitive situation.

Theory of Games: Introduction, minmax(maximum),criterion and optimal strategy solution of games with saddle points, rectangular without saddle points. Sequencing: Introduction, optimal solution for processing each of n jobs through three machines, travelling salesman problem(i.e.) shortest acyclic route models.

UNIT VI

Objective: To learn planning and scheduling large projects in a smooth manner by determining critical factors and co-ordinating various parts of overall job.

Project Management: PERT and CPM , difference between PERT and CPM, PERT/CPM network components and precedence relations, Time Estimates for activities.

TEXT BOOKS

1. Operations Research, S.D.Sharma, Ramnath,& Kedarnath co,Meerut.
2. Operations Research, An introduction , 8/e, Taha, Pearson.

REFERENCE BOOKS

1. Operations Research, P.K.Gupta, D.S. Hira, S.Chand.
1. Operations Research, R.D.Asrhedkar, R.V.Kulkarni.
2. Operations Research, Problems & sollutons, 3/e, JKSharma, Macmillan.
3. Operations Research, 8/e, Hillier/Liberman, TMH.
4. Operations Research, 2/e, Panneerselvam.

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
ORGANIZATIONAL STRUCTURE AND PERSONNEL MANAGEMENT							

Course Objective

To equip the student with the basic structure of organisation and to provide knowledge relating to recruitment, selection, training and motivation of employees in the organisation.

Course Outcome

The outcome of this program is that the student learns necessary skills in the area of people management.

UNIT I

Introduction to management- concepts, nature, definition, Importance of management-Principles of management-levels of management-evolution of management- Management Vs Administration-managerial roles and functions.

UNIT II

Organisational design- nature, importance of organising, types of organisational structures, theories of organisation, formal and informal organisations, difficulties due to informal organisation.

UNIT III

Human Resource management- objectives, functions of hrm, duties and responsibilities of hr managers, recruitment, sources of recruitment, selection procedure, tests and interview techniques, training and development- methods of training, transfer, promotion and its policies.

UNIT IV

Strategic management- Introduction- study of strategic management- corporate planning-environmental scanning- SWOT analysis- challenges in LPG

UNIT V

Motivation- need, importance, theories of motivation,-Principles of motivation- types of motivation-communication- concept-need-importance-process- barriers of communication-types and methods of communication-essentials of effective communication.

UNIT VI

Contemporary Issues- HRIS, BPO, HR Outsourcing, Exit interviews, HRD, JIT, TQM, bench marking, value chain analysis, cross culture in HRM.

REFERENCE BOOKS

1. Organization Structure and personal Management, 2/e, Subbarao.P, HPH.
2. Personal and Human Resource Management, Recenzo, Robins, PHI.
3. Business Communications and soft skills, kuberudu B, and Krishna K.s, Excel publications.
4. Management process and Organizational Behaviour, karam pal, I.k.int.
5. Management process an d Organizational Behaviour, karam pal, I.K int.
6. Human Resource Management Jyothoi, Oxford.
7 Organizations and Management, Agarwal, TMH.
8. Fundamentals of HRM, David A. Decenzo, Stephen R. Robins, Wiley India.at es
9. Organizational Structure and Human Resurce management, Varaprasad, SciTech.
10. Human Resource Management, Chabra. T.N, Dhanpat Rai.
11. Personal Management and Human Resources, Venkat Ratnam, TMH,

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	-
QUANTITATIVE APTITUDE AND REASONING							

Course Objectives

1. To train students in analysing real life scenarios considering all factors
2. To educate the students on principles of mathematical problems and problem solving methods.
3. To train students for campus placements.

Course Outcomes

After thorough learning of Quantitative Aptitude and Reasoning, a student:

1. Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements
2. Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.
3. Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

SYLLABUS FOR QUANTITATIVE APTITUDE-1

Unit I: Simple equations, Ratio, Proportion, Variation, Percentages

1. Simple equations

a. Definition of Linear Equations
b. Formation of simple equations
c. Problems on Ages, Fractions and Digits
d. Indeterminate system of equations
e. Special cases in indeterminate system of equations

2. Ratio and proportion

a) Definition of Ratio
b) Properties of Ratios
c) Comparison of Ratios
d) Problems on Ratios
e) Compound Ratio
f) Problems on Proportion, Mean proportional and Continued Proportion

3. Variation

a) Direct variation
b) Inverse variation
c) Joint variation
d) Problems on Variations

Unit II: Percentages, Profit and loss, Partnership, Simple interest and Compound interest, Quadratic equations, Progressions

1. Percentages

a) Introduction

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b) Converting a percentage into decimals
c) Converting a Decimal into a percentage
d) Percentage equivalent of fractions
e) Problems on percentages

2. **Profit And Loss**

a) Problems on Profit and Loss percentage
b) Relation between Cost Price and Selling price
c) Discount and Marked Price
d) Two different articles sold at same Cost Price
e) Two different articles sold at same Selling Price
f) Gain% / Loss% on Selling Price

3. **Partnership**
a) Introduction
b) Relation between capitals, Period of investments and Shares

Simple Interest

a) Definitions
b) Problems on interest and amount
c) Problems when rate of interest and time period are numerically equal

4. **Compound Interest**

a) Definition and formula for amount in compound interest
b) Difference between simple interest and compound interest for 2 years on the same principle and time period

5. **Quadratic equations**

a) General form of Quadratic equations
b) Finding the roots of Quadratic equations
c) Nature of the roots
d) Relation between the roots
e) Maximum and minimum value of Quadratic Expression

6. **Progressions**

a) Arithmetic Progression
b) Geometric Progression
c) Harmonic Progression
d) Arithmetic Mean, Geometric Mean and Harmonic Mean and their relation.

SYLLABUS FOR REASONING-1

UNIT III: Deductions & Connectives

1. **Deductions**

a) Finding the conclusions using Venn diagram method
b) Finding the conclusions using syllogism method

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2. Connectives

a) Definition of a simple statement
b) Definition of compound statement
c) Finding the Implications for compound statements
d) Finding the Negations for compound statements

UNIT IV: Analytical Reasoning puzzles

a) Problems on Linear arrangement
b) Problems on Circular arrangement
c) Problems on Double line-up
d) Problems on Selections
e) Problems on Comparisons

UNIT V: Clocks, Calendars & Blood relations

1. Clocks

a) Finding the angle when the time is given
b) Finding the time when the angle is known
c) Relation between Angle, Minutes and Hours
d) Exceptional cases in clocks

2. Calendars

a) Definition of a Leap Year
b) Finding the number of Odd days
c) Framing the year code for centuries
d) Finding the day of any random calendar date

3. Blood relations

a) Defining the various relations among the members of a family
b) Solving Blood Relation puzzles
c) Solving the problems on Blood Relations using symbols and notations

SYLLABUS FOR QUANTITATIVE APTITUDE-2

Unit I: Numbers, Time and Distance, Time and work, Averages, Mixtures and Allegations

Numbers

a) Classification of numbers
b) Divisibility rules
c) Finding the units digit
d) Finding remainders in divisions involving higher powers
e) LCM and HCF Models

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1. **Time and Distance**

a) Relation between speed, distance and time
b) Converting km/h into m/s and vice versa
c) Problems on average speed
d) Problems on relative speed
e) Problems on trains
f) Problems on boats and streams
g) Problems on circular tracks
h) Problems on races

2. **Time and Work**

a) Problems on Unitary method
b) Relation between Men, Days, Hours and Work
c) Problems on Man-Day-Hours method
d) Problems on alternate days
e) Problems on Pipes and Cisterns

3. **Averages, Mixtures and Allegations**

a) Definition of Average
b) Rules of Average
c) Problems on Average
d) Problems on Weighted Average
e) Finding average using assumed mean method
f) Problems on mixtures
g) Allegation rule
h) Problems on Allegation

Unit II: Data Interpretation, Data Sufficiency, Mensuration, Permutation and Combinations, Probability

1. **Data Interpretation**

a) Problems on tabular form
b) Problems on Line Graphs
c) Problems on Bar Graphs
d) Problems on Pie Charts

2. **Data Sufficiency**

a) Different models in Data Sufficiency
b) Problems on data redundancy

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3. **Mensuration**
   a) Formulas for Areas
   b) Formulas for Volumes of different solids
   c) Problems on Areas
   d) Problems on Volumes
   e) Problems on Surface Areas

4. **Permutation and Combinations**

   a) Definition of permutation
   b) Problems on Permutations
   c) Definition of Combinations
   d) Problems on Combinations

5. **Probability**

   a) Definition of Probability
   b) Problems on coins
   c) Problems on dice
   d) Problems on Deck of cards
   e) Problems on Years

SYLLABUS FOR REASONING-2

Unit III: Cubes, Venn diagrams, Binary Logic

1. **Cubes**
   a) Basics of a cube
   b) Formulae for finding volume and surface area of a cube
   c) Finding the minimum number of cuts when the number of identical pieces are
   d) Finding the maximum number of pieces when cuts are given
   e) Problems on painted cubes of same and different colors
   f) Problems on cuboids
   g) Problems on painted cuboids
   h) Problems on diagonal cuts

2. **Venn diagrams**

   a) Representing the given data in the form of a Venn diagram
   b) Problems on Venn diagrams with two sets
   c) Problems on Venn diagrams with three sets
   d) Problems on Venn diagrams with four sets

3. **Binary Logic**
   a) Definition of a truth-teller
   b) Definition of a liar

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c) Definition of an alternator
d) Solving problems using method of assumptions
e) Solving analytical puzzles using binary logic

Unit IV: Number and letter series, Number and letter Analogies, Odd man out

1. Number and letter series

a) Difference series
b) Product series
c) Squares series
d) Cubes series
e) Alternate series
f) Combination series
g) Miscellaneous series
h) Place values of letters

2. Number and Letter Analogies

a) Definition of Analogy
b) Problems on number analogy
c) Problems on letter analogy
d) Problems on verbal analogy

3. Odd man out

a) Problems on number Odd man out
b) Problems on letter Odd man out
c) Problems on verbal Odd man out

Unit IV: Coding and decoding, Direction sense, Critical Reasoning, Lateral reasoning puzzle

1. Coding and decoding

a) Coding using same set of letters
b) Coding using different set of letters
c) Coding into a number
d) Problems on R-model

2. Direction sense

a) Solving problems by drawing the paths
b) Finding the net distance travelled
c) Finding the direction
d) Problems on clocks
e) Problems on shadows
f) Problems on damaged compass
g) Problems on direction sense using symbols and notations

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3. Critical Reasoning

a) Problems on assumption
b) Problems on conclusions
c) Problems on inferences
d) Problems on strengthening and weakening of arguments
e) Problems on principle
f) Problems on paradox

4. Lateral reasoning puzzle

a) Problems on common balance
b) Problems on digital balance
c) Problems on coins
d) Problems on lockers
e) Problems on heights
f) Digit puzzles using basic arithmetic operations

TEXT BOOKS

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'
3. R S Agarwal, S Chand, 'Quantitative Aptitude'
4. Quantitative Aptitude - G. L BARRONS
5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

REFERENCE BOOKS

1. www.careerbless.com/**aptitude**/qa/home.php
2. www.affairscloud.com/**quantitative-aptitude**-questions
3. www.careerafter.com/rs-aggarwal-**quantitative-aptitude**-pdf/
4. www.amazon.in/**Quantitative-Aptitude**-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practice**aptitude**tests.com/numerical-**reasoning**-tests

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
DATABASE MANAGEMENT SYSTEM LAB							

1. Execute a single line and group functions for a table.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB.
5. Write PL/SQL procedure for an application using exception handling.
6. Write PL/SQL procedure for an application using cursors.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Write a PL/SQL block for transaction operations of a typical application using package.
10. Design and develop an application using any front end and back end tool (make use of ER diagram and DFD).
11. Create table for various relation Implement the query in sql for
    a) insertion b) retrieval c) updation d) deletion
12. Creating Views
13. Writing Assertion
14. Writing Triggers
15. Implementing operation on relation using PL/SQL
16. Creating Forms
17. Generating Reports
18. Typical Applications – Banking, Electricity Billing, Library Operation, Pay roll, Insurance, Inventory etc.

