

Department of Studies in Computer Science

Programme: Master of Science (M.Sc.) in Computer Science

Duration: 2 Years (4 semesters)

Programme Overview:

Master of Science (M.Sc.) in Computer Science programme is designed to prepare students for a career in Industry, Government, Society and the Scientific community by introducing them to a wide range of new technologies in Computer Science disciplines. The programme aims to address research, solve real-world problems, participate in interdisciplinary research and its applications.

Programme Educational Objectives (PEOs):

After 3-4 years of completion of the programme the graduates will be able to:

1. Ability to apply the basic knowledge of database systems, computing, operating system, digital circuits, microcontroller, computer organization and architecture in the design of computer based systems.
2. Ability to specify, design and develop projects, application softwares and system softwares by using the knowledge of data structures, analysis and design of algorithm, programming languages, software engineering practices and open source tools.
3. Ability to debug, verify and validate the systems using various testing methods and tools.

Program Outcomes:

1. Computer knowledge: Apply the knowledge of mathematics, science and engineering fundamentals to the solution of complex problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using principles of mathematics, natural sciences.
3. Design/development of solutions: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern IT tools to complex problems with an understanding of the limitations.
5. Environment and sustainability: Understand the impact of the professional solution in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
6. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
7. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

8. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

9. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

M.Sc. Computer Science First Semester

Course: Data Structure and Algorithms

Course Objectives:

1. To impart the basic concepts of data structures and algorithms
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs

Course Outcomes (CO):

After completion of this course student able to

- 1 Implements basic data structures such as stacks, queues and trees.
- 2 Apply algorithms and data structures in various real-life software problems.
- 3 Develop skills in implementations and applications of data structures.
- 4 Discuss the computational efficiency of the principal algorithms for sorting, searching.

Course: Java Programming

Course Objectives:

1. To impart the basic concepts of Java
2. To understand concepts about classes, Objects and methods
3. To understand basic concepts about Polymorphism, Abstract classes and interfaces

Course Outcomes (CO):

After completion of this course student able to

- 1 Understand Java based software code of medium to high complexity

- 2 Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- 3 Explain and write input – output programming in java and applications using Applets.
- 4 Apply the Java programming concepts and develop the applications with graphical user interface.

Course: Computer Networks

Course Objectives:

1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Understand how errors detected and corrected that occur in transmission
3. Know about routing mechanisms and different routing protocols
4. Understand transport layer functions

Course Outcomes (CO):

After completion of this course student able to

- 1 Apply the knowledge of Packet switching concepts in computer networking
- 2 Identify different categories of IP addresses and design subnets.
- 3 Analyze different Unicast and multicast routing mechanisms.
- 4 Analyze the transport-layer concepts and services -unreliable vs. reliable data transfer

Course: Discrete Mathematical Structures

Course Objectives:

1. Understand sets, propositions and conditional.
2. Apply Principles of Mathematical induction.
3. Solve Different Graph Problems

Course Outcomes (CO):

After completion of this course student able to

- 1 Understand sets, relations, functions and discrete structures.
- 2 Apply propositional logic and first order logic to solve problems.
- 3 Understand discrete mathematical structures.

4 Formulate and solve graph problems.

Course: Web Technologies

Course Objectives:

1. Understand the concepts of web design.
2. Understand the concepts of list and tables.
3. Using HTML, CSS in developing the website applications.

Course Outcomes (CO):

After completion of this course student able to

- 1 Understand the concepts of WWW protocols.
- 2 Analyze a web page and identify its elements and attributes.
- 3 Apply the knowledge of HTML, CSS in developing the website applications.
- 4 Build dynamic web pages using JavaScript (Client side programming)

Course: Web Technologies Lab

Course Objectives:

1. Students will be able to Make own Web page and how to host own web site on internet.
2. Students will also learn about the protocols involved in internet technology.

Course: Data Structure Lab

Course Objectives:

At the end of this lab session,

1. The student will be able to design and analyze the time and space efficiency of the data structure .
2. Be capable to identify the appropriate data structure for given problem
3. Have practical knowledge on the applications of data structures

Course: Java Programming Lab

Course Objectives:

1. To impart hands on experience with java programming
2. To write programs for solving real world problems using java
3. To write multithreaded programs
4. To write programs on applets and servlets

Course: Computer Networking Lab

Course Objectives:

1. To get practical knowledge of working principles of various communication protocols
2. Analyze structure and formats of TCP/IP layer protocols using network tools

M.Sc. Computer Science Second Semester

Course Title: Database Management Systems

Course Outcomes (CO's):

