| Learning Assessment | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bloom's Level of Thinking | | Continuous Learning Assessment (50% weightage) | | | | | | | | Final Examination (50% weightage) | |
| | | CLA – 1 (10%) | | CLA – 2 (10%) | | CLA – 3 (20%) | | CLA – 4 (10%) | | | |
| | | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice |
| Level 1 | Remember | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* |
| | Understand | | | | | | | | | | |
| Level 2 | Apply | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* |
| | Analyze | | | | | | | | | | |
| Level 3 | Evaluate | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* |
| | Create | | | | | | | | | | |
| Total | | 100 % | | 100 % | | 100 % | | 100 % | | 100% | |

| **Course Designers** | | |
|---|---|---|
| **Experts from Industry** | **Experts from Higher Technical Institutions** | **Internal Experts** |
| Mr. S. Karthik, IT Analyst, Tata Consultancy Services | Dr. Neelanarayanan,, Professor, School of Computer Science and Engineering, VIT Chennai | 1.Mrs. E. Sweety Bakyarani<br>2.Mr. M.R.Vinodh<br>3.Dr. J.AnithaRuth |

| Course Code | USA20202J | Course Name | DATA STRUCTURES AND ALGORITHMS | Course Category | C | Professional Core | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 4 | 0 | 2 | 5 |

| Pre-requisite Courses | Nil | Co-requisite Courses | Nil | Progressive Courses | Nil |
|---|---|---|---|---|---|
| Course Offering Department | Computer Science | Data Book / Codes/Standards | Nil | | |

| Course Learning Rationale (CLR): | The purpose of learning this course is to: | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Level of Thinking (Bloom) | Expected Proficiency (%) | Expected Attainment (%) | Engineering Knowledge | Problem Analysis | Design & Development | Analysis, Design, Research | Modern Tool Usage | Society & Culture | Environment & Sustainability | Ethics | Individual & Team Work | Communication | Project Mgt. & Finance | Life Long Learning | PSO - 1 | PSO - 2 | PSO – 3 |
| CLR-2 : | Utilize linked list in developing applications | | | | | | | | | | | | | | | | | | |
| CLR-3 : | Utilize stack and queues in processing data for real-time applications | | | | | | | | | | | | | | | | | | |
| CLR-4 : | Utilize tree data storage structure for real-time applications | | | | | | | | | | | | | | | | | | |
| CLR-5 : | Utilize algorithms to find shortest data search in graphs for real-time application development | | | | | | | | | | | | | | | | | | |
| CLR-6 : | Utilize the different types of data structures and its operations for real-time programming applications | | | | | | | | | | | | | | | | | | |
| Course Learning Outcomes (CLO): | At the end of this course, learners will be able to: | | | | | | | | | | | | | | | | | | |
| CLO-1 : | Identify linear and non-linear data structures. Create algorithms for searching and sorting | 2 | 80 | 70 | L | H | - | H | L | - | - | - | L | L | - | H | - | - | - |
| CLO-2 : | Create the different types of linked lists and evaluate its operations | 2 | 85 | 75 | M | H | L | M | L | - | - | - | M | L | - | H | - | - | - |
| CLO-3 : | Construct stack and queue data structures and evaluate its operations | 2 | 75 | 70 | M | H | M | H | L | - | - | - | M | L | - | H | - | - | - |
| CLO-4 : | Create tree data structures and evaluate its types and operations | 2 | 85 | 80 | M | H | M | H | L | - | - | - | M | L | - | H | - | - | - |
| CLO-5 : | Create graph data structure, evaluate its operations, implement algorithms to identify shortest path | 2 | 85 | 75 | H | H | M | H | L | - | - | - | M | L | - | H | - | - | - |
| CLO-6 : | Construct the different data structures and evaluate their types and operations | 2 | 80 | 70 | L | H | - | H | L | - | - | - | L | L | - | H | - | - | - |

| Duration (Hour) | | 18 | 18 | 18 | 18 | 18 |
|---|---|---|---|---|---|---|
| S-1 | SLO-1 | Introduction to theory of data structures | Introduction to stack | Tree Traversals – Inorder, preorder | Introduction to sorting | Graph Terminology |
| | SLO-2 | Data representation | Representation of stack through array | Tree Traversals - Postorder | Efficiency of algorithm | Representation of graph - Arrays |
| S-2 | SLO-1 | Abstract Data type | Representation of stack through linked list | Binary Search Tree | Time complexity and space complexity | Representation of graph – Linked list |
| | SLO-2 | Classification of data types | Operations on stack | Threaded Binary Search Tree | Different types of sorting | Graph Traversal – BFS |