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I MCA II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
OOPS Through JAVA Lab							

Note: 1) Use JDK 1.5 or above on any platform e.g. Windows or Unix.
2) Student is expected to complete any 16 programs.

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1,1.every subsequent value is the sum of the 2 values preceding it. Write A Java Program (WAJP) that uses both recursive and nonrecursive functions to print the nth value of the Fibonacci sequence.

2. WAJP to demonstrate wrapper classes and to fix the precision.

3. WAJP that prompts the user for an integer and then prints out all the prime numbers upto that Integer.

4. WAJP that checks whether a given string is a palindrome or not.
Ex. MALAYALAM is a palindrome.

5. WAJP for sorting a given list of names in ascending order.

6. WAJP to check the compatibility for multiplication , if compatible multiply two matrices and find its transpose.

7. WAJP that illustrates how runtime polymorphism is achieved.

8. WAJP to create and demonstrate packages.

9. WAJP, using String Tokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.

10. WAJP that reads on file name form the user then displays information about whether the file exists, whether the file is readable/writable, the type of file and the length of the file in bytes and display the content of the using FileInputStream class.

11. WAJP that displays the number of characters, lines and words in a text/text file.

12. Write an Applet that displays the content of a file.

13. WAJP that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.
14. WAJP for handling mouse events.

15. WAJP demonstrating the life cycle of a thread.

16. WAJP that correctly implements Producer-Consumer problem using the concept of Inter Thread Communication.
17. WAJP that lets users create Pie charts. Design your own user interface(with Swings & AWT).

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18. WAJP that allows user to draw lines, rectangles and ovals.

19. WAJP that implements a simple client/server application. The client sends data to a server.
    The server receives the data, uses it to produce a result and then sends the result back to the client. The client displays the result on the console. For ex: The data send form the client is the radius of a circle and the result produced by the server is the area of the circle.

20. WAJP to generate a set of random numbers between two numbers x1 and x2, and x1>0.

21. WAJP to create an abstract class named shape, that contains an empty method named numberOfSides(). Provide three classes named Trapezoid, Triangle and Hexagon, such that each one of the classes contains only the method numberOfSides(), that contains the number of sides in the given geometrical figure.

22. WAJP to implement a Queue, using user defined Exception Handling (also make use of throw, throws).

23. WAJP that creates 3 threads by extending Thread class. First thread displays "Good Morning" Every 1 sec, the second thread displays "Hello" every 2 seconds and the third displays "Welcome" every 3 seconds. (Repeat the same by implementing Runnable).

24. Create an inheritance hierarchy of Rodent, Mouse, Gerbil, Hamster etc. In the base class Provide methods that are common to all Rodents and override these in the derived classes to perform different behaviors, depending on the specific type of Rodent. Create an array of Rodent, fill it with different specific types of Rodents and call your base class methods.

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II MCA III SEMESTER SYLLABUS

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
SOFTWARE ENGINEERING							

Course Objective

This course is intended to provide the students with an overall view over Software Engineering discipline and with insight into the processes of software development.

Course Outcomes

After completion of this course the students should be able to
1. Identify generic models of software development process.
2. Understand fundamental concepts of Requirements Engineering and Analysis Modeling.
3. Compare different design techniques and their implementation.
4. List out various testing and maintenance measures.

UNIT I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.
A Generic View of Process: Software Engineering- A Layered Technology, A Process Framework, The Capability Maturity Model Integration (CMMI), Process Patterns, Process Assessment, Personal and Team Process Models.

UNIT II

Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, the Unified Process, Agile Models-Extreme Programming.
Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.
Requirements engineering processes: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT III

Design Engineering: Design Process and Design Quality, Design Concepts, the Design Model.
Creating an architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design.

UNIT IV

System models: Context Models, Behavioral models, Data models, Object models, structured methods.
Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution.

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UNIT V

Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.
Product Metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

UNIT VI

Metrics for Process and Projects: Software Measurement, Metrics for Software Quality.
Risk management: Reactive vs Proactive Risk Strategies, Software Risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management: ISO 9000 quality standards, Six Sigma.

TEXT BOOKS

1. Software Engineering, A Practitioner's Approach- Roger S. Pressman, 7th edition. McGraw-Hill International Edition, 2005(Unit-1, 3, 5, 6)
2. Software Engineering- Somerville, 7th edition, Pearson education.(Unit-2,4)
3. Software Engineering, A Precise approach, Pankaj Jalote, Wiley.

REFERENCE BOOKS

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt, Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
OBJECT-ORIENTED ANALYSIS AND DESIGN using UML							

Course Objective

The students become familiar with all phases of Object-Oriented Analysis and Design (OOAD). List out the Object Design Principles and understand how to apply them towards implementation.

Course Outcomes

After completion this course, the student should be able to:

1. Analyze software requirements and document those using Use Cases.
2. Utilize the notation of the UML diagrams such as Use Case, Class, Sequence, Activity, State chart, Deployment and Package Diagrams.
3. Acquire the knowledge of Library Files, Executable Files, Processors and Devices for a system.
4. Build the Forward and Reverse Engineering using UML notations.

UNIT I

Introduction to UML: The Meaning of Object-Orientation, Object Identity, Encapsulation, Information Hiding, Polymorphism, Genericity.
Why We Model: Importance of Modeling, Principles of Modeling, Object Oriented Modeling.
Introducing the UML: An Overview of the UML, A Conceptual Model of the UML, Architecture and Software Development Life Cycle.

UNIT II

Basic Structural Modeling:
Classes: Terms and Concepts, Common Modeling Techniques-Modeling the Vocabulary of a System, Modeling the Distribution of Responsibilities in a System, Modeling Nonsoftware Things, Modeling Primitive Types.
Relationships: Terms and Concepts, Common Modeling Techniques-Modeling Simple Dependencies, Modeling Single Inheritance, Modeling Structural Relationships.
Common Mechanisms: Terms and Concepts, Common Modeling Techniques-Modeling New Building Blocks, Modeling Comments, Modeling New Semantics, Modeling New Properties.
Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Different Views of a System, Modeling Different Levels of Abstraction, Modeling Complex Views.
Advanced Structural Modeling:
Advanced Classes: Terms and Concepts, Common Modeling Techniques–Modeling the Semantics of a Class.
Advanced Relationships: Terms and Concepts, Common Modeling Techniques–Modeling Webs of Relationships.
Interfaces, Types and Roles: Terms and Concepts, Common Modeling Techniques–Modeling the Seams in a System, Modeling Static and Dynamic Types.
Packages: Terms and Concepts, Common Modeling Techniques-Modeling Groups of Elements, Modeling Architectural Views.
Instances: Terms and Concepts, Common Modeling Techniques–Modeling Concrete Instances, Modeling Prototypical Instances.

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Class Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Simple Collaborations, Modeling a Logical Database Schema, Forward and Reverse Engineering.
Object Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Object Structures, Forward and Reverse Engineering.

UNIT III

Basic Behavioral Modeling-I:
Interactions: Terms and Concepts, Common Modeling Techniques-Modeling a Flow of Control.
Interaction Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Flows of Control by Time Ordering, Modeling Flows of Control by Organization, Forward and Reverse Engineering.
Sequence Diagrams: Terms and Concepts, differences between Collaboration and Sequence Diagrams, Depicting Synchronous Messages with/without Priority Call Back Mechanism Broadcast Message.
Collaboration Diagrams: Terms and Concepts, Depicting a Message, Polymorphism in Collaboration Diagrams, Iterated Messages, use of self in messages.

UNIT IV

Basic Behavioral Modelling-II:
Use Cases: Terms and Concepts, Common Modeling Techniques-Modeling the Behaviour of an Element.
Use Case Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling the Context of a System, Modeling the Requirements of a System, Forward and Reverse Engineering.
Activity Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering.

UNIT V

Advanced Behavioral Modeling:
Events and Signals: Terms and Concepts, Common Modeling Techniques–Modeling a Family of Signals, Modeling Exceptions.
State Machines: Terms and Concepts, Common Modeling Techniques–Modeling the Lifetime of an Object.
Processes and Threads: Terms and Concepts, Common Modeling Techniques–Modeling Multiple Flows of Control, Modeling Interprocess Communication.
Time and Space: Terms and Concepts, Common Modeling Techniques–Modeling Timing Constraints, Modeling the Distribution of Objects, Modeling Objects that Migrate.
State Chart Diagrams: Terms and Concepts, Common Modeling Techniques–Modeling Reactive Objects, Forward and Reverse Engineering.

UNIT VI

Architectural Modeling:
Components: Terms and Concepts, Common Modeling Techniques–Modeling Executables,

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and Libraries, Modeling Tables, Files, and Documents, Modeling an API, Modeling Source Code.

Deployment: Terms and Concepts, Common Modeling Techniques-Modeling Processors and Devices, Modeling the Distribution of Components.

Component Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems, Forward and Reverse Engineering.

Deployment Diagrams: Terms and Concepts, Common Modeling Techniques-Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System, Forward and Reverse Engineering.

Case Study: The Library Application, University Management System.

TEXT BOOKS

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education,2004, 2007, 2009(UNIT-I, UNIT-II, Chapter 1 & 2 of UNIT-III, UNIT-IV, UNIT-V, UNIT -VI)
2. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education, 2005 (Chapter 3 & 4 of UNIT-III).

REFERENCE BOOKS

1. Appling UML and Patterns: An introduction to Object–Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
2. The Unified Modeling Language Reference Manual, 2/e, Rambaugh, Grady Booch,etc., PEA
3. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson
4. Object Oriented Analysis & Design, John Deacon, PEA
5. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
WEB TECHNOLOGIES							

Course Objective

The main objective of the course is to expose the students to different web technologies and prepare him to design, develop and maintain a web site.

