SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
INFORMATION TECHNOLOGY DEPARTMENT
MCA I Year I Semester
Subject: Computer Organization & Architecture

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10209	Computer Organization & Architecture	3	-	-	3	0	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Analyze and understand digital systems, including number systems, data representation, and basic digital components like logic gates, flip-flops, and registers.

CO2 Apply knowledge of computer architecture, including the evolution of digital computers, Von-Neumann model, and various components such as ALU, control units, and memory.

CO3 Evaluate and differentiate between various types of memory and control units, understanding their properties, technologies, and functions

CO4 Demonstrate understanding of input-output systems, including characteristics of I/O devices, interfacing, and communication protocols.

CO5 Analyze advanced computer architectures, understanding concepts like pipelining, vector processing, RISC vs CISC, and fault-tolerant architectures.

THEORY:

COURSE CONTENTS:

Unit 1: Introduction of digital system:

Number systems, Data and number representation, Character codes, Binary arithmetic. Logic gates, Flip Flops, Latches, Registers, Boolean algebra, Combinational and sequential circuits, Arithmetic circuits.

Unit 2: Introduction of computer architecture:

Evolution of digital computer, multilevel model of a Computer, Von-Neumann model, ALU, Control Unit, System bus, Memory, I/O Devices, Concept of instruction execution. Machine Level Instructions: Instruction formats, Addressing modes, Instruction types, Instruction cycle, Flow of control.

Unit 3: Memory & Control Unit:

Secondary and main memory; Main memory organization, properties and technologies; Associative memory, Cache memory. Control Unit operation: Micro operations, Control of the CPU, Hardwired and Micro programmed control.

Unit 4: Input Output system:

I/O devices, their characteristic, Interfacing, I/O ports, Memory mapped and I/O mapped I/O, Programmed I/O, Concept of interrupts, Interrupt driven and DMA based I/O, I/O processors, Device controllers, I/O device interfaces, Device Drivers, I/O and system buses, Serial and Parallel Communication.

Unit 5: Introduction to Advanced Architectures:

Basic concepts of Pipeline, Types of pipelining, Pipelining hazards, Vector Processing, RISC v/s CISC, Multiprocessors, Fault Tolerant architectures.

Books Recommended:

Text Books:

1. William Stalling, “Computer Organization and Architecture”, Pearson Education.
2. Douglas V. Hall, “Microprocessors and Interfacing”, TMH, 1991.
3. M. Morris Mano, “Computer System Architecture”, Pearson Education.

Reference Books:

1. Andrew S. Tannenbaum, “Structured Computer Organization”, Pearson Education..
2. Govindrajalu, “IBM PC and Clones, Hardware, Troubleshooting & Maintenance”, TMH, 1996.
3. Peter Abel, “IBM PC Assembly Language and Programming”, Pearson Education.

ASSESSMENT TOOLS: Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
INFORMATION TECHNOLOGY DEPARTMENT
Subject: Mathematical Foundation of Computer Science

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10211	Mathematical Foundations of Computer Science	3	-	-	3	0	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Apply set theory and counting techniques, including principles of mathematical induction, permutation, and combination, to solve computational problems.

CO2 Understand and utilize concepts of relations, functions, and lattice theory in computational contexts.

CO3 Analyze graph theory and tree structures, including algorithms for Euler and Hamiltonian paths, and apply these concepts to computer science problems.

CO4 Understand the principles of automata theory, including finite state and push down automata, and their application in language processing.

CO5 Analyze and apply the concepts of Turing machines, including their types and relevance to the Chomsky hierarchy of languages.

THEORY:
COURSE CONTENTS:

Unit 1: Set theory and counting techniques:
Set, Subsets, Operations on set, finite infinite set, Principle of Inclusion – Exclusion, Principle of Mathematical induction, Principle of strong mathematical induction, Permutation and Combination, Logic Theory - Prepositional calculus and Predicate calculus.

Unit 2: Relations, Functions and Lattice:
Properties of relations, equivalence relation, Partial order relation, poset, onto function, one–to– one functions, pigeon hole principle, Lattices, Distributive law in lattices, complemented lattice.

Unit 3: Graphs and Trees:
Definitions, Algorithms, Euler path and circuit, Hamiltonian path and circuit, Planner and non planner graphs, Characteristics of tree, theorems, minimum cost spanning tree.

Unit 4: Automata Theory:
Finite State Automata: Deterministic, Non–deterministic M/c, regular expressions, regular language and regular grammar. Push down Automata: Deterministic, Non deterministic push down automata, Context free language and grammar.

Unit 5: Turing Machine:
Turing machine and compatibility, Types of turing machine, context sensitive language and grammar, Chomsky Hierarchy.

Books Recommended:

Text books:

1. C. L. Liu, “Elements of Discrete Mathematics”, TMH, 2000.
2. S. Lipschutz & M. Lipson, “Discrete Mathematics”, TMH, 1999.

3. Peter Linz, “Introduction to Automata Theory, Languages, and Computation”, Narosa Pub., 1997.

Reference Books:

1. B. Kolman, R. Busby & S. Ross, “Discrete Mathematical Structures”, Pearson Education.
2. J. P. Trembley and R. Manohar, “Discrete Mathematical Structures with Application to Computer Science”, TMH, 1997.
3. John C. Martin, “Introduction to Languages and the Theory of Computation”, TMH, 1998.
4. Cohen, “Introduction to Computer Theory”, John Wiley & Sons, 1996.

ASSESSMENT TOOLS: Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance

Indirect assessment: Course End Surve

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Data Structure

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10212	Data Structure	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Demonstrate proficiency in implementing and manipulating data structures, understanding their memory representation and performance implications

CO2 Understand and apply various data structures like stacks, queues, linked lists, trees, and graphs in appropriate computational contexts**.**

CO3 Apply algorithms for tree and graph traversal, such as depth-first and breadth-first search, and understand their applications in real-world problems.

CO4 Analyze and implement different sorting and searching techniques, understanding their efficiency and suitability for various data sets.

CO5 Evaluate the use of different data structures and algorithms in terms of their efficiency and effectiveness in solving specific problems.

THEORY:
COURSE CONTENTS:

Unit 1: Introduction of Data structure:
Review of Computer Programming, Definition of Data Structure, Types of Data Structures, Concept of data and information, Abstract Data Types, Design and Implementation issues of Data Structures and their memory representation.

Unit 2: Stacks, Queues & Linked list:
Stacks as ADT, Implementation of various operations on stack, Application of stack: Infix-Prefix expressions, their evaluation and conversions, Recursion. Queues: Definition, Queues as an ADT, Types of Queues: Circular Queue, Deque, Priority Queue, Implementation of various Operations on Queues, Applications of Queue. Linked List: Representation of linked list in memory, Implementation of linked list, Types of Linked List: Circular linked list, Doubly linked list, Header linked list, Linked Implementation of Stacks and Queues, Applications of linked list.

Unit 3: Trees:
Definitions: height, depth, order, degree, etc., Binary Tree, Types of Binary Tree, Binary Search Tree: Introduction, Operations, Traversal, Search, Implementation, Applications of Trees: Representation and Evaluation of an expression with binary operators, Huffman's Algorithm, Heap; AVL Tree, Threaded Binary Tree, Multiway Trees: B tree, B+ tree.

Unit 4: Graphs:
Introduction, Directed and Undirected graphs, Representation, Graph Traversal: Depth First search (DFS) and Breadth First Search (BFS), Minimum Spanning Tree: Kruskal, Prim's algorithms, Shortest Path Algorithm: Dijkstras and Warshalls algorithm, Applications of Graphs.

Unit 5: Sorting:
Introduction, Different Sorting Techniques like: Bubble Sort, Quick Sort, Selection Sort, Heap Sort, Insertion Sort, Shell Sort, Merge Sort, Radix Sort, Comparison of various Sorting Techniques. Searching: Basic Search Techniques: Sequential Search, Binary Search, Indexed Sequential Search, Hashing, Comparison of various Searching techniques.

Books Recommended:
Text books:
1. Langston, Augestine, Tannenbaum, "Data structures using C & C++", Pearson Education.
2. Seymour Lipschutz, Schaums's Outline Series, "Theory and problems of Data Structures", TMH.

Reference Books:
1. Kruse, Tondo, Leung, "Data structures and Program Design in C", Prentice Hall
2. H. Sahni, "Fundamentals of Computer Algorithms", Galgotia, 1984.
3. Wirth Niklaus , "Algorithm + Data Structures= programs", Pearson Education

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance,Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Software Engineering

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10213	Software Engineering	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand and apply different software development life cycle models, including Agile methodologies and their principles in software development projects.

CO2 Demonstrate skills in software project planning, including estimation techniques, risk analysis, and scheduling.

CO3 Apply system analysis and design principles to develop software that meets specified requirements and is user-friendly, maintainable, and scalable.

CO4 Develop and apply testing strategies for software validation and verification, understanding the importance of quality assurance and reliability in software development.

CO5 Evaluate the use of different data structures and algorithms in terms of their efficiency and effectiveness in solving specific problems.

THEORY:

COURSE CONTENTS:

Unit 1: Introduction:

System Development Life Cycle ; Software Process Models, Agile Process, Agile Principles, Agile Model- Extreme Programming, Adaptive Software Development (ASD), Dynamic System Development Method (DSDM), Scrum, Crystal,Feature Driven Devolopment (FDD), Agile Modeling (AM), System Engineering. Software Process and Project Metrics: Measures, Metrics and Indicators.

Unit 2: Software Project Planning:

Planning Objectives, Project Estimation, Decomposition Techniques, Empirical Estimation Models – the COCOMO Model. Risk Analysis and Management: Software Risks, Risk identification and Projection, Risk Mitigation, Monitoring and Management. Project Scheduling and Tracking: Basic Concepts; Defining the Task Set for the S/W Project; Scheduling; Error Tracking.

Unit 3: System Analysis:

-Requirement Analysis, Use-Cases, Analysis Principles, Software Prototyping, Requirement Specifications.

-Analysis Modeling: Data Modeling –Entity Relationship Diagrams; Functional Modeling – Data Flow Diagrams; Behavioral Modeling; Data Dictionary.

Unit 4: System Design:

-The Design Process, Design Principles, Design Concepts, Effective Modular Design, Design Documentation.

-Architectural Design: Data Design

-User Interface Design, Component Level Design.

Unit 5: Software Testing:

Testing Fundamentals, Test Case Design, White-Box Testing, Black-Box Testing; Verification and Validation, System Testing. Technical Metrics for Software: Metrics for the Analysis Model, Design Model; Metrics for Testing, Maintenance. Software Quality Assurance &

Reliability:
-Quality Control, Quality Assurance, Software Reviews, Statistical Software Quality Assurance.
-Introduction to ISO Quality Standards
-Software Reliability: Measures of Reliability.
Software Configuration Management: Version Control, Change Control.

Books Recommended:

Text Books:

1. R. S. Pressman,"Software Engineering -A practitioner's approach", 5th Edition, McGraw-Hill 2001.
2. Pankaj Jalote, "An Integrated Approach to Software Engg.", 2nd Edition, Narorsa.

References Books:

1. Richard Fairley," Software Engineering Concepts", McGraw-Hill.
2. Ian Sommerville,"Software Engineering", 6th Edition Pearson Education.
3. G. L. Myers, "Software Reliability", Wiley Inter Science.
4. M. L. Shooman, "Software Engineering", McGraw-Hill.

ASSESSMENT TOOLS: Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Surve

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Programming Lab I

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10452	Programming Lab I	-	2	2	-	3	-	-	40	60	100

COURSE OUTCOMES: The student will be able to:

CO1 Apply programming fundamentals in C, including understanding of flowcharts, algorithms, and basic structure of C programs.

CO2 Develop proficiency in decision-making and branching structures, and implement looping constructs effectively in programming.

CO3 Demonstrate understanding of arrays, structures, pointers, and file handling in C programming.

CO4 Develop and implement recursive algorithms and understand their applications.

CO5 Understand and compare procedural and object-oriented programming paradigms, demonstrating skills in file handling and basic object-oriented concepts in C programming.

THEORY:
COURSE CONTENTS

UNIT 1:
Block Schematic of digital computer and its working. Introduction to computer hardware and software, Different number systems. Flowchart and algorithm.

UNIT 2:
Structure of C programs, key words and identifiers, constants, variables, Data types, enumerated data types, Strings. Declarations of variables, scope and life of variables. Various
types of operators and expressions. Programming errors and their handling.

UNIT 3:
Decision making and Branching: if-else, switch-case, Looping: While-do, for, do-while etc., nesting of loops.

UNIT 4:
Introduction to Arrays, Structures, Pointers, Files, Functions, Recursion.

UNIT 5:
File handling in C, Introduction to Object oriented Programming paradigm, Comparison of Procedural and Object Oriented Programming paradigm.

Books Recommended:
Text books:
1. Herbert Schildt, “The Complete Reference C”, TMH, 2000.
2. Yashavant Kanetkar, “Let us C”, BPB, 1997.
3. V.Rajaraman, “Computer Oriented Numerical Methods”, PHI, 1998.

Reference Books:
1. Byron S. Gottfried, “Programming with C”, TMH, 1997.

2. Yashavant Kanetkar, “Understanding Pointers in C”, BPB, 1997.
3. B.W. Kernighan & D.M. Ritchie, “The C Programming Language”, Pearson Education.
4. Conte and Boor, “Elementary Numerical Analysis, an Algorithmic Approach”, TMH, 1984.

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
MCA I YEAR (II SEMESTER)
Subject: Computer Network

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10705	Computer Network	3		2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand and apply the fundamental concepts of computer networks, including types of networks, network topologies, hardware and software components, and layered network architecture.

CO2 Analyze and comprehend the physical layer of networking, including data communication principles, transmission media, and switching techniques.

CO3 Apply knowledge of the data link layer, including error control, flow control, and medium access control in local area networks.

CO4 Understand network layer concepts, including routing algorithms, internetworking, IP addressing, and network layer protocols.

CO5 Analyze and apply transport and application layer concepts, including connection management, error control, domain name services, email, and file transfer protocols.

THEORY:
COURSE CONTENTS

Unit 1:
Introduction: Use of Computer Networks, Types of Networks, Intranet, Different LAN & WAN topologies, Networking hardware & software: Hardware Components –Transmission media, Access Devices –NIC, Routers; Repeaters. Software Components –Protocols, Device Drivers, Communication S/W. Layered Network Architecture, Reference Models -ISO-OSI, TCP/IP.