| | | | | | | |
|---|---|---|---|---|---|---|
| S-3 | SLO-1 | Program design and algorithm | Disadvantages of Stack, Polish notations | Binary Search Tree :Construction | Bubble sort | Example |
| | SLO-2 | Problem Solving using algorithm | Applications – Evaluation of expression | Binary Search Tree : Insertion | Example | Graph Traversal – DFS |
| S-4 | SLO-1 | Recursion | Infix to Postfix expression | Binary Search Tree : Searchimg | Insertion Sort | Example |
| | SLO-2 | Example | Tower of Hanoi, Recursion | Example | Example | Topological Sorting |
| S 5-6 | SLO-1 | Laboratory 1: Recursion | Laboratory 4 : stack and its applications | Laboratory 7 : Tree Traversals | Laboratory 10 : Implementation of Bubble and Insertion sort | Laboratory 13: Implementation of Graph using Array |
| | SLO-2 | | | | | |
| S-7 | SLO-1 | Asymptotic Notation | Queue | Applications of trees | Selection sort | Shortest Path Algorithm- Introduction |
| | SLO-2 | Algorithm Analysis | Representation of Queue using Arrays and Linked list | Applications of BST | Example | Shortest Path Algorithm: Dijkstra |
| S-8 | SLO-1 | Introduction to Data structures | Operations on Queue | Expression trees | Comparison of sorts | Minimum spanning tree – Prims |
| | SLO-2 | Data Structures and its uses | Circular Queue | Example | Quick sort | Example |
| S-9 | SLO-1 | Linear and Non Linear Data Structures | Double ended Queue | AVL Tree | Example | Minimum Spanning Tree - Kruskals |
| | SLO-2 | Operations on data structure | Priority Queue | AVL Tree Rotations | Merge sort | Example |
| S-10 | SLO-1 | Arrays and Pointers | Reversing a Queue using another queue | Example | Example | Network flow problem |
| | SLO-2 | Structure and Pointers | Applications of Queue | Applications of AVL tree | Radix sort | Applications of Graph |
| S 11-12 | SLO-1 | Laboratory 2: Arrays, structure using pointers | Laboratory 5: Queue implementation using array and pointers | Laboratory 8: Implementation of BST | Laboratory 11 : Implementation of Qucik sort and merge sort | Laboratory 14 : Implementation of shortest path algorithm |
| | SLO-2 | | | | | |
| S-13 | SLO-1 | Array types | Introduction to non linear data structures | Heap Data Structure | Shell sort | Define Hashing |
| | SLO-2 | Array operations | Tree ADT and Terminologies | Minimum Heap Construction | Example | Hashing: Hash functions |
| S-14 | SLO-1 | Dynamic memory allocation | Tree Terminologies | Minimum Heap Deletion Construction | Heap Sort | Hashing : Collision avoidance |
| | SLO-2 | Introduction to lists | Tree Representation | Example | Example | Hashing : Separate chaining |

| | | | | | | |
|---|---|---|---|---|---|---|
| S-15 | SLO-1 | Linked list operations | Tree Types and Operations | Maximum Heap Construction | Linear search | Example |
| | SLO-2 | Types of Linked Lists | Binary Tree Representation | Maximum Heap Deletion Construction | Binary search | Open addressing |
| S-16 | SLO-1 | Linked list vs. Arrays | Properties of binary tree | Example | Comparison of different search | Example |
| | SLO-2 | Application of linked list | | Applications of Heaps and AVL trees | Example | Advantages of Hashing |
| S 17-18 | SLO-1 | Laboratory 3 : Linked List | Laboratory 6: Implementation of binary tree using Arrays | Laboratory 9 :Heap Implementation | Laboratory 12: Linear search and Binary search | Laboratory 15 : Implementation of minimum spanning tree |
| | SLO-2 | | | | | |

| | | |
|---|---|---|
| Learning Resources | 1.Seymour Lipschutz, (2014), "Data Structures with C", McGraw Hill Education, Special Indian Edition<br>2.ISRD Group, (2013), "Data structures using C",McGraw Hill, 2nd Edition,<br>3.R.F.Gilberg, B.A.Forouzan, (2005), "Data Structures", Thomson Indi, Second Edition<br>4.A.V.Aho, J.E Hopcroft , J.D.Ullman, (2003), "Data structures and Algorithms", 1st Edition, Pearson Education | 5.Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education<br>6.ReemaThareja, (2011), "Data Structures Using C", 1st Edition, Oxford Higher Education |

