SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year		III/II		Program		B.Tech –CSE					
Subject Category	DC	Subject Code:		CS-302	Subject Name	Analysis and Design of Algorithms					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Fundamentals of Data structures.

Course Objective:

- Determine different time complexities of a given algorithm
- Demonstrate algorithms using various design techniques.
- Develop algorithms using various design techniques for a given problem.

UNITs	Descriptions	Hrs.
I	**Algorithms:**Definition and characteristics. Analysis: Space and Time Complexity, Asymptotic Notations, Time Complexity Analysis of algorithms (Linear Search, Insertion Sort etc.)Recursive algorithms and recurrence relations. Solutions of recurrence relations. **Divide** and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, quick sort, merge sort, Heap Sort, Strassen's matrix multiplication with their complexity analysis.	8
II	**Greedy Algorithms:** Knapsack problem, Job sequencing with deadlines, optimal merge patterns, Huffman coding, Dynamic Programming: Multistage Graph, all pairs shortest paths, 0-1 Knapsack, Chained matrix multiplication, Longest common subsequence, Traveling salesperson problem.	8
III	**Graph and Tree Algorithms**: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms- Dijkstra's Algorithms and Complexity Analysis, Transitive closure, Minimum Spanning Tree- Prim's and Kruskal's Algorithm and their complexity analysis, Union Find Data Structure, Topological sorting, Network Flow Algorithm.	8
IV	**Branch & Bound technique**: Definition and application to solve 0/1 Knapsack Problem, 8-puzzle problem, traveling salesman problem.Back tracking concept and its examples like 8 Queens's problem, Hamiltonian cycle, Graph Coloring problem.	8
V	**Tractable and Intractable Problems:** Computability of Algorithms- P, NP, NP-complete and NP-hard. Introduction to Approximation Algorithms, NP-complete problems and Reduction techniques. Lower bound theory and its use in solving algebraic problem.	8
Total Hours		40

Course Outcomes:

CO1: Analyze and justify the running time complexity of algorithms
CO2: Articulate the effectiveness of divide and conquer methods to solve searching, sorting and other problems.
CO3: Understand the combinatorial problems and justify the use of Greedy and Dynamic Programming techniques to solve them.
CO4: Model graph or tree for a given engineering problem, and write the corresponding algorithm to solve it.
CO-5: Able to analyses the NP-complete

Text Books-

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, 3rd edition.
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", Universities Press.

Reference Books-

les Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106131/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Understand the working of Ubuntu operating system and basic commands for implementing
2. Algorithm in c programming in Ubuntu operating system using gcc compiler.
3. Write a simple c program to add two integer numbers.
4. Implement Algorithm to calculate factorial of given number using iteration method and recursive Method.
5. Implement logic to swap two integer numbers using three different approaches.
6. Implement Algorithm to determine if a given number is divisible by 5 or not without using % Operator.
7. Implement Algorithm to convert binary number to decimal number without using array and Power function.
8. Implement Algorithm to print reverse of string using recursion and without using character Array.
9. Implement Linear Search Algorithm.
10. Implement Binary Search Algorithm (By using Iterative Approach)
11. Implement Binary Search Algorithm (By using Recursive Approach)
12. Implement Insertion Sort Algorithm
13. Implement Quick Sort Algorithm (By using Recursive Approach)
14. Implement Quick Sort Algorithm (By using Non Recursive Approach).
15. Implement Merge Sort Algorithm.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year	III/II	Program	B.Tech –CSE
Subject Category: DC	Subject Code: CS-303	Subject Name	Object Oriented Programming

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Fundamentals of programming skills.

Course Objective:

- Enable students to understand concepts and principles of object oriented programming methodologies using JAVA as a vehicle.
- Also learn software development and problem solving using this JAVA technology.

