

## Program Outcomes

**PO 1:** The Programme seeks to instill in students a deep and comprehensive knowledge of core computer science disciplines, advanced computer science concepts, theories, and principles, including algorithms, data structures, programming languages, artificial intelligence, machine learning, cloud computing, advanced databases, full stack development, software Project management, and design patterns.

**PO 2:** Graduates should be equipped with the ability to analyse complex problems in computer Science, design innovative solutions, and implement them effectively.

**PO 3:** The program aims to develop students' research skills, enabling them to evaluate existing research, contribute to knowledge in the field, and apply critical thinking to solve computational problems.

**PO 4:** The program aims to cultivate a passion for research, encouraging students to engage in original research projects that contribute to the advancement of computer science knowledge and address real-world problems.

**PO 5:** Students are expected to gain proficiency in multiple programming languages and develop the ability to write efficient, reliable, and maintainable code.

**PO 6:** Depending on the chosen track or concentration, students may develop expertise in areas.

**PO 7:** Through hands-on projects, practical assignments, and exposure to state-of-the-art tools and technologies, we aim to develop the technical proficiency and problem-solving skills Necessary for success in the professional world.

**PO 8:** Graduates should be adept at presenting complex technical concepts clearly and effectively, both in written and oral forms, to various audiences.

**PO 9:** Computer science professionals often work in multidisciplinary teams. Students should learn to collaborate effectively with team members, understand different perspectives, and Contribute productively to achieve common goals.

**PO 10:**The program places a strong emphasis on ethical considerations, responsible use of technology, and awareness of the societal impact of computing solutions. We aim to produce graduates who approach their work with integrity and a sense of social responsibility.

**PO 11:**Acknowledging the dynamic nature of computer science, we aim to instill in our students a desire for continuous learning and professional development, empowering them to adapt and thrive in the face of technological advancements; prepared them to adapt to new technologies and methodologies throughout their careers.

**PO 12:** Students will be encouraged to think creatively and innovatively, exploring new ideas and approaches to solve computational problems and advance the state of the art in the field.

**PO 13:**The program include On Job Training, internships, research work, research article and papers writing or a thesis that provides students with practical experience, applying their knowledge to real-world challenges.

SEMESTER I					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
I	CS-501-MJ	Major	Advanced Operating System	4	4
Course Objective:					
1	To understand the programming interface to the Unix/Linux system				
2	To provide an understanding of the system calls of Operating Systems				
3	To get knowledge of the design and implementation of Operating Systems				
Course Outcomes:					
CO1	Understand the Operating Systems Structure with example of Unix/Linux.				
CO2	Learn the structure of files and directory in UNIX/LINUX OS.				
CO3	Use various system calls related to file subsystem.				
CO4	Learn the process control subsystem structure in UNIX/LINUX OS				
CO5	Use various system calls related to process control subsystem.				
CO6	Learn the concept of signal handling with practical implementation				
CO7	Understand the memory management policies of UNIX/LINUX OS				

SEMESTER I					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
I	CS-502-MJ	Major	Artificial Intelligence	4	4
Course Objective:					
1	To understand the concept of Artificial Intelligence (AI) in the form of various tasks.				
2	To understand Problem Solving using various searching strategies for AI.				
3	To understand multi-agent environment.				
4	To acquaint with the fundamentals of knowledge and reasoning.				
5	To understand Fundamentals of Game Theory.				
6	To explore of AI applications.				
Course Outcomes:					
CO1	Understand the fundamental concepts of Artificial Intelligence.				
CO2	Identify and apply appropriate search strategies for AI problem.				
CO3	Identify knowledge and represent AI algorithms using various techniques.				
CO4	Implement ideas to design and develop AI solutions for complex challenges.				
CO5	Analyze the performance of AI models and interpret their results.				
CO6	Implement ideas underlying modern logical inference systems.				
CO7	Understand recent trends and future scope of AI.				

