Adama Science and Technology University

School of Electrical Engineering and Computing

Computer Science and Engineering Program

<u>**Course Syllabus**</u>

Course Title	Data Structures and Algorithm			
Operation Period	Oct 2018-Feb 2018		**Course Credits**	3
Class Schedule			**Code**	CSE 2101
	Target Students' Major	-	**Target Grade**	2nd Year
	Prerequisite(s) for enrollment	CSE1101	**Capacity** (Maximum Number)	50
	Instructor Information		**Office Hour**	
			E-Mail	
	TA	**Name**	**E-Mail**	
	Course Team or SIG		Intelligent Systems	**Contact person**	
		ML, AI	AI	**Weekly programs**	Thursday 1:PM-2:30PM
	Learning outcome	On the completion of the course, students should be able to: • understand common data structures and algorithms, and be able to implement them; • analyze the complexities of data structures and algorithms; • choose appropriate data structures and algorithms for problem solving.		

Course Description	This course aims to introduce a number of popular data structures and algorithms, along with the basic techniques in algorithm analysis.
Related Research Areas	• Distributed computing • Complex Networks • Bioinformatics • Algorithmic game theory • Machine learning • Data mining Unstructured data analysis

	Parameter	Weight	Remark
Assessment	Attendance	5%	Lab Exam shall be conducted at the end of classes.
	Quiz	10%	
	Assignment / Presentation	10%	
	Class Participation	5%	
	Lab Exam	10%	
	Mid exam	25%	
	Final exam	35%	
	Total	100 %	

Weekly Lecture Schedule

SN.		
	Week1-2	**Introduction: D**ata structure definition, ADT, classification of Data structures(primitive vs. non primitive, Linear vs nonlinear Data Structures), Array revision, pointer revision, Algorithm definition, properties of algorithms, expressing algorithms (natural language, flowchart, pseudocodes), properties of algorithm, Algorithm complexity analysis (operation count, big-O, theta, omega), best case analysis, worst case analysis, average case analysis.
	Week 3-4	**Simple Searching and Sorting Algorithms:** Linear Search, Binary Search, Bubble sort, Insertion sort, Selection sort
	Week 5-6	**List Data Structure:** List ADT by the array, Dynamic memory, limitations of array, implementation of lists, Linked list:- Singly linked lists, doubly linked lists, circular (singly and doubly) linked lists, Operations on linked lists: creation, insertion, deletion, update, search, adding new nodes
	Week 7-8	**Stack Data structure:** Stack definition, Applications, operations on the stack,

		implementation of a stack using array, Stack implemented using linked lists, applications of stacks, conversion and evaluation of infix, postfix and prefix expressions using stack, recursive functions
	Week-9	**Mid Examination**
	Week 10-11	**Queue Data Structure:** Queue definition, applications, operations on queue, Queue implantation by array, queue implantation by linked lists, circular queue, priority queue
	Week 12-13	**Tree Data Structure:** Definition of tree, basic terminologies ,basic operations on tree: creation, insertion, deletion, update, search, print, Types of trees:- n-ary tree, Binary tree, BST, AVL tree, full BT, complete BT ,Balanced BT **.**Tree traversal methods: in-order, pre-order, post-order **Heap data Structure:-** definition, creation, insertion, update, deletion, print etc. Examples of Expression trees
	Week 14-15	**Graph data Structure:** Graph definition, basic terminologies, representation of graph, operations on graphs: creation, insertion, deletion, traversal (DFS, BFS) Types of graphs: Cyclic and acyclic graphs, directed and undirected graphs, complete graph, balanced graph. **Graph Algorithms:** Dijkastra and prims algorithm
	Week 16	**Advanced sorting Algorithms** Quick sort, Merge sort ,shell sort , Heap Sort

Course Text Books	1. Introduction to Algorithms, Thomas H. Cormen... [et al.].-2nd ed.(2001), McGraw-Hill; ISBN 0-07-013151-1. 2. Weiss Mark (1997), Data Structure and Algorithms Analysis in C: Benjamin Cummings Publishing. 3. Ammereaal, Leendert (1988), Programming and data Structure in C (2nd ed.): John Wiley & Sons. 4. Reingold Edward M. and Wilfred Hansen(1983).Data Structures: CBS Publisher & Distibutors.
References in MOOC	www.coursera.org,
Related References	Standish, Thomas A. (1996), Data Structures, Algorithms, and Software Principles, Addison-Wesley Pub Co; ISBN: 0201528800. Sartaj Sahni, Data Structures, Algorithms, and Applications in C++, McGraw-Hill, 1998.

Weekly Lab Schedule		
SN.	Lab 1	C++ revision, implementation of arrays and basic operations
	Lab2	Search algorithm: Linear and Binary Search
	Lab 3	Sorting Algorithms: Bubble sort, Selection sort, Insertion sort
	Lab 4	Linked list using array
	Lab 5	Linked lists using dynamic memory allocation
	Lab 6	Stack Implemntation with operations on stacks
	Lab 7	Recursion, expressions evaluation and conversion (prefix, postfix and infix)
Mid Examination		
	Lab 9	Queue Implemntation: enque, deque using array
	Lab 10	Queue Implemntation with dynamic memory allocation: creation, enque, deque using array
	Lab 11	Circular and priory queue
	Lab 12	BST implementation using array and linked lists
	Lab 13	Tree traversal methods: Pre-order, post-order, in-order
	Lab 14	Graph implantation, DFS and BFS implantation
Final Lab exam		