UNITs	Descriptions	Hrs.
I	Introduction: Procedural Paradigms of Programming, Object Oriented Paradigm for Programming, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and Applications of OOP. OOP Concepts: Data Abstraction, Encapsulation, Inheritance, and Polymorphism. Introduction of Java, Features of Java, Byte Code and Java Virtual Machine, Java Development Kit (JDK).	8
II	Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, Anonymous inner class. inbuilt classes: Object, String, StringBuffer, Array, Vector. Wrapper classes. Data members, member Function, Data Hiding: Visibility modifiers in Java.	8
III	Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and subclass, Method Signature. Overloading, Constructor Overloading, Method Overloading, this and static keyword, finalize () method, Casting objects, Instance of operator, Overriding, covariant return type. Super, final keyword, overloading vs. overriding. Static control flow, instance control flow.	8
IV	Abstraction: Abstract class, Interface in Java, differences between classes and interfaces. Defining an interface, implementing interface, applying interfaces, variables in interface, extending interfaces. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Coupling, Cohesion.	8
V	Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception subclasses. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups. Introduction of java micro services.	8
Total Hours		40

Course Outcomes:

CO-1 Define classes, objects, members of a class and relationships among them needed for a specific program.
CO-2 Write the java application programs using OOPs principles.
CO-3 Write java application on constructors, overloading.
CO-4 Demonstrate package creating and accessing members of packages.
CO-5 Understand and develop collection framework and its application programs.

Text Books-

1. Naughton&Schildt, "The Complete Reference Java 2", TataMcGraw Hill
2. E Balaguruswamy, "Programming in Java", TMH Publications

Reference Books-

3. Deitel "Java-How to Program:" Pearson Education, Asia
4. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
5. Ivan Bayross, "java 2.0", BPB publications
6. Java Programming for the absolute beginners By Russell, PHI Learning
7. Java Programming by Hari Mohan Pandey, Pearson.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105153/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	2	2	2										1	2
CO-3	2	1	2										1	2
CO-4	2	1	2											2
CO-5	2	2	1										1	2

Suggestive list of experiments:

1. Write a program to display any message.
2. Write a Java program to display the default value of all primitive data types of Java.
3. Write a program to give an example of control statements.
4. Write a program and give an example for command line arguments.
5. Write a program to create a class: room, the attributes of this class is roomno, roomtype, roomarea and ACmachine. In this class the member functions are setdata and displaydata..
6. Write a program to create a class ‘simpleobject‘. Using the constructor displays the message.
7. Write a program to give the example for ‘this’ operator. And also use the ‘this’ keyword as a return statement.
8. Create a class named ‘a’ and create a subclass ‘b’. Which extends from class ‘a’. And use these classes in the ‘inherit’ class .
9. Write a program to give an example of method overloading and overriding concepts.
10. Write a program to give a simple example for abstract class.
11. Write a program to give examples for multiple inheritance in Java.
12. Write a program to illustrate usage of try/catch with the finally clause.

Write a program to create two threads. In this class we have one constructor used to start the thread and run it. Check whether these two threads are run are not.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year		III/II	Program		B.Tech –CSE
Subject Category	DC	Subject Code:	CS-304	Subject Name	Operating System

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

knowledge of computer fundamentals

Course Objective:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and Protection

UNITs	Descriptions	Hrs.
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS.	8
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling.Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .	8
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock	8
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation	8
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.	8
Total Hours		40

Course Outcomes:

CO1:Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2: Analyze various scheduling techniques with their comparisons.

CO3: Analyze various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyze and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Books-

- Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
- Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

- Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
- Tanenbaum, A.S.: Operating Systems.
- Hansen, P.B.: Architecture of Concurrent Programs, PHI.
- Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1		2			2							2	1	2
CO-2	2	3		2	1						1	2	3	3
CO-3	2	3	3	2								2	2	2
CO-4	2	2		2								2	3	3
CO-5	2	2	2									2	3	3

Suggestive list of experiments:

1. Implementation of Basic Linux Commands.
2. Implementation of Process Related System Calls (Fork).
3. Write a program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF
4. Write a program to simulate the following CPU scheduling algorithms to find turnaround time and waiting time. a) Round Robin b) Priority
5. Write a C program to simulate page replacement algorithms) FIFO b) LRU c) OPTIMAL
6. Write a program to simulate Bankers algorithm for the purpose of deadlock avoidance.
7. Write a program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year		III/II		Program		B.Tech –CSE						
Subject Category	DL	Subject Code:		CS-306	Subject Name	Internet Programming						
Maximum Marks Allotted								Contact Hours			Total Credits	
Theory				Practical			Total Marks					
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P		
				30	10	10	50	0	0	4	2	

Prerequisites:

Fundamental knowledge of programming.

Course Objective:

Understand Static and Dynamic Web Pages.

