

Program Name	Program Outcome
MCA	<ul style="list-style-type: none"> • Ability to apply knowledge of Mathematics, Computer Science and Management in practice. • Ability to identify, analyze, formulate and develop Computer Applications • Ability to work with modern computing tools and techniques and use them with appropriate skills • Ability to devise and conduct experiments, interpret data and provide well informed conclusions • Ability to understand the impact of system solutions in a contemporary, global, economic, environmental, and societal context for sustainable development. • Ability to design a computing system to meet desired needs within realistic constraints of an Industry / Organization / Institution • Ability to function professionally with ethical responsibility as an individual as well as in multi disciplinary teams with positive attitude <p>Program Specific Outcome</p> <ol style="list-style-type: none"> 1. Apply the theoretical concepts of Computer Science and Practical knowledge in analysis, design, and development of Computing systems and applications (software applications) 2. Work as a socially responsible professional by applying Computer Science Principles and Management practices
M.Sc.	<ul style="list-style-type: none"> • Ability to apply knowledge of Mathematics, Computer Science and Management in practice • Ability to identify, analyze, formulate and develop Computer Applications • Ability to work with modern computing tools and techniques and use them with appropriate skills • Ability to devise and conduct experiments, interpret data and provide well informed conclusions. • Ability to design a computing system to meet desired needs within realistic constraints of an Industry / Organization / Institution • Ability to function professionally with ethical responsibility as an individual as well as in multidisciplinary teams with positive attitude <p>Program Specific Outcomes</p> <ol style="list-style-type: none"> 1. Apply the theoretical concepts of Computer Science and Practical knowledge in analysis, design, and development of Computing systems and applications (software applications) 2. Work as a socially responsible professional by applying Computer Science Principles and Management practices

Course Name	Subject	Course Outcome
MCA	First Semester	
	Digital Logic and Computer Design	<ul style="list-style-type: none"> • Students completing this course will be able to perform the conversion among different number systems, familiar with basic logic gates, build simple logic circuits using basic gates. • Students will be able to design combinational and sequential circuits using discrete components. • Use basic structural Hardware Description Languages to implement digital circuits, design and conduct experiments related to digital systems and to analyze their outcomes. • Students will gain understanding of basic organization of computer system.
	Operating System Principles with UNIX	<ul style="list-style-type: none"> • Students will be able to explain the structure of OS and basic architectural components involved in OS design. • Able to analyze and design the applications to run in parallel either using process or thread models of OS. • Analyze the various device and resource management techniques in time sharing and distributed environment. <ul style="list-style-type: none"> • Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system. • Interpret the mechanisms adopted for file sharing in distributed Applications. • Conceptualize the components involved in designing a temporary OS.
	Data Structure using C++	<ul style="list-style-type: none"> • Students completing this course will be able to describe the properties, interfaces, and behaviors of basic abstract data types list, stack and queue. • Will have ability to implement and analyze various searching techniques. • Will have ability to implement and analyze text processing techniques.
	Practical lab-1 Digital Logic Lab	<ul style="list-style-type: none"> • Hands-on experiments to study logic gates and realization of OR, AND, NOT AND XOR Functions using universal gates. • Understand the relationships between combination logic and Boolean algebra, and between sequential logic and finite state machines; • Ability to design and implement combinational circuits like half adder/full adder, half subtractor/full subtractor, code converters, comparators, MUX/DEMUX c). • Design and implement sequential circuits like flip-flops, counters and shift registers d) Study of 8-bit DAC and 8-bit ADC
	Practical lab-2 Data Structure Lab	<ul style="list-style-type: none"> • Students understand OOPs concepts; use them to represent the data structure. • Ability to code sorting methods, including selection, merge sort, heap sort and Quick sort. • Understand dynamic memory management techniques using pointers, constructors, destructors, etc • Ability to implement Stack ADT and Queue ADT using array and linked-list implementation in C++. • Choose appropriate data structures to represent data items in real world problems
Discrete	<ul style="list-style-type: none"> • Students completing this course will have understanding of the 	

