**ICS 2105: DATA STRUCTURES AND ALGORITHMS; YEAR II SEM II: JAN-APRIL SEMESTER; 2022/2023 ACADEMIC YEAR**

**Bsc BC and Bsc IT**

**COURSE SYLLABUS**

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**1) Course purpose:** This course is designed to teach learners fundamental and advanced data structures and algorithms in order to develop efficient programs. Learners will gain skills on different ways of structuring data and how it impact on data manipulation and overall efficiency of program.

**2) Learning outcomes**: Upon successful completion of this course, the student should be able to demonstrate understanding of fundamental and advanced data structures, their implementation and applications and the design and analysis of computer algorithms.

**3) Course description:** Introduction to data structures and algorithms: definitions and uses of data structures and algorithms, role of data structures and algorithms programming, choice of data structures and algorithms. Elementary data structures: list, queue, stack, tree, records, arrays; types of list: linear-linked list, doubly linked list, circular linked list, circular doubly linked list; types of queue: circular queue; types of trees: AVL tree, red black trees, b-trees; graphs; array based and pointer-based implementation of data structures, hashing, heap, linear, binary search algorithms; sorting algorithms; depth-first, breadth, hill-climbing, least-cost search algorithms using either a structured programming language or an OOP language such as C++, JAVA, C#

**4) Course outline**

a) Introduction: Definition of data structures and algorithms, Difference between algorithm and program
b) Array and linked list: Definition and applications
c) Stack and queue: definition, implementation and applications
d) Infix, prefix and post-fix expressions
e) Recursive functions
f) Searching and sorting algorithms
g) Tree and graph: Definition and implementation; Types of trees: binary tree, full binary tree, complete binary tree, AVL tree, red black trees, b-trees, spanning tree, heap
h) Depth-first search and breadth first search algorithm
i) Introduction to asymptotic analysis of algorithms

Note: I have sent the following textbook in your class email account "A practical Introduction to Data structures and Algorithm Analysis; Third Edition (C++ Version) by Clifford A. Shaffer". Please read the following sections