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

1. Describe the Entity–Relationship (ER) modeling and model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification
2. Apply the Relational Data Model, its Constraints and the Relational Database Schemas Formulate queries in Relational Algebra & SQL (Knowledge)
3. Apply normalization techniques to normalize a database
4. Illustrate how a DBMS enforces recovery from failure and concurrency control

Course Title: Python Programming

Course Outcomes (CO's):

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

1. Explain basic principles of Python programming language

2. Implement object oriented concepts
3. Implement database and GUI applications.
4. Explain basic principles of Python programming language

Course Title: Software Engineering

Course Outcomes (CO's):

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

1. Analyze the process model chosen for the development of software and its merits and demerits
2. Identify the clear, correct and consistent requirements for the project
3. Design suitable data, architecture and user interface that copes with the requirements
4. Estimate the cyclomatic complexity and design the corresponding test cases.
5. Conduct various integration testing approaches and note down pit falls in requirements, design.

Course Title: Operating System

Course Outcomes (CO's):

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

1. Explain the core structure and functionality of operating system.
2. Discuss and analyze various inter process communication mechanisms.
3. Evaluate and analyze the different techniques for solving CPU scheduling problems
4. Describe and Apply the knowledge of deadlock concepts to provide wide range of functionality to applications
5. Identify and analyze the problems that occur in the design of OS based on knowledge gained through process synchronization techniques
6. Analyze the performance of different memory management techniques and page replacement algorithms

Course Title: Advanced Web Programming

Course Outcomes (COs):

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

1. Understand client server architecture and able to use the skills for web project development Develop a static, interactive and well-formed webpage using JavaScript, CSS and HTML5
2. Apply PHP to improve accessibility of a web document.
3. Understand client server architecture and able to use the skills for web project development Develop a static, interactive and well-formed webpage using JavaScript, CSS and HTML5

Course Title: Database Management Systems Lab

Course Outcomes (COs):

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

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures and triggers.

Course Title: Python Programming Lab

Course Outcomes (COs):

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

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries

Course Title: Mini Project based on DBMS & Software Engineering

Course Outcomes (COs):

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

1. Apply the knowledge of database management system development process and conduct the experiments using SQL queries to find the solution for given database problem.
2. Apply the knowledge of Software Engineering concepts like SDLC model, UML Concepts, Software Design, Testing for the development of applications.
3. Analyze and design solutions for Database system components to meet the specified needs of online transaction processing and information systems like Banking systems, Ticket Reservation systems etc..
4. Develop code for stored programs, triggers assertions and to generate reports.
5. Contribute to the team as a member, lead the team

Course Title: Advanced Web Programming

Course Outcomes (COs):

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

1. Design and develop dynamic web pages with good aesthetic sense of designing.
2. Understand the concepts of Web Application Terminologies, Internet Tools other Web services.
3. Design and develop pages using the JavaScript, XML, CSS, PHP.

M.Sc. Computer Science Third Semester

Course Title: Multimedia & Animation

Course Outcomes (CO's):

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

1. Deploy the right multimedia communication models.
2. Apply QoS to multimedia network applications with efficient routing techniques.
3. Solve the security threats in the multimedia networks.
4. Develop the real-time multimedia network applications

Course Title: Data Analytics

Course Outcomes (CO's):

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

1. A brief methodological description and some descriptive statistics of data.
2. Concerning data quality issues.
3. Converting data to different scales or scale types and reducing data dimensionality.

Course Title: Data Mining

Course Outcomes (COs):

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

1. Perform the preprocessing of data and apply mining techniques on it.
2. Use data analysis tools for scientific applications.
3. Implement various supervised machine learning algorithms.

Course Title: Cryptographic & Network Security

Course Outcomes (COs):

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

1. Apply the knowledge of mathematics to perceive the foundations of Cryptography and network security and explain the security principles.
2. Design solutions for problems on classical encryption techniques and illustrate symmetric and asymmetric cryptographic algorithms.
3. Develop solutions for problems on public key cryptosystems
4. Analyze different authentication protocols, integrity protocols and key agreement protocols.
5. Apply the knowledge of engineering fundamentals to comprehend existing network security protocols.

Course Title: Artificial Intelligence

Course Outcomes (COs):

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

1. Gain knowledge about fundamentals of Artificial Intelligence and its importance.
2. Explore essential skills to implement different applications of AI used in daily life.
3. Get familiar about robotic systems and their components.

Course Title: Digital Image Processing

Course Outcomes (COs):

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

1. Explain fundamentals of image processing.
2. Compare transformation algorithms.
3. Contrast enhancement, segmentation and compression techniques.

