



**UTKAL UNIVERSITY**  
**MASTER OF SCIENCE DEGREE COURSE**  
**M.Sc. COMPUTER SCIENCE**  
**UNDER UTKAL UNIVERSITY**  
**(With effect from 2015-2016)**

**Program Objectives:**

- ❖ To impart quality training to the students in the core area of computer science.
- ❖ To provide guidance to Bachelors in computer science students to grasp more knowledge.
- ❖ To promote critical thinking by organizing seminars and conferences to exchange knowledge among the academicians, industry professionals and researchers from other institutes.
- ❖ To conduct in-house training and Industry –Institute interaction to update knowledge and skill of students.
- ❖ To provide consultancy in development of application specific software.
- ❖ To impart industrial training to students of affiliated colleges.
- ❖ To collaborate with industry in various research projects.
- ❖ To make them employable according to current demand of IT Industry and academia.
- ❖ To aware them to publish their work in reputed journals and conferences.

**Program Specific Outcomes:**

After completing M.Sc. Computer Science Program students will be able to:

- ❖ Enrich the knowledge in the areas like Artificial Intelligence, Cloud Computing, Paradigm of Programming language, Design and Analysis of Algorithms, Database Technologies Advanced Operating System, Mobile Technologies, Software Project Management and other core computing subjects.
- ❖ Students understand all dimensions of the concepts of software developments and projects.
- ❖ Students understand the computer science subjects with demonstration of all programming and theoretical concepts with the use of ICT.
- ❖ Developed in-house applications in terms of projects.
- ❖ Interact with IT experts & grasp knowledge by IT Industry visits.
- ❖ Get industrial exposure through the 6 months Industrial Internship in IT industry.

Curriculum and Structure:

Year / Semester	Subject	Paper	Title of the Paper	Credit	Max.Marks		
					IA	Uni. Exam	Total
I Year I Semester	Core	CS-1.1	Data Structure and Algorithms	4	30	70	100
	Core	CS-1.2	Computer System Architecture	4	30	70	100
	Core	CS-1.3	Database Systems & Implementation	4	30	70	100
	Core	CS-1.4	Discrete Mathematical Structures	4	30	70	100
	Elective I	CS-1.5	(a) Visual Programming (or) (b) Object Oriented Design using UML	4	30	70	100
	Core Practical	CS-1.6	Algorithms Lab	4		100	100
	Core Practical	CS-1.7	Database Lab	4		100	100
I Year II Semester	Core	CS-2.1	Computer Networks	4	30	70	100
	Core	CS-2.2	Advanced JAVA	4	30	70	100
	Core	CS-2.3	Operating System Design	4	30	70	100
	Core	CS-2.4	Theory of Computation	4	30	70	100
	Elective II	CS-2.5	(a)Data Mining (or) (b)Computer Graphics	4	30	70	100
	Core Practical	CS-2.6	JAVA Programming Lab	4		100	100
	Core Practical	CS-2.7	Operating Systems Lab	4		100	100
II Year III Semester	Core	CS-3.1	Artificial Intelligence	4	30	70	100
	Core	CS-3.2	Software Engineering	4	30	70	100
	Core	CS-3.3	Compiler Design	4	30	70	100
	Elective III	CS-3.4	(a) Network Security (or) (b) Cloud Computing	4	30	70	100
	Elective IV	CS-3.5	(a) Embedded System (or) (b) Mobile Computing	4	30	70	100
	Core Practical	CS-3.6	AI Programming Lab	4		100	100
	Core Practical	CS-3.7	Software Engineering Lab	4		100	100
II Year IV Semester		CS-4.1	Comprehensive Viva	4		100	100
		CS-4.2	Project Work and Viva Voce	12		300	300
<b>Total</b>				<b>100</b>			<b>2500</b>

## **CS.1.1 DATA STRUCTURE & ALGORITHMS**

### **OBJECTIVES**

- To understand the fundamentals of different data structure.
- To be able to learn design principles and concepts of algorithms.
- To have a mathematical foundation in analysis of algorithm.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Learn the basic types for data structure, implementation and application.
- Know the strength and weakness of different data structures.
- Use the appropriate data structure in context of solution of given problem.
- Develop programming skills which require solving given problem.

## **CS.1.2 COMPUTER SYSTEM ARCHITECTURE**

### **OBJECTIVES**

- To understand the structure, function and characteristics of computer systems.
- To understand the design of the various functional units and components of computers.
- To identify the elements of modern instructions sets and their impact on processor design.
- To explain the function of each element of a memory hierarchy in order to identify and compare different methods for computer I/O.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- The student will be able to understand the major architectural styles and appreciate the compromises that they encapsulate.
- They will be able to read outline descriptions of real processors and understand in which way their designs fit into the frameworks described in the course.
- They will be also able to understand the impact of design choices in programming in the context of a specific architecture.

## **CS.1.3 DATABASE SYSTEMS & IMPLEMENTATION**

### **OBJECTIVES**

- To learn the fundamental elements of database system.
- To learn the basic concepts of relational database management systems.
- To learn various SQL commands.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Identify advance database concepts and database models.
- Apply and analyze various terms related to transaction management in centralized and distributed database.
- Produce data modeling and database development process for object-oriented DBMS.
- Analyze and Implement the concept of object- relational database in development of various real time software.

## **CS.1.4 DISCRETE MATHEMATICAL STRUCTURES**

### **OBJECTIVES**

- To learn the mathematical foundations for Computer Science.
- Topics covered essential for understanding various courses.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- Use tree and graph algorithms to solve problems.
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

## **CS.1.5 OBJECT ORIENTED DESIGN USING UML**

### **OBJECTIVES**

- To learn the importance of modeling in the software development life cycle
- To learn various UML notation, symbols and their usage
- To learn the object-oriented approach to analyzing and designing systems and software solutions
- How to Employ the UML notation to create effective and efficient system designs

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Analyse, design, document the requirements through use case driven approach.
- Identify, analyse, and model structural and behavioural concepts of the system.
- Develop, explore the conceptual model into various scenarios and applications.
- Apply the concepts of architectural design for deploying the code for software.

## **CS.2.1 COMPUTER NETWORKS**

### **OBJECTIVES**

- To learn about computer network organization and implementation.
- To obtain a theoretical understanding of data communication and computer networks.
- To gain practical experience in installation, monitoring, and troubleshooting of current LAN systems

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Describe how computer networks are organized with the concept of layered approach.
- Describe how signals are used to transfer data between nodes.
- Implement a simple LAN with hubs, bridges and switches.
- Describe how packets in the Internet are delivered.

## **CS. 2.2 ADVANCED JAVA**

### **OBJECTIVES**

- To know the fundamentals of Java programming and develop error-free, well-documented Java programs
- To develop and test various advanced concepts of Java such as Java network, search engine, and web framework programs.
- Learn how to write, test, and debug advanced-level Object-Oriented programs using Java.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Know some concepts of advanced programming and practice on reusing components.
- Write sophisticated Java applications.
- Use the Java language for writing well-organized, complex computer programs with both command line and graphical user interfaces.

## **CS.2.3 OPERATING SYSTEM DESIGN**

### **OBJECTIVES**

- To understand Operating system structure and services.
- To understand the concept of a Process, memory, storage and I/O management.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Identify the low-level structure and internal mechanism of operating system.
- Understanding the performance and design trade-offs in complex software systems.
- Describe the main responsibilities of a contemporary operating system (OS).
- List the most fundamental subsystems of an OS and the functions that each subsystem is responsible.
- Recognize and give examples of conflicting goals and compromises necessary in implementing an OS and configuring its run-time parameters

## **CS.2.4 THEORY OF COMPUTATION**

### **OBJECTIVES**

- To learn the mathematical foundations of computation including automata theory
- To learn the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
- To learn about how really computers works and what kind of activities can be computed mechanically within a computer.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Model, compare and analyse different computational models using combinatorial methods.
- Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
- Construct algorithms for different problems and argue formally about correctness on different restricted machine models of computation.
- Identify limitations of some computational models and possible methods of proving them.
- Have an overview of how the theoretical study in this course is applicable of application like designing the compilers.

## **CS.2.5 DATA MINING**

### **OBJECTIVES**

- To introduce students to the basic concepts and techniques of Data Mining
- To develop skills of using recent data mining software for solving practical problems.
- To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems
- Develop and apply critical thinking, problem-solving, and decision-making skills which can initiate students about research oriented thinking.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Understand what data mining is all about.
- Perform the data preparation tasks and understand the implications.
- Demonstrate an understanding of the alternative knowledge representations such as rules, decision trees, decision tables, and Bayesian networks.
- Demonstrate an understanding of the basic machine learning algorithmic methods that support knowledge discovery.
- Identify alternative data mining implementations and what might be most appropriate for a given data mining task.

## **CS.3.1. ARTIFICIAL INTELLIGENCE**

### **OBJECTIVES**

- To learn the basic concepts of AI principles and approaches.
- To develop the basic understanding of the building blocks of AI.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Have fundamental understanding of the basic concepts of artificial intelligence (AI).
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Have fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Have knowledge of current scope and limitations, and societal implications of AI.
- Have basic foundation of machine learning.

## **CS.3.2 SOFTWARE ENGINEERING**

### **OBJECTIVES**

- To learn the way of developing software with high quality and the relevant techniques.
- To introduce software engineering principles for industry standard.
- To focus on Project management domain and Software risks management.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Identify, formulate, and solve complex problems by applying principles different principles of software engineering.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- Communicate effectively with a range of audiences and recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

## **CS.3.3 COMPILER DESIGN**

### **OBJECTIVES**

- To provide a thorough understanding of the internals of Compiler Design.
- To explore the principles, algorithms, and data structures involved in the design and construction of compilers.
- Topics include context-free grammars, lexical analysis, parsing techniques, symbol tables, error recovery, code generation, and code optimization.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Realize basics of compiler design and apply for real time applications.
- Introduce different translation languages
- Understand the importance of code optimization
- Know about compiler generation tools and techniques
- Working of compiler and non-compiler applications
- Compiler for a simple programming language

## **CS.3.4 NETWORK SECURITY**

### **OBJECTIVES**

- To know the basics of network security and identify some of the factors driving the need for network security
- Identify and classify particular examples of attacks and the identification of the terms vulnerability, threat and attack
- Identify physical points of vulnerability in simple networks
- Compare and contrast symmetric and asymmetric encryption systems and their vulnerability to attack, and explain the characteristics of hybrid systems.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Protect and defend computer systems and networks from cyber-attacks.
- Characterize privacy, legal and ethical issues of information security.
- Identify vulnerabilities critical to the information assets of an organization.
- Define the security controls sufficient to provide a required level of confidentiality, integrity, and availability in an organization's computer systems and networks.
- Diagnose attacks on an organization's computer systems and networks.
- Apply critical thinking and problem-solving skills to detect current and future attacks on an organization's computer systems and networks in view of network security research.

## **CS.3.5- MOBILE COMPUTING**

### **OBJECTIVES**

- To impart fundamental concepts in the area of mobile computing, to provide a computer systems perspective on the converging areas of wireless networking, embedded systems.
- To know the software, and to introduce selected topics of current research interest in the field of mobile computing.

### **LEARNING OUTCOMES**

Upon Completing the Course, Students will be able to:

- Understand the characteristics and limitations of mobile hardware devices including their user-interface modalities.
- Develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
- Design and development of context-aware solutions for mobile devices.
- Have professional and ethical issues, in particular those relating to security and privacy of user data and user behaviour.