SEMESTER I					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
I	CS-503-MJ	DSEC-I	Principles of Programming Language	2	2
Course Objective:					
1	To introduce the various programming paradigms.				
2	To understand the evolution of programming languages.				
3	To understand the concepts of OO languages, functional languages, logical and scripting				
	Languages.				
Course Outcomes:					

CO1	Separate syntax from semantics
CO2	Compare programming language designs
CO3	Understand their strengths and weaknesses
CO4	Learn new languages more quickly
CO5	Understand basic language implementation techniques

SEMESTER I					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
I	CS-510-MJ	Major Elective	Advance Databases and Web Technologies	4	4
Course Objective:					
1	Provides an overview of the concept of NoSQL technology.				
2	Provides an insight into the different types of NoSQL databases				
3	Makes the student capable of making a choice of what database technologies to use, based on their application needs.				
4	To introduce students to modern web technologies.				
5	To introduce students to modern web designing technologies.				
6	Should gain knowledge about web designing using html5 and css3				
7	Student able to use frame work				
Course Outcomes:					
CO1	Students will get knowledge of advance database technology				
CO2	Students will be able to choose appropriate database technology as per application				
CO3	Students will learn to design responsive web application				
CO4	Students could design and implement scalable web application				

SEMESTER I					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
I	CS-531-RM	Major	Research Methodology	4	4
Course Objective:					
1	Research Methodology course are designed to equip students with the necessary knowledge, skills, and understanding of various research techniques and methodologies.				
2	Students should be familiar with various data collection techniques, such as surveys, interviews, observations, and experiments, and understand their strengths and limitations.				
3	Students should be aware of ethical considerations in research, including issues related to participant consent, privacy, confidentiality, and avoiding plagiarism.				
4	Its aim is to enable students to conduct research effectively, critically evaluate existing research, and contribute to the advancement of knowledge in their respective fields.				
Course Outcomes:					
CO1	Understand of the fundamental concepts of research, including the research process, research questions, hypotheses, and variables.				
CO2	Conduct a comprehensive literature review to identify relevant studies, synthesize existing knowledge, and identify research gaps.				
CO3	Identify research problems, formulate research questions, and design appropriate methodologies to address these problems				
CO4	Identify and select appropriate research designs, such as experimental, observational, survey, qualitative, or mixed-methods, based on the research objectives.				
CO5	Apply appropriate data analysis methods, including statistical techniques or qualitative analysis, to draw meaningful conclusions from research data.				
CO6	Develop a well-structured research proposal, outlining research questions, methodology, expected outcomes, and a rationale for the study.				

CO7	Communicate research findings effectively through written reports, presentations, and academic papers.
CO8	Gain an appreciation for the importance of research in contributing to the advancement of knowledge in their field of study and broader society.
CO9	Understand the principles of research ethics and integrity and apply them in their research.

SEMESTER II					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
II	CS-551-MJ	Major	Design and Analysis of Algorithms	4	4
Course Objective:					
1	To design the algorithms				
2	To learn basic Algorithm Analysis techniques and understand the use of asymptotic notation				
3	To Understand different design strategies				
4	To Understand the use of data structures in improving algorithm performance				
5	To critically analyze the efficiency of alternative algorithmic				
6	To understand different algorithm design techniques.				
7	To provide foundation in algorithm design and analysis				
8	To develop the ability to understand and design algorithms in the context of space and time complexity.				
Course Outcomes:					
CO1	Analyze worst-case running times of algorithms using asymptotic analysis.				
CO2	Compare between different data structures. Pick an appropriate data structure for a design situation.				
CO3	Ability to design algorithms using standard paradigms like:Greedy, Divide and Conquer, Dynamic Programming and Backtracking.				
CO4	Able to Explain the major graph algorithms and Employ graphs to model engineering problems, when appropriate.				
CO5	Able to Compare between different data structures and pick an appropriate data structure for a design situation.				

SEMESTER II					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
II	CS-552-MJ	Major	Mobile App Development Technologies	4	4
Course Objective:					
1	Students should learn the Android Fundamentals and Android architecture framework.				
2	Students should understand GUI Design concepts and design Android GUI Layout.				
3	Students should be able to design visually appealing and intuitive user interfaces for Android apps, using appropriate layouts, widgets, and styles.				
4	Students should be Develop and design event-driven programming with UI Controls.				
5	Students should understand how to manage data in Android applications, including using SQLite databases, shared preferences, and data storage.				
6	Students should develop problem-solving skills related to Android app development, addressing challenges in app design and implementation.				
Course Outcomes:					
CO1	To provide students with a solid understanding of the mobile app development, Android operating system, its architecture, components, and the software development kit (SDK).				
CO2	To teach students how to build Android applications from scratch, including UI design, handling user interactions, and integrating various features.				

