ETC/ECE 3.1 APPLIED MATHEMATICS - III

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 3.1	Applied Mathematics-III	4	--	--	3	100	25	--	--	--	125

Course Objectives :

The subject aims to provide the student with:

1. Mathematics fundamental necessary to formulate, solve and analyze engineering problems.
2. An understanding of Fourier Series and Laplace Transform to solve real world problems.
3. An understanding of Linear Algebra through matrices.
4. An understanding of Complex integration.

Course Outcomes:

The student after undergoing this course will be able to:

1. Solve problems in engineering domain related to Linear Algebra using matrices.
2. Analyze and solve engineering problems using Laplace Series.
3. Analyze and solve engineering problems using Fourier Series.
4. Solve engineering problems using Complex Integration.

UNIT - 1 (16 hours)

Matrices: Types of matrices, Determinant, adjoint, inverse of matrix, elementary transformation,

Elementary matrices, Rank of matrix, Reduction to normal form, canonical form. Rank using elementary transformation, Linear independence end dependence. System of the form AX=0 and AX=B, their solutions.
Eigen values, Eigen vectors with properties. Cayley Hamilton theorem with Applications. Minimal polynomial, Diagonalisation.

UNIT - 2 (16 hours)

Laplace Transforms: Definition. Existence conditions, Properties, Laplace transform of periodic functions, Laplace transform of Dirac-Delta function,
Inverse Laplace Transform, Convolution theorem, Application of Laplace transforms in solving linear differential equations with initial conditions and system of linear simultaneous differential equations.

UNIT - 3 (16 hours)

Fourier Series: Fourier Series, Fourier series of Periodic functions, Trigonometric Series, Euler's formulas, Dirichlets condition, Even and Odd functions, Half range series, Parseval's Identity.
Wave equation derivation and solution using separation of variable method. Derivation and solution of one dimensional heat equation using separation of variable method.

UNIT - 4 (16 hours)

Complex Integration, Cauchy's Integral theorem and its application. Integral formula for simply and multiply connected domains and its applications.
Taylors and Laurents' series and their application. Singular points.
Liouvilles theorem with applications. Residue theorem and applications.
Contour Integration. Boundary value problems.

Recommended Readings:

1. B.S. Grewal; Higher Engineering Mathematics; Khanna Publishers.
2. Erusing Kreyszig; Advanced Engineering Mathematics; New International Ltd.
3. J. Brown and R. Churchill; Complex Variables and Its applications; McGraw-Hill Higher Education.
4. Frank Ayres; Theory and Problems of Matrices; Schaum Outline Series.
5. K.P. Gupta; Special Functions; Krishna Prakashan Media.
6. H.S. Kasana; Complex Variables (Theory and Applications); - PHI.
7. Srimanta Pal, Subodh C. Bhunia; Engineering Mathematics; Oxford University Press.

ETC/ECE 3.2 ECONOMICS AND MANAGEMENT

<table>
<tr><th rowspan="3">Subject Code</th><th rowspan="3">Name of the Subject</th><th colspan="3">Scheme of Instruction Hrs/Week</th><th colspan="7">Scheme of Examination</th></tr>
<tr><th rowspan="2">L</th><th rowspan="2">T</th><th rowspan="2">P</th><th rowspan="2">Th Duration (Hrs)</th><th colspan="6">Marks</th></tr>
<tr><th>Th</th><th>S</th><th>TW</th><th>O</th><th>P</th><th>Total</th></tr>
<tr><td>ETC/ECE 3.2</td><td>Economics and Management</td><td>4</td><td>--</td><td>--</td><td>3</td><td>100</td><td>25</td><td>--</td><td>--</td><td>--</td><td>125</td></tr>
</table>

Course Objectives:

The subject aims to provide the student with:

1. An understanding of demand and supply.
2. An understanding of Game theory and Break even analysis.
3. An understanding of the role of Communication Function in organizations.
4. An understanding of the complexity of managing in a global world.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain economics using demand and supply.
2. Apply the concepts of Game theory and Break even analysis.
3. Explain the role of Communication Function in organizations.
4. Apply managerial concepts to solve complex problems related to global issues.

UNIT - 1 **(16 hours)**

Introduction and General Concepts: Demand and Supply- Demand curve, Supply curve, Market Equilibrium.

National Income Terms: GDP, Real v/s Nominal GDP, Net Domestic Product, GNP, National Income, Per capita income, Disposable Income, Price Index, Inflation.

Foreign Exchange – Functions of forex market, transactions in the forex market, Determination of exchange rates, Exchange rate systems.

Estimation/Forecasting of Demand Meaning, Importance, Methods – trend, exponential smoothing, regression analysis.

UNIT - 2 (16 hours)

Econometrics – What is econometrics? Methodology of Econometrics.

Game Theory – Introduction to game theory, payoff matrix, Nash equilibrium, dominant and dominated strategies, maximin strategies and mixed strategies.

Break even Analysis. **Working Capital Management –** Determinants of working capital, financing of working capital, dangers of excessive and shortage of working capital.

UNIT - 3 (16 hours)

Preparation of Income statement, Balance sheet, Fund Flow statement, Understanding and analyzing them using financial ratios – liquidity, leverage and profitability ratios.

Capital Budgeting - Different Methods of Evaluation of Projects- Payback Period, Discounted Cash Flow methods- Net Present Value, Internal Rate of Return. Mergers, Takeovers and Acquisitions.

UNIT - 4 (16 hours)

General Principles of Management – Different schools of management, functions of a manager.

Nature of Objectives, MBO Process Organization, Formal and Informal Organization, Organizational levels and the Span of Management, Factors Determining an Effective Span Matrix Organization.

Strategic Business Unit.

Motivation: Motivation and Motivators, The Carrot and The Stick Maslow's, Theory of Needs Herzberg's Theory Vroom's expectancy theory, McGregor's Theory X and Theory Y.

Communication:

Communication Function in organizations, Basic Communication Process, Communication in an Organization, Barriers in Communication.

Toward Effective communication Controlling.

Basic control process Critical Control points and Standards Requirements for Effectives Controls.

