BS 901MT **MATHEMATICS-III**

Credits: 4

Instruction: (3L+1T) hrs per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*

Course Objectives:

- To introduce the concept of functions of complex variables and their properties
- To formulate partial differential equations and to introduce methods to solve first order linear and non-linear partial differential equations
- To study Fourier series and its applications to partial differential equations

Course Outcomes:
Students will be

- Able to determine the analyticity of a complex functions and expand functions as Taylor and Laurent series
- Able to evaluate complex and real integrals using residue theorem
- Able to learn expansion of Fourier series
- Able to find solutions of first order and second order partial differential equations

UNIT-I

Functions of Complex Variables: Limits and continuity of function, differentiability and analyticity, necessary & sufficient conditions for a function to be analytic, Cauchy-Reimann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's formula for derivatives and their applications.

UNIT-II

Residue Calculus: Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, bilinear transformation, and conformal mapping.

UNIT-III

Fourier Series: Fourier series, Fourier series expansions of even and odd functions, convergence of Fourier series, and Fourier half range series.

UNIT-IV

Partial Differential Equations: Formation of first and second order partial differential equations, solution of first order equations, Lagrange's equation, Nonlinear first order equations, Charpit's method, higher order linear equations with constant coefficients.

UNIT-V

Fourier Series Applications to Partial Differential Equations: Classification of linear second order partial differential equations, Separation of variables method (Fourier method), Fourier series solution of one dimensional heat and wave equations, Laplace's equation.

Suggested Reading:

1. R.K.Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publication, 4th Edition, 2014.
2. B.S.Grewal, *Higher Engineering Mathematics,* Khanna Publications, 43rd Edition, 2014.
3. Gupta & Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi, 2014.
4. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, 2012.
5. James Brown and Ruel Churchill, *Complex Variables and Applications*, 9th Edition,2013.

PC301CS **DATA STRUCTURES**

Credits:3

Instruction: (3L+1T) hrs per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*

Course Objectives:

- To introduce the time and space complexities of algorithms.
- To discuss the linear and non-linear data structures and their applications.
- To introduce the creation, insertion and deletion operations on binary search trees and balanced binary search trees.
- To introduce various internal sorting techniques and their time complexities

Course Outcomes:
Students will be

- Able to analyze the time and space complexities of algorithms.
- Able to implement linear, non-linear data structures and balanced binary trees
- Able to analyse and implement various kinds of searching and sorting techniques.
- Able to find a suitable data structure and algorithm to solve a real world problem.

UNIT–I

Performance and Complexity Analysis: Space Complexity, Time Complexity, Asymptotic Notation (Big-Oh), Complexity Analysis Examples.
Linear List-Array Representation: Vector Representation, Multiple Lists Single Array.
Linear List-Linked Representation: Singly Linked Lists, Circular Lists, Doubly Linked Lists, Applications (Polynomial Arithmetic).
Arrays and Matrices: Row And Column Major Representations, Sparse Matrices.

UNIT –II

Stacks: Array Representation, Linked Representation, Applications (Recursive Calls, Infix to Postfix, Postfix Evaluation).
Queues: Array Representation, Linked Representation.
Skip Lists and Hashing: Skip Lists Representation, Hash Table Representation, Application- Text Compression.

UNIT- III

Trees: Definitions and Properties, Representation of Binary Trees, Operations, Binary Tree Traversal.
Binary Search Trees: Definitions, Operations on Binary Search Trees.
Balanced Search Trees: AVL Trees, and B-Trees.

UNIT –IV

Graphs: Definitions and Properties, Representation, Graph Search Methods (Depth First Search and Breadth First Search)
Application of Graphs: Shortest Path Algorithm (Dijkstra), Minimum Spanning Tree (Prim's and Kruskal's Algorithms).

UNIT -V
Sorting and Complexity Analysis: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Closest Pair Of Points, and Heap Sort.

Suggested Reading:

1. Sartaj Sahni, *Data Structures--Algorithms and Applications in C++*, 2nd Edition, Universities Press (India) Pvt. Ltd., 2005.
2. Mark Allen Weiss, *Data Structures and Problem Solving using C++,* Pearson Education International, 2003.
3. Michael T. Goodrich, Roberto Tamassia, David M. Mount, *Data Structures and Algorithms in C++*, John Wiley & Sons, 2010.