CO3	To learn about Android's UI components, layouts, and design principles to create visually appealing and user-friendly interfaces.
CO4	To know various methods of data storage in Android applications, such as using SQLite databases, shared preferences, and cloud-based solutions.
CO5	To empower students to independently design, develop, and deploy their Android applications using advanced android tools.
CO6	To understand how to utilize built-in sensors and hardware components on Android devices, such as GPS, accelerometer, Bluetooth, WiFi, Media Player and Camera, in their applications.
CO7	To Get knowledge of Phone Gap Programming

SEMESTER II					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
II	CS-553-MJ	Major	Software Project Management	4	4
Course Objective:					
1	To get skills that are required to ensure successful medium and large scale software projects				
2	To study Requirements Elicitation, Project Management, Verification &Validation and Management of Large Software Engineering Projects.				
3	To learn to select and apply project management techniques for process modeling, planning, estimation, process metrics and risk management				
Course Outcomes:					
CO1	Learn the skills that are required to ensure successful medium and large scale software projects.				
CO2	Examine Requirements Elicitation, Project Management, Verification &Validation and Management of Large Software Engineering Projects.				
CO3	Get knowledge to select and apply project management techniques for process modeling, planning, estimation, process metrics and risk management.				
CO4	Understand the concepts, skills, tools, and techniques of software project management.				

SEMESTER II					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
II	CS-560-MJ	Major Elective	Full Stack Development - I	4	4
Course Objective:					
1	Get familiar with the MEAN stack				
2	Learn advanced ES6 features in Javascript & typescript				
3	Learn front end development using Angular				
4	Create backend APIs using NodeJS and ExpressJS				
5	Develop full stack application using MEAN stack				
6	Learn how to secure & scale MEAN stack applications				
7	Deploy MEAN stack application on production/local server				
Course Outcomes:					
CO1	Learn about the benefits of using MEAN stack and how to install and configure it				
CO2	Learn advanced ES6 features in JavaScript and Typescript				
CO3	Learn about Angular architecture, components, directives, pipes, forms, routing, and services.				
CO4	Learn about the event loop, asynchronous programming, modules, packages, and streams.				
CO5	Learn about the MVC pattern, routing, HTTP requests and responses, middleware, and error handling.				
CO6	Create a full-stack MEAN stack application and deploy it to a production/local server.				

SEMESTER II
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Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
II	CS-581-OJT	OJT	On Job Training/Internship (120 Hours)	4	4

**Course Objective:**

1	To provide students with practical, hands-on-experience in applying theoretical knowledge to real-world tasks
2	To help students develop and enhance their skills, problem solving abilities and work culture of the industry
3	To foster effective teamwork and collaboration skills
4	To encourage students to build and expand their professional network by interactive with experienced experts and mentors in industry

**Course Outcomes:**

CO1	Enhance the knowledge related to various tools and technologies used in industry
CO2	Improve the ability to solve complex problems independently and creatively
CO3	Effectively utilize critical thinking and analytical skills in tackling real world challenges
CO4	Effectively communicate and collaborate skills through interaction with team members and mentors.
CO5	Get an experience in working on projects or related working within industry
CO6	Develop the ability to document process, design, implementation and testing
CO7	Familiar with specific industry domain relevant to internship
CO8	Complete projects and tasks as per the predetermined objectives

MSc(CS) SEMESTER III					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
III	CS-601-MJ	Major	Software Architecture and Design Pattern	4	4

**Course Objective:**

1	To introduce students to the foundation ideas, methods and techniques of Software Architecture and Design Patterns.
2	To write java programs and applications that make use of frameworks and design patterns to create reusable and flexible software systems.
3	To make use of patterns and architectures for solving practical problems.
4	To clear idea about various design pattern.
5	To understand about the process of deploying web apps using specific Frameworks.

**Course Outcomes:**

CO1	Understand the UML basics, RUP and basics of software architecture
CO2	Acknowledge the traits of patterns that make them helpful in solving real-world issues.
CO3	Able to use specific frameworks as per applications need.
CO4	Design java application using design pattern techniques.

MSc(CS) SEMESTER III					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
III	CS-602-MJ	Major	Machine Learning	4	4

**Course Objective:**

1	To introduce students to the basic concepts and techniques of Machine Learning.
2	To write python programs using machine learning algorithms for solving practical problems
3	To understand about Machine Learning Library and use cases.
4	To understand about the process of deploying ML model.

**Course Outcomes:**

CO1	To introduce knowledge of Machine Learning.
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CO2	To demonstrate all categories of Machine learning algorithms along with implementation.
CO3	To compose real time application using machine learning algorithms.
CO4	Analyse the concept of neural networks for learning linear and non-linear activation functions.