Recommended Readings:

1. R. L. Varshney and K L Maheswari; Managerial Economics; Nineteenth, Revised and Enlarged Edition; Sultan Chand and Sons Publications.
2. Heinz Weihrich and Harold Koontz; Management, A Global Perspective; Tenth Edition; McGraw-Hill, Inc, International Editions 1994.
3. Peterson, Lewis; Managerial Economics; P.H.I.
4. Prasanna Chandra; Fundamentals of Financial Management; Third Edition; Tata McGraw-Hill, New Delhi.
5. Richard M. Lynch and Robert W. Williamson; Accounting for Management, Planning and Control; Third Edition; Tata McGraw-Hill, New Delhi.
6. Damodar N. Gujarati; Basic Econometrics; Fourth edition; TATA Mc GRAW-HILL edition.

ETC/ECE 3.3 ALGORITHMS FOR DATA STRUCTURES

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 3.3	Algorithms for Data Structures	3	1	2	3	100	25	25	--	--	150

Course Objectives:

The subject aims to provide the student with:

1. An ability to use data structures as the foundational base for computer solutions to engineering problems.
2. An understanding of the different logical relationships among various data items.
3. Ability to understand the generic principles of computer programming as applied to sophisticated data structures.
4. An ability to plan, design, execute and document sophisticated technical programs to handle various sorts of data structures.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyze algorithms for time and space complexity.
2. Design algorithms using principles of recursion.
3. Demonstrate the use of data structures like linked lists , stacks and queues.

4. Demonstrate the use of complex data structures like trees and graphs.
5. Apply the knowledge of data structures to a given problem.
6. Illustrate searching, sorting and hashing techniques.

UNIT - 1 (12 hours)

Structures, Unions, Files, Macros, Strings, Pointers, Arrays.

Analysis of Algorithms: Pseudo code for expressing algorithms, time complexity and space complexity, O-notation, Omega notation and theta notation.

Recursion: Recursive definitions and Processes, Writing Recursive Programs, Efficiency in Recursion, Towers of Hanoi problem.

UNIT - 2 (12 hours)

Linked Lists: Abstract Data Types, Dynamic Representation, Structure of linked lists (nodes and pointers to linked lists), Insertion and Deletion of Nodes, Circular linked lists, Doubly linked lists,

Building a linked list implementation, Array implementation of linked lists, Comparison of Dynamic and Array Representations.

Stacks: Basic Stack Operations, Linked list implementation of Stacks, Array implementation of Stacks.

Queues: Basic Queue Operations, Linked list implementation of Queues, Array implementation of Queues, Circular Queues, Priority Queues.

UNIT - 3 (12 hours)

Trees: Binary Trees: Terms associated with binary trees, Strictly binary, Complete binary, Almost complete binary tree, Operations on binary tree, Representation of trees, Tree Traversals, Properties and Terms associated with trees, Introduction to Balanced Trees, Representation of Balanced trees, Operations on Trees.

Graphs: Concept of linear graphs, Directed and undirected graphs, Degree-indegree, outdegree, C Representation of graphs, Adjacency matrix, Adjacency list, connected components, Spanning trees, Graph Traversals.

UNIT - 4 (12 hours)

Applications of different data structures, Application of Graphs, Shortest Path Algorithm.
Sorting Techniques: Bubble Sort, Selection Sort, Insertion Sort, Radix Sort, Heap Sort

Searching techniques, Linear Search Binary Search, Tree search,
Hashing Techniques: Definition of Hashing, Linear Hashing, Chaining, Collision Handling Mechanisms.

Recommended Readings:

1. Yedidya Langsam, Moshej Augenstein, Aaron M. Tenenbaum; Data Structure Using C & C++; Prentice Hall of India.
2. K. R. Venugopal, Sudeep R. Prasad; Programming with C; Tata MacGraw Hill.
3. Yeshwant Kanitkar; Data Structures using C++; BPB Publications.
4. Ellis Horowitz and Sartaj Sahni; Fundamentals of Data Structures; Galgotia Publications.
5. Jean Paul Tremblay and Paul G. Sorenson; An introduction to data structures with applications; Tata McGraw Hill.
6. Ellis Horowitz and Sartaj Sahni; Fundamentals of Computer Algorithms; Galgotia Publications.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments. Term Work marks to be awarded based on the assessment of the experiments conducted.)

1. Structures
2. Unions
3. Strings and Arrays
4. Pointers
5. Files
6. Recursion
7. Towers of Hanoi Problem
8. Linked Lists
9. Stacks
10. Queues
11. Trees
12. Graphs
13. Sorting techniques
14. Searching techniques
15. Hashing

ETC/ECE 3.4 ELECTRONIC DEVICES AND CIRCUITS - I

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 3.4	Electronic Devices and Circuits - I	3	1	2	3	100	25	--	--	25	150

Course Objectives:

The subject aims to provide the student with:

1. An understanding of energy band theory for semiconductor device operation.
2. Ability to design circuits using diodes like rectifiers, filters, regulators.
3. Ability to perform transistor modeling and analysis of circuits.
4. An understanding of multi stage and large signal amplifier.

Course Outcomes:

The student after undergoing this course will be able to:

1. Interpret the energy band diagram for semiconductors.
2. Explain the theory of p-n junction diodes.
3. Compare the characteristics of p-n, p-i-n, tunnel and schottky barrier diodes.
4. Design rectifier, clipper and clamper circuits.
5. Analyze BJT biasing for various configurations.

6. Analyze BJT models for various configurations.
7. Analyze multi stage and large signals BJT amplifiers.

UNIT - 1 (12 hours)

Energy Band Theory of Crystals - Insulators, Semiconductors and Metal. Conduction in semiconductors: electrons and holes, conductivity of semiconductors, carrier concentration in intrinsic semiconductors, donor and acceptor impurities, charge densities in semiconductors, Fermi level in semiconductors, diffusion, carrier lifetime, continuity equation, hall effect.

Semiconductor Diode Characteristics- Qualitative theory of the PN junction, PN junction as a diode, band structure of an open circuited p-n junction, Quantitative theory of the p-n diode currents, The Volt-Ampere characteristic, The Temperature dependence of p-n characteristics.

UNIT - 2 (12 hours)

Piecewise linear diode characteristics, transition and diffusion capacitance, p-n diode switching times, Tunnel, p-i-n and schottky barrier diodes and their characteristics.

