HANDONG UNITWIN FELLOWSHIP

SYLLABUS

Lecturer's Information	
Name	Dr John M Mbogholi
University	Pwani University

Course Information			
Course Name	Data Structures and Algorithms	Prerequisite Course	introduction to programming
Course Date	2023-09-04 ~ 2023-11-24	Course Language	English
Keyword	data structures, lists, sets, stacks, queues, dictionary, sort, trees, search, graphs		

Course Description (100 ~200 words)	This course purposes to introduce students to the fundamental data structures that will enable them to organize and manipulate data efficiently. It aims to provide techniques for programming with collections of data, and the data structures and algorithms that are needed to implement these collections. The data structures are explained in simple language and implementations in at least two different modern programming languages are discussed in a step by step manner. The course provides step-by-step explanations and focused examples clearly explain the design of collection classes with polymorphism and inheritance and multiple implementations of collection interfaces
Course Goals and Objectives (Approximately 100 words)	By the end of this course, the learner should be able to: • Understand the fundamental data structures and algorithms. • Demonstrate understanding of the description, design and implementation of fundamental data structures and their algorithms. • Be able to apply different data structures and their algorithms to implement solutions to various computational problems
Textbook	**(The format : Title, Author/Editor, Publisher, Year of Publication)** Data structures and algorithms made easy : to all my readers : concepts, problems, interview questions. Narasimha Karumanchi. Careermonk Publications.(2017). Algorithms and data structures : the basic toolbox. Kurt Mehlhorn, & Sanders, P. Springer.(2008).
References	Data structures and algorithms using Python. Necaise, R. D. John Wiley And Sons.(2011) Algorithms and Data Structures: The Science of Computing (1sted.). Baldwin, D. and Scragg, G.W. Hingham, Mass.: Charles River Media.(2004) Data Structures and Algorithms in Java. Drozdek, A. Boston, M.A.: Thomson Course Technology.(2004).
Course Requirements and Grades	A basic knowledge of programming is required to understand data structures and their application to data. The programming language the learner has been exposed to is not important; rather understanding of programming concepts is what is required.

Weekly Schedule		
Week	Main Topics	Keywords
1	Introduction	variables, abstract data types, algorithms, asymptotic notations, big O, master theorem
2	Collections	linear, hierarchical, graphical, unordered, sorted
3	Searching, sorting and complexity analysis	big-O, searching, binary search, logarithmic, recursive, quicksort
4	Arrays and Linked structures	dimensional arrays,associative arrays, linked, nodes
5	Implementations in Object Oriented environments	interfaces, implementations, polymorphism, bag collection, class diagram
6	Inheritance and abstract classes	code sharing, subclass, inheritance, overriding, hierarchy
7	Stacks	stack ADT, top of stack, bottom of stack, operations, implementations
8	Queues	exceptions, applications, implementations, priority queues, FIFO
9	Lists	index based, content based, position based, memory efficient, features, applications
10	Trees	tree traversal, binary search tree, expression tree, parsing, heap
11	Sets and Dictionaries	set types, traversal, implementation, key, value, operations
12	Graphs	vertex, sub graph, directed graph, matrix implementation, graph traversal
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