Course Specification

(Bachelor)

Course Title:	Data Structures and Algorithms
Course Code:	COMP 321
Program:	BS in Computer Science
Department:	Computer Science
College:	Computer Science and Information Technology
Institution:	Jazan University, Jazan
Version:	V2
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (03 Hours)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: (Level -07 / Year 04)					
4. Course general Description:					
This course focuses on the study and implementation of various data Structures-Arrays, Linked lists, Stacks, Queues, Trees and Graphs. The course introduces asymptotic complexity and performance measurement of simple algorithms. The topic includes the concepts of hashing, hash-tables, implementation and analysis of Sorting Algorithms-Bubble Sort, Insertion Sort, Selection Sort and Searching algorithms- Linear Search, Binary Search.					
5. Pre-requirements for this course (if any):					
None					
6. Pre-requirements for this course (if any):					
None					
7. Course Main Objective(s):					
1. **Explain various linear and nonlinear data structures.** 2. **Introduces the concepts of asymptotic complexity and compute the efficiency of algorithms.** 3. **Describe how to choose the appropriate data structure required to solve some simple problems.** 4. **Demonstrate the implementation of the various data structures and their algorithms using Java programming.** 5. **Illustrate the methods to analyze and calculate the complexity and efficiency of algorithms and data structures.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	28
2.	Laboratory/Studio	28
3.	Field	
4.	Tutorial	
5.	Others (specify)	4
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe** the properties of various linear and nonlinear data structures and their usage.	K1	Class lectures and lecture notes	Midterm/ Assignment 1 / Final Exam/Final Lab
1.2	**Define** the concepts of hashing and collision handling methods.	K1	Class lectures and lecture notes	Assignment 2/ Final Exam
...				
2.0	**Skills**			
2.1	**Evaluate** the complexity and efficiency of algorithms and data structures.	S2	Class lectures/ lecture notes	Final Exam/ Group Assignments
2.2	**Apply** appropriate data structures for solving a given computing problem.	S4	Class lectures/ lecture notes/ Lab sessions	Final Exam/ Assignments 1 /Group Assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.3	**Implement** various data structures and their algorithms using Java programming.	S4	Class lectures/ lecture notes/ Lab sessions	Final Exam/ Group Assignments / Final Lab
3.0	**Values, autonomy, and responsibility**			
3.1	**Demonstrate** the ability to work in a team to choose and apply appropriate data structures to solve a given problem.	V2	Group Presentation	Group Assignments/ Lab Assignments

C. Course Content

No	List of Topics	Contact Hours
1.	**An Introduction to Data Structure and Algorithm Analysis:** Introduction to Algorithms, Data Structures, Reference Types and Primitive Types, Arrays Declaration, Multidimensional Arrays, Algorithm Efficiency, Big Oh Notation, Sequential Search, Binary Search and Selection Sort examples.	4T + 4P
2.	**Linked Lists:** Introduction to Singly Linked Lists, Linked List Operations, Implementation of Singly Linked Lists, Circular Linked List and its implementation, Doubly Linked List and its implementation	3T + 3P
3.	**Stacks:** Introduction to Stack, Basic Stack Operations, Stack implementation, Applications of Stacks **Queues:** Introduction to Queues, Queue operations, Queue Implementation, Basic Queue operations.	5T + 5P
4.	**Trees:** Introduction to Trees, Binary trees, Tree traversals, Binary search tree and its operations, Introduction to B-trees and AVL Trees.	5T + 5P
5.	**Heaps:** Introduction to priority queues, Completer Binary Tree, Heaps and its operations	4T + 4P
6.	**Hashing: Introduction to hashing concepts, hash-tables, hash functions, collision handling methods – Linear probing, Buckets and chaining.**	**2T + 2P**
7.	**Graphs:** Introduction to Graphs, Graph terminologies, Graph representations, Graph traversal implementation.	3T + 3P
Total		26T+26P

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1,	Midterm Exam	8th/ 9th week	15%
2.	Assignment I	5th week	10%
3.	Assignment II(Group)	11th week	15%
4.	Lab Exam + Lab Assignment	As per schedule	20%
5.	Final Theory Exam	As per schedule	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Nell Dale, Daniel T. Joyce, and Chip Weems., Object-Oriented Data Structures Using Java, Fourth Edition, 2018, Jones & Bartlett Learning, ISBN-13: 9781284089097
Supportive References	• Narasimha Karumanchi, Data Structures and Algorithms Made Easy in Java: Data Structure and Algorithmic Puzzles, Second Edition, 2020, Career Monk Publications, ISBN-13: 978-1468101270. • Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Java, 6th Edition, 2014, John Wiley & Sons Inc., ISBN: 978-1-118-77133-4
Electronic Materials	• Course Materials available at https://lms.jazanu.edu.sa/ • https://www.geeksforgeeks.org/data-structures/ https://www.java2novice.com/data-structures-in-java/
Other Learning Materials	Online tutorial

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom equipped with projector, whiteboard, and sufficient seating arrangements. • Lab with software installed and individual computer terminal for each student.
Technology equipment (projector, smart board, software)	• Whiteboards and projectors for classroom and labs • Computer Lab equipped with 30 PCs having JDK and NetBeans IDE or any other Java Editor installed. • An active internet connection.

Items	Resources
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Course evaluation survey form)
Effectiveness of students assessment	CRC / QAU / HoD	Direct (Course reports / result analysis)
Quality of learning resources	Track leaders / CRC	Indirect (Review, meetings and star rating with suggestions for further modification and improvements)
The extent to which CLOs have been achieved	CRC / QAU	Direct (CLO assessment template further verified at course coordinator, Track leader and QAU level)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	
DATE	