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

" عراقة وجودة"
"Tradition and Quality"

Detailed Course Description - Course Plan Development and Updating Procedures/ Computer Information Systems Department	QF01/0408-3.0E

Faculty	Faculty of Science and Information Technology	Department	Computer Information Systems
Course Number	**0113212**	**Course Title**	**Data Structure**
Number of Credit Hours	3	Pre-Requisite/Co-Requisite	Object Oriented Programming

This course concerns with: concepts of object oriented programming, data structures and algorithms; Concept of Abstract Data Type, design and implementation; Design and implement of many user defined data structures (lists, stacks, and queues) as Java class using both Array representation and Node representation; Principles of recursion; Principles of Analysis Tools and Analysis of Algorithms; Concepts of trees, tree traversal, tree search, binary tree search; Searching and sorting methods; and finally, the concepts of Text/String processing.

Course Goals and Learning Outcomes	
Goal 1	**Concepts of data structures and algorithms.**
Learning Outcomes	**1.1** Understanding the main concepts of data structures and algorithms. **1.2** learning concept of an Abstract Data Type (ADT), design and implementation.
Goal 2	**Design and implement user defined data structures (lists, stacks, and queues)**
Learning Outcomes	**2.1** Learning the implementation of user defined data structures as Java class using Array. **2.2** Learning the implementation of user defined data structures as Java class using Node.
Goal 3	**Principles of recursion.**
Learning Outcomes	**3.1** Learning the concepts, conditions and benefits of recursion.
Goal 4	**Principles of Analysis Tools and Analysis of Algorithms.**
Learning Outcomes	**4.1** Understanding the principles of Analysis Tools and Analysis of Algorithms
Goal 5	**Concepts of trees, tree traversal, tree search, binary tree search.**
Learning Outcomes	**5.1** Understanding the concepts of trees and tree traversal. **5.2** Understanding binary tree search.
Goal 6	**Sorting methods and Text/String processing.**
Learning Outcomes	**6.1** Understanding the searching and sorting methods. **6.2** learning the concepts of Text/String processing.
Textbook	**1.** Data Structures & Algorithms in JAVA, by Michael T. Goodrich and Roberto Tamassia, and Michael H. Goldwasser, 6th Ed., 2014, John Wiley & Sons, Inc.
Supplementary References	**1.** Object-Oriented Data Structures Using Java, 4th Edition, by Chip Weems, Daniel T. Joyce, Nell Dale, Publisher: Jones & Bartlett Learning, 2016. **2.** Data Structures and Algorithm Analysis in Java, by Mark A. Weiss, 3rd Edition, 2012, Addison-Wesley.

Course Timeline				
Week	**Number of Hours**	**Course Topics**	**Pages (Textbook)**	**Notes**
01	1 1	**Chapter 1: Java Primer** – Classes, Types, and Objects (Base Types)	1-50	

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	1	– Methods – Expressions (Literals, Operators, and Casting) – Control Flow (If and Switch Statements, Loops) – Arrays, Declaring Arrays, Arrays are Objects – Nested Classes and Packages			
02	**1** **1** **1**	**Chapter 2: Object-Oriented Design** – Goals, Principles, and Patterns – Inheritance and Polymorphism – Interfaces and Abstract Classes	59-96		
03	**1** **1** **1**	**Chapter 3: Fundamental Data Structures** – Using Arrays – Sorting an Array – Singly Linked Lists – Implementing a Singly Linked List Class – Circularly Linked Lists – Round-Robin Scheduling – Design and Implementing a Circularly Linked List	103-129		
04	**1** **1** **1**	– Doubly Linked Lists – Implementing a Doubly Linked List Class – Equivalence Testing with Arrays – Equivalence Testing with Linked Lists	132-145		
05	**1** **1** **1**	**Chapter 4: Algorithm Analysis** – Experimental Studies – Moving Beyond Experimental Analysis – Seven Functions Used: Comparing Growth Rates – Asymptotic Analysis – The "Big-Oh" Notation – Comparative Analysis – Examples of Algorithm Analysis	149-179		
06	**1** **1** **1**	**Chapter 5: Recursion** – Illustrative Examples – The Factorial Function – Drawing an English Ruler – Binary Search – Analyzing Recursive Algorithms – Linear Recursion – Binary Recursion – Multiple Recursion – Designing Recursive Algorithms	189-219		
07	**1**	**Review of previous topics**			

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	1 1	**First Exam**		
08	1 1 1	**Chapter 6: Stacks, Queues, and Deques** – Stacks – The Stack Abstract Data Type – A Simple Array-Based Stack Implementation – Implementing a Stack with a Singly Linked List – Reversing an Array Using a Stack – Queues – The Queue Abstract Data Type – Array-Based Queue Implementation – Implementing a Queue with a Singly Linked List – A Circular Queue	225-246	
09	1 1 1	– Double-Ended Queues – The Deque Abstract Data Type – Implementing a Deque – Deques in the Java Collections Framework	248-251	
10	1 1 1	**Chapter 7: List and Iterator ADTs** – The List ADT – Array Lists – Dynamic Arrays – Implementing a Dynamic Array – Positional Lists – The Positional List Abstract Data Type – Doubly Linked List Implementation	257-284	
11	1 1 1	**Review of previous topics** **Second Exam**		
12	1 1 1	**Chapter 8: Trees** – Tree Definitions and Properties – The Tree Abstract Data Type – Computing Depth and Height – Binary Trees – The Binary Tree Abstract Data Type – Implementing Trees – Linked Structure for Binary Trees – Array-Based Representation of a Binary Tree – Linked Structure for General Trees	307-333	
13	1 1 1	– Tree Traversal Algorithms – Preorder and Postorder Traversals of General Trees	334-350	

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		– Breadth-First Tree Traversal – Inorder Traversal of a Binary Tree – Implementing Tree Traversals in Java		
14	1 1 1	**Chapter 12: Sorting and Selection** – Merge-Sort – Divide-and-Conquer – Array-Based Implementation of Merge-Sort – The Running Time of Merge-Sort – Merge-Sort and Recurrence Equations – Alternative Implementations of Merge-Sort – Quick-Sort – Randomized Quick-Sort – Lower Bound for Sorting – Linear-Time Sorting: Bucket-Sort and Radix-Sort – Selection – Randomized Quick-Select	531-565	
15	1 1 1	**Chapter 13: Text Processing** – Abundance of Digitized Text – Notations for Character Strings – Pattern-Matching Algorithms – Brute Force – The Boyer-Moore Algorithm	573-582	
16	1 1 1	– Review of previous topics – Projects Discussions **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%

Approved by Head of Department		**Date of Approval**	

Extra information (to be updated every semester by corresponding faculty member)

Name of Teacher		Office Number	
Phone Number (Extension)		Email	_____ @zuj.edu.jo
Office Hours			