MULTIMEDIA UNIVERSITY OF KENYA

P.O. Box 15653 - 00503, Mbagathi, Nairobi Tel: +254 020 2071391, +254 020 724257083, +254 020 735900008 Fax: +254 020 2071243Email:**info@mmu.ac.ke**

Leader in Innovative Technology

FACULTY OF COMPUTING AND INFORMATIN TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE OUTLINE

UNIT CODE: CCS 2214 UNIT NAME: DATA STRUCTURES AND ALGORITHM

LECTURER NAME: MR. KELVIN KARIUKI

CONTACTS: +254 729 385 557 | kkariuki@mmu.ac.ke | kelvinkariuki89@gmail.com

Prerequisite: Introduction to Programming and Algorithms, Object Oriented Programming I

Purpose;

To enable the learner to understand concepts and applications of data structures and algorithms.

Learning outcomes

By the end of this course unit the student should be able to:

1. Explain the concept of an abstract data type
2. Describe the various data structures and their implementation
3. Explain the different sorting and searching techniques
4. Implement data structures on large scale applications

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#, Python Practical implementation of Data Structures and search strategies.

Content Summary:

Lecture/Week	Course content	Remarks
1	• Introduction to DSA • Recursion • Big O Notation	Theory and Practical
2	• Arrays • Lists • Dictionaries • Tuples	Theory and Practical
3	• Linked Lists • Circular Singly Linked Lists • Doubly Linked Lists • Circular Doubly Linked Lists	Theory and Practical
4	• Stack • Queue	Theory and Practical
5	• Binary Tree • Binary Search Tree • AVL Tree • Binary Heap	Theory and Practical
6	• Trie • Hashing • Sort Algorithms	Theory and Practical
7	• Search Algorithms • Graph Algorithms • Graph Traversal Breadth First Search and Depth First Search	Theory and Practical
8	• Topological Sort Algorithm • Single Source Shortest Path • Graph Algorithms Dijsktras Algorithm	Theory and Practical
9	• Graph Algorithms Bellman Ford Algorithm • All Pairs Shortest Path	Theory and Practical
10	• Graph Algorithms Floyd Warshall Algorithm • Minimum Spanning Tree Disjoint Set	Theory and Practical
11	• Graph Algorithms Kruskal and Prims Algorithms • Greedy Algorithms	Theory and Practical
12	• Divide and Conquer Algorithms	Theory and Practical
13	• Dynamic Programming	
14	• Revision	
15 & 16	• End of Semester Exams	

Teaching Methodologies;

Lectures, Guest Lectures, Practical Sessions and Tutorials.

Instructional Materials/Equipment;

1. LCD Projector
2. Whiteboard
3. Textbooks, Computers and Internet.

Course Assessment;

Continuous Assessment Tests	30%
End of Semester Examination	70%

Course Textbooks;

1. Michael, T. and Roberto, T. (2013). *Data Structures and Algorithms in Python*.
2. Antii, L. (2017). Guide to Competitive Programming. ISBN 978-3-319-72546-8
3. Parker, A. (2018). *Data Structures and Algorithms in C++* (1st ed.) Routledge; ISBN-10: 0849371716
4. Weiss, M. A. (2013). *Data Structures and Algorithms in C++* (4th ed.) Pearson; ISBN-10: 013284737X

Reference Textbooks;

1. Karumanchi, N. (2016) *Data Structures and Algorithms Made Easy (5th ed.)* Career Monk Publications; ISBN-10: 819324527X

Course Journals;

1. International Journal of Advanced Computer Science and Technology (IJACST)
2. Journal of Computer and System Sciences
3. Advances in Computational Sciences and Technology (ACST)

Reference Journals;

1. International Journal of Computational Science and Engineering (IJCSE)
2. International Journal of Information Science and Education (IJISE)
3. Global Journal of Computational Intelligence Research (GJCIR)