هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Data Structures**
Course Code:	**CS1256**
Program:	**Bachelor of Computer Science Program**
Department:	**Computer Science**
College:	**Computer Science and Information Technology**
Institution:	**Al Baha University**
Version:	**V1.0**
Last Revision Date:	**3/4/2023**

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A. General information about the course:

Course Identification					
1. Credit hours:	3 hours				
2. Course type					
a.	University ☐	College ☒	Department☐	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered:	4th Level (2nd Year)				

4. Course general Description

This course is designed to provide students with an overview of data structures and types that are a prerequisite for understanding algorithms. Upon successful completion of the course, the student will develop fundamental understanding and competency in the following topics:

- Lists
- Stacks
- Queues
- Recursion
- Trees
- Sets and maps
- Sorting
- Graphs
- Coplexity

Lab

Laboratory exercises will be used to demonstrate problem-solving techniques. Programming assignments and laboratory work will be done in Java programming language. Students enrolled in this class will: Implementing basic data structures–List, Stack, Queue trees, heaps, and the computational complexity of the searching and sorting algorithms that use these structures.

5. Pre-requirements for this course (if any):

Programming 2 (**CS1251**)

6. Co- requirements for this course (if any):

7. Course Main Objective(s)

The main purpose for this course is to teach students how to:

- Describe the fundamentals of OOP like the reference and pointer.
- Recognize the difference between linked list and array implementation.

- Outline the basic concepts of data structures (linked list, Stack, Queue, Tree, Graph, ….)
- Apply, searching and sorting algorithms using several data structures. • Make use of special algorithms like recursion for data structures manipulation.
- Develop, solve problems and finding algorithms' complexity for several data structures.
- Interact in groups collaboratively.
- Communicate concepts and techniques in oral presentations.

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	22	50%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning	22	50%
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	22
2.	Laboratory/Studio	22
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	44

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	Demonstrate an understanding of the basics of data structures and fundamentals of OOP	K1	• Lectures	• Midterm Exam • Quiz • Final Exam • Rubric
1.2	Recognize the difference between linked list and array implementation.	K2	• Tutorials • Lectures • Exercises	• Midterm Exam • Quiz • Final Exam • Rubric
1.3	Outline the basic concepts of data structures (linked list, Stack, Queue, Tree, Graph,…)	K3	• Lectures	• Midterm Exam • Quiz • Final Exam • Rubric
2.0	Skills			
2.1	Apply searching and sorting algorithms using several data structures.	S1	• Tutorials • Lectures • Exercises • Assignments	• Midterm Exam • Quiz • Final Exam • Rubric • Lab Exam
2.2	Make use of special algorithms like recursion for data structures manipulation.	S2	• Lectures • Exercises • Assignments • Lab Exercises	• Midterm Exam • Quiz • Final Exam • Rubric • Lab Exam
2.3	Develop, solve problems and finding algorithms' complexity for several data structures.	S3	• Lectures • Exercises • Assignments • Lab Exercises	• Midterm Exam • Quiz • Final Exam • Rubric • Lab Exam
2.4	Identify theoretically and practicallythe strength of each searching and sorting algorithms using several data structures.	S4	• Lectures • Exercises • Assignments • Lab Exercises	• Midterm Exam • Quiz • Final Exam • Rubric • Lab Exam
3.0	Values, autonomy, and responsibility			
3.1	Appreciate learning as a lifelong process and the importance development of data structure and algorithm.	V1	• Mini projects/Labs	• Lab/Project evaluation form (Rubric)

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to data structures	2
2.	Object-oriented programming and class hierarchies	3
---	Single and double Linked lists	3
	Circular linked lists	1
	Stacks	2
	Queues	2
	Recursion	2
	Graphs	2
	Trees and heap	2
	Sorting	2
	Complexity	1
Total		22

No	List of Topics	Contact Hours
3.	Introduction to data structures	1
4.	Object-oriented programming and class hierarchies	1
---	Single and double Linked lists	3
	Circular linked lists	2
	Stacks	2
	Queues	1
	Recursion	1
	Graphs	2
	Trees and heap	3
	Sorting	3
	Project	3
Total		22

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework, Exercises, and Programming Assignments	Weekly	10%
2.	Midterm	6th week	20%
3.	Project	10th week	20%
4.	Lab Exam	11th week	20%
5.	Final Exam	TBD	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	• "Data Structures: Abstractions and Design Using Java," by Elliot B. Koffman and Paul A. Wolfgang, 2nd edition, John Wiley and Sons, 2010. • Object-Oriented Data Structures Using Java", Nell Dale, Jones & Bartlett Learning; 3rd edition (February 25, 2011). ISBN-10: 1449613543. ISBN-13: 978-1449613549
Supportive References	• "Data Structures & Algorithms in Java," (2rd Ed.) by Robert Lafore, 2002, Sams Publishing • "Data Structures and Algorithms in Java" ,M.T. Goodrich and R. Tamassia, Jon Wiley & Sons Inc., 2014
Electronic Materials	• ACM (Association for Computer Machinery) web site - http://www.acm.org/ • ACM SIGPLAN (Special Interest Group on Programming Languages) - http://www.sigplan.org/ • IEEE Computer Society web site - http://www.computer.org/portal/web/guest/home • Open access course material online
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• A classroom or lecture hall with whiteboard for 25 students.
Technology equipment (projector, smart board, software)	• Data Show • Updated version of subject syllabus is uploaded for student reference. • An instructor computer station with High-speed Internet connection • A desktop computer with a common language compiler (Java, etc.) • Power outlets for instructor's laptop plug-in
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	• Course Coordinator • Students • Program Chair • Peer Reviewers	• Survey (indirect) • Exam Review (direct) • Course evaluation by Peer Reviewers (indirect). • Comprehensive Course report (where we can find information about teaching difficulties and action plan, …)
Effectiveness of students assessment	• Students • Exam Evaluation Committee • Course Coordinator	• Survey (indirect) • Exam Review (direct) • Review of course file (direct) • Direct feedback from students (interview between Program leader and students). • Exam evaluation by the Exam Evaluation Committee (indirect)
Quality of learning resources	• Faculty • Students	• Survey (indicator)
The extent to which CLOs have been achieved	• Faculty • Program Leaders • Course Coordinator	• Exam Exit Exam (direct) • Student Results (direct) • Comprehensive Course report (where we can find the CLO assessment results)
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	