Course Outcomes

After completion of this course, the students should be able to

1. Acquaint with necessary fundamental skills for creating web applications.
2. Install and manage web server software and study server side scripting languages like servlets and JSP.
3. Acquire the concepts of java beans.
4. Understand database access and use it in JSP and servlets.

UNIT I

Review of HTML 5: HTML Common Tags, List, Tables, images, forms, Frames, SVG, CSS3: Images, Rounded Corners, Shadows, Animations.
Client side Scripting: Introduction to JavaScript: JavaScript language, declaring variables, scope of variables, functions, Event handlers (onclick, onsubmit etc.), Document Object Model, Form validation, Simple AJAX application.

UNIT II

Introduction to Swing: Differences between AWT Controls & Swing Controls, Handling Swing Controls like Icons, Buttons,
Text Boxes, Combo Boxes, Tabbed Panes, Scroll Panes, Layout Managers, Trees, Tables, Developing a Home page using Applets & Swing.
Introduction to Applets, Life cycle of an Applet, Japplet.

UNIT III

Introduction to Servlets: Lifecycle of a Servlet, JSDK, the Servlet API, Types of Servlet (HTTP and Generic), The javax.servlet Package, Reading Servlet parameters, Reading Initialization Parameters, The javax.servlet.HTTP package, Handling, Http Request & Responses, Using Cookies, Session Tracking, Security Issues.

UNIT IV

Introduction to JSP: The Problem with Servlets, The Anatomy of a JSP Page, Differences between Servlets and JSP, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

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UNIT V

JSP Application Development & Java Beans: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing – Displaying Values, Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data between JSP Pages, Requests and Users.
Java Beans: Introduction to Java Beans, Advantages of Java Beans, Introspection, Using Bound Properties, Bean Info Interface, Constrained Properties, Persistence, Customizers, Java Beans API, Deploying JAVA Beans in a JSP Page.

UNIT VI

Database Access: Database Programming using JDBC, JDBC Drivers, Studying javax.sql.*Package, Prepared statement, Result set, Accessing a Database from a JSP Page, Application Specific Database Actions.

TEXT BOOKS

1. Internet and World Wide Web: How to program,6/e, Dietel, Dietel, Pearson(2008).
2. The Complete Reference Java2, 8/e, Patrick Naughton, Herbert Schildt, TMH.
3. Java Server Faces, Hans Bergstan, O'reilly.

REFERENCE BOOKS

1. Web Programming, building internet applications, 2/e, Chris Bates, Wiley Dreamtech
2. Programming world wide web, Sebesta, PEA
3. Web Tehnologies, 2/e, Godbole, kahate, TMH
4. An Introduction to Web Design , Programming ,Wang,Thomson

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	4	-	-	40	60	100	4
DESIGN AND ANALYSIS OF ALGORITHMS							

Course Objective

Learn the students good principles of algorithm design, elementary analysis of algorithms, and fundamental data structures. The emphasis is on choosing appropriate data structures and designing correct and efficient algorithms to operate on these data structures.

Course Outcomes

After completion this course, the student should be able to:

1. Analyze worst-case running times of algorithms using asymptotic analysis.
2. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
3. Describe the greedy, dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
4. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

UNIT I

Introduction: Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation, little-oh notation, little- Omega notation).
Disjoint Sets: Disjoint set operations, union and find algorithms.

UNIT II

Divide and Conquer: General method, Applications: Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.

UNIT III

Greedy method: General method, Applications: 0/1 Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.

UNIT IV

Dynamic Programming: The General method, Applications: All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack, Reliability design, The Travelling sales person problem, Matrix-chain multiplication.

UNIT V

Backtracking: The General method, Applications: n-queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

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UNIT VI

Branch and Bound: The method, Applications: 0/1 knapsack problem, Travelling sales person, LC Branch and Bound Solution. NP-Hard and NP-complete problems: Basic concepts, non-deterministic algorithms, cook's theorem.

TEXT BOOKS

1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Satraj Sahni and Rajasekaram, Universities Press.

REFERENCE BOOKS

1. Design and Analysis of Algorithms, First Edition – S. Sridhar, Oxford.
2. Design and Analysis of Algorithms, Second Edition – Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education.
3. Design and Analysis of Computer Algorithms – Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education.
4. Introduction to the Design and Analysis of Algorithms, Third Edition – Anany Levitin, Pearson Education.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
HUMAN VALUES & PROFESSIONAL ETHICS							

Course Objective

To equip the student with the basic knowledge relating to the ethical behavior in to grow & develop the right professionalism.

Course Outcome

To learn necessary behavioral skills to gain fundamental knowledge relating to professionalism.

UNIT I

Introduction to Ethics: Ethics – Personal Vs Professional Ethics, Significance – Types of Ethics, Applied Ethics – Relevant Cases.

UNIT II

Ethics History: Ethics in Hindu Mythology - Evolution – Post Industrial Revolution – Modern Perspectives of Ethics – Code of Dharma.

UNIT III

Code of Ethics: Introduction – Scope & Limitations – Conflicts created by codes – Corporate Ethics – Ethics vs Law – Corporate Social Responsibility of Professionals.

UNIT IV

Morals: Introduction – Moral Problems –Dilemmas – Gifts Vs Bribe – Skills – Theories.

UNIT V

Human Values: Introduction – Values – Morals – Ethics – Virtues – Integrity – Civic Virtue – Respect for Others – Living Peacefully – Honesty/Courage.

UNIT VI

Contemporary Issues: Commitment – Character – Self Confidence – Spirituality – Research – Intellectual Professionalism – Egoism – Whistle Blowing.

TEXT BOOKS

1. "Professional Ethics and Morals" by Prof. A. R. Arasri, Dharanikota Suyodhana- Maruthi Publications.
2. "Professional Ethics and Values" by Prof. D. R. Kiran, Tata McGraw Hill Publications.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
WEB TECHNOLOGIES LAB							

Course Objectives

The main objective of the lab course is to expose the students to different programming aspects related to web designing using different technologies.

1. Understand web page site planning, designing, and maintenance.
2. Develop web sites which are secure and dynamic in nature and writing scripts which get executed on server as well.
3. Study the actual advanced Web methodologies, specifications and techniques.
4. Acquire the skills necessary to design, implement and deploy complex Web sites and applications.
5. Understands the concepts of PHP and AJAX to develop web pages & website.

Course Outcomes

After Completion of this course, the student should be able to:

1. Get practical exposure on HTML, XHTML, CSS, JavaScript, XML and other web technologies.
2. Get practical exposure to develop XML Technologies such as XML Schemas, XSLT.
3. Get practical exposure to develop Server-Side Programming using Servlets and JSP's.
4. Develop a web page & web site using AJAX and PHP.

Week-1

Design the following static web pages required for an online book store web site.

HOME PAGE

The static home page must contain three frames.

Top frame:

Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame:

At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link **"CSE"** the catalogue for **CSE** Books should be displayed in the Right frame.

Right frame:

The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.

Week-2:

1) Login Page:

This page looks like below:

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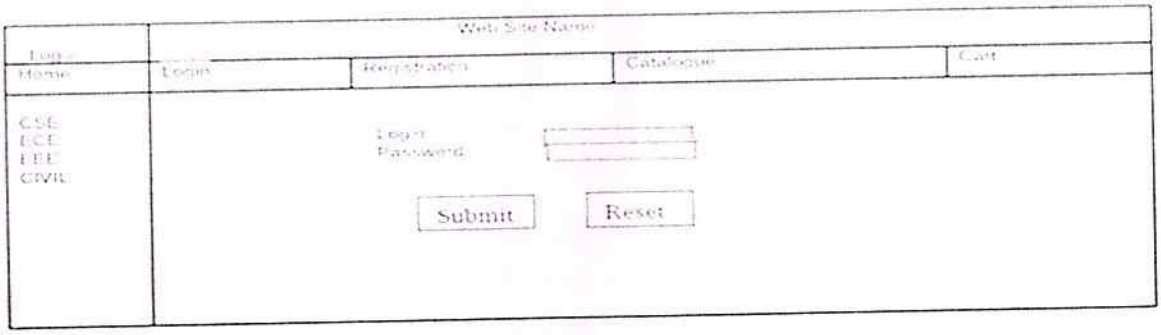

2) CATALOGUE PAGE:	
The catalogue page should contain the details of all the books available in the web site in a table.	
The details should contain the following:	
1. Snap shot of Cover Page.	2. Author Name.
3. Publisher.	4. Price.
5. Add to cart button.	

Note: Week 2 contains the remaining pages and their description.

3) CART PAGE: The cart page contains the details about the books which are added to the cart. The cart page should look like this:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	**Book name** Java 2 XML bible	**Price** $35.5 $40.5	**Quantity** 2 1	**Amount** $70 $40.5
		Total amount		$130.5

4) REGISTRATION PAGE:

Create a "*registration form* "with the following fields

1) Name (Text field)
2) Password (password field)
3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)

WEEK 3:

VALIDATION:

Write *JavaScript* to validate the following fields of the above registration page.

1. Name (Name should contains alphabets and the length should not be less than 6 characters).

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2. Password (Password should not be less than 6 characters length).
3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
4. Phone number (Phone number should contain 10 digits only).

Week-4:

Design a web page using CSS (Cascading Style Sheets) which includes the following:

Use different font, styles: In the style definition you define how each selector should work (font,color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

For example:

```
BODY {background-image:url(myimage.gif);}
```

```
<HTML>
<HEAD>
<style type="text/css">
B.headline {color:red; font-size:22px; font-family:arial; text-decoration:underline}
</style>

</HEAD>
```

```
<BODY>
<b>This is normal bold</b><br>
Selector {cursor:value}

For example:

<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>

<b class="headline">This is headline style bold</b>
</BODY>

</HTML>
```

2) Set a background image for both the page and single elements on the page.
You can define the background image for the page like this:
3) Control the repetition of the image with the background-repeat property.
As background-repeat: repeat Tiles the image until the entire page is filled, just like an ordinary background image in plain HTML.
4) Define styles for links as A:link
A:visited
A:active
A:hover

Example:

<style type="text/css"> A:link {text-decoration: none}
A:visited {text-decoration: none} A:active {text-decoration: none}
A:hover {text-decoration: underline; color: red;} </style>

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5) Workwith layers: For example:

LAYER 1 ON TOP:

LAYER 1 LAYER 2

LAYER 2 ON TOP:

LAYER 1 LAYER 2

6) Add a customized cursor:

Selector {cursor:value}

For Example:

```
<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>
```

Week 5:

Write an XML file which will display the Book information which includes the following:

1) Title of the book
2) Author Name
3) ISBN number
4) Publisher name
5) Edition
6) Price

Write a Document Type Definition (DTD) to validate the above XML file. Display the XML file as follows.

