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

| Semester/Year | | III/II | | Program | | B.Tech – Internet of Things | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject Category | DC | Subject Code: | | IO 302 | Subject Name | Analysis and Design of Algorithms | | | |

| Maximum Marks Allotted | | | | | | | Contact Hours | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Practical | | Total Marks | L | T | P | |
| ES | MS | Assignment | Quiz | ES | LW | Quiz | | | | |
| 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. <br> **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, Travelling 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, travelling 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 **f**or a given engineering problem, and write the corresponding algorithm to solve it.

**CO-5:** Able to analyses the NP-complete

**Text Book**

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, 3rd edition.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms",

| | Universities Press. |
|---|---|

**Reference Books**

1. Gilles 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 | PO11 | PO12 | 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. Implement Algorithm to calculate factorial of given number using iteration method and recursive Method.
2. Implement logic to swap two integer numbers using three different approaches.
3. Implement Algorithm to determine if a given number is divisible by 5 or not without using % Operator.
4. Implement Algorithm to convert binary number to decimal number without using array and Power function.
5. Implement Algorithm to print reverse of string using recursion and without using character Array.
6. Implement Linear Search Algorithm.
7. Implement Binary Search Algorithm (By using Iterative Approach)
8. Implement Binary Search Algorithm (By using Recursive Approach)
9. Implement Insertion Sort Algorithm
10. Implement Quick Sort Algorithm (By using Recursive Approach)
11. Implement Quick Sort Algorithm (By using Non Recursive Approach).
12. 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 CS & IT |

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

| Semester/Year | | III/II | | Program | | B.Tech – Internet of Things | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Subject Category | DC | Subject Code: | | IO 303 | Subject Name | Object Oriented Programming | | | | |

| Maximum Marks Allotted | | | | | | | Contact Hours | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Practical | | | | | | |
| ES | MS | Assignment | Quiz | ES | LW | Quiz | Total Marks | 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). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strict keyword. | 8 |
| II | Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, 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 sub class, 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 sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization, threads 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 a packages.

**CO-5** Understand and develop collection frame work and its application programs.

| Text Book |
| --- |

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

| Reference Books |
| --- |

1.  Deitel "Java-How to Program:" Pearson Education, Asia
2.  Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3.  Ivan Bayross, "java 2.0", BPB publications
4.  Java Programming for the absolute beginners By Russell, PHI Learning
5.  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 | | | | | | | | | 3 | 3 | 3 | 2 |
| CO-2 | 1 | | 1 | 2 | | | | | | | 2 | 1 | 3 | 2 |
| CO-3 | 2 | 1 | | | | | | | | | 2 | 2 | 1 | 2 |
| CO-4 | 3 | 2 | 3 | 2 | 1 | | | 1 | 2 | | 3 | | 3 | 1 |
| CO-5 | 3 | 3 | 2 | 1 | | | | 2 | | 2 | 2 | 3 | 1 | 1 |

| Suggestive list of experiments: |
| --- |

1.  Write a java program to find the Fibonacci series using recursive and non-recursive functions.
2.  Write a java program to multiply two given matrices.
3.  Write a java program for Method overloading and Constructor overloading.
4.  Write a java program to display the employee details using Scanner class.
5.  Write a java program that checks whether a given string is palindrome or not.
6.  A. Write a java program to represent Abstract class with example.

     B. Write a java program to implement Interface using extends keyword.
7.  A. Write a java program to create inner classes.

     B. Write a java program to create user defined package.
8.  A. Write a java program for creating multiple catch blocks.

     B. Write a java program for producer and consumer problem using Threads.
9.  Write a Java program that implements a multi-thread application that has three threads.
10. A. Write a java program to display File class properties.

     B. Write a java program to represent ArrayList class.

C. Write a Java program loads phone no, name from a text file using hashtable.

11. Write an applet program that displays a simple message.
12. A. Write a Java program computes factorial value using Applet.

     B. Write a program for passing parameters using Applet.
13. A. Write a java program for handling Mouse events and Key events.

     B. Write a java program for handling Key events.
14. Write a java program that connects to a database using JDBC.
15. A. Write a java program to connect to a database using JDBC and insert values into it.

     B. Write a java program to connect to a database using JDBC and delete values from it.
16. Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the

     + - * %operations. Add a text field to display the result

| Recommendation by Board of studies on | |
| --- | --- |
| Approval by Academic council on | |
| Compiled and designed by | |
| Subject handled by department | Department of CS & IT |

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

| Semester/Year | | III/II | | Program | | B.Tech – Internet of Things | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject Category | DC | Subject Code: | IO 304 | Subject Name | | Electronic Devices and Circuits | | | |

| 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:**

Applied Physics

**Course Objective:**

- The purpose of the course is to teach the fundamental principle of electronics.
- The material covers a variety of topics including various types of diodes, transistor, amplifiers and application.

| UNITs | Descriptions | Hrs. |
|---|---|---|
| I | Semiconductor Diodes: Basics of semiconductor theory, Introduction to PN junction diode, Special function diode, Zener diode, PIN, Varactor, Tunnel, Schottky, LED & Photo diode and its applications. Design circuits using diodes. Half wave & Half Wave rectifier, Clampers and clippers. | 8 |
| II | Bipolar Junction Transistors (BJTs): Transistor construction and operation, CB configuration, transistor amplifying action, CE & CC configuration, Limits of operation, BJT Biasing. | 8 |
| III | Field Effect Transistor (FET): Junction Field-Effect Transistor (JFET) - Construction, Operation and Biasing, Depletion-type MOSFET, Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics, D.C. operation, Biasing, configuration: common source, gate and drain types. | 8 |
| IV | Compound Configurations: Cascade and cascade connection, Darlington connection, CMOS circuit, current source circuit, current mirror circuits, differential amplifier circuits. | 8 |
| V | Operational Amplifier and Application: Differential and common mode operations, Op-amp basics, practical Op-amp circuits, Op-amp Specification- DC offset parameters & frequency parameters, Op-amp unit specifications. Op-amp Applications: Constant gain multiplier, voltage summing, voltage buffer, comparator. | 8 |
| **Total Hours** | | 40 |

**Course Outcomes:**

**CO1:** Identify and understand the fundamental principle and working of Diodes.

**CO2:** Analyze the behavior of BJT and its biasing.

**CO3:** Analyze the behavior of FET and its biasing.

**CO4:** Examine the various configurations of BJT and FET.

**CO5:** Analyze and synthesize the Op-amps.

**Text Book**

1. Electronic Devices & circuits – Boyelstad & Neshelsky – PHI
2. Intuitive Analog Circuit Design- Marc T. Thompson

**Reference Books**

1. A Text of electronic" 2nd edition S.Chand-R.S Sedha
2. Integrated Electronics. – Millman Halkias
3. Electronic Devices & Circuits – David A. Bell – PHI
4. Principles of Electronic Devices – Malvino
5. Starting Electronics (Fourth Edition)-Keith Brindley
6. Microelectronics & circuit 5th edition - Sandra & Smith.

**List/Links of e-learning resource**

- https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ee80/

**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 | 1 | 1 | | | | | | | | | | 1 | 1 |
| CO-2 | 2 | 1 | 2 | 1 | 1 | | | | | | | | 2 | 1 |
| CO-3 | 2 | 1 | 2 | 1 | 1 | | | | | | | | 2 | 1 |
| CO-4 | 2 | 2 | 2 | 1 | | | | | | | | | 2 | 1 |
| CO-5 | 2 | 2 | 2 | 1 | | | | | | | | | 1 | 1 |

**Suggestive list of experiments:**

1. Design voltage regulator using Zener diode and verify its characteristics.
2. To draw the output waveform of Full wave rectifier. Calculate PIV, Ripple Factor, Form Factor and Efficiency.
3. Analysis of common base PNP bipolar junction transistor and verify input and output characteristics.
4. Analysis of common emitter NPN bipolar junction transistor and verify input and output characteristics.
5. To draw the static characteristics of JFET and find out its parameters.
6. To design the power supply of +5V and -5V using IC regulator.
7. To design a positive clipper circuit using a 1 kHz square wave with a 10 volt peak-to-peak magnitude as the input signal.
8. To design a negative clamper circuit using a 1 kHz square wave with a 10-volt peak-to-peak magnitude as the input signal.
9. To draw the frequency response of two stages RC coupled class A amplifier using transistor.
10. To draw the frequency response of two stages Direct coupled class A amplifier using transistor.