Mathematical Structures	<p>computational and algorithmic aspects of Sets, Relations, Mathematical Logic, Boolean algebra, Graphs, Trees and Algebraic Structure in the field of Computer sciences and its applications.</p> <ul style="list-style-type: none"> • Able to apply them in problem solving.
Probability and Statistical Methods	<ul style="list-style-type: none"> • Understand concepts of probability theory and statistical inference in order to solve applied problems. • Familiarity with basic rules of probability and will be able to use them in modeling uncertainty in obtaining and recording data. • Understand the logic of statistical inference and will be able to apply common inferential procedures
Numerical Methods	<ul style="list-style-type: none"> • Apply Numerical analysis which has enormous application in the field of Computer Science and Engineering. • Familiar with finite precision computation. • Familiar with numerical solutions of nonlinear equations in a single variable. • Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations. • Familiar with calculation and interpretation of errors in numerical method.
Fundamentals of Programming	<ul style="list-style-type: none"> • To introduce the fundamental concepts of computers and computing environment. • To acquire the basic knowledge of algorithm design and problem-solving using c. • To understand the concept of object-oriented programming and acquiring skills for problem solving using OOPs syntax.
Computer Fundamentals(OE)	<ul style="list-style-type: none"> • Upon completion of this course, the student will be describing the components of a typical computer and explain the characteristics of each of them. • Understand the working of Windows operating system and the services it provides. • Understand the importance of computers in business and society. • Describe various types of networks network standards and communication software.
Second Semester	
Database Management System	<ul style="list-style-type: none"> • Describe the fundamental elements of relational database management systems • Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. • Design ER-models to represent simple database application scenarios • Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data. • Improve the database design by normalization. • Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing
Advanced Computer Network	<ul style="list-style-type: none"> • After the completion of the course the students will be able to illustrate reference models with layers, protocols and interfaces. • Understands the functionalities of different Layers, Routing algorithm and its applications. • They will be able to describe and analyze the basic protocols of computer networks, and how they can be used to assist in network design and implementation. • Explain and identify security and ethical issues in

	computer networking. • Ability to simulate key networking techniques/algorithms.
Design and Analysis of Algorithm	<ul style="list-style-type: none"> • The outcome of this course will help the students to analyze the performance of recursive and iterative algorithms. • Understanding and performing simple proofs of algorithmic complexity and correctness. • An understanding of a variety of well-known algorithms on some of the data structures including the grasping approach, divide and overcome, dynamic programming, backtracking. • To understand P and NP classes. • Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
DBMS and Java Lab	<ul style="list-style-type: none"> • Apply the basic concepts of Database Systems and Applications. • Use the basics of SQL and construct queries using SQL in database creation and interaction. • Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system. • Analyze and Select storage and recovery techniques of database system.
DAA Lab	<ul style="list-style-type: none"> • Students will be able to designing algorithm using the concepts of dynamic programming, greedy method, Back tracking, Branch and Bound strategy. • Able to compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem. • Able to develop the efficient algorithms for the problems with suitable designing techniques.
Web Technology	<ul style="list-style-type: none"> • Analyze a web page and identify its elements and attributes. • Create web pages using XHTML and Cascading Style Sheets. • Build dynamic web pages using JavaScript (Client-side programming). • Create XML documents and Schemas. • Build interactive web applications using AJAX.
Computer Graphics	<ul style="list-style-type: none"> • Compare various graphics devices • Analyze and implement algorithms for line drawing, circle drawing and polygon filling • Apply geometrical transformation on 2D and 3D objects • Analyze and implement algorithms for clipping • Apply various projection techniques on 3D objects • Interpret various concepts and basic operations of image processing.
Cryptography and Network Security	<ul style="list-style-type: none"> • Analyze the vulnerabilities in any computing system and hence be able to design a security solution. • Identify these security issues in the network and resolve it. • Evaluate security mechanisms using rigorous approaches, including theoretical. • Compare and Contrast different IEEE standards and electronic mail security.
Open Elective Office Automation	<ul style="list-style-type: none"> • Solve common business problems using Word • Processors and Spreadsheets packages. • Identify categories of programs, system software and applications. • Organize and work with files and folders. • Develop Presentation ability
Third Semester	
Software Engineering	<ul style="list-style-type: none"> • The students will be able to demonstrate the minimum requirements for the development of application. • Ability to develop, maintain, efficient, reliable and cost-effective software solutions. • Able to demonstrate and understand how to apply current theories, models, and techniques that provide a basis for the software lifecycle. • Ability to critically thinking and

