

COMPUTER SCIENCE

1. *Name of Department:* **Department of Computer Science**

2. *Title of Programme:* **BSc CS & MSc CS**

3. *Programme Outcomes:*

- To develop an understanding and knowledge of the basic theory of Computer Science with good foundation on theory, systems and applications.
- To foster necessary skills and analytical abilities for developing computer based solutions of real-life problems.
- To provide training in emergent computing technologies which lead to innovative solutions for industry and academia.
- To develop the necessary study skills and knowledge to pursue further post-graduate study in computer science or other related fields.
- To develop the professional skillset required for a career in an information technology oriented business or industry.
- To enable students to work independently and collaboratively, communicate effectively, and become responsible, competent, confident, insightful, and creative users of computing technology

4. *Programme Specific Outcomes:*

- To formulate, to model, to design solutions, procedure and to use software tools to solve real world problems.
- To design and develop computer programs/computer -based systems in the areas such as networking, web design, security, cloud computing, IoT, data science and other emerging technologies.
- To familiarize with the modern-day trends in industry and research based settings and thereby innovate novel solutions to existing problems.
- To apply concepts, principles, and theories relating to computer science to new situations.
- To use current techniques, skills, and tools necessary for computing practice
- To apply standard Software Engineering practices and strategies in real-time software project development.
- To pursue higher studies of specialization and to take up technical employment.

- To work independently or collaboratively as an effective team member on a substantial software project.
- To communicate and present their work effectively and coherently.
- To display ethical code of conduct in usage of Internet and Cyber systems.
- To engage in independent and life-long learning in the background of rapid changing IT Industry

5. Course Outcomes:

Title of the course	Course credit	Course outcome
Design & Analysis of Algorithms	02	<ol style="list-style-type: none"> 1. To learn about how computer systems work and underlying principles 2. To understand the basics of digital electronics needed for computers 3. To understand the basics of instruction set architecture for reduced and complex instruction sets 4. To understand the basics of processor structure and operation 5. To understand how data is transferred between the processor and I/O devices
Introduction to Programming with Python	02	<ol style="list-style-type: none"> 1. Ability to store, manipulate and access data in Python 2. Ability to implement basic Input / Output operations in Python 3. Ability to define the structure and components of a Python program. Ability to learn how to write loops and decision statements in Python. Ability to learn how to write functions and pass arguments in Python. Ability to create and use Compound data types in Python
LINUX Operating System	02	<ol style="list-style-type: none"> 1. Work with Linux file system structure, Linux Environment 2. Handle shell commands for scripting, with features of regular expressions, redirections 3. Implement file security permissions 4. Work with vi, sed and awk editors for shell scripting using various control structures 5. Install softwares like compilers and develop programs in C and Python programming languages on Linux Platform
Open Source Technologies	02	<ol style="list-style-type: none"> 1. Differentiate between Open Source and Proprietary software and Licensing. Recognize the applications, benefits and features of Open-Source Technologies. 2. Gain knowledge to start, manage open-source projects.
Discrete Mathematics	02	<ol style="list-style-type: none"> 1. Define mathematical structures (relations, functions, graphs) and use them to model real life situations. 2. Understand, construct and solve simple mathematical

		<p>problems.</p> <ol style="list-style-type: none"> Solve puzzles based on counting principles. Provide basic knowledge about models of automata theory and the corresponding formal languages. Develop an attitude to solve problems based on graphs and trees, which are widely used in software
Descriptive Statistics	02	<ol style="list-style-type: none"> Organize, manage and present data. Analyze Statistical data using measures of central tendency and dispersion. Analyze Statistical data using basics techniques of R. Study the relationship between variables using techniques of correlation and regression
Soft Skills	02	<ol style="list-style-type: none"> Learners will be able to understand the importance and types soft skills Learners will develop skills for Academic and Professional Presentations. Learners will able to understand Leadership Qualities and Ethics. Ability to understand the importance of stress management in their academic & professional life
Design & Analysis of Algorithms	02	<ol style="list-style-type: none"> Students should be able to understand and evaluate efficiency of the programs that they write based on performance of the algorithms used. Students should be able to appreciate the use of various data structures as per need to select, decide and apply appropriate design principle by understanding the requirements of any real life problems
Advanced Python Programming	02	<ol style="list-style-type: none"> Ability to implement OOP concepts in Python including Inheritance and Polymorphism. Ability to work with files and perform operations on it using Python. Ability to implement regular expression and concept of threads for developing efficient program Ability to implement exception handling in Python applications for error handling. Knowledge of working with databases, designing GUI in Python and implement networking in Python
Introduction to OOPs using C++	02	<ol style="list-style-type: none"> Work with numeric, character and textual data and arrays. Understand the importance of OOP approach over procedural language. Understand how to model classes and relationships using UML. Apply the concepts of OOPS like encapsulation, inheritance and polymorphism. Handle basic file operations.
Database Systems	02	<ol style="list-style-type: none"> To appreciate the importance of database design. Analyze database requirements and determine the entities involved in the system and their relationship to one another. Write simple queries to MySQL related to String, Maths and