The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose.

Note: Give at least for 4 books. It should be valid syntactically.

Week-6:

VISUAL BEANS:

Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click. The color should also be changed if we change the color in the "property window".

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Week-7:

1) Install TOMCAT web server and APACHE.
   While installation assign port number 4040 to TOMCAT and 8080 to APACHE. Make sure that these ports are available i.e., no other process is using this port.
2) Access the above developed static web pages for books web site, using these servers by putting the web pages developed in week-1 and week-2 in the document root.
   Access the pages by using the urls :
   http://localhost:4040/rama/books.html (for tomcat)
   http://localhost:8080/books.html (for Apache)

Week-8:

User Authentication:

Assume four users user1, user2, user3 and user4 having the passwords pwd1,pwd2,pwd3 and pwd4 respectively. Write a servelet for doing the following.

1. Create a Cookie and add these four user id's and passwords to this Cookie.
2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.
   If he is a valid user(i.e., user-name and password match) you should welcome him by name(user-name) else you should display " You are not an authenticated user ".
   Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the getInitParameters() method.

Week 9:

Install a database(Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form). Practice 'JDBC' connectivity.

Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

Week-10:

Write a JSP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

Week-11:

Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount)) of each category. Modify your catalogue page (week 2)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

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Week-12:

HTTP is a stateless protocol. Session is required to maintain the state. The user may add some items to cart from the catalog page. He can check the cart page for the selected items. He may visit the catalogue again and select some more items. Here our interest is the selected items should be added to the old cart rather than a new cart. Multiple users can do the same thing at a time(i.e., from different systems in the LAN using the ip-address instead of localhost). This can be achieved through the use of sessions. Every user will have his own session which will be created after his successful login to the website. When the user logs out his session should get invalidated (by using the method session.invalidate()). Modify your catalogue and cart JSP pages to achieve the above mentioned functionality using sessions.

TEXT BOOKS

1. Internet and World Wide Web: How to program,6/e, Dietel, Dietel, Pearson(2008).
2. The Complete Reference Java2, 8/e, Patrick Naughton, Herbert Schildt, TMH.
3. Java Server Faces, Hans Bergstan, O'reilly.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
OBJECT-ORIENTED ANALYSIS AND DESIGN using UML LAB							

Course Objective

The students acquire the knowledge of various phases of Object-Oriented Analysis and Design (OOAD) Principles and understand how to apply them towards implementation.

Course Outcomes

After completion this course, the student should be able to

1. Understand how to model requirements with Use Cases.
2. Utilize the principles to design packages for large scale software projects.
3. Design the Dynamic Behaviour and Structure of the design.
4. Apply the pragmatic approach to Software Design and Development.

S. No.	Name of the Experiment
1	Banking System
2	Automatic Teller Machine (ATM) Application
3	Online Auction System
4	Railway Reservation System
5	Sending Secure File using Cryptography
6	Library Information System
7	University Course Registration System
8	Hospital Management System
9	Stock Inventory System

TEXT BOOK

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education(2004).

REFERENCE BOOKS

1. Visual Modeling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education.
2. UML2 Toolkit, Hans-Erik Eriksson, etc; Wiley.

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II MCA III SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
UNIX PROGRAMMING LAB							

Course Objective

This subject provides professional skills and knowledge for working in a UNIX environment. UNIX is a widely popular operating system for computing platforms ranging from tablet PCs to server farms. In this subject, students acquire the fundamentals of UNIX and how to perform system programming in the UNIX shell. These skills are essential for professional profiles as diverse as IT system administrators, system developers, data engineers, software engineers, network administrators, and IT managers at large.

Course Outcomes

After completion of this course, student should be able to:

1. Utilize the UNIX environment effectively to perform a range of system-level tasks.
2. Analyze and apply shell scripts of medium complexity to solve system-level problems and form an appropriate skill set.
3. Construct and apply regular expressions in shell to process text, search files and Validate formats.
4. Acquire the knowledge with the Unix environment and Unix Administration

Note: Student needs exposure to all programs, but expected to complete at least 25-30.

1. Unix Utilities – Introduction to Unix File System, vi editor, File Handling Utilities, Security by File Permissions, Process Utilities, Disk Utilities, Networking Commands, Text Processing Utilities, Backup Utilities, and General Purpose Utilities.
2. Write a shell script to find the simple interest.
3. Write a shell script to display student grade based on 3 subjects.
4. Write a shell script to perform arithmetic operations using case construct.
5. Write a shell script to find the factorial of a given number.
6. Write a shell script to display prime numbers.
7. Write a shell script to find the addition of two numbers using functions.
8. Write a shell script to count number of characters, words, and lines in a given text using wc command.
9. Write a shell script whether the directory is exist/not.
10. Write a shell script whether the file is exist/not.
11. Write a shell script to display the good morning, good afternoon, good evening and good night depending on the users log on time.
12. Write a shell script which deletes all lines containing the word "UNIX" in the files supplied as arguments to this shell script.
13. Write a shell script which displays a list of all files in the current directory to which you have Read, Write and Execute Permissions.

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14. Write a menu-driven program which has the following options: i) append data into the file ii) Search a word in an existing file iii) Display content of the file iv) Display the users v) Display the current directory name vi) Display the current login.
15. Program using system calls: create, open, read, write, close, stat, fstat, lseek, dup, dup2.
16. Program using Standard I/O: fopen, fclose, getchar, putchar, getc, fgetc, putc, fputc, fgets, fputs, fseek.
17. Program using File and Directory maintenance: chmod, chown, unlink, link, symlink, mkdir, rmdir chdir, getcwd.
18. Program using Directory handling system calls: opendir, closedir, readdir, rewinddir, seekdir.
19. Write a 'C' Program that demonstrate the fork() system call.
20. Write a 'C' Program that demonstrate vfork() system call.
21. Write a 'C' Program to implement zombie process.
22. Write a 'C' Program to implement orphan process.
23. Write a 'C' Program that demonstrates SIGSTOP, SIGQUIT, and SIGINT.
24. Write a 'C' Program that demonstrates SIGSTOP, SIGCONT, and SIGKILL.
25. Write a 'C' Program to illustrate sleep functions.
26. Write a 'C' Program to illustrate the pipe function.
27. Write a 'C' Program to implement unnamed pipe by using fork() system call.
28. Write a 'C' Program to illustrate fcntl function.
29. Write a 'C' Program to illustrate message queue.
30. Write a program demonstrating mutual exclusion principle using semaphore/file locks/mutex.
31. Write a 'C' Program to implement client-server application by using shared memory.
32. Program using TCP sockets (Client and Server).
33. Program using UDP sockets (Client and Server)
34. Write a 'C' Program to implement threads.
35. Write a 'C' Program to implement producer-consumer problem.
36. Write a 'C' Program to implement thread synchronization using mutex variable.

TEXT BOOKS

1. Unix Concepts and Applications - Sumitabha Das -2nd Edition - Tata McGraw Hill, 2001.
2. Advanced Programming in the Unix Environment – W.Richard Stevens (2004)
3. Unix Network Programming – W.Richard Stevens(2001).

REFERENCE BOOKS

1. Learning Perl - Randal Schwartz , Tom Phoenix , briand foy- oreilly, 5th Edition 2008
2. Unix Shell Programming Y.Kanetkar-BPB Pub.,2003.

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II MCA IV SEMESTER SYLLABUS

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
COMPUTER NETWORKS							

Course Objective

The course provides knowledge on the fundamental concepts of the Computer Networks and problem solving techniques on Networks.

Course Outcomes

After completion of this course, the students should be able to
1. Interpret the basic computer network technology.
2. Identify the different types of network topologies and protocols.
3. Explain the layers of the OSI and TCP/IP model and the functions of each layer.

UNIT I

Network Hardware Reference Model: Transmission Media, Narrowband ISDN, Broad-band ISDN, ATM.

The Data Link Layer: Error detection and correction, Elementary Data Link Protocols, Sliding window protocols.

UNIT II

Channel Allocation Methods: TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols, IEEE standard BO2 for LANS, Ethernet, Token Bus, Token ring, Bridges.

UNIT III

Network Layer Routing Algorithms: Shortest path, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms, General principles of congestion control, Congestion prevention polices.

UNIT IV

Internet Working: Tunneling, internetworking, Fragmentation, Network Layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP.

Network Layer in the ATM Networks-cell formats, connection setup, routing and switching, service categories and quality of service, ATM LANs.

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UNIT V

The Transport Layer: Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to End protocols: UDP, TCP Protocol and Remote Procedure Call.

UNIT VI

Application Layer: Network Security, Cryptographic Algorithms: DES, RSA. Security Mechanisms: Authentication Protocols, Firewalls, DNS, Protocols-SMTP, MIME, HTTP, SNMP.

TEXT BOOKS

1. Computer Networks Andrew, Tanenbaum, 4/e, Pearson.
2. Data and computer communications, Stallings, 8/e, PHI.

REFERENCE BOOKS

1. Data communications and networking, Forouzan, 4/e, TMH.
2. An Engineering approach to compute networking, Kesha, Pearson.
3. Communication networks, 2/e, Leon-Garcia, TMH.
4. Computer networks, C R Sarma, Jaico, Held, 7/e, Pearson.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	-	-	-
ADVANCED COMMUNICATION SKILLS							

Course Objectives

1. To make the students conscious about their Non-Verbal communication
2. Train the students to use the language effectively to face interviews and participate in Group Discussions.
3. To develop effective written communication skills in academic, technical and professional contexts.
4. Develop critical thinking skills necessary to become employable.

Course Outcomes

At the end of the course students will be able to

1. Use English language fluently, accurately and appropriately
2. Know how body language is used in communication and interpret non-verbal symbols.
3. Understand the nuances of the written language and write technical reports effectively.
4. Participate in Group discussions and successfully face interviews.

Unit-1: **Non-Verbal Communication**

Unit-2: **Resume Preparation**

Unit-3: **E-mail writing & Professional Letter writing**

Unit-4: **Essay Writing & Paragraph writing**

Unit-5: **Group discussion**

Unit-6: **Interview skills**

REFERENCE BOOKS

1. Rajendra Pal, J S KorlahaHi, Essentials of Business Communication, Sultan Chand & Sons.
2. Andrea J. Rutherford, Basic Communication Skills for Technology, Pearson Education Asia.
3. V. Prasad, Advanced Communication Skills, Atma Ram Publications.
4. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press.
5. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press.
6. Meenakshi Raman, Sangeeta Sharma, Fundamentals of Technical Communication, Oxford University Press.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
DATA WAREHOUSING AND MINING							

Course Objective

This course helps the students to understand the overall architecture of a data warehouse and techniques and methods for data gathering and data pre-processing by OLAP tool and outlier detection.

Course Outcomes

After completion of this course, students should be able to

1. Examine the types of data to be mined and extract knowledge using Data Mining Techniques.
2. Analyze the different operations and techniques involved in Data Warehouse.
3. Identify components in typical Data Warehouse architectures.
4. Compare and contrast different dominant Data Mining Algorithms for classification, Association Analysis and Clustering.

UNIT I

Introduction to Data Mining: What Is Data Mining, Motivating Challenges, The Origins of Data Mining, Data Mining Tasks, Types of Data: Attributes and Measurement, Types of Data Sets, Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.

UNIT II

Data: Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation, Measures of similarity and dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures.

UNIT III

Data Warehouse and OLAP Technologies: What is a Data Warehouse, A Multidimensional Data Model: From tables to data cubes, Stars, snowfakes, and fact constellations(schemas for multidimensional databases), Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation), Introducing concept hierarchies, OLAP operations in the multidimensional data model, A starnet query model for querying multidimensional databases, Data Warehouse Architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, OLAP server architectures: ROLAP vs. MOLAP vs. HOLAP, SQL extensions to support OLAP operations, Data Warehouse implementation: Efficient computation of data cubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository, Data warehouse back-end tools and utilities.

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UNIT IV

Classification: Basic Concepts, Decision Trees, and Model Evaluation: General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, Evaluating the Performance of a Classifier: Holdout Method, Random Subsampling, Cross-Validation, Bootstrap Method.

Classification: Alternative Techniques: Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier, SVM.

UNIT V

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Itemset Generation: The Apriori principle, Frequent Itemset Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support Counting, Rule Generation: Confidence-Based Pruning, Compact Representation of Frequent Itemsets: Maximal Frequent Itemsets, Closed Frequent Itemsets, FP-Growth algorithms: FP-Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.

Association Analysis: Advanced Concepts: Handling Categorical Attributes, Handling Continuous Attributes: Discretization-Based Methods, Statistics-Based Methods, Non-discretization Methods.

UNIT VI

Cluster Analysis: Basic Concepts and Algorithms: Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, K-means: The Basic K-means Algorithm, K-means and Different Types of Clusters, Strengths and Weaknesses, Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses.

TEXT BOOKS

1. Introduction to Data Mining: Pang-Ning tan, Michael Steinbach, Vipin kumar, Addision-Wesley. (UNIT – 1, 2, 4, 5, 6)
2. Data Mining, Concepts and Techniques, 2/e, Jiawei Han, Micheline Kamber, Elsevier, 2006. (UNIT – 3)

REFERENCE BOOKS

1. Data Mining: Introductory and Advanced Topics, Margaret H Dunham, Pearson, 2008.
2. Introduction to Data Mining with Case Studies: GK Gupta; Prentice Hall.
3. Fundamentals of data warehouses, 2/e , Jarke, Lenzerini, Vassiliou, Vassiliadis, Springer.
4. Data Mining Theory and Practice, Soman, Diwakar, Ajay, PHI, 2006.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
MOBILE COMPUTING							

Course Objectives

1. To make the student understand the concepts of mobile computing paradigm, its applications and limitations.
2. To understand the typical Mobile Networking infrastructure through GSM.
3. To understand the issues and solutions of various layers of Mobile Networks, i.e, MAC Layer, Network Layer & Transport Layer.
4. To understand the adhoc networks and related concepts.

Course Outcomes

After completion of this course, the students should be able to:

1. Understand the various types of Wireless Networks.
2. Carry out the applications and architecture of Mobile Computing.
3. Analyze the various Mobile TCP Variants and Mobile IP issues.

UNIT I

Mobile Communications: An Overview, Mobile Communication-Guided transmission, unguided transmission, Mobile Computing: Mobile Computing Architecture, Mobile System Networks.

UNIT II

Mobile Devices and Systems: Cellular Networks, Mobile Smart Phones, Smart Mobiles and Smart Systems, Handheld Pocket Computers, Limitations of Mobile Devices.

UNIT III

GSM and Other 2G Networks: GSM services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture.
Wireless Medium Access Control & 3G, 4G Networks: CDMA, WCDMA, SDMA, FDMA, TDMA, 3G and 4G Networks.

UNIT IV

Mobile IP Network Layer: IP and Mobile IP Network Layers: OSI layer functions, TCP/IP and Internet protocol, Mobile Internet Protocol, Packet delivery and Handover Management, Location Management, Agent Discovery, Mobile TCP.

UNIT V

Introduction to Mobile Adhoc Network: Fixed Infrastructure Architecture, MANET infrastructure architecture, MANET, properties, spectrum, applications; Security in Ad-hoc Network, Wireless sensor networks; Sensor Network Applications.

UNIT VI

Mobile Wireless Short Range Networks and Mobile Internet: Wireless LAN (WLAN) Architecture, IEEE 802.11 protocol layers, Wireless application protocol (WAP) architecture.

TEXT BOOKS

1. "Mobile Computing," RAJ KAMAL, second edition, Oxford(2009).
2. "Mobile Computing, Technology Applications and Service Creation" ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, Second Edition, Mc Graw Hill.
3. "Principles of Mobile Computing," Second Edition, Springer.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
DISTRIBUTED OPERATING SYSTEMS							

Course Objective

To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols. The algorithms for implementation of distributed shared memory, recovery and commit protocols.

Course Outcomes

After completion of the course, students should be able to

1. Student will gain the knowledge on various Operating systems like Windows and Unix.
2. Student will gain knowledge on various internals of operating system.
3. Describe, contrast and compare differing structures for operating systems.
4. Understand and analyse theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files.

UNIT I

Introduction: Introduction to Distributed System, Goals of Distributed system, Hardware and Software concepts, Design issues.

Communication in Distributed System: Layered protocols, ATM Networks, Client – Server model, Remote Procedure Calls and Group Communication, Middleware and Distributed Operating Systems.

UNIT II

Synchronization in Distributed System: Clock synchronization, Mutual Exclusion, Election algorithm, Bully algorithm, Ring algorithm, Atomic Transactions, Deadlock in Distributed Systems, Distributed Deadlock Prevention, Distributed Deadlock Detection.

UNIT III

Processes and Processors in Distributed Systems: Threads, System models, Processors Allocation, Scheduling in Distributed System, Real Time Distributed Systems.

UNIT IV

Distributed File Systems: Distributed file system Design, Distributed file system Implementation, Trends in Distributed file systems. Distributed Shared Memory: What is shared memory, Consistency models, Page based distributed shared memory, shared variables distributed shared memory.

UNIT V

Fault Tolerance: Concepts, Failure Models, Failure Masking by Redundancy.

Process Resilience: Design Issues, Failure Masking and Replication, Agreement in Faulty Systems.

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Recovery: Introduction, Check –pointing, Message Logging – Synchronous and Asynchronous, Adaptive Logging.

UNIT VI

Case Study MACH: Introduction to MACH, process management in MACH, communication in MACH, UNIX emulation in MACH.

TEXT BOOK

1. Distributed Operating System – Andrew S. Tanenbaum, PHI.

REFERENCE BOOKS

1. Distributed Systems: Principles of Paradigms : Andrew Tannenbaum And Maarten van steen.
2. Distributed Operating Systems: Concepts and Design : Pradeep K.Sinha.
3. Distributed Operating Systems and Algorithm Analysis : Randy Chow , Theodore Jhonson.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
SOFTWARE DESIGN METHODOLOGIES							

Course Objectives

1. To make the student understand the concept of Software Design Paradigm.
2. To understand the Design Principles, Quality Attributes of Design, Design Architectures and different scenarios of design.

Course Outcomes

After completion of this course, the students should be able to
1. Learn the Software Designing Skills.
2. Analyze the various Design Principles.
3. Distinguish various architectural styles & Quality attributes of software design.

UNIT I

Basic Concepts of Design: Introduction, Characteristics of Design Activities, Essential Elements of Designs.
Design Quality: Software Quality Models: Hierarchical Models, Relational Models, The effect of Design on Software Quality: Efficiency, Correctness and Reliability, Portability, Maintainability, Reusability, Interoperability.

UNIT II

Quality Attributes of Software Design: Witt, Baker and Merritt's Design Objectives, Parnas and Weiss's requirements of Good Designs, Quality of Development Process.
Design Principles: Basic rules of Software Design: Causes of difficulties, Vehicles to overcome difficulties, Basic Rules of Software Design.
Design Processes: The context of design in Software Development Process, Generic Design Process: Descriptive Models, Structure of Software Design Methods.

UNIT III

Software Architecture: The notion of Architecture: Architecture in the Discipline of Buildings, Architecture in the Discipline of Computer Hardware.
The General Notion of Architecture: The notion of Software Architecture, Prescriptive Models, Descriptive Models, Multiple View Models, the roles of Architecture in Software Design.
Software Architectural Style: Introductory examples, the Notion of Software Architectural Style.

UNIT IV

Description of Software Architectures: The Visual Notation: Active and Passive Elements, Data and Control Relationships, Decomposition and Composition of Architectural Elements.

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UNIT V

Typical Architectural Styles:

Data Flow: The general data flow styles, the pipe and filter sub-style, the batch sequential processing sub-style.

Independent Components: The general independent components style, the event-based implicit invocation systems sub-style.

Call and Return: The general call and return style, the layered systems sub-style, Data abstraction: The abstract data type and object-oriented sub-styles, Data-centered style, Virtual Machine Architecture.

UNIT VI

Analysis and Evaluation: The Concept of Scenario, Scenarios for Evaluating Modifiability: Scenarios for evaluating reusability, specification of operational profiles, evaluation and analysis of performance, Scenarios for evaluating reusability.

TEXT BOOK

1. Software Design Methodology: From Principles to Architectural Styles, Hongzhu, Elsevier, 2009

REFERENCE BOOKS

1. Software Architecture: Perspectives on an Emerging discipline, Shaw, M. Garlan, PEA, 2008.
2. Software Architecture in Practice, Bass, L., Clements P, Kazman, PEA,2003.
3. Evaluating Software Architectures: Methods and Case Studies, Clements Kazman, Klien, PEA, 2002.
4. Software Architecture and Design, Bernard Witt, Baker, Merritt, VonNostrandReinhold, NY, 1994.

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	4	-	-	40	60	100	4
INTERNET OF THINGS							

Course Objectives

1. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
3. Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).

Course Outcomes

1. Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
2. Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
3. Develop critical thinking skills

UNIT I

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices.

UNIT II

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV

Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

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UNIT V

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT VI

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Sensor Network Technology, Sensing the World.

TEXTBOOKS

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.
2. Internet of Things, A. Bahgya and V. Madisetti, Univesity Press, 2015.

REFERNCE BOOKS

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.
2. Getting Started with the Internet of Things CunoPfister , Oreilly.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
E-COMMERCE							

Course Objectives

1. Explain to students why information systems are so important today for business and management.
2. Evaluate the role of the major types of information systems in a business environment and their relationship to each other.
3. Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges.

