

Detailed Course Description - Course Plan Development and Updating Procedures/ Computer Science Department	QF01/0408-3.0E
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Faculty	Faculty of Science and Information Technology	Department	Computer Science
Course number	0112212	Course title	Data structures
Number of credit hours	3	Pre-requisite/co-requisite	Object Oriented Programming

Brief course description

Principles of data design. Data types and structures. Abstract data types (ADTs) and encapsulation. Unsorted List and Sorted List ADTs. Stack and Queue ADTs. Linked structures. Implementing Unsorted Lists, Sorted Lists, Stacks and Queues as linked structures. Programming with recursion. Binary Search Trees.

Course goals and learning outcomes	
Goal 1	Ability to analyze, design and implement efficient and reliable computer programs.
Learning outcomes	1.1 Student should know different programming methods 1.2 Student should understand how to build and use computer programs 1.3 Student should be able to use different programming languages
Goal 2	Recognize the concept of an Abstract Data Type (ADT).
Learning outcomes	2.1 Apply the stages of ADT design and implementation. 2.2 Determine how an ADT is designed and implemented as a class of some object-oriented programming language
Goal 3	Enable students to design and implement some user-defined data structures (lists, stacks, queues, linked lists, binary trees, etc.) as Java generic classes.
Learning outcomes	3.1 Understand well-known generic data structures such as list, stack, queue, tree and related algorithms and apply them to solve problems. 3.2 Design new data structures to solve problems. 3.3 Implement selected data structures.
Textbook	1. 1.- Nell Dale, Daniel Joyce, Chip Weems, <i>Object-Oriented Data Structures Using Java</i> , 4 th ed., 2016.
Supplementary references	1. 1.- Data Structures and Abstractions with Java, F.N. Carano, 3rd Edition, Prentice Hall, 2011, 1008 p. ISBN-10: 0136100910.

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2. Object-Oriented Data Structures Using Java, by N. Dale, D.T. Joyce, and Ch. Weems, 3d ed., 2012, 802 p. ISBN-10: 1-4496-1354-3.
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Course timeline

Week	Number of hours	Course topics	Pages (textbook)	Notes
01	1 1 1	Introduction to data structures: What is a data structure? References, arrays, Big-O Analysis. Concept of an ADT: Definition of an Abstract Data Type (ADT), representation of objects, implementation of operations.	Ref.1: 28-68	
02	1 1 1	Introduction to Linked Lists: Array vs. Linked Lists, operations on Linked Lists. Stack ADT: Stack ADT definition and its array implementation.	Ref.1: 102-112 Ref.1: 160-162,185-193	
03	1 1 1	Stack ADT: Linked stack implementation, applications of stacks (Evaluating Postfix Expressions). Recursion: recursive definitions, how recursion works, classic examples.	Ref.1: 194-229 Ref.1: 243-253	
04	1 1 1	Recursion: Recursive processing of linked lists, deciding when to use recursion. Queue ADT: Queue ADT definition and its linear array implementation.	Ref.1: 269-285 Ref.1: 297-314	
05	1 1 1	Queue ADT: Circular Queue implementation, Queue implementation as a linked structure, applications of queues.	Ref.1: 331-339	
06	1 1 1	Review of previous chapters + solutions of problems. First Exam. Analysis of exam results.		
07	1 1 1	List ADT: Comparing Objects, varieties of lists, List ADT specifications, array implementation of sorted and unsorted lists.	Ref.1: 383-413	
08	1 1 1	List ADT: Binary Search algorithm, recursive binary search, implementing List ADT as a linked structure.	Ref.1: 425-444	
09	1 1 1	List ADT: Circular linked lists, doubly linked linear and circular lists, linked lists with headers and trailers, linked list as an array of nodes.	Ref.1: 474 - 496	
10	1 1 1	Binary Trees: Binary tree ADT, array and linked representations, binary tree traversal.	Ref.1: 531-539	

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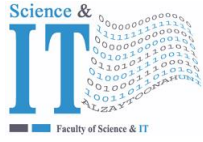
11	1 1 1	Review of previous chapters + solutions of problems. Second Exam. Analysis of exam results.		
12	1 1 1	Binary Search Trees: Binary search tree specification, binary search tree implementation.	Ref.1: 536-554	
13	1 1 1	Binary Search Trees: Recursive binary search tree operations, adding and removing nodes.	Ref.1: 555-577	
14	1 1 1	Binary Trees: Application of binary trees, array representation of binary trees, case study.	Ref.1: 584-598	
15	1 1 1	Discussion of assignments, review of binary tree topics, general review of the course topics, solutions of sample problems.		
16	1 1 1	Final Exam		

Theoretical course evaluation methods and weight	Participation = 10% First exam 20% Second exam 20% Final exam 50%	Practical (clinical) course evaluation methods	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%
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Approved by head of department		Date of approval	
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Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Dr Farhan Abdul Fattah	Office Number	
Phone number (extension)		Email	_____@zug.edu.jo
Office hours			



جامعة الزيتونة الأردنية
Al-Zaytoonah University of Jordan
كلية العلوم وتكنولوجيا المعلومات
Faculty of Science and Information
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"عراقة وجودة"
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