UNITs	Descriptions	Hrs.
I	WEBSITE BASICS, Web Essentials: Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web.	8
II	HTTP Request Message, HTTP Response Message, Web Client, Web Servers, HTML5, Tables, Lists, Image, HTML5 control elements, Semantic elements, Drag and Drop, Audio , Video control	8
III	CSS3, Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images, Colors Shadows, Text, Transformations, Transitions, Animations.	8
IV	Java Script: An introduction to JavaScript, JavaScript DOM Model-Date and Objects, function, Regular Expressions.	8
V	Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. XML- Elements, attributes, parser, DOM, query.	8
Total Hours		40

Course Outcomes:

CO1: To understand and interpret the basic concepts of the Internet, tools.

CO2: To understand, analyze CSS components and apply them to web page design tools like HTML,CSS.

CO3: To know and analyze client side scripting language concepts.

CO4: Design and Develop Internet applications with the help of Java script.

CO5: Understand the concept of exceptional handling

Text Books-

1. Achyut Godbole, Atul Kahate & quot ;Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing", Third Edition, McGraw Hill Education.

Reference Books-

2. Deitel, Deitel, Goldberg, " Internet & World Wide Web How to Program ", Third Edition,Pearson Education.
3. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO1	2	1	2										1	1
CO2	2	1	2										1	1
CO3	2	1	2										1	2
CO4	2	2	2										1	2
CO5	2	2	2										1	2

Suggestive list of experiments:

1. Design a web page to display your CV.
2. Design a web page using HTML tags to take the input in a form and display it in another page/frame.
3. Design a web page to isolate a part of the text that might be formatted in a different direction from other text outside it.
4. Create a Zebra Striping a Table and make an image rounded with CSS3.
5. Create speech bubble shape and Image cross effect with CSS3 transition.
6. Using HTML, CSS create a styled checkbox with animation on state change.
7. Using HTML, CSS create display an image overlay effect on hover.
8. Using HTML, CSS create a list with floating headings for each section.
9. Using HTML, CSS, JavaScript create a typewriter effect animation.
10. Using HTML, CSS create an animated underline effect when the user hovers over the text.
11. Write a JavaScript program to set paragraph background color.
12. Write a JavaScript function to add rows to a table.
13. Write a JavaScript function that accepts a row, column (to identify a particular cell) and a string to update the cell's contents.
14. Write a JavaScript program to highlight the bold words of the following paragraph, on mouse over a certain link.
15. Write a JavaScript program to get the window width and height (any time the window is resized).

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year		III/II		Program		B.Tech –CSE					
Subject Category	OE	Subject Code:		OE-305 (OE – 1A)	Subject Name	Computer System Organization					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

Fundamental knowledge of digital electronics.

Course Objective:

I. Understand the organization and architecture of computer systems and electronic computers.
II. Study the assembly language program execution, instruction format, and instruction cycle.
III. Design a simple computer using hardwired and microprogrammed control methods.
IV. Study the basic components of computer systems besides computer arithmetic.
V. Understand input-output organization, memory organization and management, and pipelining

UNITs	Descriptions	Hrs.
I	Introduction: Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Register Transfer language : Register Transfer, Bus and Memory Transfers, Three-State Bus Buffers, Memory Transfer, Arithmetic Microoperations Binary Adder, Binary Adder-Subtractor, Binary incrementer,Arithmetic Circuit, Logic Microoperations, Shift Micro Operations, Arithmetic Logic Shift Unit, List of Logic Microoperations, , Shift Micro operations, Arithmetic Logic Shift Unit	6
II	Control unit: Control memory, address sequencing, micro program example, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Microprogram and design of the control unit, Microprogram Sequencer.	6
III	CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, and program control. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.	8
IV	Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.	8
V	Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, interconnection structures, interprocessor arbitration, inter-processor communication, and synchronization.	7
Total Hours		35

Course Outcomes:

CO1: Understand the organization and levels of design in computer architecture and understand the concepts of Register transfer languages.

CO2: Describe arithmetic micro-operations, logic micro-operations, shift micro-operations address sequencing, microprogram example, and design of control unit

CO3: Understand the Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, program control. Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.

CO4: Knowledge about Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory Input or output Interface, asynchronous data transfer, modes of transfer, Priority interrupt, and direct memory access.