	evaluate assumptions for the techniques and tools necessary for engineering practice.
Digital Image Processing	<ul style="list-style-type: none"> • Understanding fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression • Be able to implement basic image processing algorithms in MATLAB. • Have the skill base necessary to further explore advanced topics of Digital Image Processing. • Be in a position to make a positive professional contribution in the field of Digital Image Processing
DIP Lab	
INTERNET OF THINGS	<ul style="list-style-type: none"> • Develop schemes for the applications of IOT in real time scenarios • Manage the Internet resources • Model the Internet of things to business • Understand the practical knowledge through different case studies
Cloud Computing	<ul style="list-style-type: none"> • Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies • Implement different types of Virtualization technologies and Service Oriented Architecture systems • Elucidate the concepts of NIST Cloud Computing architecture and its design challenges • Analyze the issues in Resource provisioning and Security governance in clouds Choose among various cloud technologies for implementing applications
Data Analytics	
Internship	
Digital Technology (OE)	<ul style="list-style-type: none"> • To perform and get knowledge about applications, virtual learning and internet fundamentals. • Develop holistically by learning essential skills such as effective communication, problem solving, design thinking, and teamwork.
Fourth Semester	
Artificial Intelligence and Machine Learning	
DATA SCIENCE	<ul style="list-style-type: none"> • Define data science and its fundamentals • Demonstrate the process in data science • Explain machine learning algorithms necessary for data sciences • Illustrate the process of feature selection and analysis of data analysis algorithms • Visualize the data and follow of ethics
Ad-hoc Wireless Networks	<ol style="list-style-type: none"> 1. Identify the characteristics and features of Adhoc Networks. 2. Understand the concepts & be able to design MAC protocols for Ad Hoc networks 3. Implement protocols / Carry out simulation of routing protocols of Adhoc Networks 4. Interpret the flow control in transport layer of Ad Hoc Networks 5. Analyze security principles for routing of Ad Hoc Networks 6. Utilize the concepts of Adhoc Networks in VANETS
DEEP LEARNING	<ul style="list-style-type: none"> • Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains. • Implement deep learning algorithms and solve real-world problems. • Execute performance metrics of Deep Learning Techniques.
Project Work	

(16 Weeks)

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M.Sc.	First Semester	
	Advanced Operating System Concepts	<ul style="list-style-type: none"> • Students will be able explain the structure of OS • and basic architectural components involved in OS design • Able to analyze and design the applications to run in parallel either using process or thread models of OS. • Analyze the various device and resource management techniques in timesharing and distributed environment. • Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system. • Interpret the mechanisms adopted for file sharing in distributed Applications. • Conceptualize the components involved in designing a contemporary OS.
	Digital Logic and Computer Design	<ul style="list-style-type: none"> • Students completing this course will able to perform the conversion among different number systems; familiar with basic logic gates, build simple logic circuits using basic gates. Students will be able to design combinational and sequential circuits using discrete components, Use basic structural Hardware Description Languages to implement digital circuits, design and conduct experiments related to digital systems and to analyze their outcomes. • Students will gain understanding of basic organization of computer system.
	Data Structures Using CPP	<ul style="list-style-type: none"> • Students completing this course will be able to describe the properties, interfaces, and behaviors of basic abstract data types list, stack and queue. • Will have ability to implement and analyze various searching techniques • Will have ability to implement and analyze text processing techniques
	Data Structures Using CPP Lab.	<ul style="list-style-type: none"> • Students understand OOPs concepts; use them to represent the data structure. • Ability to code sorting methods, including selection, merge sort, heap sort and Quick sort. • Understand dynamic memory management techniques using pointers, constructors, destructors, etc • Ability to implement Stack ADT and Queue ADT using array and linked-list implementation in C++. • Choose appropriate data structures to represent data items in real world problems
Digital Logic Lab	<ul style="list-style-type: none"> • Hands-on experiments to study logic gates and realization of OR, AND, NOT AND XOR Functions using universal gates. • Understand the relationships between combination logic and Boolean algebra, and between sequential logic and finite state machines; • Ability to design and implement combinational circuits like half adder/full adder, half subtractor/full subtractor, code 	