Rectifiers & Filters: Half wave, full wave, L, C, LC, multiple LC, CLC analysis. Clippers and clampers, Harmonic components in rectifier circuits.

UNIT - 3 (12 hours)

Transistor DC biasing. Bias stabilization for typical transistor biasing circuits.

BJT transistor modelling, Amplification in the ac domain, input and output impedance, current and voltage gain, hybrid and re equivalent model, BJT small signal analysis for all configurations, approximate and complete hybrid equivalent model. Miller's theorem

UNIT - 4 (12 hours)

Multistage Amplifiers-direct, RC-coupled and transformer coupled, Darlington pair, Cascade and Cascode.

Large Signal Amplifiers: Class A, B, C, D, complementary symmetry and push-pull amplifiers.

Recommended Readings:

1. J. Millman, C. Halkias & Satyabrata Jit; Electronic Devices and Circuits; McGraw Hill.
2. R. Boylestad & L. Nashelsky; Electronic Devices and Circuits; PHI.
3. A. Mottershead; Electronic Devices and Circuits; PHI.
4. B.G. Streetman; Solid State Electronic Devices, PHI.

5. S. M. Sze; Physics of Semiconductor Devices Wiley Publication.
6. Garud & Jain; Electronic Devices & Linear circuits; Tata McGraw Hill.
7. J.B Gupta; Electronic Devices and Circuits; S. K. Kataria & Sons.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. PN junction as a diode
2. Hall effect
3. Rectifiers
4. Filters
5. Clippers
6. Clampers
7. Transistor DC biasing
8. RC-coupled
9. Transformer coupled,
10. Darlington pair
11. Cascade and Cascode
12. Class A
13. Class B, complementary symmetry
14. Push-pull amplifiers
15. Class C

ETC/ECE 3.5 DIGITAL SYSTEM DESIGN

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 3.5	Digital System Design	3	1	2	3	100	25	--	--	25	150

Course Objectives :

The subject aims to provide the student with:

1. An understanding of various Number Systems & Codes along with Boolean algebra.
2. An ability to solve Boolean algebra problems.
3. An ability to design combinational and sequential circuits.
4. An understanding of various digital Logic families.

Course Outcomes:

The student after undergoing this course will be able to:

1. Convert the numbers from one radix to another and perform arithmetic operations using the 1's and 2's compliments.
2. Solve Boolean Expressions using Boolean algebra, K-maps and VEM and implement them using logic gates.
3. Design any given combinational circuits.

4. Explain different flip flops, registers and their applications.
5. Design sequential circuits and state machines.
6. Design synchronous and asynchronous counter circuits.
7. Explain arithmetic circuits like adders and multipliers and their applications.
8. Compare the characteristics of Digital Logic families.

UNIT - 1 (12 hours)

Number Systems & Codes: Decimal, Binary, Hexadecimal, Octal systems; Interconversions, Signed & Unsigned Binary numbers, Complements, Binary Arithmetic: Addition & Subtraction using 1's & 2's complements.

Binary Codes-Decimal codes (BCD, Excess-3, 8421, 2421), Error Detection codes (Parity generation & Detection), Reflected code, Alphanumeric codes (EBCDIC, ASCII), Study of Binary logic with logic gates.

Boolean Algebra: Postulates & Theorems, Boolean functions and their Algebraic manipulation, Canonical & Standard forms, Minterms & Maxterms.
Simplification of Boolean functions: K-maps, POS & SOP simplification and their inter conversions, NAND & NOR implementation, Plotting & Reading of K-map using VEM.

UNIT - 2 (12 hours)

Combinational Logic: Design Procedure for Combinational logic circuits, Design & Analysis of Half Adder, Full Adder, Subtractor, Code Conversion, binary Parallel Adder, Look-ahead Carry generator, Decimal Adder (BCD Adder), Magnitude Comparator, Decoders, Combinational logic implementation, Demultiplexers, Encoders, Multiplexers, Boolean function implementation with multiplexers. Design of Seven-segment display, Parity generator, checker.

Flip-flops: Basic flip-flop circuit, Clocked RS flip-flop, D flip-flop, JK flip-flop, T flip-flop, Triggering of flip-flops, Master Slave flip-flop, Edge triggered flip-flops: their schematic symbols, truth table & Excitation table, conversion between different types of flip flops.

UNIT - 3 (12 hours)

Sequential Circuits: Design procedure for sequential circuits using state diagrams, state table, state equations, state reduction and assignment, Circuit implementation, Moore & Mealy Machine. Finite state machine.

Design and analysis of counters, Modulo Counters, Synchronous, Ripple and ring counters (Switch tail, Johnson), Application of counters, Timing Sequences, Word time generation, timing signals.
Registers: SISO, SIPO, PISO, PIPO, Register with parallel load, Shift registers, Universal shift register.

UNIT - 4 (12 hours)

Design of Arithmetic circuits – Adders: Carry Save, Carry Look Ahead, Carry Select Adder delta delay. Multipliers: Wallace Tree, Braun Multiplier, Restoring and Non Restoring Dividers.

Digital Logic Families:
Characteristics of Digital ICs, TTL-Operation of TTL NAND gate, Active pull-up, Open Collector output, Wired AND, three state (or tri-state) output, Schottky TTL, ECL. Characteristics of MOSFET's, CMOS Inverter, NAND and NOR, CMOS to TTL and TTL to CMOS interfacing.

