



# SARDAR PATEL UNIVERSITY, BALAGHAT

## School of Engineering and Technology

### Syllabus

**Course: M.Tech**

**Semester: I**

**Branch: Computer Science and Engineering**

**w.e.f. Academic Session: 2024-25**

### MCSE101 Advanced Computational Mathematics

#### Course Objectives:

1. Build foundational knowledge in advanced computational mathematics.
2. Develop skills in solving complex problems using analytical and numerical methods.
3. Provide practical experience with MATLAB for real-world applications.
4. Understand and apply Markov processes and queuing theory.
5. Introduce fuzzy systems and their applications in decision-making.

#### Unit I: Linear Algebra:

Linear Algebra: Linear transformation, vector spaces, hash function, Hermite polynomial, Heavisite's unit function and error function. Elementary concepts of Modular mathematics.

#### Unit II: Differential Equations:

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabolic) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

#### Unit III: Probability:

Probability, compound probability and discrete random variable. Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

#### Unit IV: Markovian Process:

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Application of Eigen value problems in Markov Process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FCFS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

#### Unit V: Fuzzy System:

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

#### Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.



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4. Advance Engg Mathematics, O' Neil, Cengage (Thomson)
5. Introductory Methods of Numerical Analysis by S.S. Shastry,
6. Introduction of Numerical Analysis by Forberg
7. Numerical Solution of Differential Equation by M. K. Jain
8. Numerical Mathematical Analysis By James B. Scarborough
9. Fourier Transforms by J. N. Sheddon
10. Fuzzy Logic in Engineering by T. J. Ross
11. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

#### **Course Outcome:**

At the end of the course, students should be able to:

1. Solve problems in linear algebra, differential equations, and probability.
2. Program and simulate solutions using MATLAB.
3. Apply numerical methods to solve partial differential equations.
4. Model and analyze stochastic processes like Markov chains.
5. Design fuzzy logic systems for handling uncertainty.



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### MCSE102 Advanced Data Structure and Algorithms

#### Course Objectives:

1. Understand OOP concepts, algorithm analysis, and data structures.
2. Learn implementations of basic data structures (stacks, queues, trees).
3. Study advanced data structures (graphs, sets, priority queues).
4. Explore memory management and garbage collection techniques.
5. Master searching, sorting, and algorithm design techniques.

#### Unit I: Basic Concepts of Programming:

Basic concepts of OOPs – Templates – Algorithm Analysis – ADT - List (Singly, Doubly and Circular) Implementation - Array, Pointer, Cursor Implementation.

#### Unit II: Basic Data Structures:

Stacks and Queues – ADT, Implementation and Applications - Trees – General, Binary, Binary Search, Expression Search, AVL, Splay, B-Trees – Implementations - Tree Traversals.

#### Unit III: Advanced Data Structures:

Set – Implementation – Basic operations on set – Priority Queue – Implementation - Graphs – Directed Graphs –Shortest Path Problem-Undirected Graph - Spanning Trees – Graph Traversals

#### Unit IV: Memory Management:

Issues - Managing Equal Sized Blocks - Garbage Collection Algorithms for Equal Sized Blocks - Storage Allocation for Objects with Mixed Sizes - Buddy Systems - Storage Compaction.

#### Unit V: Searching Sorting and Design Techniques:

Searching Techniques, Sorting – Internal Sorting – Bubble Sort, Insertion Sort, Quick Sort, Heap Sort, Bin Sort, Radix Sort – External Sorting – Merge Sort, Multi-way Merge Sort, Polyphase Sorting - Design Techniques - Divide and Conquer - Dynamic Programming - Greedy Algorithm – Backtracking - Local Search Algorithms.

#### Reference Books:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson P
2. Aho, Hopcroft, Ullman, “Data Structures and Algorithms”, Pearson Education P
3. Drozdek, Data Structures and algorithm in Java, Cengage (Thomson)
4. Gilberg, Data structures Using C++, Cengage
5. Horowitz, Sahni, Rajasekaran, “Computer Algorithms”, Galgotia,
6. Tanenbaum A.S., Langram Y, Augestien M.J., ”Data Structures using C & C++”,Prentice Hall of India, 2002



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#### **Course Outcome:**

At the end of the course, students should be able to:

1. Implement and analyze basic data structures.
2. Design algorithms using advanced data structures.
3. Apply memory management techniques effectively.
4. Implement efficient searching and sorting algorithms.
5. Solve problems using advanced design techniques.



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### MCSE103 Advanced Computer Architecture

#### Course Objectives:

1. Learn parallel computing structures and classifications.
2. Understand and resolve data and control hazards.
3. Study multiprocessor systems and parallel algorithms.
4. Explore multiprocessing algorithms, scheduling, and load balancing.

#### Unit I: Parallel Computing:

Flynn's and Handler's Classification of parallel computing structures. Pipelined and Vector Processors.

#### Unit II: Data and Control Hazards:

Data and control hazards and method to resolve them. SIMD multiprocessor structures.