MSc(CS) SEMESTER III					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
III	CS-603-MJ	Major	Internet of Things	2	4
Course Objective:					
1	To understand the fundamentals of Internet of Thing				
2	To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent Boards				
3	To create a network of connected devices.				
4	To apply the concept of Internet of Things in the real world scenario.				
Course Outcomes:					
CO1	Demonstrate basic concepts, principles and challenges in IoT.				
CO2	Illustrate functioning of hardware devices and sensors used for IoT.				
CO3	Analyze network communication aspects and protocols used in IoT.				
CO4	Apply IoT for developing real life applications using Arduinio programming.				
CO5	To develop IoT infrastructure for popular applications.				

MSc(CS) SEMESTER III					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
III	CS-610-MJ	Major Elective	Full Stack Development- II	2	4
Course Objective:					
1	Get deep understanding of Angular framework and RxJS library.				
2	Learn State management with NgRx.				
3	Create dynamic components with custom life-cycle hooks.				
4	Build scalable and reusable features.				
5	Learn advanced Typescript concepts.				
6	Build a more reliable Angular app with type safety.				
7	Learn Node JS In depth.				
8	Build industry grade Restful APIs with ExpressJS.				
9	Learn advanced MongoDB concepts.				
10	Learn Best practices related to application performance optimization, security, testing.				
Course Outcomes:					
CO1	Learn In Depth understanding of Angular framework and State Management.				
CO2	Learn using typescript effectively in Angular framework.				
CO3	Learn in-depth knowledge of NodeJS and Express JS.				
CO4	Learn advance concepts in MongoDB.				
CO5	Learn best practices to be followed when creating industry grade applications				

MSc(CS) SEMESTER III					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
III	CS-631-RP	Research Project	Research Project Work (120 Hrs)	4	4
Course Objective:					
1	To acquire skills necessary for conducting independent research in the field of computer science.				

2	To apply theoretical concepts learned throughout the program to solve real-world problems.
3	To foster collaboration and teamwork by working in groups under the guidance of a mentor.
4	To enhance communication skills through presentation and documentation of research findings
Course Outcomes:	
CO1	Independently conduct research in a specific area of computer science
CO2	Apply appropriate research methodologies to address research problems.
CO3	Analyse and synthesize information gathered from literature reviews, experiments, or data analysis
CO4	Develop innovative solutions to research problems within the scope of computer science.
CO5	Effectively present research findings through written reports, oral presentations, or poster presentations.
CO6	Publish research work in reputable journals, present at conferences or in recognized project competitions.

MSc(CS) SEMESTER IV					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
IV	CS-651-MJP	Major Core	Full Time Industrial Training (IT)	12	
Course Objective:					
1	To provide students with an opportunity to apply theoretical knowledge gained throughout the program in a real-world industrial setting				
2	To foster professional skills such as teamwork, communication, time management, and problem-solving in an industrial environment.				
3	To expose students to the practices, technologies, and challenges prevalent in the IT industry or related sectors.				
4	To enable students to gain hands-on experience by working on projects or tasks relevant to their field of study.				
5	To facilitate networking opportunities with professionals in the industry, potentially leading to future career prospects.				
Course Outcomes:					
CO1	Apply theoretical concepts learned in the classroom to solve practical problems encountered in an industrial setting.				
CO2	Demonstrate proficiency in using industry-standard tools, technologies, and methodologies relevant to their area of specialization.				
CO3	Apply analytical and problem-solving skills to address challenges encountered during the industrial training				
CO4	Collaborate effectively with team members to achieve project goals and objectives.				
CO5	Manage time and resources efficiently to complete assigned tasks and projects within the stipulated timeframe.				
CO6	Prepare a comprehensive report documenting their experience, including project details, learnings, and reflections.				

MSc(CS) SEMESTER IV					
Semester No	Course Code	Type of Course	Course Title	Credits	Hours/Week
IV	CS-681-RP	Research Project	Research Project Work (180 hrs)	6	
Course Objective:					
1	To acquire skills necessary for conducting independent research in the field of computer science.				
2	To apply theoretical concepts learned throughout the program to solve real-world problems.				



3	To foster collaboration and teamwork by working in groups under the guidance of a mentor.
4	To enhance communication skills through presentation and documentation of research findings.
5	To get hands-on-experience for applying research methodology
Course Outcomes:	
CO1	Independently conduct research in a specific area of computer science
CO2	Apply appropriate research methodologies to address research problems.
CO3	Analyse and synthesize information gathered from literature reviews, experiments, or data analysis
CO4	Develop innovative solutions to research problems within the scope of computer science.
CO5	Effectively present research findings through written reports, oral presentations, or poster presentations.
CO6	Publish research work in reputable journals, present at conferences