Recommended Readings:

1. M. Morris Mano; Digital Logic and Computer Design; PHI.
2. Anand Kumar; Fundamentals of Digital Circuits; PHI.
3. D. Leach, A. P. Malvino, G. Saha; Digital Principles & Applications; Tata McGraw-Hill.
4. R. P Jain; Modern Digital Electronics;Tata McGraw-Hill.
5. William Fletcher; An Engineering Approach to Digital Design; PHI.
6. Thomas Floyd; Digital Fundamentals - A Systems Approach; Pearson Education.
7. Robert Morris & John Miller; Designing with TTL integrated circuits; McGraw-Hill.
8. Neil H. E. Weste; Principles of CMOS VLSI Design; Addison-Wesley Publishing Company.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Truth Table and Logic Gates
2. Half Adder, Full Adder
3. Half Subtractor, full Subtractor
4. Combinational Circuit Implementation
5. Multiplexer
6. Demultiplexer
7. Encoder
8. Decoder
9. SR & JK Flip-Flop
10. T & D Flip-Flop
11. Synchronous Counters
12. Asynchronous Counters
13. SISO, SIPO Shift register
14. PISO, PIPO Shift register

15. Universal Shift Register

ETC/ECE 3.6 ELECTRICAL CIRCUITS AND SYSTEMS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 3.6	Electrical Circuits and Systems	3	1	2	3	100	25	--	25	--	150

Course Objectives :

The subject aims to provide the student with:

1. Ability to analyze linear electrical networks and perform Time domain analysis of electrical circuits.
2. An understanding of graph theory and its application for circuit analysis.
3. Ability to synthesize an electrical circuit and model a circuit into any equivalent Two port network.
4. An understanding of the Construction and working of various types of attenuators, motors and bridges.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyze voltages and currents in circuits using various network analysis techniques and theorems.

2. Determine response of passive circuits using time domain analysis and laplace transforms.
3. Calculate various two port network parameters for electrical circuits.
4. Synthesize an electrical circuit from characteristic circuit equation.
5. Design T, pi, Lattice and Bridged-T attenuator circuits.
6. Explain the construction and working of the different types of motors.
7. Explain the different types of bridges.

UNIT - 1 (12 hours)

Network Classification: Distributed and lumped, passive and active, time variable and time invariant, symmetrical and asymmetrical networks.
Network Analysis: Mesh and nodal analysis, super-node and super-mesh analysis.
Network Theorems (AC and DC analysis): Thevenin's, Maximum power transfer, Norton's, Superposition, Compensation, Reciprocity and Tellegen's theorem.

UNIT - 2 (12 hours)

Graph Theory: Basic definitions, Duality, Matrices associated with network graphs: Incidence, Tieset, Cutset matrices. Applications to mesh and nodal analysis.
Time- domain analysis: Network equations in time- domain, first and second order circuits, Initial condition. Analysis of transient and steady state response to step, ramp, impulse, exponential, sinusoidal input; Application of Laplace transform to analysis of networks for different inputs (sinusoidal, step, ramp, impulse, sinusoidal).

UNIT - 3 (12 hours)

Two Port Networks: Characterization in terms of Z,Y,H and ABCD parameters, Equivalent circuits; interrelationship between the two port parameters; input, output ,characteristic impedance and image impedances of two ports. Introduction to S parameters.

Elements of Network Synthesis: Positive real functions, Reactance functions, R, L and RC functions (Foster method and Caver method).
Attenuators – Classification, Analysis and design of T, pi, Lattice and Bridged-T attenuator.

UNIT - 4 (12 hours)

Construction and working of DC motors, stepper motors, servo motors, synchro motors, single phase Induction motors
Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges.
AC Bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge. Kelvin Bridge, Q-meter

Recommended Readings:

1. A. Sudhakar & P. Shyamohan; Circuits & Networks- Analysis and Synthesis; Tata McGraw-Hill.
2. M.E. Van Valkenburg; Network Analysis; Pearson Education.
3. B. L. Theraja; A Textbook of Electrical Technology; S. Chand & Company.
4. A. K. Sawhaney; A Course in Electrical and Electronic measurements & Instrumentation; Dhanpat Rai & Sons.
5. D. Roy Choudhary; Networks & systems; New Age International Publishers.
6. F. F. Chuo; Network Analysis and Synthesis;Wiley Eastern.
7. A. Chakrabarti; Circuit theory (analysis and synthesis); Dhanpat Rai Publishing Company.
8. K. L. Kishore; Electronic Measurements & Instrumentations; Pearson Education.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Verification of Mesh and Nodal analysis
2. Verification of Super-node and Super-mesh analysis
3. Verification of Superposition Theorem
4. Verification of Thevenin's Theorem
5. Verification of Norton's theorem
6. Verification of Maximum power transfer theorem
7. To measure input impedance and output impedance of a given two port network
8. To design a T attenuator which attenuate given signal to the desired level
9. To design a ∏ attenuator which attenuate given signal to the desired level
10. DC motors, stepper motors, servo motors
11. Synchro motors, single phase Induction motors
12. Wheatstone bridge
13. Wein Bridge
14. Schearing Bridge
15. Kelvin Bridge

ETC/ECE 4.1 PROBABILITY THEORY AND RANDOM PROCESSES

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 4.1	Probability Theory and Random Processes	4	--	--	3	100	25	--	--	--	125

Course Objectives :

The subject aims to provide the student with:

1. The mathematics fundamental necessary to formulate, solve and analyze engineering problems.
2. An understanding of Probability Theory and Random Variables.
3. An understanding of Tests of Hypotheses and Analysis of Variance.
4. An understanding of Stochastic Processes.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyze and solve engineering problems using Probability Theory.
2. Analyze and solve engineering problems using Random Variables.
3. Apply Tests of Hypothesis and Analysis of Variance for solving engineering problems.
4. Analyze engineering problems by modeling them as Stochastic Processes.

UNIT - 1 (16 hours)

Introduction to Probability Theory and Random Variables.
Introduction - Sample Space and Events, Probabilities defined on Events, Conditional Probabilities, Independent Events, Total Probability Theorem, Bayes'Theorem and its Applications.
Random Variables, Discrete and Continuous Random Variables, Probability Distribution, Expectation, Variance, Cumulative Distribution Function, Moment Generating Function, Functions of a Random Variable and their Distribution, Expectation and Variance of functions of a random variable.
Some Important Probability Distributions and their Mean, Variance and Moments – Bernoulli Distribution, Binomial Distribution, Geometric Distribution Poisson Distribution, Uniform Distribution, Exponential Distribution, Gamma Distribution and Normal Distribution.

UNIT - 2 (16 hours)

Higher Dimensional Random Variables Introduction, Discrete and Continuous Two Dimensional Random Variables- Joint Probability Distribution, Marginal Distributions, Independence of Random Variables, Covariance and Correlation, Uncorrelated Random Variables.
Real Valued Functions of Two Dimensional Random Variables and their Probability Distributions, Conditional Probability Distribution and Conditional Expectation, Computing Probabilities and Expectations by Conditioning.
Moment Generating Function of Sums of Independent Random Variables.