Unit 2:
Physical Layer : Basics of Data Communication, Guided Transmission media –Twisted Pair Wire, Coaxial Cables, Fibre-optic Links; Wireless Transmission –Radio, Microware, Lightwave Transmission; Communication Satellites, PSTN. Introduction to Switching: Circuit Switching , Packet Switching, Message Switching. Physical Layer N/W Devices –Hubs, Repeaters, Transceivers, Connectors, N/W Adapters, Bridges.

Unit 3:
Data Link Layer: Framing, Error control, Flow control. Elementary Data Link Protocols: Stop and Wait Protocols; Sliding Window Protocols. Example Data Link Protocols - HDLC, SLIP, PPP. Medium Access Sub-layer: Channel allocation - Static, Dynamic. Multiple Access Protocols: Pure ALOHA, slotted ALOHA, CSMA/CD, CDMA, CSMA/CA. Collision Free Protocols; Limited Contention Protocols. Local Area Networks: LANtypes, IEEE 802.X standards – Ethernet, Fast Ethernet, Gigabit Ethernet; Token Ring Protocols, FDDI Protocol.

Unit 4:
Network layer: Design issues -Implementation of Connectionless and connection oriented services; Virtual circuits Vs Data-gram subnets. Routing algorithms: Shortest path, Flooding, Flow based, Distance Vector, Link state, Hierarchical, Broadcast, Multicast Routing.Flow & Congestion Control. Internetworking : IP overview, IP packet structure; IP addressing, subnetting, supernetting, CIDR, Fragmentation & Reassembly; Inter-network routing protocols –OSPF, RIP, BGP, EGP; ICMP; ARP,

RARP; DHCP; Introduction to Tunneling, Mobile IP, IPv6.

Unit 5:
Transport Layer: Connection Establishment & Termination; Error Control, Flow Control & Buffering, Multiplexing, Crash recovery; RPCs. The Internet Transport Protocols – UDP and TCP. Gateways. Application Layer: Introduction to Client-Server Applications, Domain Name Services, Email, File Transfer protocols. Remote Access Applications and protocols like Telnet; WWW, HTTP. Introduction to Network Programming; Network Management

Books Recommended:

Text books:
1. Forozan B.A.,"Data communications and networking", Tata mcGraw Hill ,4/e.
2. Tanenbaum, A.S., "Computer Networks", Pearson Education.

Reference Books:
1. Comer, Douglas E., "Internetworking with TCP/IP, Vol. I", Pearson Education.
2. Larry Peterson, Bruce Davie, "Computer Networks: A System Approach", Morgan Kaufman.
3. William Stallings, "Data & Computer Communication", Pearson Education.

ASSESSMENT TOOLS:
Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test
Indirect assessment: Course End Survey, External Examinar Feedback

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Database Management System

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10706	Database Management System	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand database fundamentals, including data models, architecture, and design issues.

CO2 Analyze and apply the relational data model, including domains, tuples, relations, SQL queries, and integrity constraints.

CO3 Comprehend the principles of functional dependencies and normalization in database design.

CO4 Understand transaction processing concepts, including properties of transactions, concurrency control, and recovery techniques.

CO5 Analyze and apply storage structures and indexing techniques for efficient data retrieval.

THEORY:
COURSE CONTENTS

Unit 1: Introduction :
Basic concepts –View of Data –Data Abstraction, Instances and Schemas, Data independence; Database Languages; Database Administrator; Overall system structure; Database system Architecture; Comparison with conventional methods of data processing. Various Data Models: E-R model - Basic Concepts, design issues, E-R Diagram.

Unit 2: Relational Data Model:
Domains, Tuples, Attributes, Relations, keys and types of keys, Integrity Constraints, Relational Algebra: Queries using Select operation, project operation, renaming, joins, union, intersection, difference, division, and product etc. Relational Calculus, Tuple calculus. Query Language: SQL – basic SQL queries, functions, constraints, joins and nested queries.

Unit 3: Functional dependencies and normalization:
Features of good relational designs, database design approaches, anomalies, functional dependencies - Definition and rules of axioms , 1NF, 2NF, 3NF and BCNF. Dependency preservation, properties, loss less join decomposition, decomposition using multivalued dependency, more normal forms.

Unit 4: Introduction to transaction processing:
Transaction and system concepts, desirable properties of transactions, schedules and recoverability, serializability of schedules, types of serializability and test for serializability, locking techniques for concurrency control, concurrency control based on timestamp ordering. Multiversion schemes. Recovery: Basic concepts, techniques based on deferred update and immediate update, Shadow paging, check points.

Unit 5: Storage structure:
Secondary storage devices, file of ordered records and file of unordered records , Hashing Techniques: Internal Hashing ,External Hashing for Disk Files, RAID. Index structure for files: single level ordered indexes, multi level indexes, dynamic multilevel indexes using B-Tree and B+ Tree.

Books Recommended:

Text books:

1. H. F. Korth and A. Silberschatz, "Database System Concepts",6/e, TataMcGraw -Hill.
2. R. Elimasri and S. Navathe, "Fundamentals of Database Systems", 5/e, Pearson Education, 2006.

Reference Books:

1. C. J. Date, "An Introduction to Database Systems, vol-1", Addison Wesley, 1994.
2. J. D. Ullman, "Principles of Database Systems", Galgotia, 1994.
3. Rob & Coronel, "Database Systems: Design, Implementation & Management" , Thomson Learning.
4. Patrick O'Neil & Elizabeth O'Neil, "Database Principles, Programming and Performance", Harcourt India.

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Object Oriented Programming Using Java

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10708	Object Oriented Programming Using Java	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand object-oriented programming concepts and their application using Java.

CO2 Apply fundamental Java programming constructs and object-oriented principles, including classes, objects, and inheritance.

CO3 Develop Java applications using control structures, string handling, and exception handling mechanisms.

CO4 Analyze and design object-oriented systems using Java, focusing on advanced concepts such as polymorphism and multi-threading.

CO5 Understand and apply object-oriented analysis and design concepts, including use cases and class diagrams.

THEORY:

COURSE CONTENTS

Unit 1:

Introduction: Inherent Complexity of Software, Attributes of Complex Systems, Elements of the Object Model: Minor and Major elements.

Unit 2:

Object Oriented Concepts: Problem Solving using Object Oriented approach, Objects and classes, attributes and methods, constructors, data abstraction and encapsulation, data hiding.

Unit 3:

Introduction to Object Oriented Fundamentals: Basic language elements, Primitive and Non primitive data types, Unicode Character set, Variables: default and initial value of variables, Operators And Assignments, Access Modifiers, Methods: declaration, calling.

Unit 4:

Object Oriented Programming : Arrays, control structures, String handling, Conversions, packages and interfaces, class inheritance , polymorphism :Compile time and Run time, wrapper class, error handling with exceptions, multithreaded programming, I/O and advanced features of object oriented programming.

Unit 5:

Introduction to Object Oriented Analysis and Design: Design concept, Use Cases, Class diagrams, State Transition diagrams, Object diagrams.