PC 302 CS **DISCRETE MATHEMATICS**

Credits:4

Instruction: (3L+2T) hrs per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*

Course Objectives:

- To introduce concepts of set theory, arithmetic, logic, and proof techniques.
- To understand the use of mathematical and logical notation to define and formally reason about discrete structures like trees, graphs and partial orders.
- To introduce generating functions and recurrence relations and to find asymptotic growth rates of different functions.

Course Outcomes:

Students will be

- Able to use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.
- Able to produce convincing arguments, analyse basic mathematical proofs and discriminate between valid and unreliable arguments.
- Able to model and solve real-world problems using graphs and trees, both quantitatively and qualitatively.
- Able to formulate problems and solve the recurrence relations and to find asymptotic growth rates of different functions.

UNIT- I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions and the Proof of Theorems.
Set Theory: Set and Subsets, Set Operations, and the Laws of Set theory, Counting and Venn Diagrams.
Properties of the Integers: The well – ordering principle, Recursive Definitions, Division Algorithms, Fundamental theorem of Arithmetic.

UNIT-II

Relations and Functions: Cartesian Product, Functions onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions, Computational Complexity.

Relations: Partial Orders, Equivalence Relations and Partitions.

Principle of Inclusion and Exclusion: Principles of Inclusion and Exclusion, Generalization of Principle, Derangements, Rock Polynomials, Arrangements with Forbidden Positions.

UNIT–III

Generating Functions: Introductory Examples, Definition And Examples, Partitions Of Integers, Exponential Generating Function, Summation Operator.

Recurrence Relations: First – order linear recurrence relation, second – order linear homogenous recurrence relation with constant coefficients, Non homogenous recurrence relation, divide and conquer algorithms.

UNIT-IV

Algebraic Structures: Algebraic System – General Properties, Semi Groups, Monoids, Homomorphism, Groups, Residue Arithmetic, Group Codes and their Applications.

UNIT -V

Graph Theory: Definitions and examples, subgraphs, complements and graph Isomorpshim, Vertex degree, Planar graphs, Hamiltonian paths and Cycles, Graph Coloring, Euler & Hamiltonian graphs, and Chromatic number.

Trees: Definitions, properties and Examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees.

Suggested Reading:

1. Tremblay J P, and Manohar R, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill Education, 2001.
2. Shanker Rao G, *Mathematical Foundations of Computer Science*, I K International Publishing House Pvt. Ltd., 2006.
3. Mott Joe L Mott, Abraham Kandel, and Theodore P Baker*, Discrete Mathematics for Computer Scientists & Mathematicians*, Prentice Hall NJ, 2nd Edition, 1986.
4. Thomas Koshy, *Discrete Mathematics with Applications*, Elsevier Inc., 2004.

PC 303 CS **LOGIC AND SWITCHING THEORY**

Credits:3

Instruction: (3L+1T) hrs per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*

Course Objectives:

- To introduce concepts of Boolean logic, Postulates and Boolean Theorems.
- To understand the use of logic minimization methods and to solve the Boolean logic expressions
- To understand how to design the combinational and sequential circuits.
- To introduce and realize the adder circuits
- To understand the state reduction methods for sequential circuits.

Course Outcomes:

Students will be

- Able to apply the concepts of Boolean logic, Postulates and Boolean Theorems to solve the Boolean expressions.
- Able to solve the Complex Boolean logic expressions using Minimization methods.
- Able to design the combinational, sequential circuits and Various adder circuits.
- Able to apply state reduction methods to solve sequential circuits.

UNIT-I

Boolean Algebra: Axiomatic definition of Boolean Algebra Operators, Postulates and Theorems, Boolean Functions, Canonical Forms and Standard Forms, Simplification of Boolean Functions Using Theorems and Karnaugh Map Method.

UNIT-II

Minimization of Switching Functions: Quine-McCluskey Tabular Method, Determination of Prime Implicants and Essential Prime Implicants.

Combinational Logic Design: Single-Output and Multiple-Output Combinational Circuit Design, AND-OR, OR-AND and NAND/NOR Realizations, Exclusive-OR and Equivalence functions.

UNIT–III

Design of Combinational Logic Circuits: Gate Level design of Small Scale Integration (SSI) circuits, Modular Combinational Logic Elements- Decoders, Encoders, Priority encoders, Multiplexers and De-multiplexers.

Design of Integer Arithmetic Circuits using Combinational Logic: Integer Adders – Binary Adders, Subtractors, Ripple Carry Adder and Carry Look Ahead Adder, and Carry Save Adders.

UNIT-IV

Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices.

Introduction to Sequential Circuit Elements: Latch, Various types of Flip-Flops and their Excitation Tables.