UNIT - 3 (16 hours)

Tests of Hypothesis and Analysis of Variance (ANOVA) Sampling Theory, Random Samples, Sampling Distributions, Statistical Decisions and Statistical Hypotheses, Tests of Hypothesis and Significance, Level of Significance, One-Sided and Two-sided Hypotheses, Two-Tailed and One-Tailed Tests.
Tests of Hypothesis for Large samples – Tests of hypothesis on the Mean, Tests of Hypothesis on the equality of Two Means, Tests of Hypothesis on a Proportion, Tests of Hypothesis on the Equality of Two Proportions, Tests of Hypothesis on a Standard Deviation, Tests of Hypothesis on the Equality of Two Standard Deviations.
Tests of Hypotheses for Small Samples – Test of Hypothesis on the Mean for a Normally Distributed Population, Tests of Hypothesis on the equality of Two Means for Normally Distributed Populations, Tests of Hypothesis on the Variance of a Normally Distributed

Population, Tests of Hypothesis on Equality of Variances of two Normally Distributed Populations, Testing for Goodness of Fit, Tests for Independence of Attributes.
Analysis of Variance (ANOVA) – One-Way and Two- Way Classification Analysis of Variance.

UNIT - 4 (16 hours)

Stochastic Processes
Introduction, State Space, Higher Order Joint Distributions of a Stochastic Process, Independence of a Stochastic Process, Auto – Correlation Function, Auto – Covariance, Correlation Coefficient, Cross –Correlation Function, Cross- Covariance, Cross- Correlation Coefficient, Strict Sense Stationary Process, Wide Sense Stationary Process, Jointly Wide Sense Stationary Process, Evolutionary Process, Ergodicity in Mean and Auto - Correlation Function.
Markov Chains – Introduction, Transition Probabilities, Homogeneous Markov Chains, One-Step and n-Step Transition Probability Matrix , Initial Distribution, Probability Mass Function of the Random Variables of a Markov Chain, Joint Distribution of a Markov Chain, Chapman-Kolmogorov Equations, Absorbing States, Communication between States, Irreducible Markov Chains, Steady State Vector.
Poisson Processes – Introduction, Counting processes, Definition of Poisson Process, Sum of Two Independent Poisson Processes, Inter-Arrival and Waiting Time Distributions for a Poisson Process, Applications of Poisson Processes.

Recommended Readings:

1. S. Ross; A first Course in Probability; Sixth Edition; Pearson Education.
2. W. W. Hines, D. C. Montgomery, D. M. Goldsman, C. M. Borror; Probability and Statistics in Engineering.
3. T. Veerajan; Probability, Statistics and Random Processes; Second Edition; Tata McGraw- Hill.
4. K. S. Trivedi; Probability and Statistics with Reliability, Queuing and Computer Science Applications; Prentice Hall.
5. M. R. Spiegel and H. J. Stephens; Statistics, Third Edition, Schaum‘s Outlines.
6. S. Ross; Introduction to Probability Models; Seventh Edition; Academic Press.

ETC/ECE 4.2 SIGNALS AND SYSTEMS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 4.2	Signals and Systems	3	1	--	3	100	25	--	--	--	125

Course Objectives:

The subject aims to provide the student with:

1. Understanding of time-domain representation and analysis of signals and systems.
2. An ability to perform frequency-domain representation and analysis using Fourier tools.
3. An ability to perform frequency-domain representation and analysis using Laplace transform and Z transforms.
4. An understanding of sampling, aliasing and Signal reconstruction.

Course Outcomes:

The student after undergoing this course will be able to:

1. Classify different types of signals and systems.
2. Illustrate the properties of continuous-time and discrete-time systems.
3. Analyze Continuous-time (CT) and discrete-time (DT) systems in time-domain using convolution.
4. Analyze CT and DT systems in Frequency domain using tools like CTFS, CTFT, DTFS and DTFT.
5. Explain the concepts of Sampling, aliasing and Signal reconstruction.
6. Analyze CT and DT systems using Laplace transforms and Z Transforms.

UNIT - 1 (12 hours)

Introduction: Definitions and concept of different types of signals; continuous time and discrete time signals; transformation of independent variable; exponential and sinusoidal signal; unit impulse and unit step functions.

Systems: continuous time and discrete time system and basic system properties. Linear time invariant (LTI) systems: Introduction, Discrete time LTI system, the convolution sum, continuous time LTI systems, the convolution integral, Impulse and step response.

UNIT - 2 (12 hours)

Fourier Series: introduction; response of LTI system to complex exponential; Fourier series representation of continuous-time periodic signals; convergence of the Fourier series; Parseval's relation.

Fourier series representation of discrete time periodic signals; properties of discrete-time **Fourier Series: Properties:** linearity, time shifting, time reversal, time scaling, conjugation and conjugate symmetry, frequency shifting, convolution, multiplication.

UNIT - 3 (12 hours)

Continuous-Time Fourier Transform: Representation of aperiodic signals: Fourier transform of aperiodic signals and their properties; linearity, time shifting, differentiation, integration, conjugation and conjugate symmetry, time ,frequency scaling, duality, Parseval's relation, convolution.

Discrete-Time Fourier Transform: Representation of aperiodic signals; Fourier transform of aperiodic signals.

Sampling: Introduction; representation of continuous time signals by its samples; sampling theorem; reconstruction of a signal from its samples using interpolation; the effects of undersampling; aliasing; Discrete-time processing of continuous-time signals; sampling of discrete- time signals.

UNIT - 4 (12 hours)

The Laplace transform: introduction; Laplace transforms; the region of convergence; inverse Laplace transform; Analysis and characterization of LTI system using the Laplace transform. Unilateral Laplace transforms.
The Z-transform: introduction; Z-transform; the region of convergence; the inverse Z-transform; properties of Z-transform: linearity, time shifting, scaling ,time reversal, conjugation, convolution analysis and characterization of LTI system using Z-transforms.

