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| **Course Code** | CSU3302 | | | | | |
| **Level** | 3 | | | | | |
| **Course Title** | Data Structures and Algorithms | | | | | |
| **Credit value** | 3 | | | | | |
| **Core/Optional** | Core | | | | | |
| **Prerequisites** | CSU3200((EL/CR) | | | | | |
| **Hourly breakdown** | **Theory** | | **Practical**  **hours** | **Independent Learning** | **Assessments** | **Total hrs.** |
| 25 Sessions X 2 = **50 hrs.** | 5 DS x 3 hrs. = **15 hrs.** | 1 Lab x 3 hrs. =  **03 hrs.** | * Sessions (25 x 3)   = 75 hrs.   * Online = 3.5 hrs. * Lab (03 x 0.5) = 1.5   hrs.  Total = **80 hrs.** | * Continuous Assessments (CA) : **01 hr.** * Practical assessments (PA) : **01 hr.** | **150 hrs.** |
| **Course Aim/s.** | To provide an understanding regarding different types of Data Structures including Lists, Stacks, Queues, Graphs, Hash tables and their implementations through arrays and pointers. Also understand about different types of internal and external sorting methods, searching methods and their implementations. | | | | | |
| **PLOs addressed by course** | **PLO1: Knowledge:** Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree.  **PLO2: Practical Knowledge and Application**. Demonstrate the competency to use the knowledge and practical skills appropriately.  **PLO5: Creativity and Problem Solving:** Identify and analyze problems using quantitative and/or qualitative approaches using scientific methodology to provide valid conclusions.  **PLO9: Lifelong Learning**: Develop the capacity to foresee new trends and their impacts and continuously update knowledge and develop skills willingly to meet those future challenges. | | | | | |
| **Course Learning Outcomes (CLO)** | At the completion of course, student will be able to:  CLO1: Explain what is an abstract data type and need of having data structures (PLO1).  CLO2: Explain different types of linked list structures including singly, doubly and circular linked list and explain array and pointer implementations of those linked list structures (PLO1,2 & 9 ).  CLO3: Explain Stack and Queue data structures and explore their basic operations through array and pointer implementations (PLO1,2 & 5).  CLO4: Describe tree data structures, different types of tree data structures, array and pointer implementation of binary tree data structures and hence exploring different tree traversal methods and implementing different applications of tree structures ( PLO1,2 & 5).  CLO5: Describe different properties of graphs, implementation of graph structures, different graph traversal methods and thereby identify the most suitable traversal method for a given application (PLO1,2 ,5 & 9).  CLO6: Explain what is an algorithm, different algorithm designing techniques, different measures of analyzing an algorithm and different methods of calculating time complexity ( PLO1 & 9).  CLO7: Describe the characteristics of a recursive algorithm and thereby writing recursive algorithms( PLO1).  CLO8: Explain Internal and External Sorting methods and identify appropriate situations to apply them (PLO1 & 2).  CLO9: Describe different types of searching and Hashing methods and their Implementations (PLO1).  CLO10: Describe what is memory management and distinguish between different methods of allocating memory (PLO1). | | | | | |
| **Content**  **(Main topics, sub topics)** | Data Structures and Algorithms-Overview, Preliminaries, Lists, Pointer Implementation of List, Advanced Linked List Structures, Stack, Queues, Tree Structures, Binary Trees, Applications of Tree Structures, Different Tree Structures, Graphs, Graph Traversals, Introduction to Algorithms, Analyzing Algorithms, Asymptotic Analysis of Algorithms, Recursion, Internal Sorting, Internal Sorting by Insertion, Internal Sorting by Selection, External Sorting, Searching methods, Binary Search Tree, Hashing, Memory Management | | | | | |
| **Teaching Learning methods (TL)** | Self-learning/independent learning of self - study (IL)   * Learning the course contents in course materials in print and web-based materials (SS) * Learning through practical exercises & group work projects (PR) & (GP) * Additional reading materials/ recommended reading (RE)   Contact sessions   * Day schools (discussion sessions) (Non-compulsory) * Laboratory practical exercises (PR) (Non-compulsory) | | | | | |

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| **Assessment strategy** | Overall Continuous Assessment Mark (OCAM): 40% | Final Assessment: 60 % |
| Details: Continuous Assessment (CA) : **01 hr.**  Practical Assessment (PA) : **01 hr.**    OCAM computation:  OCAM= 60% of best CA/PA + 40% of other CA/PA | Final Evaluation  Theory: **02 hrs.** |
| **Recommended**  **Readings:** | 1. Mehlhorn, Kurt; Sanders, Peter. *Algorithms and data structures: the basic toolbox* 2. Shaffer, Clifford A. *A practical introduction to data structures and algorithm analysis* 3. Mohan, I. Chandra.*Design and analysis of algorithms* | |