Books Recommended :

Text books:

1. Grady Booch, “Object Oriented Analysis and Design with Applications”, Pearson, 2/e, 2001.
2. H. Schildt, “Java The Complete Reference”, TMH, 2001.
3. Khalid A Mughal “A Programmer’s Guide to Java SCJP Certification”

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Operating System

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT10709	Operating System	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand the basic concepts, functions, and types of operating systems.

CO2 Analyze process management concepts, including scheduling algorithms, process synchronization, and deadlock handling.

CO3 Comprehend memory management techniques and virtual memory concepts.

CO4 Understand file system organization, access methods, and system calls for file management.

CO5 Analyze I/O systems, including principles of I/O operations and security aspects in operating systems.

THEORY:
COURSE CONTENTS

Unit 1: Introduction to Operating Systems:

Functions, Desirable Features, Structure of an O/S, Evolution, Different Types, Booting process of a system. Operating System Services: Different types of O/S services, Methods of providing these services – System programs, System Calls; Importance of System Calls.

Unit 2: Processes Management:

Processes Management: Scheduling Concepts, Types of Schedulers, Scheduling Algorithms, Algorithm Evaluation. Multiple Processor Scheduling. Process Synchronization:Concurrent Processes, Mutual Exclusion, Synchronization, Inter Process Communication, Critical Sections, Locks, Synchronization Hardware, Semaphores. Classic Problems of Synchronization, Monitors. Deadlocks: Problem, Characterization, Prevention, Avoidance, Recovery.

Unit 3: Memory Management:

Different Memory Management Techniques: Partitioning, Swapping, Segmentation, Paging, Segmented Paging and Paged Segmentation, Comparison of These Techniques. Techniques For Supporting The Execution of Large Programs: Overlays, Dynamic Linking and Loading. Virtual Memory: Concept, Demand Paging, Page Replacement, Thrashing.

Unit 4: File Systems:

File Concept, User's and System Programmer's View of File System. Access Method, Directory Structures, Disk Organization, Different Modules of a File System. Disk-Space Allocation Methods : Contiguous, Linked, Indexed. Free Space Management, Directory Structures. File Protection. System Calls For File Management.

Unit 5: I/O Systems:

Principles and Programming I/O,Input/Output Problem, Asynchronous Operation, Speed Gap, Format Conversion, I/O Interfaces. Program Controlled I/O, Interrupt Driven I/O, Concurrent I/O.

Protection and Security: Principal of Protection, Domain of Protection,Access Matrix, Access Control, Capability List. Security Problem, Program Threats, User Authentication.

Books Recommended:

Text books:

1. Silberschatz and Galvin, “Operating System Concepts”, John-Willey & Sons, 2002.
2. William Stallings, “Operating System”, Pearson Education.

Reference Books:

1. Milan Melancholic, “Operating System Concepts and Design”, TMH, 2001.
2. Maurice J. Bach, “The Design of Unix Operating System”, Pearson Education.
3. Bill Ball, David Pitts, “Red Hat Linux 7”, Techmedia, 2001.
4. David Solomon, “Inside Windows NT”, Microsoft Press, 2/e, 1998

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
MCA II Year III Semester
Subject : Information Security

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20002	Information Security	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand the fundamentals of information security, including security needs, attacks, services, and mechanisms.

CO2 Analyze symmetric encryption techniques and their application in securing data.

CO3 Understand public key encryption and hash functions, including digital signatures and certificates.

CO4 Recognize trends in internet crime and methods for detecting and preventing cyber attacks.

CO5 Analyze IP security architecture, web security protocols, and email security.

THEORY:
COURSE CONTENTS

Unit 1: Introduction to Information Security:
Security needs, security trends, security attacks, security services, security mechanisms. Security technologies, Firewalls: types of firewalls, configuration of firewalls, Virtual Private Network.

Unit 2: Symmetric ciphers:
Classical encryption techniques, substitution techniques, transposition techniques, steganography, block ciphers, Feistel cipher, Data Encryption Standard, strength of DES, triple DES, AES, block cipher modes of operation.

Unit 3: Public key encryption and hash functions:
Public key cryptography, RSA algorithm, key management, Diffie-Hellman key exchange, message authentication and hash functions, digital signatures and authentication protocols, Kerberos, Digital envelope and Digital Certificates.

Unit 4: Trends in Internet crime:
Historical hacking techniques, denial of service attacks, flood attacks, distributed DOS, spoofing, spoofing tools, sniffers, sniffer programs, detection and protection against sniffer. Virus: types and phases, worms, Trojan horses, infamous Trojans, detection and prevention of Trojans.

Unit 5: Introduction to IP security:
Architecture, authentication header and ESP. Web security: Secure Socket Layer and Transport Layer Security. Email security: PGP, Vulnerabilities: vulnerability detection, language vulnerabilities, window vulnerabilities, Linux vulnerabilities.

Books Recommended:

Text Books

1. William Stallings, "Cryptography and Network Security" 5th edition ,Pearson Education.
2. Atul Kahate. "Cryptography and Network Security" 3rd edition Tata McGraw-Hill.
3. NIIT, " Hacking Tools and Techniques and Incident Handling", Prentice Hall of India.

Reference Books

1. Mark Merkow,Jim Breithaupt, " Information Security: Principle and Practices", Pearson Education.
2. Mark Stamp, " Information Security: Principle and Practices", Wiley.
3. Mark Rhodes, Ousley " Information Security : The Complete Reference", 2nd edition, TMH

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback.

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Analysis & design of Algorithms

S.no	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20003	Analysis and Design of Algorithms	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand and analyze the performance of algorithms in terms of time and space complexity.

CO2 Apply divide and conquer, greedy, and dynamic programming methods to design efficient algorithms.

CO3 Analyze and design algorithms using various problem-solving paradigms, including backtracking and branch and bound.

CO4 Understand the concepts of NP-hard and NP-complete problems and their significance in algorithm design.

CO5 Get introduced to parallel algorithms and randomized algorithms.

THEORY:
COURSE CONTENTS

Unit 1:
Review of Elementary Data Structures: Stacks, Queues, Lists, Trees, Hash, Graph. Internal representation of Data Structures, Introduction to Algorithms, Algorithm Specifications.

Unit 2:
Performance Analysis of Algorithms: Time and Space Complexity; Time space tradeoff, Various bounds on complexity, Asymptotic notations: O-notation, Ω-notation, Θ-notation, Recurrences and Recurrences solving techniques: Recursion-tree method, Master method, Substitution method, Average time analysis methods: Probabilistic methods.

Unit 3:
Divide and Conquer Method: Structure of Divide and Conquer Algorithms, Binary Search, Quick Sort, Strassen Matrix Multiplicationetc; Greedy Method: Overview of Greedy Method, Example Problems like: Minimum Cost Spanning Tree, Knapsack Problem etc.

Unit 4:
Dynamic Programming: Overview, Matrix Multiplication, Travelling Salesman Problem, All Pairs Shortest Path and other problems; Backtracking: Overview, 8-Queens Problem, Knapsack Problem etc. Branch and Bound: The Method, Example Problems.

Unit 5:
NP-hard and NP-complete problems: Definition, Properties and Examples; Introduction to Parallel Algorithms and Randomized Algorithms.

Books Recommended:

Text Books:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms", Second Edition, Prentice Hall of India, 2001.