Recommended Readings:

1. A. V. Oppenheim, A.S.Willsky; Signals and systems; PHI.
2. S. Haykins , B. V. Veen; Signals and Systems; Wiley India.
3. D. G. Rao, S. Tunga; Signals and systems; Pearson Education.
4. R. E. Ziemer, W.H Trantor, Fannin; Signal and Systems; D.R. Pearson education, Asia.
5. I. Nagrath, J. Sharan, R. Rajan, S. Kumar; Signal and Systems; Tata McGraw Hill.

ETC/ECE 4.3 ELECTROMAGNETIC FIELDS AND WAVES

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 4.3	Electromagnetic Fields and Waves	4	--	2	3	100	25	25	--	--	125

Course Objectives :

The subject aims to provide the student with:

1. An understanding of different coordinate systems.
2. Ability to perform analysis for Electrostatics and Magnetostatic fields.
3. An understanding of the Electromagnetic wave equation and its solution for application in real world problems.
4. An ability to handle design issues in Guided waves.

Course Outcomes:

The student after undergoing this course will be able to:

1. Transform between coordinate systems.
2. Solve problems related to Electrostatics and Electric fields.
3. Analyze working of Electrostatic and Magnetostatic fields.
4. Solve problems related to Electromagnetic wave equations.
5. Explain the working of Propagation of plane waves.
6. Explain the propagation of Guided waves.

UNIT -1 (16 hours)

System of Coordinates: Cartesian, cylindrical and spherical coordinate system, transformation from cartesian to cylindrical and spherical coordinate system, Divergence of a vector field, Curl of a vector, Stoke's theorem. Conservative and non-conservative fields, Helmholtz's theorem.

Electrostatics: Coulomb's Law, Electric Field Intensity due to point charges and distributed charges.

Electric Flux density, Electric flux, Postulates of the electrostatic field, Gauss's law and its applications, **Electric Potential:** Electrical potential due to point charges and distributed charges.

Energy in electrostatic field, Energy due to point and distributed charges.

Boundary Value Problems: Poisson's equations for the electrostatic field, Laplace's equation for the electrostatic field, Solution methods, Solution by direct integration.

UNIT - 2 (16 hours)

Interface Conditions: Interface conditions between two dielectrics, Interface conditions between dielectrics and conductors.

Capacitance: Parallel plate capacitor, Capacitance of infinite structures.

Conduction and Convection Current Density: Convection current and convection current density, Conduction current and Conduction current density, Power dissipation and Joule's law, The continuity equation.

The Static Magnetic Field: Magnetic Field, Magnetic Field Intensity, Magnetic Flux Density and Magnetic Flux, Postulates of static Magnetic field, Magnetic Vector potential, Magnetic Scalar potential, Magnetic Dipole, Biot Savart Law, Ampere's circuital Law. Behaviour of Magnetic Materials, Diamagnetic and Ferromagnetic materials.

Magnetic Circuits: Magnetomotive force, Magnetic reluctance, Forces in the magnetic field. Energy stored in the magnetic field.

UNIT - 3 (16 hours)

Magnetostatic energy in terms of fields. Time varying Electric and Magnetic fields: Faraday's Law, Lenz's Law, Electromotive force, Eddy currents. Maxwell's Equations: Continuity equation for time varying fields, Displacement current density, Generalized

Ampere's Law, Maxwell's equations in differential, integral and time harmonic representation.

Interface Conditions for Electromagnetic Field: Interface condition for the electric field, interface condition for the magnetic field.

Electromagnetic Wave Equation and its Solution: Electromagnetic waves, Time dependent wave equation, Time Harmonic Wave Equation, Solution of the wave equation for uniform plane waves in free space, perfect dielectrics.

Poynting's Theorem: Poynting vector, Complex Poynting vector, Electromagnetic power density.

Propagation of Plane waves in Materials.

UNIT - 4 (16 hours)

Propagation of plane waves in lossy dielectrics, low loss dielectrics and conductors, Concept of Phase and Group velocity. Polarization of Plane Waves: Concept of Polarization, Linear, Elliptical and Circular Polarization.

Reflection and Transmission of Plane Waves: Reflection and Transmission at a General Dielectric Interface with Normal Incidence, Standing Waves,

Guided Waves: Waves between parallel planes; Transverse electric (TE) waves, Transverse magnetic (TM) waves; Characteristics of TE and TM waves; Transverse electromagnetic (TEM) waves; Velocities of propagation.

Recommended Readings:

1. M. Sadiku; Elements of Electromagnetics, 4th edition; Oxford University Press.
2. E. C. Jordan, K. G. Balmain; Electromagnetic Waves & Radiating Systems; PHI.
3. J. D. Kraus; Electromagnetics 5th Edition; McGraw Hill.
4. N. Ida; Engineering Electromagnetics, 2nd Edition; Springer International Edition.
5. J. Edminister; Theory and Problems in Electromagnetics; Schaum Series, McGraw Hill.
6. D. K. Cheng; Field and Wave Electromagnetics, Second Edition; Pearson Education.
7. W. H. Hayt, J. A. Buck; Engineering Electromagnetics, Seventh Edition; Tata McGraw Hill Edition.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments. Term Work marks to be awarded based on the assessment of the experiments conducted.)

1. Divergence and Curl of a vector
2. Stoke's theorem
3. Helmholtz's theorem
4. Coulomb's Law

5. Boundary value problems
6. Capacitance
7. Energy in electrostatic field
8. Interface conditions between dielectrics and conductors
9. Biot Savart Law, Ampere's circuital Law
10. Maxwell's Equations
11. Poynting's theorem
12. Propagation of Plane waves in free space
13. Propagation of Plane waves in Materials
14. TE & TM waves
15. TEM waves

ETC/ECE 4.4 ELECTRONIC DEVICES AND CIRCUITS - II

<table>
<tr><th rowspan="3">Subject Code</th><th rowspan="3">Name of the Subject</th><th colspan="3">Scheme of Instruction Hrs/Week</th><th colspan="7">Scheme of Examination</th></tr>
<tr><th rowspan="2">L</th><th rowspan="2">T</th><th rowspan="2">P</th><th rowspan="2">Th Duration (Hrs)</th><th colspan="6">Marks</th></tr>
<tr><th>Th</th><th>S</th><th>TW</th><th>O</th><th>P</th><th>Total</th></tr>
<tr><td>ETC/ECE 4.4</td><td>Electronic Devices and Circuits - II</td><td>3</td><td>1</td><td>2</td><td>3</td><td>100</td><td>25</td><td>--</td><td>--</td><td>25</td><td>150</td></tr>
</table>

Course Objectives:

The subject aims to provide the student with:

1. An understanding of feedback mechanism and its application in amplifier and oscillator circuits.
2. Ability to design RC differentiator, integrator, Multivibrator and Schmitt trigger circuits.