		converters, comparators, MUX/DEMUX c). • Design and implement sequential circuits like flip- flops, counters and shift registers d) Study of 8-bit DAC and 8-bit ADC
	Discrete Mathematical Structures	<ul style="list-style-type: none"> • Students completing this course will have understanding of the computational and algorithmic aspects of Sets, Relations, Mathematical Logic, Boolean algebra, Graphs, Trees and Algebraic Structure in the field of Computer sciences and its applications. Able to apply them in problem solving.
	Computer Oriented Numerical Methods	<ul style="list-style-type: none"> • Students will be able to demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems. • Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations. • Implement numerical methods in C/C++
	Probability and Statistical Methods	<ul style="list-style-type: none"> • Understand concepts of probability theory and statistical inference in order to solve applied problems. • Familiarity with basic rules of probability and will be able to use them in modeling uncertainty in obtaining and recording data. • Understand the logic of statistical inference and will be able to apply common inferential procedures
	Computer Fundamentals (OE)	<ul style="list-style-type: none"> • Upon completion of this course, the student will be describing the components of a typical computer and explain the characteristics of each of them. • Understand the working of Windows operating system and the services it provides. • Understand the importance of computers in business and society. • Describe various types of networks network standards and communication software
	Second Semester	
	Advanced Computer Networks	<ul style="list-style-type: none"> • After the completion of the course the students will be able to illustrate reference models with layers, protocols and interfaces. • Understands the functionalities of different Layers, Routing algorithm and its applications. • They will be able to describe and analyze the basic protocols of computer networks, and how they can be used to assist in network design and implementation. • Explain and identify security and ethical issues in computer networking. • Ability to simulate key networking techniques/algorithms.
	Relational Database Management Systems (RDBMS)	<ul style="list-style-type: none"> • After completing this course students will have a clear understanding of RDBMS components and its practical uses. • Design ER-models to represent simple

		<p>database application scenarios • Write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS. • Improve the database design by normalization. • Explain concurrency related issues and solutions to solve concurrency problem</p>
	Design and Analysis of Algorithms	<p>• The outcome of this course will help the students to analyze the performance of recursive and iterative algorithms. • Understanding and performing simple proofs of algorithmic complexity and correctness. • An understanding of a variety of well-known algorithms on some of the data structures including the grasping approach, divide and overcome, dynamic programming, backtracking. • To understand P and NP classes. • Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.</p>
	RDBMS Lab.	<p>• Students will be able to construct problem definition statements for real life applications and implement a database for the same. • Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra. • Create and populate a RDBMS, using SQL. • Writing queries in SQL to retrieve information from a data base. • To Analyze and apply concepts of normalization to design an optimal database</p>
	Design and Analysis of Algorithms Lab	<p>• Students will be able to designing algorithms using the concepts of dynamic programming, greedy method, Backtracking, Branch and Bound strategy. • Able to compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem. • Able to develop the efficient algorithms for the problems with suitable designing techniques.</p>
	Microprocessor	<p>• Understand the fundamentals of Microprocessors. • Understand the internal design of 8051 microcontroller along with the features and their programming. • Competent with the on-chip peripherals of microcontrollers • Design different interfacing applications using microcontrollers and peripherals.</p>
	Systems Analysis and Design	<p>• A firm basis for understanding the life cycle of a systems development project; • An understanding of the analysis and development techniques required as a team member of a medium-scale information systems development project; • An understanding of the ways in which an analyst's interaction with system sponsors and users play a part in information systems development; • Experience in developing information systems models • Experience in developing systems project</p>