2. Horowitz E. and Sahani, "Fundamentals of Computer Algorithms", Galgotia Publications, 1984.
3. Aho A.V., Hopcroft J.E., J. Ullman, "Design and Analysis of Computer Algorithms", Addison Wesley, 1998.

Reference Books:

1. Knuth D., "Fundamental algorithms: The Art of Computer programming", Volume-I, Third Edition, Pearson Education 1998.
2. Knuth D., "Semi numerical Algorithms: The Art of Computer programming", Volume-II, Third Edition, Pearson Education 1998.
3. Knuth D., "Sorting and Searching: The Art of Computer programming", Volume-III, Second Edition Pearson Education 1998.
4. John Kleinberg, Trades E., "Algorithm Design",Pearson Education 2002.
5. A. Papoulis, S.U. Pillai, "Probability, Random Variables and Stochastic Processes", McGraw Hill, Fourth Edition 2006

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback.

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
MCA II YEAR (III SEMESTER)
Subject : Internet & Web Technology

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20004	Internet and Web Technology	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand the evolution of the Internet and web technologies, including internet working concepts and TCP/IP architecture.

CO2 Develop skills in website planning, designing, and management, including understanding HTML, JavaScript, and server-side programming.

CO3 Analyze and implement web site hosting, including web servers, search engine registration, and mail hosting.

CO4 Understand important web protocols, including FTP, SMTP, and Telnet, and their applications in web development.

CO5 Analyze email formats, SOA, web services, and the concept of the semantic web.

THEORY:

COURSE CONTENTS

Unit 1:

Introduction to Internet: Evolution of Internet & WWW, Internet Working concept, Review of TCP/IP, Architecture, Basic Tools of Internet Access, Browsing and Search Technologies. DNS, Internet Service Providers, Internet Connectivity: Wired –Dial up, Leased Lines, ISDN Lines, and Wireless –Radio Link, VSAT.

Unit 2:

Web Site Planning & Designing: Introduction to HTML, Java Script, Introduction to server side programming language like php, orientation towards php,Basic rules of php programs, functions, storing information with database. Web Management: Fault Management, Configuration and Performance Management, Web Sites Maintenance

Unit 3:

Web Site Hosting: WWW Servers, Multiple Sites on a single Server,
HTTP, URLs, How to register a Web Site on Search Engine, Mail Hosting facilities. Web Browsers: Principle, Types, Examples Web Searching: Principle of working of Search Engines, Types of Search Engines, Example Search Engines, Searching Mechanisms.

Unit 4:

Important Web Protocols: File Transfer Protocol: Types of FTP Servers, including anonymous; TFTP, SMTP. Telnet: Telnet Protocol, Server Domain, Telnet Client, Terminal Emulation; Usenet and Internet relay chat, Web Applications: E-mail: E-mail Networks, E-mail Protocols (X-400, SMTP, and UUCP). .

Unit 5:

Format of an E-mail message, E-mail headers, E-mail contents and encoding, E-mail routing, E- mail client, POP-3, IMAP-4, Introduction to SOA, Web services & their architecture, service registry/brokers, WSDL interfaces, Introduction to semantic Web.

Books Recommended:

Text Books:

1. Young, “Internet : The Complete Reference”, Tata McgrawHill.
2. Zacker ,“Networking :The Complete Reference”, Tata McgrawHill.
3. Tannenbaum, A.S, “Computer Networks”,Pearson Edu.
4. David Sklar, “Learning PHP 5”,O’Reilly.

Reference Books:

1. Douglas Comer, “The Internet Book”, Pearson Education.
2. T.A.Powell, “The Complete Reference –HTML”, Tata McgrawHill
3. Joe Sklar, “Principles of Web Design”, Vikas Pub.

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback.

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Programming Lab II (Python Programming)

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20481	Programming Lab II	-	-	2	-	1	-	-	40	60	100

COURSE OUTCOMES: The student will be able to:

CO1 Develop proficiency in Python programming, including understanding its syntax, data types, and basic constructs.

CO2 Apply Python's object-oriented features, including classes, objects, and inheritance.

CO3 Utilize Python's data structures like lists and dictionaries effectively in programming.

CO4 Implement file handling and I/O operations in Python.

CO5 Handle errors and exceptions and understand the functions and modules in Python programming.

THEORY:
COURSE CONTENTS

Unit 1: Introduction and overview of python:
Introduction, What is Python, Origin, Comparison, Comments, Operators, Variables and Assignment, Numbers, Strings, Lists and Tuples, Dictionaries, if Statement, while Loop, for Loop and the range() Built-in Function, Files and the open() Built-in Function, Errors and Exceptions, Functions, Classes, Modules Syntax and Style Statements and Syntax, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management, Python Application Examples.

Unit 2: Python Objects:
Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types**,** Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings**.**

Unit 3: Lists and Dictionaries:
Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples**,** Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys.
Conditionals and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement.

Unit 4: Files and Input/Output:
File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Unit 5: Errors, Exceptions and functions:
Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Functions, Calling Functions, Creating

Functions, Formal Arguments, Positional Arguments, Default Arguments, Default Function Object Argument Example, Variable-length Arguments, Non-keyword Variable Arguments (Tuple), Keyword Variable Arguments (Dictionary).

Books recommended

Text Books:

1. Matryn C. Brown "Python: The complete references " Tata McGrawHill.
2. Chun, J Wesley, "Core Python Programming", Second Edition, Pearson.

Reference Book:

1. Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010.
2. Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009.

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback.

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Programming Lab III (Android Programming)

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20482	Programming Lab III	-	-	2	-	1	-	-	40	60	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand the basics of the Android operating system and its architecture.

CO2 Develop Android applications, understanding the Android application framework and API levels.

CO3 Design user interfaces for Android applications and implement UI programming concepts.

CO4 Implement advanced UI programming in Android, including event-driven programming and thread handling.

CO5 Work with databases in Android applications, implementing CRUD operations and understanding SQLite programming.

THEORY:
COURSE CONTENTS:

Unit 1: Android OS concepts:
Introduction of android, dalvik virtual machine & .apk file extension fundamentals, android development environment setup, development tools, creating & seting up custom android emulator, android project framework and its applications.

Unit 2: Android Architecture:
architecture framework, linux kernal, libraries, android runtime application framework, android startup and zygite, debug bridge, permission model, android menifest file, android API levels (version & version names).

Unit 3: Activities and UI Design:
Uilayout, android application components intent, activity, activity life cycle, broadcast receivers sevices and menifest, expressions and flow control, android menifest, simple UI layouts and layout properties.

Unit 4: Advanced UI Programming:
Event driven programming (text edit, button clicked etc.), creating a splash screen, introduction to threads in android, android themes, toast in android.

Unit 5: Working with databse:
SQLite programming, SQLite open helper and create database, open and close a database, cursor, Reading and updating contacts, reading bookmarks, develop an app to demonstrate database usage, CRUD operations, GridView & ListView..

Books Recommended:

Text Books

1. Mark L. Murphy, " Beginning Android", Wiley India Pvt. Ltd., 2009
2. Neil Smyth, "Android Studio Development Essentials", CreateSpace Independent Publishing.