Course Outcomes

After completion of this course, the students should be able to

1. Demonstrate an understanding of the foundations and importance of E-commerce.
2. Demonstrate an understanding of retailing in E-commerce by.
3. Analyse the impact of E-commerce on business models and strategy.
4. Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.

UNIT I

Electronic Commerce, Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT II

Consumer Oriented Electronic commerce, Mercantile Process models.

UNIT III

Electronic payment systems , Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT IV

Intra Organizational Commerce: Work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT V

Corporate Digital Library: Document Library, Digital Document types, Corporate Data Warehouses, Advertising and Marketing, Information based marketing, Advertising on Internet, on-line marketing process, market research.

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UNIT VI

Consumer Search and Resource Discovery, Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processings, Desktop video conferencing.

TEXT BOOK

1. Frontiers of Electronic Commerce , Kalakata, Whinston, PEA,2006.

REFERENCE BOOKS

1. E-Commerce Fundamentals and Applications Hendry Chan, Raymond Lee,Dillon,Chang, John Wiley.
2. E-Commerce,A Managerial Perspective, Turban E, Lee J , King, Chung H.M.,PEA,2001.
3. E-Commerce An Indian Perspective , 3/e, P.T. Joseph, PHI,2009.
4. E-Commerce, S.Jaiswal , Galgotia.
5. Electronic Commerce , Gary P.Schneider, Thomson.

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II MCA IV SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	4	40	60	100	2
MOBILE APPS DEVELOPMENT LAB							

SYLLABUS

1. Write a Program to display text and toast on button click.

2. Write a Program for login page.

3. Write a Program for registration page with edittext(firstname, lastname), button(register), radiobutton(gender), checkbox(qualification), spinner(country). And display the entered fields in alert dialog on register button click.

4. Write a Program to calculate age (pick date of birth using date picker component).

5. Write a Program to make a call from the entered numbers in edit text.

6. Write a Program to navigate from login page (on signup text click) to Register page.

7. Write a Program to get Image from gallery or camera into image view.

8. Write a Program for navigation drawer with fragments.

9. Write a Program to show static list of names/movies/countries.

10. Write a Program to store contacts using SQLite.

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	-	-	4	40	60	100	2
DATA WAREHOUSING AND MINING LAB							

Course Objective

The students acquire the knowledge of Data Mining Tools (weka) for retrieving Data from Ware House.

SYLLABUS

1. Demonstration of preprocessing on dataset student.arff.
2. Demonstration of preprocessing on dataset labor.arff.
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm.
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm.
5. Demonstration of classification rule process on dataset student.arff using j48 Algorithm.
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm.
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm.
8. Demonstration of classification rule process on dataset employee.arff using naive bayes algorithm.
9. Demonstration of clustering rule process on dataset iris.arff using simple k-Means.
10. Demonstration of clustering rule process on dataset student.arff using simple k-means.

TEXT BOOK

1. Data Mining, Concepts and Techniques, 2/e, Jiawei Han, Micheline Kamber, Elsevier, 2006.

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	-	-	4	40	60	100	2
FRAMEWORKS LAB							

Course Objective

Learn Single Page web application development Framework using Angularjs.

Course Outcome

After completion of this course, students should be able to

1. Create Scalable.
2. Easy to Use (User Friendly).
3. Platform/Device Independent Web Applications.

Syllabus

Create Sample Web applications to the following:

1. Angular Expressions
2. Angular Modules
3. Angular Directives
4. Angular Model
5. Angular Data Binding
6. Angular Controllers
7. Angular Scopes
8. Angular Filters
9. Angular Services
10. Angular Http
11. Angular Tables
12. Angular Select
13. Angular SQL
14. Angular DOM
15. Angular Events
16. Angular Forms
17. Angular Validation
18. Angular APIs
19. Angular W3.CSS
20. Angular Includes
21. Angular Animations
22. Angular Routing
23. Angular Application

REFERENCE BOOKS

1. Learning AngularJS by Ken Williamson O'Reilly Media Inc.,
2. AngularJS, co-written by S. Brad Green and Shyam Seshadri, O'Reilly.

WEB REFERENCES

https://www.w3schools.com/angular/

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	4	-	-	40	60	100	4
NETWORK SECURITY & CRYPTOGRAPHY							

Course Objectives

The objectives of this course are
1. To understand the fundamentals of Cryptography.
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks.
5. To design security applications in the field of Information technology.

Course Outcomes

At the end of this course, the student should be able to
1. Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
2. Identify the security issues in the network and resolve it.
3. Evaluate security mechanisms using rigorous approaches, including theoretical.
4. Compare and Contrast different IEEE standards and Electronic mail security.
5. Understand and use Security & Privacy mechanisms in EDI like E-mail.

UNIT I

Introduction
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs.

UNIT II

Conventional Encryption
Conventional Encryption Principles, Conventional encryption algorithms, Cipher block modes of operation, Location of encryption devices, key distribution, Approaches of Message Authentication, Secure Hash Functions and HMAC.

UNIT III

Public key Cryptography
Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management, Kerberos, X.509 Directory Authentication Service.

UNIT IV

IP Security
IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

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UNIT V

Web Security
Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).
Email Privacy
Pretty Good Privacy (PGP) and S/MIME.

UNIT VI

Intruder Types, Detection & Prevention Mechanisms
Intruders, Viruses and related threats.
Fire walls
Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOKS

1. Network Security Essentials: Applications and Standards, William Stallings, PEA.

REFERENCE BOOKS

1. Network Security & Cryptography, Bernard Menezes, Cengage, 2010.
2. Fundamentals of Network Security, Eric Maiwald, Dream Tech.
3. Network Security: Private Communication in a Public World, Kaufman, Perlman, PEA/PHI.
4. Principles of Information Security, Whitman, Thomson.
5. Cryptography and Network Security, 3/e, Stallings, PHI/PEA.
6. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH.
7. Introduction to Cryptography, Buchmann, Springer.

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DATA SCIENCE WITH R PROGRAMMING							

Course Objectives

This course will enable students to
1. Gain a foundational understanding of business analytics.
2. Understand and use the various graphics in R for data visualization.
3. Gain a basic understanding of the various statistical concepts.
4. Understand and use hypothesis testing method to drive business decisions.
5. Learn and use the various association rules and Apriori algorithm.
6. Learn and use clustering methods including K-means, DBSCAN and hierarchical clustering.

Course Outcomes

At the end of this course, students will be able to
1. List motivation for learning a programming language.
2. Access online resources for R and import new function packages into the R workspace.
3. Import, review, manipulate and summarize datasets in R.
4. Explore data-sets to create testable hypothesis and identify appropriate statistical tests.
5. Perform appropriate statistical tests using R.
6. Create and edit visualizations with R.

UNIT I

Introduction to Big Data Analytics
Big Data Overview: Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, Bl Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics.

UNIT II

Data Analytics Lifecycle: Data Analytics Lifecycle Overview: Key Roles for a Successful Analytics Project, Background and Overview of Data Analytics Lifecycle, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Model building, Phase 5: Communicate Results, Phase 6: Operationalize.

UNIT III

Introduction, how to run R, First R Sessions, Functions, Data Types, Vectors,
Matrices & Arrays: Creating Matrices, General Matrix Operations, Adding and Deleting Matrix Rows and Columns, Naming Matrix Rows and Columns
Lists: Creating Lists, General List Operations, Accessing List Components and Values, Applying Functions to Lists.
Control Statements, Loops, - Looping Over Non vector Sets- If-Else, Arithmetic and Boolean Operators and value S.

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UNIT IV

Statistical Methods for Evaluation: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II Errors, Power and Sample Size, ANOVA.

UNIT V

Advanced Analytical Theory and Methods-I: Association rule-Apriori algorithm, Clustering: Overview of Clustering, K-means, Use Cases, Overview of the Method, Determining the Number of Clusters, Diagnostics.

UNIT VI

Advanced Analytical Theory and Methods-II: Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naive Bayes' Theorem, Nai've Bayes Classifier Nai've Bayes in R.

TEXT BOOKS

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services 2014 (Unit 1,2,4,5,6).
2. The Art of R Programming, Norman Matloff, Cengage Learning (Unit -3).

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	4	-	-	40	60	100	4
SOFTWARE TESTING METHODOLOGIES							

Course Objectives

This course will enable students

1. To study fundamental concepts in software testing strategies and methods.
2. To gain the techniques and skills on how to use modern software testing tools to support Software testing projects.
3. Understand and use transaction flow testing techniques, data flow testing & domain testing.
4. To gain an understanding of Decision tables, kv charts, path expressions and state graphs.

Course Outcomes

After completion of this course, the student should be able to

1. Apply software testing knowledge and engineering methods.
2. Design and conduct a software test process for a software testing project.
3. Understand and identify various software testing problems.
4. Solve the software testing problems by designing and selecting software test models, criteria, strategies and methods.

UNIT I

Introduction: Purpose of testing, Dichotomies, Model for testing, Consequences of bugs, Taxonomy of bugs.

UNIT II

Flow graphs and Path testing: Basic concepts of path testing, Predicates, Path predicates and achievable paths, Path sensitizing, Path instrumentation, Application of path testing.

UNIT III

Transaction Flow Testing: Transaction flows, Transaction flow testing techniques.
Dataflow testing: Basics of dataflow testing, Strategies in dataflow testing, Applications of dataflow testing.

UNIT IV

Domain Testing: Domains and paths, Domain testing, Domain and interface testing, Domains and testability.

UNIT V

Logic Based Testing: Overview, Decision tables, Path expressions, kv charts, Specifications.

UNIT VI

State, State Graphs and Transition testing: State graphs, good & bad state graphs, State testing, Testability tips.

TEXT BOOKS

1. Software testing techniques - Boris Beizer, International Thomson computer press, second edition.
2. Software Testing-Yogesh Singh, CAMBRIDGE.

REFERENCE BOOKS

1. Introduction to Software Testing, Paul Amman, Jeff Offutt, CAMBRIDGE.
2. Effective Software testing, 50 Specific ways to improve your testing, Elfriede Dustin, PEA.

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	4	-	-	40	60	100	4
CYBER SECURITY							

Course Objectives

This course will enable students
1. To gain a fundamental knowledge of what Cyber Security is and how it applies to your daily work.
2. To gain an understanding of terms commonly used in Cyber Security such as "vulnerability".
3. To know how vulnerabilities occur and how to limit your exposure to them.
4. To gain a fundamental understanding of what an attack is and how to identify and prevent them from occurring.
5. To provide the fundamental skills and understanding needed to identify Cyber Security threats.

Course Outcomes

At the end of this course, the student should be able to
1. Possess a fundamental knowledge of Cyber Security.
2. Understand what vulnerability is and how to address most common vulnerabilities.
3. Know basic and fundamental Computer Forensics principles as it relates to Cyber Security.
4. Have the knowledge needed to practice safer computing and safeguard your information.
5. Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems.