#### Unit III: Multiprocessor System:

Interconnection networks. Parallel Algorithms for array processors, Search algorithms, MIMD multiprocessor systems.

#### Unit IV: Multiprocessing Algorithms:

Scheduling and load balancing in multiprocessor systems, Multiprocessing control and algorithms.

#### Reference Books:

1. Advance Computer Architecture, parthsarthy, Cengage (Thomson)
2. Computer Architecture and Organisation- John Hays, Mc.Graw-Hill.
3. Computer Architecture and Parallel Processing- Hwang And Briggs, TMH.

#### Course Outcome:

At the end of the course, students should be able to:

1. Classify parallel computing structures.
2. Resolve data and control hazards in SIMD systems.
3. Design parallel algorithms for array and MIMD processors.
4. Implement efficient multiprocessing algorithms.



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### MCSE104 Object Oriented Technology

#### Course Objectives:

1. Understand object-oriented programming concepts and languages.
2. Learn object-oriented design methodologies and system life cycle.
3. Master C++ programming with object-oriented features.
4. Explore object-oriented databases and query languages.
5. Study distributed object-oriented systems like CORBA.

#### Unit I: Introduction:

Overview of object oriented concepts: Need for object oriented programming, characterization of object oriented languages.

#### Unit II: Object Oriented Design:

Object Oriented Design : Object structure concepts, methodology for object oriented design (Booch, and chen and chen ), Design modelling, system design life cycle.

#### Unit III: Object Oriented Programming:

An overview of C++ programming, loops and decisions, structures and functions, objects and classes, Array and pointers, Inheritance, virtual function, files and stream.

#### Unit IV: Object Oriented Databases:

Relational v/s object oriented databases, The architecture of OO databases, Query languages for OO databases, Gemstone/O2/orion.

#### Unit V: Distributed OO System:

Distributed object oriented systems: Object management group, CORBA.

#### Reference Books:

1. Object Oriented Analysis and Design, Satzinger, Cengage (Thomson)
2. Object Oriented S/W Development by Mc. Gregor & Sykes DA, Van Nostrand.
3. The C++ Programming Language by Stroustrup B, Addison Wesley
4. Introduction to OOP by Witt KV, Galgotia Pub.
5. An Introduction to Java Programming and OOAD, Johnson, Cengage

#### Course Outcome:

At the end of the course, students should be able to:

1. Understand and explain OOP concepts and languages.
2. Apply object-oriented design principles.



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3. Implement C++ programs with OOP features.
4. Work with object-oriented databases.
5. Understand and use distributed object-oriented systems.



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### MCSE105 Advanced Computer Network

#### Course Objectives:

1. Understand networking basics and OSI model.
2. Learn TCP/IP protocols and internet applications.
3. Study routing protocols and configurations.
4. Explore Virtual Private Networks (VPNs).
5. Learn wireless communication technologies and mobile networks.

#### Unit I: Basics of Networking:

Review of Networking and O.S. fundamentals, ISO-OSI Model, different layers and their functions, LAN, MAN, WAN, Communication media & principles IEEE standards etc.

#### Unit II: TCP/IP Model:

Internetworking with TCP/IP, Basic concepts, Principles, Protocols and Architecture, Address handling Internet protocols and protocol layering. DNS, Applications: TELNET, RLOGN, FTP, TFTP, NFS, SMTP, POPL, IMAP, MIME, HTTP, STTP, DHCP, VOIP, SNMP.

#### Unit III: Routing and Routing Protocols:

Introduction to Router, Configuring a Router, Interior & Exterior Routing, RIP, Distance Vector Routing, OSPF, BGP, Uni-cast, Multicast and Broadcast. Multicast routing protocols: DVMRP, MOSPF, CBT, PIM, MBONE, EIGRP, CIDR, Multicast Trees, Comparative study of IPv6 and IPv4.

#### Unit IV: Basics of Virtual Private Network:

VPN addressing and routing, VPN Host management, ATM Concepts, Services Architecture, Equipments and Implementation.

#### Unit V: Wireless Communication:

Introduction to wireless transmission and medium access control, wireless LAN: IEEE 802.11, Higher LAN, Bluetooth Mobile Network and Transport layer, WAP GSM and CDMA: Network architecture and management.

#### Reference Books:

1. Computer Networks: Tanenbaum.
2. Internetworking with TCP/IP: Comer.
3. Data Communications, Computer Networks and Open Systems: Hallsall.
4. Data Communications, Stalling.
5. Mobile Communication: Schiller, Pearson Education
6. Computer Communications and network Technology, Gallo, Cengage (Thomson)



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7. Wireless and Mobile Network Architecture: Yi Bing Lin, Wiley
8. ATM Network: Kasara, TMH
9. TCP/IP protocol Suite, Forouzan ,TMH

#### **Course Outcome:**

At the end of the course, students should be able to:

1. Explain networking fundamentals and OSI layers.
2. Implement TCP/IP protocols and applications.
3. Configure and manage routing protocols.
4. Design and manage VPNs.
5. Understand wireless communication and mobile networks.