3. Michael Owens, " The Definitive Guid to SQLite" 2 nd Edition Apress.

Reference Books

1.Zigurd Mednieks, "Programming Android", Second Edition O'reilly Publication. 2. Chris Haseman, "Beginning Android Programming: Develop and Design" , 1/e Pearson Education.

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback.

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject : Big Data Analytics

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20201	Elective I	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand the concept of big data, its characteristics, and the evolution of big data technologies.

CO2 Get introduced to Hadoop and its ecosystem, including Hive and Pig for big data processing.

CO3 Understand NoSQL databases and their application in managing big data.

CO4 Analyze social network graphs and apply mining techniques for big data analytics.

CO5 Explore various big data analytic techniques and their applications.

THEORY:
COURSE CONTENTS:

Unit 1:
Introduction to Big data, Big data characteristics, Types of big data, Traditional versus Big data, Evolution of Big data, challenges with Big Data, Technologies available for Big Data, Infrastructure for Big data, Use of Data Analytics, Desired properties of Big Data system.

Unit 2:
Introduction to Hadoop, Core Hadoop components, Hadoop Eco system, Hive Physical Architecture, Hadoop limitations, RDBMS Versus Hadoop, Hadoop Distributed File system, Processing Data with Hadoop, Managing Resources and Application with Hadoop YARN.

Unit 3:
Introduction to Hive Hive Architecture, Hive Data types, Hive Hive Query Language, Introduction to Pig, Anatomy of Pig, Pig on Hadoop, Use Case for Pig, ETL Processing, Data types in Pig running Pig, Execution model of Pig, Operators, Eval function,Data types of Pig.

Unit 4:
Introduction to NoSQL, NoSQL Business Drivers, NoSQL Data architectural patterns, Variations of NOSQL architectural patterns using NoSQL to Manage Big Data.

Unit 5:
Mining social Network Graphs: Introduction Applications of social Network mining, Social Networks as a Graph, Types of social Networks, Clustering of social Graphs Direct Discovery of communities in a social graph.

Books Recommended:

Text Books:

1. Radha Shankarmani, M. Vijaylakshmi, " Big Data Analytics", Wiley, Second edition
2. Seema Acharya, Subhashini Chellappan, " Big Data and Analytics", Wiley, First edition

Reference Books:

1. Kai Hwang, Geoffrey C., Fox. Jack, J. Dongarra, “Distributed and Cloud Computing”,

Elsevier, First edition
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data Big Analytics”, Wiley

ASSESSMENT TOOLS:

Direct assessment: Lab Assignments, Quiz, Viva-Voce examination (Internal and External), Attendance, Written Test

Indirect assessment: Course End Survey, External Examinar Feedback.

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Machine Learning

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20202	Elective I	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Gain an overview of machine learning, including different forms of learning and generative learning concepts.
CO2 Understand and apply various classification methods in machine learning.
CO3 Analyze and implement clustering methods in machine learning.
CO4 Understand the concepts of neural networks and their applications in machine learning.
CO5 Explore the field of reinforcement learning and its applications.

THEORY:
COURSE CONTENTS:

Unit 1: Introduction
Overview of machine learning-Different forms of learning-Generative, learning-Gaussian parameter estimation-maximum likelihood estimation-MAP, estimation-Bayesian estimation-bias and variance of estimators-missing and noisy, features-nonparametric density estimation-applications-software tools.

Unit 2: Classification Methods
Nearest neighbour - Decision trees - Linear Discriminant Analysis- Logistic regression – Perceptrons - large margin classification - Kernel methods - Support Vector Machines. Classification and Regression Trees. Graphical and sequential models- Bayesian networks
-conditional independence.

Unit 3: Clustering Methods
Partitioned based Clustering – K-means -K-medoids; Hierarchical Clustering - Agglomerative- Divisive-Distance measures; Density based Clustering - DBScan; Spectral clustering.

Unit 4: Neural networks
Perceptron algorithm-multilayer perceptron's-back propagation nonlinear regression-multiclass discrimination-training procedures-localized network structure- dimensionality reduction interpretation.

Unit 5: Reinforcement Learning
Single State Case: K-Armed Bandit, Elements of Reinforcement Learning, Model-Based Learning- Value Iteration and Policy Iteration, Temporal Difference Learning-Exploration Strategies, Generalization.

Books Recommended

Text Books
1. T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer, 2009.
2. E. Alpaydin, "Machine Learning", MIT Press, 2010.

3. K. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
4. C. Bishop, “Pattern Recognition and Machine Learning, Springer”, 2006.

Reference Books

1. Shai Shalev-Shwartz, Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2014.
2. John Mueller and Luca Massaron, “Machine Learning For Dummies“, John Wiley & Sons, 2016.

ASSESSMENT TOOLS :
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Data Mining & Data Warehousing

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20203	Elective I	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand the basics of data mining and the difference between data mining and knowledge discovery.

CO2 Learn and apply various data mining techniques, including decision trees and neural networks.

CO3 Analyze and implement basic data mining techniques, such as classification and clustering.

CO4 Understand the concepts of data warehousing, including its architecture and design.

CO5 Explore OLAP systems and their applications in data mining and warehousing【.

THEORY:
COURSE CONTENTS:

Unit 1: Introduction:
Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Data mining issues. Data Mining from a DataBase perspective, Fuzzy sets and fuzzy logic, Information retrieval, DSS, Dimensional Model, Web search engines.

Unit 2: Data Mining Techniques:
A statistical perspective on data Mining, Similarity measures, Decision trees, Data Mining using Neural Networks and genetic algorithms.

Unit 3: Basic data mining Techniques :
Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree - based algorithms, Neural network -based algorithms, Rule-based algorithms, Combining Techniques.Clustering : Hierarchical algorithms, Partitional algorithms, Clustering large databases – BIRCH, DBSCAN, CURE algorithms.Association rules : Parallel and distributed algorithms, Basic algorithms.

Unit 4: Data Warehousing:
Introduction, Delivery Process, Data warehouse Architecture, Data Preprocessing: Data cleaning, Data Integration and transformation, Data reduction. Data warehouse Design: Database schema, Partitioning strategy Data warehouse Implementation, Data Marting, Meta Data, A Multidimensional Data model.

Unit 5: OLAP Systems:
Basic concepts, OLAP queries, Types of OLAP servers, OLAP operations etc. Data Warehouse Hardware and Operational Design: Security, Backup And Recovery, Applications of Data mining and Data warehousing.

Books Recommended:

Text Books:

1. Pang –ning Tan, “Introduction to Data Mining”, Pearson Edu, 2007.
2. Jaiwei Han, Micheline Kamber, “Data Mining : Concepts and Techniques”, Morgan

Kaufmann Publishers.

Reference Books:

1. Margaret H. Dunham, “Data Mining : Introductory and Advanced topics”, Pearson Edu., 2003.
2. Anahory & Murray, “Data Warehousing in the Real World”, Pearson Edu., 2003.

ASSESSMENT TOOLS :
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Distributed Computing

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20204	Elective I	3	-	2	3	1	70	30	40	60	200

COURSE OUTCOMES: The student will be able to:

CO1 Understand the fundamentals of distributed systems and computing.
CO2 Analyze communication and synchronization in distributed systems.
CO3 Understand distributed shared memory and distributed file systems.
CO4 Explore the concepts of fault tolerance in distributed systems.
CO5 Analyze security aspects in distributed computing and study various case studies like CORBA and .NET.

