Course Title	Data Structures and Algorithms				
Course Code	CSE200				
Course Type	Compulsory				
Level	Bachelor (1st cycle)				
Year / Semester	2nd Year / 3rd Semester				
Teacher's Name	Alberto Calzada				
ECTS	6	Lectures / week	3 hours / 14 weeks	Laboratories / week	N/A
Course Purpose and Objectives	The course will introduce students to the basic concepts of data structures, and their usefulness in various computer operations. Structures like arrays, stacks, queues, linked lists, trees and graphs will be discussed and analyzed. Algorithms will be developed that operate and manipulate these structures efficiently. Analysis of time-space complexity of algorithms.				
Learning Outcomes	Upon succesful completion of this course students should be able to: • Analyze program time complexity and express it in big-Oh, Omega and Theta notation. • Classify and evaluate different data structures, both linear and non-linear. • Develop programs that use dynamic linear and non-linear data structures to solve specific problems. • Generate programs that use abstract data structures to solve computational problems. • Apply different algorithms to solve computational problems.				
Prerequisites	CSE120, MAT170 (for BCSC and BECE students), CSE120 (for BCIS students)	Co-requisites	None		
Course Content	Introduction and basic concepts of data structures: Definition of a data struc¬ture, implementation of a data structure, definition of an algorithm, distinguishing between an algorithm and a program, how to create and analyze programs. Asymptotic notation and arithmetic, O-notation. Complexity of searching and sorting algorithms. Recursive mathematical function, recursively defined problem, relation of mathematical induction and recursion, comparison of iterative and recursive solutions, divide-and-conquer strategies, recursive backtracking. Linked Lists:				

	Cursor-implementation of a linked list, pointer implementation of a Linked list, the INSERT and DELETE operations on Linked lists, the efficiency of these opera¬tions on Linked lists compared to sequential storage structures, algorithms for Deletion and Addition with Linked lists; doubly linked lists and their advantages versus singly linked lists. STACKS and QUEUES: Definitions of these two data structures, operations associa¬ted with stacks, CREATE a stack DELETE a stack, return the TOP element of a stack, ADD an element to the stack algorithms for ADDING to and DELETING elements from a stack; operations performed on Queues, Create a queue, DELETE the FRONT element of a queue, ADD an element to the REAR of a queue, algorithms for Deletion and Addition routines on Queues. Sorting and Searching: O(n2) and O(nlogn) sorting techniques, Linear and Binary Search, Greedy and Divide and Conquer algorithmic techniques, Hashing. Trees: Definition of a Tree, a rooted tree, the height of a rooted tree, level numbers of any vertex, a balanced tree, theorems concerning¬ a Tree graph, an n-ary tree, traversing a tree, Inorder, Postorder Preorder and Level-Order traversals; implementation of trees, representation of trees by Lists of children using linked lists; BINARY trees, representing binary trees Advanced set representation methods: definition of a SET BINARY SEARCH Trees, the Binary Search Tree property, operations supported by such structures (INSERT, DELETE, MEMBER, MIN) algorithms to implement these operations, time-analysis of these operations; INSERTION into a BALANCED Tree, DELETION in a Balanced Tree Graph Theory: What a graph, what a PATH and a CIRCUIT are, directed and undirected graphs, networks, breadth- and depth-first search in graphs, representation of graphs as abstract data structures. Recent developments and contemporary issues pertaining to the subject-matter of the course.
Teaching Methodology	Face-to-face
Bibliography	Dale, N., Weems, C and Richards, T. (2016) C++ Plus Data Structures, Jones and Bartlett Publishing Weiss, M. A. (2016) Data structures and algorithm analysis in C++, Pearson. Goodrich, M. T. and Tamasia R. (2011) Data Structures and Algorithms in C++. Wiley.

	Wengrow, J. (2017). A Common-Sense Guide to Data Structures and Algorithms: Level Up Your Core Programming Skills, Pragmatic Bookshelf.
Assessment	Examinations 70% Class Participation and Attendance 10% Assignments 20% 100%
Language	English