

Adama Science and Technology University
School of Electrical Engineering and Computing
Computer Science and Engineering Program
Course Syllabus

Course Title	Data Structures and Algorithm		
Operation Period	Oct 2019-Feb 2019	Course Credits	3
Code	CSE 2101	Target Grade	2nd Year
Prerequisite(s) for enrollment	CSE1101	Capacity (Maximum Number)	50
Course Team or SIG		Intelligent Systems	Contact person Dr. Mohd Wazih Ahmad
	ML, AI	AI	Weekly programs
Learning outcome	On the completion of the course, students should be able to: <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Distributed computing Complex Networks Bioinformatics Algorithmic game theory Machine learning Data mining Unstructured data analysis		



Assessment	Parameter	Weight	Remark
	Attendance	5%	Lab Exam shall be conducted at the end of classes.
	Quiz	10%	
	Assignment / Presentation	10%	
	Lab Exam	15%	
	Mid exam	25%	
	Final exam	35%	
	Total	100 %	

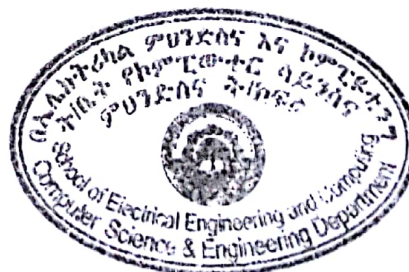
Weekly Lecture Schedule

Week1-2	Introduction: Data 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: Dijkstra and prims algorithm
Week 16	Advanced sorting Algorithms Quick sort, Merge sort ,shell sort , Heap Sort

Course Text Books	<ol style="list-style-type: none"> 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 & Distributors.
References in MOOC	www.coursera.org ,
Related References	<p>Standish, Thomas A. (1996), Data Structures, Algorithms, and Software Principles, Addison-Wesley Pub Co; ISBN: 0201528800.</p> <p>Sartaj Sahni, Data Structures, Algorithms, and Applications in C++, McGraw-Hill, 1998.</p>



Weekly Lab Schedule

Lab 1	C++ revision, implementation of arrays and basic operations
Lab 2	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 Implementation with operations on stacks
Lab 7	Recursion, expressions evaluation and conversion (prefix, postfix and infix)
Mid Examination	
Lab 9	Queue Implementation: enqueue, dequeue using array
Lab 10	Queue Implementation with dynamic memory allocation: creation, enqueue, dequeue using array
Lab 11	Circular and priority queue
Lab 12	BST implementation using array and linked lists
Lab 13	Tree traversal methods: Pre-order, post-order, in-order
Lab 14	Graph implementation, DFS and BFS implementation
Final Lab exam	