UNIT I

Understanding Computer Network Security: Securing the Computer Network Forms of Protection, Security Standards.
Security Threats to Computer Networks: Sources of Security Threats, Security Threat Motives, Security Threat Management, Security Threat Correlation, Security Threat Awareness.
Computer Network Vulnerabilities: Sources of Vulnerabilities, Vulnerability Assessment.
Cyber Crimes and Hackers: Cyber Crimes, Hackers, Dealing with the Rising Tide of Cyber Crimes.

UNIT II

Security Assessment, Analysis, and Assurance: System Security Policy, Building a Security Policy, Security Requirements Specification, Threat Identification, Threat Analysis, Vulnerability Identification and Assessment, Security Certification, Security Monitoring and Auditing, Products and Services.
Access Control and Authorization: Access Rights, Access Control Systems, Authorization, Types of Authorization Systems, Authorization Principles, Authorization Granularity, Web Access and Authorization.
Authentication: Multiple Factors and Effectiveness of Authentication, Authentication Elements, Types of Authentication, Authentication Methods, Developing an Authentication Policy.

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UNIT III

Firewalls: Types of Firewalls, Configuration and Implementation of a Firewall, The Demilitarized Zone (DMZ), Improving Security Through the Firewall, Firewall Forensics, Firewall Services and Limitations.

System Intrusion Detection and Prevention: Intrusion Detection, Intrusion Detection Systems (IDSs), Types of Intrusion Detection Systems, The Changing Nature of IDS Tools, Other Types of Intrusion Detection Systems, Response to System Intrusion, Challenges to Intrusion Detection Systems, Implementing an Intrusion Detection System, Intrusion Prevention Systems (IPSs), Intrusion Detection Tools.

The Art of Intrusion Detection: Basic Ideas of Intrusion Detection, Network-Based Detections and Host-Based Detections, Signature Detections, Statistical Analysis, Behavioural Data Forensics, Honeypots.

UNIT IV

The Art of Anti Malicious Software: Viruses, Worms, Virus Defence, Trojan Horses, Hoaxes, Peer-to-Peer Security, Web Security, Distributed Denial of Service Attacks.

Computer and Network Forensics: Computer Forensics, Network Forensics, Forensics Tools.

Virus and Content Filtering: Scanning, Filtering, and Blocking, Virus Filtering, Content Filtering, Spam.

UNIT V

Security in Wireless Networks and Devices: Cellular Wireless Communication Network Infrastructure, Wireless LAN (WLAN) or Wireless Fidelity (Wi-Fi), Standards for Wireless Networks, Security in Wireless Networks.

Security in Sensor Networks: The Growth of Sensor Networks, Design Factors in Sensor Networks, Security in Sensor Networks, Security Mechanisms and Best Practices for Sensor, Trends in Sensor Network Security Research.

UNIT VI

Security beyond Computer Networks: Information Assurance: Collective Security Initiatives and Best Practices.

Network Perimeter Security: General Framework, Packet Filters, circuit Gateways, Application Gateways, Trusted Systems and Bastion Hosts, Firewall Configurations, Network Address Translations, Setting up Firewalls.

TEXT BOOKS

1. Computer Network Security- Theory and Practice by Jie Wang, 2009 edition, Higher Education Press, Beijing and Springer-Verlag.
2. A Guide to Computer Network Security by Joseph Migga Kizza, 2009 Edition, Springer-Verlag London Limited.

REFERENCE BOOKS

1. Network Security Essentials- Applications and Standards by William Stallings, 4th edition.
2. Modern Cryptography: Theory and Practice by Wenbo Mao Hewlett-Packard Company,1st edition, Prentice Hall PTR.
3. Network Security: Private Communication in a Public World by Charlie Kaufman, Radia Perlman, Mike Speciner, 2nd edition.
4. Cryptography and Network Security: Principles and Practice by William Stallings, 6th Edition.

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III MCA V SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	-	-	40	60	100	4
HUMAN COMPUTER INTERACTION							

Course Objectives

This course will enable students to
1. Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
2. Recognize how a computer system may be modified to include human diversity.
3. Select an effective style for a specific application.
4. Design mock ups and carry out user and expert evaluation of interfaces.
5. Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.
6. Use the information sources available, and be aware of the methodologies and technologies supporting advances in HCI.

Course Outcomes

At the end of this course, the student should be able to
1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human computer interaction (HCI) models, styles, and various historical HCI paradigms.
3. Apply an interactive design process and universal design principles to designing HCI systems.
4. Describe and use HCI design principles, standards and guidelines.
5. Analyse and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
6. Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

UNIT I

Introduction

Usability of Interactive Systems- Introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing. Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories.

UNIT II

Menu Selection, Form Fill-In and Dialog Boxes

Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays.

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UNIT III

Command and Natural Languages

Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

UNIT IV

Quality of Service

Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, No anthropomorphic Design, Display Design, Web Page Design, Window Design, Colour.

UNIT V

User Documentation and Online Help

Introduction, Online Vs Paper Documentation, Reading from paper Vs. from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process.

UNIT VI

Information Search

Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

TEXT BOOKS

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Pleasant, Maxine Cohen, Steven M Jacobs, Pearsonz.
2. The Essential guide to user interface design,2/e, Wilbert O Galatz, Wiley DreamaTech.

REFERENCE BOOKS

1. Human Computer, Interaction Dan R.Olsan, Cengage, 2010.
2. Designing the user interface. 4/e, Ben Shneidermann, PEA.
3. User Interface Design, Soren Lauesen, PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.

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	4	-	-	40	60	100	4
SOFTWARE PROJECT MANAGEMENT							

Course Objectives

This course will enable students to

1. Understand the importance of Software Project Management.
2. Understand the pros and corns of different SPM.
3. Understand how to choose suitable software Project Management based on the project characteristics.
4. Understand the advanced software process models like agile and unified.

Course Outcomes

At the end of this course, the student should be able to

1. Understand the importance of Software Project Management.
2. Distinguish different process models and project economics.
3. Understand the advanced software project management methods.
4. Understand the metrics of software project management.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III

Model based software architectures: A Management perspective and technical perspective.

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Mile stones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT IV

Project Organizations and Responsibilities: Line-of-Business, Organizations, Project Organizations, evolution of Organizations.**Process Automation:** Automation Building blocks, The Project Environment.

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UNIT V

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT VI

Tailoring the Process: Process discriminates.
Future Software Project Management: Modern Project Profiles, Next.

TEXT BOOKS

1. Software Project Management, Walker Royce, PEA, 2005.

REFERENCE BOOKS

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell TMH.
2. Software Project Management, Joel Henry, PEA.
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005.
4. Effective Software Project Management, Robert K.Wysocki, Wiley, 2006.
5. Project Management in IT, Kathy Schwalbe, Cengage.
6. Quality Software Project Management, Futrell,Donald F.Shafer, Donald I. Shafer, PEA.

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	4	-	-	40	60	100	4
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING							

Course Objectives

The objectives of this course are

1. Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
2. Students will implement a small AI system in a team environment.
3. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.
4. Understand the different learning system methods.

Course Outcomes

At the end of this course, the student should be able to

1. Acquire ability to explain and apply key ideas in artificial intelligence and machine learning.
2. Gain knowledge of related fields such as natural language processing, text mining.
3. Acquire ability to design intelligent solutions to problems in a variety of domains and business applications.
4. Acquire the knowledge of related fields such as robotics, reasoning and problem solving.

UNIT I

Introduction to AI, Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

UNIT II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

UNIT III

Knowledge Representation Using Predicate Logic: Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution Representing.

Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge. Weak slot and-filler structures: Semantic Nets, Frames

UNIT IV

Machine learning Introduction: Well -posed Learning problems. Designing a Learning System: Choosing the Training Experience, Choosing the Target Function, Choosing a Representation for the Target function, Choosing a Function Approximation Algorithm, The final Design. Perspective and Issues in Machine Learning: Issues in Machine Learning.

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UNIT V

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning. The Basic Decision Tree Learning Algorithm: Which attribute is the Best classifier, an illustrative example, Hypothesis Space Search in Decision Tree Learning Inductive Bias in Decision Tree.

UNIT VI

Artificial Neural Networks: Introduction Neural Network Representations, Appropriate Problems for Neural Network Learning, Perceptrons, Multi-Layer Networks and BACK PROPAGATION Algorithm, Remarks on the BACK PROPAGATION Algorithm, An Ilustrative Example: Advanced Topics in Artificial Neural Networks

TEXT BOOKS

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3rd Edition, Tata McGraw Hill Edition, Reprint (2008) (Unit 1,2,3).
2. Tom M. Mitchell "Machine Learning", McGraw Hill,1997 (Unit 4,5,6).

REFERENCE BOOKS

1. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, (2003).
2. Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press, (2010).

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	4	-	-	40	60	100	4
CLOUD COMPUTING							

Course Objectives

This course will enable students
1. To gain knowledge about virtualization and Virtual Machines.
2. To familiarize Cloud Computing and its services.
3. Understand various basic concepts related to cloud computing technologies.
4. Understand different management applications.

Course Outcomes

After Completion of this course the student should be able to
1. Understand the Virtualization and applications for the state-of-the-art cloud computing.
2. Carry out the Cloud Scale and value of Cloud Computing.
3. Analyse the infrastructure of cloud computing including public, private and hybrid clouds and various services like PaaS, SaaS, IaaS etc.
4. Monitor the Security in cloud.

UNIT I

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era. The Enterprise Cloud computing Paradigm.

UNIT II

Infrastructure as a Service (IAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service. Secure Distributed Data Storage in Cloud Computing.

UNIT III

Platform and Software as a Service (PAAS / SAAS):
Aneka, Comet Cloud, T-Systems, Workflow Engine for Clouds. Understanding Scientific Applications for Cloud Environments.

UNIT IV

Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing.

UNIT V

Performance Production for HPC on Clouds, Best Practices in Architecture Cloud Applications in the AWS cloud, Building Content Delivery networks Clouds, Resource Cloud Mashups.

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UNIT VI

Governance and Case Studies: Organizational Readiness and Change management in the Cloud age. Data Security in the Cloud, Legal issues in Cloud computing. Achieving Production Readiness for Cloud Services.

TEXT BOOKS

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg.
2. Distributed and Cloud Computing. Kal Hwang. Geoffeiy C.Fox. Jack J.Dongarra. Esevier. 2012.

REFERENCE BOOKS

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2Oll.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'RedI SPD, rp2Oll.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Ktriaraswamy, Shahed Latif, O'Redç SPD, rp2Oll.

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	-	-	4	40	60	100	2
OPEN SOURCE TECHNOLOGIES LAB							

Course Objectives

This course will enable students
1. To provide an introduction to the Python programming language.
2. To provide basic features of most powerful open source scripting language.
3. To provide advanced features of most powerful open source scripting language i.e., Python.
4. To create awareness on Python libraries.

