**Detailed Syllabus**

Lecture-wise Breakup

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| **Course Code** | 15B11CI518 | **Semester -** ODD | | **Semester** V **Session** 2020 -2021 Month from July ’20 to Dec ‘20 | |
| **Course Name** | Data Structures & Algorithms | | | | |
| **Credits** | 4 | | **Contact Hours** | | 3-1-0 |

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| **Faculty (Names)** | **Coordinator(s)** | Dr. Shardha Porwal(62), Akanksha Mehndiratta(128) |
|  | **Teacher(s) (Alphabetically)** | Dr. Raju Pal, Dr. Manju |

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| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
| **CO1** | Apply fundamental operationson data structures such as linked-lists, trees, binary search trees, AVL trees, heap trees, graphs, and hash-tables. | Apply Level  (Level 3) |
| **CO2** | Analyze and compare different sorting and searching algorithms - ~~Merge Sort, Quick sort, Shell sort and Bucket Sort.~~ | Analyze Level  (Level 4) |
| **CO3** | Identify suitable data structure and develop solution for the given problem. | Apply Level  (Level 3) |
| **CO4** | Formulate solutions for programming problems or improve existing code using algorithms such as, Backtracking, Branch and Bound, Greedy algorithm and Dynamic programming. | Apply Level  (Level 3) |

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| **Module No.** | **Title of the Module** | **Topics in the Module** | **No. of Lectures for the module** |
| **1.** | Introduction | Introduction to data structures, lists, Doubly linked list, circular linked list, multi linked list, Applications - sparse matrix representation, Stacks – implementation (array and linked list based) and applications, Queues: linear, and queue applications, circular, deque – implementation and applications; | ~~8~~ 11 |
| **2.** | Algorithm Complexity | Abstract data type, Growth of function, Space-Time tradeoffs, Complexity analysis of algorithms - Asymptotic analysis | 2 |
| **3.** | Sorting & Searching | Searching – Linear, and binary search; Sorting – bubble, insertion, and selection, Merge Sort, Quick sort, Count sort, Bucket Sort, ~~Shell sort, Median search, Interpolation search~~ | 6 |
| **4.** | Trees | Binary Tree, Binary Search tree, AVL Tree, ~~B Tree, B+ Tree~~ | 7 |
| **5.** | Heaps | Introduction to heaps, Binary heap | 2 |
| **6.** | Graph | Introduction to graphs, Representation – adjacency list, adjacency matrix, Traversal – BFS, DFS, Minimum spanning tree – Prims and Kruskal’s algorithm, | 4 |
| **7.** | Hashing | Introduction to hashing, Collision resolution – open and closed hashing methods | 3 |
| **8.** | Algorithm | Introduction to Backtracking Algorithm (N-Queen), Branch and Bound, Greedy algorithm, Problems on Greedy algorithm (Fractional Knapsack), Dynamic programming, Problems on Dynamic Programming (0-1 Knapsack, Longest Common Subsequence)  Graph Algorithms- Shortest path using Dijkstra algorithm and Floyd–Warshall algorithm | ~~10~~ 7 |
| **Total number of Lectures** | | | **42** |
| **Evaluation Criteria**  **Components Maximum Marks**  T1 20  T2 20  End Semester Examination 35  TA 25 (Attendance = 07, Class Test/Quiz= 07, Internal assessment = 05  Assignments in PBL mode = 06)  **Total 100** | | | |

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| **Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. | |
| **Text Books** | |
| **1.** | Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning; 4th edition (2012) |
| **2.** | Data Structures and Algorithms Made Easy, by NarasimhaKarumanchi, CareerMonk Publications; 5th edition (2016) |
| **3.** | An Introduction to Data Structures with Application, by Jean-Paul Tremblay , Paul Sorenson, McGraw Hill Education; 2 edition (2017) |
| **References** | |
| **1.** | YedidyahLangsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2nd Edition, PHI, 2001 |
| **2.** | Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984 |
| **3.** | Dinesh P Mehta, SartajSahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004 |
| **4.** | Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson |
| **5.** | Sahni: Data Structures, Algorithms and applications in C++, [Universities press](javascript:OpenSearch(0,%20'Universities%20press',%209)), Hyderabad, 2005 |
| **6.** | Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002 |
| **7.** | Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson  Education Asia, 2003 |
| **8.** | Cormen et al: Introduction to Computer Algorithms, 2nd edition , PHI New Delhi 2003 |
| **9.** | Aho, Hopcraft, Ullman: Data Structures and Algorithms, [Pearson Education Asia (Adisson Wesley)](javascript:OpenSearch(0,%20'Pearson%20Education%20Asia%20(Adisson%20Wesley)',%209)), New Delhi, 2001 |
| **10.** | Standish: Data Structures in Java, [Pearson Education Asia (Adisson Wesley)](javascript:OpenSearch(0,%20'Pearson%20Education%20Asia%20(Adisson%20Wesley)',%209)), New Delhi, 2000 |
| **11.** | Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition , [Pearson Education Asia (Adisson Wesley)](javascript:OpenSearch(0,%20'Pearson%20Education%20Asia%20(Adisson%20Wesley)',%209)), New Delhi, 2002 |