		<p>Date Functions. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands.</p> <ol style="list-style-type: none"> Understand the normalization and its role in the database design process and handle data permissions. Create indexes and understands the role of Indexes in optimization search
Calculus	02	<ol style="list-style-type: none"> Develop mathematical skills and enhance thinking power of learners. Understand mathematical concepts like limit, continuity, derivative, integration of functions, partial derivatives. Appreciate real world applications which use the learned concepts. Skill to formulate a problem through Mathematical modelling and simulation.
Statistical Methods	02	<ol style="list-style-type: none"> Calculate probability, conditional probability and independence. Apply the given discrete and continuous distributions whenever necessary. Define null hypothesis, alternative hypothesis, level of significance, test statistic and p value. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Apply non-parametric test whenever necessary. Conduct and interpret one-way and two-way ANOVA.
E-Commerce & Digital Marketing		<ol style="list-style-type: none"> Object oriented programming concepts using Java. Knowledge of input, its processing and getting suitable output. Understand, design, implement and evaluate classes and applets. Knowledge and implementation of AWT package.
Theory of Computation	02	<ol style="list-style-type: none"> Understand Grammar and Languages Learn about Automata theory and its application in Language Design Learn about Turing Machines and Pushdown Automata Understand Linear Bound Automata and its applications
Core Java	02	<ol style="list-style-type: none"> Object oriented programming concepts using Java. Knowledge of input, its processing and getting suitable output. Understand, design, implement and evaluate classes and applets. Knowledge and implementation of AWT package.
Operating System	02	<ol style="list-style-type: none"> To provide a understanding of operating system, its structures and functioning Develop and master understanding of algorithms used by operating systems for various purposes.

Database Management Systems	02	<ol style="list-style-type: none"> 1. Master concepts of stored procedure and triggers and its use. 2. Learn about using PL/SQL for data management 3. Understand concepts and implementations of transaction management and crash recovery
Combinatorics and Graph Theory	02	<ol style="list-style-type: none"> 1. Appreciate beauty of combinatorics and how combinatorial problems naturally arise in many settings. 2. Understand the combinatorial features in real world situations and Computer Science applications. 3. Apply combinatorial and graph theoretical concepts to understand Computer Science concepts and apply them to solve problems
Physical Computing and IoT Programming	02	<ol style="list-style-type: none"> 1. Enable learners to understand System On Chip Architectures. 2. Introduction and preparing Raspberry Pi with hardware and installation. 3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's 4. Learn how to make consumer grade IoT safe and secure with proper use of protocols
Web Programming	02	<ol style="list-style-type: none"> 1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies. 2. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites 3. To develop and implement client-side and server-side scripting language programs. 4. To develop and implement Database Driven Websites. Design and apply XML to create a markup language for data and document centric applications.
Funda3mentals of Algorithms	02	<ol style="list-style-type: none"> 1. Understand the concepts of algorithms for designing good program Implement algorithms using Python
Advanced Java	02	<ol style="list-style-type: none"> 1. Understand the concepts related to Java Technology 2. Explore and understand use of Java Server Programming
Computer Networks	02	<ol style="list-style-type: none"> 1. Learner will be able to understand the concepts of networking, which are important for them to be known as a 'networking professionals'. 2. Useful to proceed with industrial requirements and International vendor certifications.
Software Engineering	02	<ol style="list-style-type: none"> 1. Learn and understand the Concepts of Software Engineering 2. Learn and understand Software Development Life Cycle 3. Apply the project management and analysis principles to software project development 4. Apply the design and testing principles to software project development
Linear Algebra using Python	02	<ol style="list-style-type: none"> 1. Appreciate the relevance of linear algebra in the field of computer science. 2. Understand the concepts through program implementation 3. Instill a computational thinking while learning linear algebra.

.Net Technologies	02	<ol style="list-style-type: none"> 1. Understand the .NET framework 2. Develop a proficiency in the C# programming language 3. Proficiently develop ASP.NET web applications using C# 4. Use ADO.NET for data persistence in a web application
Android Developer Fundamentals	02	<ol style="list-style-type: none"> 1. Understand the requirements of Mobile programming environment. 2. Learn about basic methods, tools and techniques for developing Apps Explore and practice App development on Android Platform. 3. Develop working prototypes of working systems for various uses in daily lives
Artificial Intelligence	02	<ol style="list-style-type: none"> 1. After completion of this course, learner should get a clear understanding of AI and different search algorithms used for solving problems. 2. The learner should also get acquainted with different learning algorithms and models used in machine learning.
Software Testing and Quality Assurance	02	<ol style="list-style-type: none"> 1. Student will understand various software testing methods and strategies. 2. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. 3. Design SQA activities, SQA strategy, formal technical review report for software quality control and assurance.
Information and Network Security	02	<ol style="list-style-type: none"> 1. Understand the principles and practices of cryptographic techniques. 2. Understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application. 3. Understand various protocols for network security to protect against the threats in a network
Web Services	02	<ol style="list-style-type: none"> 1. Emphasis on SOAP based web services and associated standards such as WSDL. 2. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services
Game Programming	02	<ol style="list-style-type: none"> 1. Learner should study Graphics and gaming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn.
Wireless Sensor Networks and Mobile Communication	02	<ol style="list-style-type: none"> 1. After completion of this course, learner should be able to list various applications of wireless sensor networks, describe the concepts, protocols, design, implementation and use of wireless sensor networks. Also implement and evaluate new ideas for solving wireless sensor network design issues.
Cyber Forensics	02	<ol style="list-style-type: none"> 1. The student will be able to plan and prepare for all stages of an investigation - detection, initial response and management interaction, investigate various media to collect evidence,

		report them in a way that would be acceptable in the court of law.
Information Retrieval	02	1. After completion of this course, learner should get an understanding of the field of information retrieval and its relationship to search engines. It will give the learner an understanding to apply information retrieval models.
Data Science	02	1. After completion of this course, the students should be able to understand & comprehend the problem; and should be able to define suitable statistical method to be adopted.
Ethical Hacking	02	1. Learner will know to identify security vulnerabilities and weaknesses in the target applications. 2. They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines.