**Detailed Syllabus**

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| **Subject Code** | 15B17CI578 | **Semester:** ODD  **(specify Odd/Even)** | **Semester 5 Session** 2021-2022  **Month from** Aug’22  **to** Dec’22 |
| **Subject Name** | Data Structures & Algorithms Lab | | |
| **Credits** | 0-0-1 | **Contact Hours** | 2 |

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| **Faculty (Names)** | **Coordinator(s)** | Dr. Manju, Dr. Raju pal |
| **Teacher(s) (Alphabetically)** | Dr. Amarjeet Prajapati, Dr Akansha Bhardwaz, Dr.Ankita Verma, Dr. Manju, Dr. Raju pal, Dr. Surendra kumar |

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| **COURSE OUTCOMES** | | **COGNITIVE LEVELS** |
| **C371.1** | Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications. | Understanding Level (C2) |
| **C371.2** | Interpret the complexity of algorithms for given problems. | Understanding Level (C2) |
| **C371.3** | Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities. | Apply Level (C3) |
| **C371.4** | Examine case-study specific application of Heaps, Graphs, and Hashing methods. | Apply Level (C3) |
| **C371.5** | Model algorithmic solutions for small real-life problems using Backtracking, Greedy algorithm and Dynamic programming, Branch and Bound, and others | Apply Level (C3) |

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| **Module No.** | **Title of the Module** | **List of Experiments** | **CO** |
| **1.** | Introduction & Algorithm Complexity | **Lab Assignment 1:** Conversion from one number system to another; Manipulation with arrays and strings, structures;  **Lab Assignment 2 and 3:** Manipulation with a single , circular and double Linked lists of integers;  **Lab Assignment 4:** Stacks and Queues  Finding Complexity: Big O, Big Omega  Cost Analysis | CO1, CO2,  Understanding Level (C2) |
| **2.** | Sorting, Searching & Trees | **Lab Assignments 5 and 6**: Sorting, Searching, Application based.  **Lab Assignments 7, 8, 9**: Binary Tree, Binary Search Trees, AVL Tree, Case-study: Priority Queue with Binary Trees | CO1  Understanding Level (C2)  CO3  Apply Level (C3) |
| **3.** | Heaps, Graph | **Lab Assignments 10:** Heaps  **Lab Assignment 11 and 12**: Directed and undirected graphs, weighted graphs, etc. | CO4  Apply Level (C3) |
| **4.** | Hashing & other Algorithms | **Lab Assignments 13:** Hashing, Backtracking, Branch and Bound, Greedy Algorithms, Dynamic Programming. | CO5  Apply Level (C3) |
| **Evaluation Criteria**  **Components Maximum Marks**  Lab Test 1 20  Lab Test 2 20  Day-to-Day Evaluations 15  Mini-Project 15  Day-to-Day - Attendance 15  Assignment 15    **Total 100** | | | |
| **Project Based Learning**: The students in a group of 3- 4 are required to submit a project based on either real-world data or a real-time application. For the data or application chosen, the students need to analyze appropriate data structure for the arrangement of data so that it can be accessed and worked on with specific algorithms more effectively. Selecting the appropriate setting for your data is an integral part of the programming and problem-solving process. Data structures organize abstract data types in concrete implementations. To attain that result, they make use of various algorithms, such as sorting, searching, etc. The project typically incorporates various data structure concepts to enable the synthesis of knowledge from real-life experiences. | | | |

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| **Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) | |
| 1 | Data Structures and Algorithms in C++, Adam Drozdek, Cengage Learning; 4th edition (2012) |
| 2 | Data Structures and Algorithms Made Easy, by Narasimha Karumanchi, 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) |
| 4 | Yedidyah Langsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2nd Edition, PHI, 2001 |
| 5 | Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984 |
| 6 | Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004 |
| 7 | Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson |
| 8 | Sahni: Data Structures, Algorithms and applications in C++, [Universities press](javascript:OpenSearch(0,%20'Universities%20press',%209)), Hyderabad, 2005 |
| 9 | Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002 |
| 10 | Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson  Education Asia, 2003 |
| 11 | Cormen et al: Introduction to Computer Algorithms, 2nd edition , PHI New Delhi 2003 |
| 12 | 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 |
| 13 | Standish: Data Structures in Java, [Pearson Education Asia (Adisson Wesley)](javascript:OpenSearch(0,%20'Pearson%20Education%20Asia%20(Adisson%20Wesley)',%209)), New Delhi, 2000 |
| 14 | 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 |
| 15 | Heileman: Data Structures, Algorithms and Object Oriented Programming, [Tata Mc-Graw Hill](javascript:OpenSearch(0,%20'Tata%20Mc-Graw%20Hill',%209)), New Delhi, 2002 |
| 16 | Sorenson and Tremblay: An Introduction to Data Structures with Algorithms, 2nd Edition, [Tata Mc-Graw Hill](javascript:OpenSearch(0,%20'Tata%20Mc-Graw%20Hill',%209)), New Delhi, 2003 |