CO5: Explore the Parallel processing, pipelining-arithmetic pipeline, instruction pipeline Characteristics of multiprocessors, interconnection structures, interprocessor arbitration, inter-processor Communication, and synchronization.

Text Books-

- M. Morris Mano, "Computer Systems Architecture", Pearson, 3rd edition.

Reference Books-

- John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1st Edition.
- Patterson, Hennessy,"ComputerOrganizationandDesign:TheHardware/Software Interface", Morgan Kaufmann.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cs15/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests. Quiz/Assignments, term work.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	2	2	2										1	2
CO-3	2	1	2										1	2
CO-4	2	1	2											2
CO-5	2	2	1										1	2

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year		**III/II**		**Program**		**B.Tech –Computer Science & Engineering**
Subject Category	**OE**	**Subject Code:**	**OE- 305 (OE – 1B)**	**Subject Name**		**Data Structure**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
60	**20**	**10**	**10**				**100**	**3**	**0**	**0**	**3**

Prerequisites:

Logical thinking and Computer Fundamentals.

Course Objective:

- Introduce the fundamentals of data structures and how these concepts are useful in problem solving.

UNITs	**Descriptions**	**Hrs.**
I	Problem-solving concepts: top-down, bottom-up design, Concept of data type, variable, constant, and pointers. Dynamic memory allocation.Algorithm: Definition and complexity Analysis. Introduction to data structure: Linear, Nonlinear, Primitive, and Nonprimitive. Arrays-Concepts of Arrays, Single dimensional array, two-dimensional array-Representation and Address Calculation, Operations on arrays with algorithms (traversing, searching, inserting, deleting).	6
II	List-Singly linked lists: Representation in memory, Operations on singly linked list with algorithms(traversing, searching, insertion, deletion)Doubly linked list-Operations with algorithms. Circular linked lists-Operations with algorithms. Representation & manipulations of polynomials/sets using linked lists.	6
III	Stack- Introduction to Stack and its operations, Implementation of stack using array and linked list with comparison. Application of stacks (Polish Notations, converting infix to postfix notation, evaluating postfix notation, Parenthesis balancing, Recursion). Queue- Introduction to Queue and its operations. Implementation of queue using array and linked list. De-queue, circular queue, priority queue. Applications of the queue.	8
IV	Tree- Definition and terminology, the concept of binary tree and representation, Traversing binary tree(pre-order, post-order, in order) Operation with an algorithm -insertion and deletion. Binary Search Trees and its application. Graph- Definition and terminology, Types of graphs, Representation of graph. Traversing of the graph- Breadth First Traversing and Depth First Traversing.	8
V	Searching- Search methods- Linear search, Binary search, and Hashing (collision, chaining, and probing) with their algorithms. Sorting-Sorting methods-Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort.	7
Total Hours		35

Course Outcomes:

CO1: Understand Problem-solving using data structure and various searching and sorting methods.

CO2: Apply different concepts of data structures to solve different computing problems.

CO3: Analyze the access pattern of various data structures and understand their applicability.

CO4: Evaluate and Compare the performance of different data structures on real-world problems.

CO5: Graph and Tree structure with their operations and applicability

Text Books-

- Data Structure- Horwitz and Sartaj Sahni

Reference Books-

- Data Structure- Schaum's Series- McGraw Hill Publication
- Data Structure through C, Yashwant Kanekar, BPB Publication.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cs26/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests. Quiz/Assignments, term work.

CO-PO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**2**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**										**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**2**	**1**										**1**	**2**

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF CSE

Semester/Year		III/II		Program		B.Tech –CSE					
Subject Category	OE	Subject Code:		OE- 305 (OE – 1C)	Subject Name	Operating System					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

knowledge of computer fundamentals.

Course Objective:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and protection

UNITs	Descriptions	Hrs.
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS.	7
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling.Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .	7
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock	7
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation	7
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.	7
Total Hours		35

Course Outcomes:

CO1:Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2:Analyze various scheduling techniques with their comparisons.

CO3:Analyze various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Books-

- Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
- Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

- Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
- Tanenbaum, A.S.: Operating Systems.
- Hansen, P.B.: Architecture of Concurrent Programs, PHI.
- Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1		2			2							2	1	2
CO-2	2	3		2	1						1	2	3	3
CO-3	2	3	3	2								2	2	2
CO-4	2	2		2								2	3	3
CO-5	2	2	2									2	3	3

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CSE