Course Title: Social Networking and Analysis

Course Outcomes (COs):

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

1. To understand the concept of semantic web and related applications.
2. To learn knowledge representation using ontology.
3. To understand human behavior in social web and related communities.
4. To learn visualization of social networks.

Course Title: Software Testing

Course Outcomes (COs):

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

1. Understand importance of testing techniques in software quality management and assurance

2. Identify various types of software risks and its impact on different software application.
3. Create test case scenarios for different application software using various testing techniques.
4. Apply different testing methodologies used in industries for software testing.

Course Title: Web Designing

Course Outcomes (COs):

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

1. Understand the concepts of web design.
2. Understand the concepts of list and tables.
3. Using HTML, CSS in developing the website applications.

Course Title: Computer Networks and Internet Technologies

Course Outcomes (COs):

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

1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Understand how errors detected and corrected that occur in transmission
3. Know about routing mechanisms and different routing protocols
4. Understand transport layer functions

Course Title: Introduction to C Programming

Course Outcomes (COs):

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

1. Develop a C program.
2. Control the sequence of the program and give logical outputs.
3. Implement strings in your C program.
4. Manage I/O operations in your C program.

Course Title: Research Methodology

Course Outcomes (COs): At the end of the course, students will be able to:

1. Clear research question definition.
2. Comprehensive literature review.
3. Selection of appropriate research methodologies.
4. Determination of data collection techniques.
5. Implementation and experimentation.

M.Sc. Computer Science Four Semester

Course Title: Internet of Things

Course Outcomes (CO's):

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

1. Realize the evolution of IOT in Mobile Devices, Cloud & Sensor Networks.
2. Study the building blocks of IOT, its characteristics and application areas of IOT.
3. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.
4. Explore the architecture, its components and working of IOT components.

Course Title: Machine Learning

Course Outcomes (CO's):

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

1. Explain the characteristics of datasets and compare the trivial data and big data for various applications.
2. Illustrate implement machine learning techniques and computing environment that are suitable for the applications under consideration.
3. Describe various ways for implementation of selecting suitable model parameters for different machine learning techniques.

4. Discuss machine learning libraries and mathematical and statistical tools with modern technologies like Hadoop and MapReduce.

Course Title: Business Intelligence

Course Outcomes (COs):

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

1. Explain the turbulent business environment and describe how organizations survive.
2. Comprehend the need for computerized support of managerial decision making.
3. Describe the business intelligence methodology and concepts.
4. Discuss the various types of analytics

Course Title: Cloud Computing

Course Outcomes (COs):

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

1. Apply the key dimensions of Cloud Computing and characteristics.
2. Analyze and infer the benefits and drawbacks of Cloud computing.
3. Analyze and apply the various types of virtualization and capacity planning metrics to Clouds.
4. Identify the uses of different Cloud Service.

Course Title: Mobile Computing

Course Outcomes (COs):

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

1. Describe the concepts of mobile computing and cellular networks.
2. Learn the basic concepts of wireless networks.
3. Description and applications of Ad hoc networks.

Course Title: Pattern Recognition

Course Outcomes (COs):

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

1. Summarize the various techniques involved in pattern recognition.
2. Categorize the various pattern recognition techniques into supervised and unsupervised.
3. Illustrate the artificial neural network based pattern recognition.
4. Discuss the applications of pattern recognition in various applications.

Course Title: Soft Computing

Course Outcomes (COs):

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

1. To learn the basic concepts of Soft Computing.
2. To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
3. To apply soft computing techniques to solve problems.

Course Title: Computer Forensic & Cyber Security

Course Outcomes (COs):

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

1. Define and cite appropriate instances for the application of computer forensics Correctly collect and analyze computer forensic evidence
2. Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics
3. Understand the threats in networks and security concepts.
4. Apply authentication applications in different networks.
5. Understand security services for email, Awareness of firewall and it applications.

Course Title: Multimedia & Animation

Course Outcomes (COs):

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

1. Deploy the right multimedia communication models.
2. Apply QoS to multimedia network applications with efficient routing techniques.

Course Title: Artificial Intelligence

Course Outcomes (COs):

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

1. Gain knowledge about fundamentals of Artificial Intelligence and its importance.
2. Explore essential skills to implement different applications of AI used in daily life.
3. Get familiar about robotic systems and their components

Course Title: R Programming

Course Outcomes (COs):

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

1. Develop an R script and execute it.
2. Install, load and deploy the required packages, and build new packages for sharing and reusability.
3. Extract data from different sources using API and use it for data analysis.
4. Visualize and summarize the data.
5. Design application with database connectivity for data analysis.