| | |
|---|---|
| Recommendation by Board of studies on | |
| Approval by Academic council on | |
| Compiled and designed by | |
| Subject handled by department | Department of CS & IT |

| Semester/Year | | III/II | | Programme | | B.Tech – Internet of Things | |
|---|---|---|---|---|---|---|---|
| Subject Category | DLC | Subject Code: | | IO 306 | Subject Name | Internet Programming | |

| **Maximum Marks Allotted** | | | | | | | **Total Marks** | **Contact Hours** | | | **Total Credits** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Theory** | | | | **Practical** | | | | | | | |
| **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 Clients, 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, analyse CSS components and apply them web page design tools like HTML,CSS.
**CO3**: To know and analyse 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 Book & Reference Books-**

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

1. Deitel, Deitel, Goldberg, & quot; Internet &amp; World Wide Web How to Program & quot, Third Edition,Pearson Education.
2. 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 | PO₁ | PO₂ | PO₃ | PO₄ | PO₅ | PO₆ | PO₇ | PO₈ | PO₉ | PO₁ | PO₁₁ | PO₁₂ | 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 | 1 | 2 | 2 | 1 | 2 | | | | | | | | 2 | 1 |

| **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 colour.
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 and the cell's content.
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 CS & IT |

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

| Semester/Year | | III/II | | Program | | B.Tech –Internet of Things | | | |
|---|---|---|---|---|---|---|---|---|---|
| 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 | L | T | P | |
| ES | MS | Assignment | Quiz | ES | LW | Quiz | | | | |
| 60 | 20 | 10 | 10 | | | | 100 | 3 | 0 | 0 | 3 |

**Prerequisites:**

Fundamental knowledge of Digital Electronics

**Course Objective:**

- Understand the organization and architecture of computer systems and electronic computers.
- Study the assembly language program execution, instruction format, and instruction cycle.
- Design a simple computer using hardwired and microprogrammed control methods.
- Study the basic components of computer systems besides computer arithmetic.
- 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-Stare Bus Buffers, Memory Transfer, Arithmetic Microoperations Binary Adder, Binary Adder-Subtractor, Binary incremenrer, Arithmetic Circuit, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit, List of Logic Microoperations, , Shift Micro operations,  Arithmetic Logic Shift Unit | 7 |
| II | Control unit: Control memory, address sequencing, micro program example, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Micro program and design of the control unit, Microprogram Sequencer. | 7 |
| 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. | 7 |
| 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. | 7 |
| V | Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, interconnection structures, inter-processor 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, inter-processor arbitration, inter-processor Communication, and synchronization.

**Text Book**

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

**Reference Books**

1.   John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1st Edition.
2.   Patterson, Hennessy, "Computer Organization and Design: The Hardware/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 CS & IT |

| | **SAMRAT ASHOK TECHNOLOGICAL INSTITUTE** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **(Engineering College), VIDISHA M.P.** | | | | | | | |
| | **(An Autonomous Institute Affiliated to RGPV Bhopal)** | | | | | | | |
| | **DEPARTMENT OF CS & IT** | | | | | | | |

| Semester/Year | | III/II | | Program | | B.Tech – Internet of Things | | |
|---|---|---|---|---|---|---|---|---|
| Subject Category | OE | Subject Code: | OE 305 (OE -1B) | Subject Name | | Object Oriented Programming | | |

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

**Prerequisites:**

Fundamental knowledge 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). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strictfp keyword. | 7 |
| II | Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, Array, Vector. Wrapper classes. Data members, member Function. | 7 |
| III | Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and sub class, 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. | 7 |
| 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. | 7 |
| 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 sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization. | 7 |
| **Total Hours** | | 35 |

**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 a packages.
**CO-5** Understand and develop collection frame work and its application programs.