UNIT -V

Models of Sequential Circuits: Moore Machine and Mealy Machine, Analysis of Sequential Circuits-State Table and State Transition Diagrams. Design of Sequential Circuits-Counters. Moore and Mealy State Graphs for Sequence Detection, Methods for Reduction of State Tables and State Assignments.

Suggested Reading:

1. M Morris Mano and Michael D Ciletti, *Digital Design*, Prentice Hall of India, Fourth Edition, 2008.
2. Zvi Kohavi, *Switching and Finite Automata Theory*, Tata McGraw Hill, 2nd Edition, 1979.

ES321EC **BASIC ELECTRONICS ENGINEERING**

Credits:3

Instruction: (3L+1T) hrs per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*

Course Objectives:

- To analyze the behavior of semiconductor diodes in Forward and Reverse bias.
- To design of Half wave and Full wave rectifiers with L,C, LC & CLC Filters.
- To explore V-I characteristics of b\Bipolar Junction Transistor n CB, CE & CC configurations.
- To explain feedback concept and different oscillators.
- To analyze Digital logic basics and Photo Electric devices.

Course Outcomes:

Students will be

- Able to learn about forward biased and reversed biased circuits
- Able to plot the V-I Characteristics of diode and transmission
- Able to design combinational logic circuits and PLDs

UNIT-I

Semi Conductor Theory: Energy Levels, Intrinsic and Extrinsic Semiconductors, Mobility, Diffusion and Drift current. Hall Effect, Characteristics of P-N Junction diode, Parameters and Applications.

Rectifiers: Half wave and Full wave Rectifiers (Bridge, center tapped) with and without filters, ripple regulation and efficiency. Zener diode regulator.

UNIT-II

Bipolar Junction Transistor: BJT, Current components, CE, CB, CC configurations, characteristics, Transistor as amplifier. Analysis of CE,CB,CC Amplifiers(qualitative treatment only).

JEET: Construction and working, parameters, CS, CG, CD Characteristics, CS amplifier.

UNIT-III

Feedback Concepts – Properties of Negative Feedback Amplifiers, Classification, Parameters .
Oscillators – Barkhausen Criterion, LC Type and RC Type Oscillators and Crystal Oscillators. (Qualitative treatment only)

UNIT-IV

Operational Amplifiers – Introduction to OP Amp, characteristics and applications – Inverting and Non-inverting Amplifiers, Summer, Integrator, Differentiator, Instrumentation Amplifier.
Digital Systems: Basic Logic Gates, half, Full Adder and Subtractors.

UNIT-V

Data Acquisition systems: Study of transducer (LVDT, Strain gauge, Temperature, Force).
Photo Electric Devices and Industrial Devices: Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics only.
Display Systems: Constructional details of C.R.O and Applications.

Suggested Reading:

1. Jocob Millman, Christos C. Halkias and Satyabrata Jit, *Electronics Devices and Circuits*", 3rd Edition, McGraw Hill Education (India) Private Limited, 2010.

2. Rama Kanth A. Gaykward, *Op-AMPS and Linear Integrated Circuits*, 4th Edition Prentice Hall of India, 2000.
3. M. Morris Mano, *Digital Design*, 3rdEdition, Prentice Hall of India, 2002.
4. William D Cooper, and A.D. Helfrick, *Electronic Measurements and Instrumentations Techniques*, 2nd Edition, Prentice Hall of India, 2008
5. S.Shalivahan, N. Suresh Kumar, A. Vallava Raj, *Electronic Devices and Circuits*, 2nd Edition., McGraw Hill Education (India) Private Limited, 2007.

HS901BT **ENVIRONMENTAL SCIENCES**

Credits:3

Instruction: (3L) hrs per week *Duration of SEE: 3 hours*
CIE: 30 marks *SEE: 70 marks*

Course Objectives:

- To study the basic concepts, sources of water, floods and their impact on environment
- To know the ecosystems and energy resources systems
- To understand the Biodiversity concepts and their advantages
- To study the different pollutions and their impact on environment
- To know the social and environment related issues and their preventive measures

UNIT-I

Environmental Studies: Definition, scope and importance, need for public awareness.
Natural resources: Water resources; use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams:benefits and problems. Effects of modern agriculture, fertilizer- pesticide problems, water logging and salinity.

UNIT-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).
Energy resources: Growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT-III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV

Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution; solid and liquid waste management.

Environment Protection Act: Air, water, forest and wild life Acts, enforcement of environmental legislation.

UNIT-V

Social Issues and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle, and disaster management in India.