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THEORY:
COURSE CONTENTS:

Unit 1:
Introduction to Distributed Systems and Distributed Computing, Distributed systems Vs Computer Networks, Goals and objectives of distributed Systems, Distributed Computing models & architectures : Client/Server Architecture - Two tier and Multi tier architecture; other models. Processes in Distributed Systems: Threads, concurrent Process, clients, servers, code migration, software agents.

Unit 2:
Communication & Synchronization: Interprocess communication, message passing & RPC, Remote Method Invocation, Clock synchronization, Logical & Physical clock, distributed programming, Election Algorithms, Mutual exclusion, Distributed transaction processing.

Unit 3:
Distributed Shared Memory: Introduction, Architecture of DSM, design & implementation issues, consistency models & protocols. Distributed File System, Introduction File Models, File Sharing semantics, File caching & File replication, Atomic transactions.

Unit 4:
Fault Tolerance: Basic concepts, failure models, reliable client server communication, Distributed commit, Recovery methods.

Unit 5:
Security: Security threats, Authentication , Cryptography, Access Control-Firewalls. Case Study: CORBA, D-COM, GLOBE, .NET etc.

Books Recommended:

Text Books:
1. Andrew S. Tanenbaum, Maarten Van Steen "Distributed Systems: Principles and Paradigms", Pearson Education, 3rd Ed.
2. Pradeep K. Sinha, "Distributed Operating System: Concepts & Design", PHI,2003.

Reference Books:

1. Randy Chow, and Theodore Johnson, "Distributed Operating Systems and Algorithms", Addition-Wesley.
2. Singhal Mukesh, Shivaratri N.G., "Advanced Concepts in Operating Systems, Distributed, Database, and Multiprocessor Operating Systems", McGraw Hill.
3. George Caulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems : Concepts and Design"Addison Wesley, 3rd Ed.
4. Andrew S. Tanenbaum ," Distributed Operating System", Pearson Education.

ASSESSMENT TOOLS:

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Advanced Operating System

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20301	Elective II	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Review fundamental concepts of operating systems and explore advanced operating systems.
CO2 Understand network and distributed operating systems, including RPC and distributed shared memory.
CO3 Analyze process and resource management in distributed operating systems.
CO4 Study multiprocessor operating systems and their scheduling techniques.
CO5 Explore real-time operating systems and their applications in embedded systems.

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THEORY:
COURSE CONTENTS:

Unit 1:
Review of fundamental concepts of Operating System. Evolving trends in traditional O/S: related to security & Protection, Multithreading, Design and implementation issues of operating System: current trends, Introduction to Advanced Operating System, Different types of Advanced Operating Systems, Comparison of Advanced Operating System with traditional Operating System.

Unit 2:
Network & Distributed Operating Systems: Fundamentals, Message Passing: features, issues, buffering, process addressing, group communication, RPC: RPC model, implementation, stub generation, RPC messages, server management, client server binding, Distributed Shared Memory: architecture, design & implementation issues, advantages of DSM, Synchronization: clock synchronization, event ordering, election algorithm.

Unit 3:
Process Management: process migration, threads, Resource Management: features, Distributed file systems: features, file models, file accessing models, file replication, design principles, Security & protection in Distributed Operating System: cryptography, authentication, access control, digital signature.

Unit 4:
Multiprocessor Operating System: Types of Multiprocessor Operating Systems, functions & requirements, Processor management & Scheduling.

Unit 5:
Real Time Operating System: Introduction, applications and essential features; Real Time scheduling, tasks & task states; memory management, semaphores and shared data; Embedded System design using a Real Time Operating System. Introduction to Database O/S, Multimedia O/S, Case studies of Operating System like windows 2000, Linux, RT - Linux, VxWorks etc.

Books Recommended:

Text Books:

1. Pradeep K Sinha," Distributed Operating Systems: Concepts & Design", PHI, 2002.
2. Milan Milenkovic, "Operating Systems: Concepts & Design", TMH, 2nd Ed.

References Books:

1. Mukesh Singhal Niranjan G.Shrivaratri, "Advanced Concepts in Operating Systems",TMH,2001.
2. George Coulouris, Jeal dollimore, Tim Kindberg, "Distributed Systems: Concepts & Design", Pearson Education, 4th Ed.
3. David E.Simon, " An Embedded Software Primer" Addison Wesley.
4. Silberschatz and Galvin," Operating Systems Concepts", John Willey & Sons, 6th Ed.

ASSESSMENT TOOLS:

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Artificial Intellegence

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20302	Elective II	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand the definition, scope, and techniques of artificial intelligence.
CO2 Analyze knowledge representation techniques and their applications in AI.
CO3 Explore handling uncertainty and learning methods in AI.
CO4 Understand the concepts and applications of expert systems.
CO5 Study advanced issues in AI, including natural language processing and computer vision.

THEORY:
COURSE CONTENTS:

Unit 1:
Artificial intelligence: Definition, Scope of AI, AI techniques, Problem Solving, Use of Heuristics, Game Playing.

Unit 2:
Knowledge Representation: Symbolic logic, Predicate logic, Deduction, Abduction and Induction, Conceptual dependency, Semantics nets, frames and scripts, Design of knowledge bases, inference engine, deductive databases, OO databases, implementation in PROLOG/ LISP like languages.

Unit 3:
Handling Uncertainty – Use of certainty Factors, Fuzzy Logic. Learning: Learning using neural nets, Explanation based learning, Learning by example. Planning: Representations for planning, Knowledge engineering for planning, Conditional planning.

Unit 4:
Expert Systems: Knowledge elicitation, acquisition, processing, Knowledge Engineering Tools. Intelligent interfaces, Prototyping.

Unit 5:
Advanced issues in AI: Natural language processing, Speech Recognition, Computer Vision, Perception, CASE based and modal based reasoning.

Books Recommended:

Text Books:
1. Rich and Knight, "Artificial Intelligence", Tata Mcgraw Hill, 2nd Edition.
2. Patterson, "Introduction to AI and Expert systems", Pearson Education.

Reference books:
1. J. D. Ullman, "Principles of databases and knowledge based systems", MD.

2. Addis, “Designing Knowledge Based systems”, Prentice Hall.
3. Stuart Russell, Peter Norwig, “Artificial Intelligence A modern Approach”, Pearson Ed., 2002.

ASSESSMENT TOOLS:

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Mobile Computing

S.No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20303	Elective II	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Gain an overview of mobile and wireless technology, including cellular systems and wireless transmission.

CO2 Understand wireless networking, including ad-hoc networks, wireless LANs, and mobile network layer.

CO3 Study wireless systems and standards, including telecommunication and satellite systems.

CO4 Explore wireless security issues and their implications in mobile commerce.

THEORY:
COURSE CONTENTS:

Unit 1: Introduction:
Overview of Mobile and Wireless Technology, Evolution of Mobile communication, Examples of Wireless communication systems, Applications of Mobile and Wireless Technology. Cellular Systems: Introduction, Cell Area, Capacity of Cells, Channel allocation, Frequency reuse, Cochannel Interference, Cell Splitting, Cell Sectoring

Unit 2: Wireless transmission:
Signals and Noise, Antennas. Multiplexing – SDM, FDM, TDM, CDM.
Modulation – ASK, FSK, PSK, AFSK, APSK, Multicarrier modulation. Spread Spectrum – DHSS, FHSS. Wireless Medium Access Control: SDMA, FDMA, TDMA, Spread Spectrum Multiple Access – FHMA, CDMA, Hybrid spread spectrum techniques, GPRS, SMS. Packet Radio –
Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CA, Reservation ALOHA, PRMA. Multi-hop Wireless.

Unit 3: Wireless Networking:
Ad-hoc Networks, Wireless LANs and PANs –IEEE 802.11, HiperLAN, Bluetooth. Mobile Network Layer –Mobile IP, Routing in mobile networks. Mobile Transport Layer –Indirect TCP, Snooping TCP, Mobile TCP. Mobile Agent – Model, Architecture, Mobile DataBase, Mobile DataBase Management.

Unit 4: Wireless Systems & Standards:
Telecommunication Systems – AMPS, GSM, DECT, TETRA, UMTS, IMT-2000.Satellite Systems –Types -GEO, LEO, MEO, GPS. WLL, MMDS, LMDS, WAP, WML.

Unit 5: Wireless Security Issues:
Security threats to wireless networks, Open system authentication, Shared key authentication – WEP, Encryption Issues in Mobile Commerce.

Books Recommended:

Text Books:

1. Schiller J., “Mobile Communications”, AW Publications, 2001.
2. Rapport T., “Wireless Communications –Principles and Practice”, Pearson, 2/e, 2003.

Reference Books:

1. Agrawal D. & Zeng Q., “Introduction to Wireless and Mobile Systems”, Vikas Publishing House, 2003.
2. Blake R., “Wireless Communication Technology”, Thomson Asia, 2001.

ASSESSMENT TOOLS:

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Internet of Things

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20304	Elective II	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand the conceptual framework and architectural view of IoT.
CO2 Learn design principles for web connectivity in IoT.
CO3 Explore data acquiring, organizing, processing, and analytics in IoT.
CO4 Understand sensors, RFIDs, and wireless sensor networks in IoT.
CO5 Analyze software development for IoT applications and security vulnerabilities in IoT.

THEORY:
COURSE CONTENTS:

Unit 1: Introduction**:** IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M Communication. Design Principles for Connected Devices:IoT/M2M Systems Layers and Design Standardisation, Communication Technologies, Realization of IoT Ecosystem Using Wireless Technologies-Architecture for IoT Using Mobile Devices, Mobile Technologies for supporting IoT Ecosystem

Unit 2 : Design Principles for Web Connectivity: – Web Communication Protocols for Connected Devices, Message Communication Protocols for Connected Devices, Web Connectivity for Connected Devices Network Using Gateway, SOAP, REST, HTTP RESTful and WebSockets. Internet Connectivity Principles: Internet Connectivity, Internet Based Communication, IP Addressing in the IoT, Media Access Control, Application Layer Protocols :HTTP, HTTPs, FTP, Telnet and others

Unit 3 : Data Acquiring, Organising, Processsing and Analytics: Data Acquiring and storage, Organising the Data, Transactions, Business Processes, Integration and Enterprise Systems, Analytics, knowledge Acquiring, managing and Storing Processes. Data Collection, Storage and Computing Using a Cloud Platform**:** Cloud Computing Paradigm for IoT Cloud based Services Using the Xively Nimbits and Other Platforms.

Unit 4 : Sensors, Participatory Sensing, RFIDs and Wireless Sensor Networks: Sensor Technology, Participatory Sensing, Industrial IoT ant Automotive Iot, Actuator, Sensor Data Communication Protocols, Radio Frequency Identification Technology. Prototyping the Embedded Devices for IoT and M2M**:** Embedded Computing Basics,Embedded Platforms for Prototyping,Things Always Connected to the Internet/Cloud.

Unit 5 : Prototyping and Designing the Software for IoT Application : Prototyping Embedded Device Software, Devices, gateways, Internet and Web/Cloud Services, Software-Development, Prototyping Online Component APIs and Web APIs. IoT Privacy, Security and Vulnerabilities Solutions – Vulnerabilities, Security Requirements and Threat Analysis, Use cases and Misuse Cases, IoT Security Tomography and Layered Attacker.

Books Recommended:

Text Book:

1. Raj Kamal ” Internet of Things Architecture and Design principles”,First Edition,McGrawHill Education.
2. Pethuru Raj and Anupama C Raman “The Internet of Things” CRC Press

Reference Book:

1. Michael Miller,” The Internet of Things”, First Edition, Pearson, 2015.
2. Daniel Minoli,” Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications”, Wiley, 2013

ASSESSMENT TOOLS:

Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey

SHRI G.S. INSTITUTE OF TECHNOLOGY & SCIENCE, INDORE
DEPARTMENT OF INFORMATION TECHNOLOGY
Subject: Cloud Computing

S. No	Code No.	Subject Name	L	T	P	Th. Credit	Pr. Credit	Marks Theory	CW	SW	Pr.	Total
1.	CT20305	Elective II	3	-	-	3	-	70	30	-	-	100

COURSE OUTCOMES: The student will be able to:

CO1 Understand and Describe the Fundamentals of Cloud Computing
CO2 Analyze and Differentiate Various Cloud Computing Architectures.
CO3 Apply Virtualization Techniques and Implement Scalability Solutions in Cloud Computing.
CO4 Evaluate and Address Cloud Security Challenges.
CO5 Design and Plan for Disaster Recovery in Cloud Computing.

THEORY:
COURSE CONTENTS:

Unit 1:
Introduction to Cloud Computing: Cloud Computing Technology, Hardware & Software Infrastructure, Different Clouds, Risks, Cloud Services, Applications, Regulatory Issues and Limitations.

Unit 2:
Cloud Computing Architecture: Requirements, Introduction to Cloud Computing Architecture, Various kinds of Cloud Computing Architecture, Grid Computing, Transactional Computing, On demand Computing, Distributed Computing.

Unit 3:
Virtualization & Scalability: Virtualization at the Infrastructure level, CPU virtualization, Storage Virtualization, Network Virtualization, A discussion on Hypervisors, SAN, ISCSI, VLAN, Scaling a cloud Infrastructure

Unit 4:
Cloud security fundamentals, vulnerability assessment tool for cloud, Privacy and Security in cloud: Cloud Computing security architecture, General Issues, Security Challenges: Virtualization security management – virtual threats, VM Security Recommendations, VM-Specific security techniques, Secure execution environments and Communications in cloud.

Unit 5:
Disaster Management: Disaster Recovery Planning: Recovery Point Objectives, Recovery time Objectives, Disaster management in Cloud: Backup Management, Geographic Redundancy, Disaster Management: Monitoring, Load Balancing, Database Recovery.

Books Recommended:

Text book:

1. Michael Miller, "Cloud Computing: Web-Based Applications That change the Way You Work and Collaborate Online", Pearson.
2. George Reese, "Cloud Application Architectures", Publication O' Reilly.

3. Anthony T. Velte, Tobe J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical

Approach", Pearson Education

ASSESSMENT TOOLS:
Direct assessment: End-Sem Examination, Mid-Term Test, Class Assignments, Quiz, Attendance
Indirect assessment: Course End Survey