Learning Assessment

| Bloom's Level of Thinking | | Continous Learning Assessment(50% weightage) | | | | | | | | Final Examination (50% weightage) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CLA – 1 (10%) | | CLA – 2 (10%) | | CLA – 3 (20%) | | CLA – 4 (10%) | | | |
| | | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice | Theory | Practice |
| Level 1 | Remember | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* |
| | Understand | | | | | | | | | | |
| Level 2 | Apply | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* | *20%* |
| | Analyze | | | | | | | | | | |
| Level 3 | Evaluate | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* | *15%* |
| | Create | | | | | | | | | | |
| Total | | 100 % | | 100 % | | 100 % | | 100 % | | 100% | |

# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

| Course Designers | | |
|---|---|---|
| **Experts from Industry** | **Experts from Higher Technical Institutions** | **Internal Experts** |
| Mr. S. Karthik, IT Analyst, Tata Consultancy Services | Dr. Neelanarayanan,, Professor, School of Computer Science and Engineering, VIT Chennai | Mrs.P.Yogalakshmi<br>Dr..S.Sabeen<br>Dr.L.V.Raja |

| Course Code | UMS20G02T | Course Name | MATHEMATICAL FOUNDATION | Course Category | G | *Generic Elective Course* | L | T | P | C |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 3 | 1 | 0 | 4 |

| Pre-requisite Courses | *Nil* | Co-requisite Courses | *Nil* | Progressive Courses | *Nil* |
|---|---|---|---|---|---|
| Course Offering Department | *Mathematics and Statistics* | Data Book / Codes/Standards | *Nil* | | |

| Course Learning Rationale (CLR): | *The purpose of learning this course is to:* | Learning |
|---|---|---|
| CLR-1 : | *To apply the basic concepts and theorems of matrices* | |
| CLR-2 : | *To learn the concepts of polynomial equations, reciprocal equations and approximation of roots.* | |
| CLR-3 : | *To learn the basic concepts of differentiation, successive differentiation and partial differentiation* | |
| CLR-4 : | *To learn the basic concepts of integration and to apply Bernoulli's formula and reduction formula.* | |
| CLR-5 : | *To understand how a function is transformed by Laplace and inverse Laplace methods and how they are related.* | |

| Course Learning Outcomes (CLO): | *At the end of this course, learners will be able to:* | 1 Level of Thinking (Bloom) | 2 Expected Proficiency (%) | 3 Expected Attainment (%) |
|---|---|---|---|---|
| CLO-1 : | *Gaining knowledge in basic concepts of matrix method.* | *3* | *85* | *80* |
| CLO-2 : | *Gaining knowledge in the concepts of polynomial equations and reciprocal equations and applying Horner's and Newton's methods for finding roots* | *3* | *80* | *75* |
| CLO-3 : | *Understanding the concepts of differentiation and to solve the problems of Radius of* | *3* | *85* | *80* |

| Program Learning Outcomes (PLO) | 1 Scientific Knowledge | 2 Problem Analysis | 3 Design & Development | 4 Analysis, Design, Research | 5 Modern Tool Usage | 6 Society & Culture | 7 Environment & Sustainability | 8 Ethics | 9 Individual & Team Work | 10 Communication | 11 Project Mgt. & Finance | 12 Life Long Learning | 13 PSO - 1 | 14 PSO - 2 | 15 PSO – 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLO-1 : | *L* | *L* | *L* | *M* | *L* | - | - | - | *L* | *M* | *H* | *M* | - | - | - |
| CLO-2 : | *M* | *M* | *M* | *M* | *M* | - | - | - | *M* | *M* | *H* | *M* | - | - | - |
| CLO-3 : | *H* | *H* | *M* | *H* | *M* | - | - | - | *M* | *M* | *H* | *H* | - | - | - |