Suggested Reading:

1. A.K. De, *Environmental Chemistry*, Wiley Eastern Ltd.
2. E.P. Odum, *Fundamentals of Ecology*, W.B. Sunders Co., USA.
3. M.N. Rao and A.K. Datta , *Waste Water Treatment*, Oxford and IBK Publications.
4. Benny Joseph, *Environmental Studies*, Tata McGraw Hill, 2005.
5. V.K. Sharma, *Disaster Management*, National Centre for Disaster Management, IIPE,1999.
6. *Green Building Council of India*, Teri Document.

PC351CS **DATA STRUCTURES LAB**

Credits: 1

Instruction: (2P) hrs per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*

Course Objectives:

- To develop skills to design and analyze simple linear and non linear data structures, such as stacks, queues and lists and their applications.
- To gain programming skills to implement sorting and searching algorithms.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

Course Outcomes:

Students will be

- Able to understand various data structure such as stacks, queues, trees, graphs to solve various computing problems.
- Able to implement various kinds of searching and sorting techniques, and know when to choose which technique
- Able to decide a suitable data structure and algorithm to solve a real world problem.

Programming Exercise using C++:

1. Implementation of Singly Linked List, Doubly Linked List and Circular List.
2. Implementation of Stacks, Queues (using both arrays and linked lists).
3. Infix to Postfix conversion, evaluation of postfix expression.
4. Polynomial arithmetic using linked list.
5. Implementation of Binary Search and Hashing.
6. Implementation of recursive and iterative traversals on binary tree.
7. Implementation of Binary Search Tree.

8. Implementation of operations on binary tree (delete entire tree, copy entire tree, mirror image, level order, search for a node etc.)
9. Implementation of Selection, Shell, Merge and Quick sorts.
10. Implementation of Heap Sort.
11. Implementation of operations on AVL Trees.
12. Implementation of traversal on Graphs.
13. Implementation of B-Trees.

Note : To debug these programs it is recommended to use a debugging tool.

ES342EC **BASIC ELECTRONICS LAB**

Credits: 1

Instruction: (2P) hrs per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*

Course Objectives:

- To understand the characteristics of diode
- To learn the behavior of diode, transistor and V-I characteristics
- To understand the design of amplifier circuits and plots

Course Outcomes:

Students will be

- Able to design the diode in forward and reverse bias
- Able to plot the V-I characteristics of diode transistor
- Able to design transistor amplifier circuit

Experiments to be done

1. Characteristics of Semi-conductor diodes (Ge, Si, Ze).
2. Static Characteristics of BJT (CE).
3. Static Characteristics of FET.
4. Full wave Rectifier with and without filters.
5. Transistor as an amplifier.
6. CRO Applications.
7. Current series Feedback amplifier.
8. Voltage series FB amplifier.
9. RC phase shift oscillator, Hartley oscillator.
10. Operational amplifier applications.
11. RC coupled amplifier frequency response.

12. Emitter follower and Source Follower.
13. Frequency response of FET Amplifier.

Suggested Reading:

1. David A Bell, *Laboratory Manual for Electronic Devices and Circuits*, PHI, 2007.
2. RL Borlestand and L Nashelsky, *Electronic Devices and Circuit Theory*, PHI, New Delhi, 2006.

ES341EE **ELECTRICAL ENGINEERING LAB**

Credits: 1

Instruction: (2P) hrs per week *Duration of SEE: 3 hours*
CIE: 25 marks *SEE: 50 marks*

Course Objectives:

- To learn practical electric AC & DC circuits.
- To learn operation and performance characteristics of electrical machines by conducting various tests practically.

Course Outcomes:

- Awareness about various electric safety rules to be followed while working with electrical equipments
- Explore themselves in designing basic electric circuits
- Identify requirements for electric machines for domestic and industrial purpose

Experiments to be done

1. Verification of Kirchoff's Laws
2. Verification of Thevinin's & Norton's Theorems
3. Study of Three-Phase Balanced Circuits
4. Measurement of Power by Two – Wattmeter Method
5. Study of Single – Phase RLC Series Circuits
6. Magnetization Curve of a Separately Excited DC Generator
7. Load Characteristics of Shunt Generator
8. Performance Characteristics of Shunt Motor
9. Speed Control of DC Shunt Motor

10. O.C. and S.C. Tests on Single – Phase Transformer
11. Load Test on Single – Phase Transformer
12. Load Test on Three – Phase Induction Motor

Note: At least TEN experiments should be conducted in the Semester.