3. Ability to perform analysis of JFET and MOSFET biasing circuits.
4. An understanding of power devices and Oscilloscope.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyse the different configurations of negative feedback in amplifier circuits.
2. Design different types of oscillator circuits.
3. Design RC Differentiator and Integrator circuits.
4. Design different types of Multivibrator circuits.
5. Analyze JFET and MOSFET biasing for various configurations.
6. Explain the construction and working of Power Electronic and Opto-electronic Devices.
7. Explain the working of PUT, LED, LCD and CRO.

UNIT - 1 (12 hours)

Principle of negative feedback in amplifiers, voltage series, voltage shunt, current series, current shunt types of feedback. Typical transistor circuit effect of negative feedback on input and output impedance, voltage and current gains, bandwidth, noise and distortion.
Principle of positive feedback, concept of feedback and stability in electronic circuits, the Nyquist Criterion, Gain and Phase Margin, Sinusoidal Oscillators, Barkhausen criterion, various types of oscillators – RC, Clapps, Wein Bridge, Colpitt, Hartley, Tuned LC.

UNIT - 2 (12 hours)

Steady state response of RC differentiator & integrating circuits to square wave, BJT as a switch, Junction & Diffusion Capacitance of a BJT, Improving switching times.
Analysis & Design of Basic BJT Monostable Multivibrator, BJT Bistable Multivibrator, BJT Astable Multivibrator and BJT Schmitt trigger.

UNIT - 3 (12 hours)

FET BIASING: (JFETs and Depletion –type FET) -Fixed-Bias, Self-Bias and Voltage-Divider Bias Configurations(both n- and pchannel); Enhancement-Type MOSFETs-Feedback Biasing Arrangement, Voltage –Divider Biasing Arrangement.
Sampling Gates: UJT, JFET and MOSFET Sampling gate, Sample & Hold circuits. Transistor bootstrap ramp generator.

UNIT - 4 (12 hours)

Power diode, SCR, Diac, Triac, SCS, GTO, Light activated SCR.

UPS, Normally ON and Normally OFF configurations,
Photo diode, Photoconductive cells, IR emitters, Solar Cells, Phototransistor, Opto-isolator, PUT, LCD and LED.
Working of CRO and measurements using CRO.

Recommended Readings:

1. J. Millman, C. Halkias, Satyabrata Jit, Electronic Devices and Circuits, McGraw Hill.
2. R. Boylestad, L. Nashelsky; Electronic Devices and Circuits, PHI.
3. P. S. Bimbhra; Power Electronics – Khanna Publishers.
4. David Bell; Solid State Pulse Circuits; Oxford University Press.
5. Garud, Jain; Electronic Devices & Linear circuits; Tata McGraw Hill.
6. J.B Gupta; Electronic Devices and Circuits; S. K. Kataria & Sons.
7. A. Mottershead; Electronic Devices and Circuits; PHI.
8. Mohd. Rasheed; Power Electronic Circuits, Devices and Applications; Pearson Education.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Voltage series, voltage shunt, current series, current shunt types of feedback
2. RC & LC oscillator
3. Clapps oscillator
4. Wein Bridge oscillator
5. Colpitt oscillator
6. Hartley oscillator
7. Steady state response of RC differentiator & integrating circuits
8. Design of Basic BJT Monostable Multivibrator
9. Design of Basic BJT Bistable Multivibrator
10. Design of Basic BJT Astable Multivibrator
11. Design of BJT Schmitt trigger
12. Fixed- Bias, Self-Bias and Voltage-Divider Bias Configuration for FET
13. Sample & Hold circuits
14. SCR
15. Measurements using CRO

ETC/ECE 4.5 LINEAR INTEGRATED CIRCUITS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 4.5	Linear Integrated Circuits	3	1	2	3	100	25	--	--	25	150

Course Objectives :

The subject aims to provide the student with:

1. An understanding of the basic principles, configurations and practical limitations of op-amps.
2. Ability to design op-amp circuits, Voltage regulators, A/D and D/A converters.
3. An understanding of the basic principles of VCO and PLL.
4. Ability to design circuits using 555 timer IC.

Course Outcomes:

The student after undergoing this course will be able to:

1. Analyze the working of differential amplifier configurations.
2. Design amplifiers, filters, comparator, oscillator, multivibrator and arithmetic circuits using Op-amp.
3. Design fixed and variable voltage regulator circuits for given applications.
4. Design Analog to Digital and digital to analog converters using Op-amp.
5. Explain the working of Voltage controlled oscillator and phased locked loop.
6. Design timing circuits using IC 555.

<u>UNIT - 1</u> (12 hours)

Basics of Op-Amp: Differential amplifiers, ac and dc analysis, FET differential amplifier, constant current bias, current mirror circuit, op-amp parameters, definitions, measurements.

Functional block diagram and working specification of IC741, equivalent circuit of Op-amp and voltage transfer curve, open loop inverting, non-inverting, differential amplifier. Disadvantages of open loop op-amp

Basics of Op-Amp: Frequency response and methods of frequency compensation, offset compensation, closed loop inverting and non-inverting amplifiers, voltage follower.

Applications of op-amp: Differentiator, integrator, summing scaling and averaging amplifier.

<u>UNIT - 2</u> (12 hours)

Applications of Op-Amp: Instrumentation amplifier, V-I & I-V converter, precision rectifier, log and antilog amplifier.

Op-Amps as comparators, zero crossing detectors, Schmitt trigger, comparator characteristics, limitations of comparator, sample and hold circuit.

Applications of Op-Amp: Advantages of active filter, Butterworth low pass, high pass, band pass, band reject filter, design problems.

Square wave generator, triangular wave generator, Wien bridge oscillator, Phase shift oscillators, design problems.