Course Outcomes

After Completion of this course the student should be able to
1. Implement a given algorithm as a computer program (in Python).
2. Adapt and combine standard algorithms to solve a given problem (includes numerical as well as non-numerical algorithms).
3. Adequately use standard programming constructs: repetition, selection, functions, Composition, modules, aggregated data (arrays, lists, etc.).
4. Explain what a given program (in Python) does.
5. Identify and repair coding errors in a program.
6. Understand and use object based software concepts (constructing OO software will be dealt within the course Software Engineering).
7. Awareness on Python libraries like GUI, Web Applications and Mathematical Software.

SYLLABUS

1. Create Scalable
2. Easy to Use (User Friendly).
3. Platform/Device Independent Applications, Covering the Following

Create Sample Applications to the following:

1. Python Introduction
2. Python Operators, Keywords, Numbers
3. Python Strings
4. Python Data types
5. Python Variables
6. Python Lists
7. Python Tuples
8. Python Date & Time
9. Python Decision Making
10. Python Loops
11. Python File Handling
12. Python Dictionaries
13. Python Functions.
14. Python Modules
15. Python Exception Handling.
16. Python Object Oriented features.
17. Inheritance in Python.
18. Python Regular Expressions.
19. Python Networking Programming

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20. Python Multi-threaded Programming.
21. Introduction to Python Libraries.

Students are expected to solve any 10 of the following Exercises.

Exercise 1 - Basics

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

Exercise 2 - Operations

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

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, ¼, 1/10
c) Write a program using a for loop that loops over a sequence. What is sequence ?
d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 - DS - Continued

a) Write a program combine_lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

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

Exercise - 8 Functions

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

Exercise - 9 Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

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

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b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

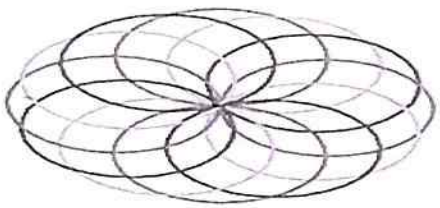
a) Install packages requests, flask and explore them. using (pip)
b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)
c) Write a simple script that serves a simple HTTP Response and a simple HTML Page

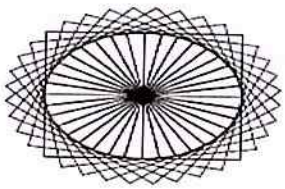
Exercise - 13 OOP

a) Class variables and instance variable
   i) Robot
   ii) ATM Machine

Exercise - 14 GUI, Graphics

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





Exercise - 15 - Testing

a) Write a test-case to check the even numbers which return true on passing a list of all numbers
b) Write a test-case to check the function reverse_string which returns the reversed string.

Exercise - 16 - Advanced

a) Build any one classical data
b) Write a program to solve knapsack

TEXT BOOKS

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

REFERENCE BOOKS

1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W. Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

WEB REFERENCES

https://www.w3schools.com/ Python Programming /

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	-	-	4	40	60	100	2
DATA SCIENCE WITH R PROGRAMMING LAB							

Course Objectives

This course will enable Students to
1. Install R, R-studio, and workspace setup, learn about various R packages.
2. Master the R programming and understand how various statements are executed in R.
3. Gain an in-depth understanding of data structure used in R and learn to import/export data in R.
4. Understand and use linear, non-linear regression models, and classification techniques for data analysis.

Course Outcomes

At the end of this course, students will be able to
1. List motivation for learning a programming language.
2. Access online resources for R and import new function packages into the R workspace.
3. Import, review, manipulate and summarize data-sets in R.
4. Explore data-sets to create testable hypotheses and identify appropriate statistical tests.
5. Perform appropriate statistical tests using R.
6. Create and edit visualizations with R.

List of Experiments

1. Introduction to R data objects, data types, variables, and basics of Programming constructs.
   a) Finding Factorial of number.
   b) Finding Armstrong no.
   c) Generating fibonacci series etc.
2. R- language, (List, objects and functions).
3. Applying Descriptive statistics functions of R. (mean, mode etc.)
4. Data visualization using various kinds of plots. (bar, box, line, histogram, pie).
5. To obtain the weight of a given student's height through linear regression.
6. Classification using RPART package.
7. To predict the class of testing sample using Bayes Classification.
8. To understand the concept of k-means clustering using IRIS data set.
9. To Test hypothesis by using Annova model generation.

REFERENCE BOOKS

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services 2014.
2. The Art of R Programming, Norman Matloff, Cengage Learning.

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	-	-	4	40	60	100	2
SOFTWARE TESTING LAB							

Course Objectives

1. Learn the importance of software testing.
2. Learn different testing methodologies.
3. Learn how to test functional & Non-functional requirements.
4. Learn the importance of modern testing tools.

Course Outcomes

After completion of this course student must be able to
1. Perform manual testing.
2. Perform boundary value analysis.
3. Apply path testing on any given program.
4. Differentiate Block box, White box, Alpha & Beta testing.

Problem Statement 01

Consider an automated banking application. The user can dial the bank from a personal computer, provide a six-digit password, and follow with a series of keyword commands that activate the banking function. The software for the application accepts data in the following form:

Area Code	Blank or three-digit number
Prefix	Three-digit number, not beginning with 0 or 1
Suffix	Four-digit number
Password	Six-character alphanumeric
Commands	"Check status", "Deposit", "Withdrawal"

(a) Design adhoc test cases to test the system.
(b) Design the test cases to test the system using following Black Box testing technique: BVA, Worst BVA, Robust BVA, Robust Worst BVA Equivalence class testing (Input/Output domain)

Problem Statement 02

Consider an application that is required to validate a number according to the following simple rules:

- A number can start with an optional sign.
- The optional sign can be followed by any number of digits.
- The digits can be optionally followed by a decimal point, represented by a period.
- If there is a decimal point, then there should be two digits after the decimal.
- Any number-whether or not it has a decimal point, should be terminated a blank.

Generate test cases to test valid and invalid numbers.
(HINT) Use Decision table and cause-effect graph to generate test cases.

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Problem Statement 03

Generate test cases using Black box testing technique to Calculate Standard Deduction on Taxable Income. The standard deduction is higher for tax payers who are 65 or older or blind. Use the method given below to calculate tax.

1. The first factor that determines the standard deduction is the filing status.
   The basic standard deduction for the various filing status are:
   Single $4,750
   Married, filing a joint return $9,500
   Married, filing a separate return $7,000
2. If a married couple is filing separate returns and one spouse is not taking standard Deduction, the other spouse also is not eligible for standard deduction.
3. An additional $1,000 is allowed as standard deduction, if either the filer is 65 years or the spouse is 65 years or older
   (the latter case applicable when the filing status is "Married" and filing "joint").
4. An additional $1,000 is allowed as standard deduction, if either the filer is blind or the spouse is blind (the latter case applicable when the filing status is "married" and filing "joint").

(HINT): From the above description, it is clear that the calculation of standard deduction depends on the following 3 factors:
1. Status of filing of the filer
2. Age of the filer
3. Whether the filer is blind or not

In addition, in certain cases, the following additional factors also come into play in calculating the standard deduction.

1. Whether spouse has claimed standard deduction
2. Whether spouse is blind
3. Whether the spouse is more than 65 years old

Problem Statement 04

Consider the following program segment:

```
1. int max (int i, int j, int k)
2. {
3. int max;
4. if (i>j) then
5. if (i>k) then max=i;
6. else max=k;
7. else if (j > k) max=j
8. else max=k
9. return (max);
10. }
```

a) Draw the control flow graph for this program segment
b) Determine the cyclomatic complexity for this program
c) Determine the independent paths

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Problem Statement 05

Source code of simple insertion sort implementation using array in ascending order in c programming language

```
#include
int main(){
int i,j,s,temp,a[20];
Printf ("Enter total elements: "); Scanf ("%d",&s);
printf("Enter %d elements: ",s); for(i=0;i<s;i++) scanf("%d",&a[i]); for(i=1;i<s;i++){
temp=a[i]; j=i-1; while((temp<a[j])&&(j>=0)){ a[j+1]=a[j];
j=j-1;
}
a[j+1]=temp;
}
printf("After sorting: ");
for(i=0;i<s;i++) printf(" %d",a[i]); return 0;
}
```

HINT: for loop is represented as while loop

a) Draw the program graph for given program segment
b) Determine the DD path graph
c) Determine the independent paths
d) Generate the test cases for each independent path

Problem Statement 06

Consider a system having an FSM for a stack having the following states and transitions:
States Initial: Before creation Empty: Number of elements = 0
Holding: Number of elements > 0, but less than the maximum capacity
Full: Number elements = maximum
Final: After destruction
Initial to Empty: Create
Empty to Holding, Empty to Full, Holding to Holding, Holding to Full: Add
Empty to Final, Full to Final, Holding to Final: Destroy
Holding to Empty, Full to Holding, Full to Empty: Delete
Design test cases for this FSM using state table-based testing.

Problem Statement 07

Given the following fragment of code, how many tests are required for 100% decision coverage? Give the test cases.

```
if width > length
then biggest_dimension = width if height > width
then biggest dimension = height end_if
else if biggest dimension = length then if height > length
then biggest_dimension = height end_if
end_if end_if
```

Hint 04 test cases

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Problem Statement 08

Given the following code, how much minimum number of test cases is required for full statement and branch
coverage?
read p read q
if p+q> 100
then print "Large" endif
if p > 50
then print "p Large" endif
Hint 1 test for statement coverage, 2 for branch coverage

Problem Statement 09
Consider a program to input two numbers and print them in ascending order given below. Find all du paths and identify those du-paths that are not feasible. Also find all dc paths and generate the test cases for all paths (dc paths and non dc paths).

```
#include
#include
1. void main ()
2. {
3. int a, b, t;
4. Clrscr ();
5. Printf ("Enter first number");
6. scanf ("%d",&a);
7. printf("Enter second number");
8. scanf("%d",&b);
9. if (a<b){
10. t=a;
11. a=b;
12. b=t;
13. }
14. printf ("%d %d", a, b);
15. getch ();
}
```

Problem Statement 10
Consider the code to arrange the nos. in ascending order. Generate the test cases for relational coverage, loop coverage and path testing. Check the adequacy of the test cases through mutation testing and also compute the mutation score
for each.

```
i = 0;
n=4; //N-Number of nodes present in the graph
While (i<n-1) do j = i + 1;
While (j<n) do
if A[i]<A[j] then swap (A[i], A[j]); end do;
i=i+1;
end do
```

REFERENCE BOOKS

1. Software testing concepts & Tools, P. Nageswara Rao, Dreamtech press.
2. Software testing tools, Dr. K.V.K. Prasad, Dreamtech press.

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