		documentation; • An understanding of the object-oriented methods models as covered by the Unified Modeling Language
	JAVA Programming	• Knowledge of the structure and model of the Java programming language. • Use the Java programming language for problemsolving. • Design object-oriented solutions for small systemsinvolving multiple objects
	Office Automation (OE)	• Solve common business problems using Word • Processors and Spreadsheets packages. • Identify categories of programs, system software andapplications. • Organize and work with files and folders. • Develop Presentation ability
Third Semester		
	Software Engineering	• The students will be able to demonstrate the minimum requirements for the development ofapplication. • Ability to develop, maintain, efficient, reliable and cost-effective software solutions. • Able to demonstrate and understand how to apply current theories, models, and techniques that provide a basis for the software lifecycle. • Ability to critically thinking and evaluate assumptionsfor the techniques and tools necessary forengineering practice.
	Programming with Python	• To acquire programming skills in core Python. • To acquire Object Oriented Skills in Python. • To develop the skill of designing Graphical user Interfaces in Python. • Demonstrate significant experience with the Python program development environment. • Understand and implement python modules like NumPy, Tkinter, Matplotlib
	Big Data Analytics	• Understand Big Data and its analytics in the real world • Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics Design of Algorithms to solve Data Intensive. • Problems using Map Reduce Paradigm • Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics • Implement Big Data Activities using Hive
	Practical I: Programming with Python	• To acquire programming skills in core Python. • To acquire Object Oriented Skills in Python. • To develop the skill of designing Graphical user Interfaces in Python. • Demonstrate significant experience with the Python program development environment. • Understand and implement python modules like NumPy, Tkinter, Matplotlib
	Data Mining	• The outcome of the course will help the students to • Understand the data mining principles and techniques. •

		Understand the strengths and limitations of various data mining and data warehousing models. • Demonstrate basic data mining algorithms, methods, and tools. • Understanding of application areas - web mining, text mining, and ethical aspects of data mining.
	Mobile Computing	• Define mobile technologies in terms of hardware, software, and communications. • Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures. • Evaluate the effectiveness of different mobile computing frameworks. • Describe how mobile technology functions to enable other computing technologies
	Digital Image Processing	• Understanding fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression • Be able to implement basic image processing algorithms in MATLAB. • Have the skill base necessary to further explore advanced topics of Digital Image Processing. • Be in a position to make a positive professional contribution in the field of Digital Image Processing
	Digital Technology	• To perform and get knowledge about applications, virtual learning and internet fundamentals. • Develop holistically by learning essential skills such as effective communication, problem-solving, design thinking, and teamwork.
Fourth Semester		
	Artificial Intelligence	• To understand basic principles of Artificial Intelligence • Understand formal methods of knowledge representation, logic and reasoning • Understand foundational principles, mathematical tools and program paradigms of artificial intelligence • Design an application of artificial intelligence (AI)
	Artificial Intelligence Lab	Solve basic AI based problems • Apply AI techniques to real-world problems to develop intelligent systems. • Design an application of artificial intelligence
	Practical –II Project Work	• On successful completion the project student will be able to demonstrate a sound technical knowledge of their selected project topic. • Design engineering solutions to complex problems utilizing a systems approach. • To report and present the findings of the study conducted in the preferred domain
	Internet of Things	• Identify the IoT networking components with respect to OSI layer. • Build schematic for IoT solutions. • Design and develop IoT based sensor systems. • Select IoT protocols and software. • Evaluate the wireless technologies for IoT. • Appreciate the need for IoT Trust

		and variants of IoT
	Cloud Computing	<ul style="list-style-type: none"> • Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies • Implement different types of Virtualization technologies and Service Oriented Architecture systems • Elucidate the concepts of NIST Cloud Computing architecture and its design challenges • Analyze the issues in Resource provisioning and Security governance in clouds Choose among various cloud technologies for implementing applications
	Cryptography and Network Security	<ul style="list-style-type: none"> • Analyze the vulnerabilities in any computing system and hence be able to design a security solution. • Identify the security issues in the network and resolve it. • Evaluate security mechanisms using rigorous approaches, including theoretical. • Compare and Contrast different IEEE standards and electronic mail security.
	Artificial Intelligence (OE)	<ul style="list-style-type: none"> • Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations. • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning • Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models. • Demonstrate proficiency in applying scientific method to models of machine learning.