<u>UNIT - 3</u> (12 hours)

Voltage Regulators: Specifications, functional block diagrams of IC 723, Design of IC 723 as

High and low voltage regulators.
Specifications, three terminal regulators-IC78XX, 79XX, LM309, LM317 voltage regulator and tracking regulator, principles and working of switching mode regulators.
Introduction to resolution and accuracy in convertors, quantization error.
ADC and DAC: Principle of successive approximation, successive approximation ADC.
Binary weighted resistors and R-2R resistor ladder design problems, specifications, functional block diagrams of 0809 & 0808.

UNIT - 4 (12 hours)

Voltage controlled oscillator IC566: block diagram of IC566.
PLL: Basic principles of phase-locked loop and block diagram, transfer characteristics of PLL, lock range and capture range (no derivations).
Applications of PLL as frequency multiplier, AM demodulation, FM demodulation, Study of PLLIC565 and design problems.
IC 555: Functional block diagram and specification, modes of IC555, applications of IC555 as monostable and astable multivibrator, design problems, modification for 50% duty cycle
Applications of IC 555 as VCO, missing pulse detector, frequency divider, PWM, IC 8038 and its applications in waveforms generation.

Recommended Readings:

1. R. Gayakwad; Op-Amps and linear integrated circuits; Prentice Hall of India Pvt. Ltd.
2. K. R. Botkar; Integrated Circuits; Khanna Publishers.
3. J. Millman, C. Halkias; Integrated Electronics: Analog and Digital Circuits System; McGraw Hill.
4. S. Franco; Design with operational amplifiers and analog integrated circuits; McGraw Hill.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Current mirror circuit
2. Open loop inverting and non-inverting circuit
3. Application of op-amp: Differentiator, Integrator
4. Application of op-amp: Summing, Scaling and Averaging amplifier
5. Application of op-amp: Instrumentation amplifier
6. Application of op-amp: Op-amps as comparator
7. Application of op-amp: Square wave generator, triangular wave generator
8. Application of op-amp: Active filter
9. Application of op-amp: oscillator
10. Application of op-amp: ADC & DAC
11. Design of Voltage Regulators

12. Design of Voltage controlled oscillator IC566
13. Design of phase-locked loop
14. Applications of IC 555
15. IC 8038

ETC/ECE 4.6 MICROPROCESSORS AND INTERFACING

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	O	P	Total
ETC/ECE 4.6	Microprocessors and Interfacing	3	1	2	3	100	25	--	--	25	150

Course Objectives:

The subject aims to provide the student with:

1. An in-depth understanding of the Intel 8085 architecture and programming model.
2. An ability to write Assembly language programs for a given task.
3. An understanding of different types of memories, peripheral IC's like 8255, 8259 and 8251and their interfacing with the processor.
4. An ability to interface various I/O devices with the processor.

Course Outcomes:

The student after undergoing this course will be able to:

1. Describe the architecture and explain the working of each block in 8085 processor.
2. Analyze the instruction set of 8085 processor.
3. Analyze the timing sequence of various instructions.
4. Create Assembly language programs for a given task.
5. Explain the basic programmable ICs like 8255, 8259 and 8251.
6. Design interfacing of memories and various I/O devices with the processor.

UNIT - 1 (12 hours)

Introduction of Microcomputer System: CPU, I/O devices, clock, memory, bus architecture, tri-state logic, address bus, data bus and control bus.

Semiconductor Memories: Development of semiconductor memory, internal structure and decoding, memory read and write timing diagrams, RAM, ROM, EPROM, EEPROM, DRAM.

Architecture of 8-bit Microprocessor: Intel 8085A microprocessor, Pin description and internal architecture.

Operation and Control of Microprocessor: Timing and control unit, op-code fetch machine cycle, memory read/write machine cycles, I/O read/write machine Cycles, interrupt acknowledge machine cycle.

UNIT - 2 (12 hours)

Instruction Set: Addressing modes; Data transfer, arithmetic, logical, branch, stack and machine control groups of instruction set, Subroutines, parameter passing to subroutines.
Writing, Assembling & Executing A Program, Debugging The Programs, Decision Making, Looping, Stack & Subroutines, Developing Counters And Time Delay Routines, Code Conversion, BCD Arithmetic And 16-Bit Data Operations.

UNIT - 3 (12 hours)

Interfacing: Interfacing of memory chips, address allocation technique and decoding; Interfacing of I/O devices, LEDs, and toggle-switches as examples, memory mapped and isolated I/O structure.
Programmable Peripheral Interface: Intel 8255, pin configuration and block diagram, modes of operation, programming; ADC and DAC chips, stepper motor their interfacing and programming.

UNIT - 4 (12 hours)

Interrupts: Interrupt structure of 8085A microprocessor, processing of vectored and non-vectored interrupts, Handling multiple interrupts, and programming.
Programmable Interrupt Controller: Intel 8259, Block diagram, Interrupt operation, programming.
Serial I/O Concepts, SID and SOD, Intel 8251A programmable communication Interface, pin configuration, internal block diagram, programming.

Recommended Readings:

1. Gaonkar R. S.; “Microprocessor Architecture, Programming and Applications”; 5th Ed.; Penram International; 2007.
2. Hall D. V.; “Microprocessor and Interfacing-Programming and Hardware”; 2nd Ed.; Tata McGraw-Hill Publishing Company Limited; 2008.
3. Stewart J; “Microprocessor Systems- Hardware, Software and Programming”; Prentice Hall International Edition; 1990.
4. Short K. L.; “Microprocessors and Programmed Logic”; 2nd Ed.; Pearson Education; 2008.
5. Manual on 8-bit Processors 808; Intel.
6. Manual on Peripheral Devices; Intel.

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Writing programs using Data Transfer and arithmetic
2. Writing programs using logical and branch instructions
3. Writing Subroutines and passing parameters to subroutines
4. Developing Counters and Time Delay Routines
5. Developing programs for Code Conversion
6. Developing programs for BCD Arithmetic
7. Developing programs for 16-Bit Data Operations
8. Interfacing of memory chips
9. Interfacing of I/O devices: LEDs and toggle-switches
10. Interfacing Intel 8255
11. Interfacing ADC and DAC chips
12. Interfacing Stepper motor
13. Interrupt Programming
14. Interfacing Intel 8259
15. Interfacing Intel 8251