**Text Book**

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

**Reference Books**

1. Deitel "Java-How to Program:" Pearson Education, Asia
2. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3. Ivan Bayross, "java 2.0", BPB publications
4. Java Programming for the absolute beginners By Russell, PHI Learning
5. 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 | | | | | | | | | 3 | 3 | 3 | 2 |
| CO-2 | 1 | | 1 | 2 | | | | | | | 2 | 1 | 3 | 2 |
| CO-3 | 2 | 1 | | | | | | | | | 2 | 2 | 1 | 2 |
| CO-4 | 3 | 2 | 3 | 2 | 1 | | | 1 | 2 | | 3 | | 3 | 1 |
| CO-5 | 3 | 3 | 2 | 1 | | | | 2 | | 2 | 2 | 3 | 1 | 1 |

**Suggestive list of experiments:**

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions.
2. Write a java program to multiply two given matrices.
3. Write a java program for Method overloading and Constructor overloading.
4. Write a java program to display the employee details using Scanner class.
5. Write a java program that checks whether a given string is palindrome or not.
6. A. Write a java program to represent Abstract class with example.
   B. Write a java program to implement Interface using extends keyword.
7. A. Write a java program to create inner classes.
   B. Write a java program to create user defined package.
8. A. Write a java program for creating multiple catch blocks.
   B. Write a java program for producer and consumer problem using Threads.
9. Write a Java program that implements a multi-thread application that has three threads.
10. A. Write a java program to display File class properties.
    B. Write a java program to represent Array List class.
C. Write a Java program loads phone no, name from a text file using hashtable.
11. Write an applet program that displays a simple message.
12. A. Write a Java program computes factorial value using Applet.
    B. Write a program for passing parameters using Applet.
13. A. Write a java program for handling Mouse events and Key events.
    B. Write a java program for handling Key events.
14. Write a java program that connects to a database using JDBC.
15. A. Write a java program to connect to a database using JDBC and insert values into it.
    B. Write a java program to connect to a database using JDBC and delete values from it.
16. Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the
    + - * %operations. Add a text field to display the result

| Recommendation by Board of studies on | |
|---|---|
| Approval by Academic council on | |
| Compiled and designed by | |
| Subject handled by department | Department of CS & IT |

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

| Semester/Year | | III/II | | Program | | B.Tech – Internet of Things | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject Category | OE | Subject Code: | OE 305 (OE – 1C) | Subject Name | | Data Structure | | | |

| Maximum Marks Allotted | | | | | | | Contact Hours | | | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| Theory | | | | Practical | | | | | | |
| ES | MS | Assignment | Quiz | ES | LW | Quiz | Total Marks | 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
- Utilization of the concepts are useful in problem solving.

| UNITs | Descriptions | Hrs. |
|---|---|---|
| I | Problem solving concepts: top-down, bottom-up design, Concept of datatype, 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). | 7 |
| 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 and analysis. Representation & manipulations of polynomials/sets using linked lists. | 7 |
| 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 queue. | 7 |
| IV | Tree- Definition and terminology, concept of binary tree and representation, Traversing binary tree (pre order, post order, in order) Operation with algorithm -insertion and deletion. Binary Search Trees and its Applications. Graph- Definition and terminology, Types of graphs, Representation of graph. Traversing of graph- Breadth First Traversing and Depth First Traversing. | 7 |
| 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:**

**CO-1Understand**- Problem solving using of data structure and various searching and sortingmethods.

**CO-2 Apply**- Apply different concepts of data structures to solve different computing problems.

**CO-3 Analyse-** Analyze the access pattern of various data structure and understand theirapplicability.

**CO-4 Evaluate-**Evaluate and Compare the performance of different data structures on real worldproblems.

**CO-5 Discuss-** Graph and Tree structure with their operations and applicability

**Text Book**

1. Data Structure- Horwitz and Sartaj Sahni

**Reference Books**

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

**List/Links of e-learning resource**

- https://archive.nptel.ac.in/courses/106/106/106106127/

**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 | 1 | | | | | | | | | | 1 | 2 |
| CO-2 | 2 | 2 | 2 | 1 | | | | | | | | | 1 | 2 |
| CO-3 | 2 | 2 | 2 | 1 | | | | | | | | | 1 | 2 |
| CO-4 | 2 | 2 | 2 | 1 | | | | | | | | | 1 | 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 CS & IT |