



Course Specification

(Bachelor)

Course Title: Data Structures

Course Code: CS1242

Program: Bachelor of Computer Science

Department: Computer Science

College: College of Computer and Information Sciences

Institution: Imam Mohammad Ibn Saud Islamic University

Version: 1.0

Last Revision Date: 27 April 2025 *Pick Revision Date.*



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A. General information about the course:

1. Course Identification

1. Credit hours: (4 Hours)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (Level 4/Year 2)

4. Course General Description:

This course provides the students with understanding of the concepts on data representation and organization used in development of computer applications. This includes basic and advanced data structures such as Linked Lists, Stacks, Queues, Binary Trees, Binary Search Trees, Hash Tables and Graphs. The students are trained to use the programming concepts such as Abstraction and encapsulation to implement the data structures using Java language. The course will also introduce basic knowledge of algorithm analysis and, space and time complexity. Various sorting and searching algorithms will be introduced as well

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

CS1241-Object Oriented Programming

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

No co-requisites

7. Course Main Objective(s):

The main purpose of this course is to provide students the knowledge of data representation and their organization with respect to concepts of time and space complexity.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	90	100%
2	E-learning	-	-
3	Hybrid - Traditional classroom - E-learning	-	-





No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning	-	-

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	30
5.	Others (specify)	0
Total		90

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

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the basic and advanced data structures and their applications for real world software systems	K1, K2	1. In-class lectures. 2. In-class tutorials.	Written exams (midterms and final).
2.0	Skills			
2.1	Compute the time complexity for small programs.	S1	1. In-class lectures. 2. In-class tutorials. 3. Lab tutorials.	Written exams (midterms and quizzes). Lab Exams
2.2	Implement the appropriate concepts related to data structures for solving a particular problem.	S3	1. In-class lectures. 2. In-class tutorials. 3. Lab tutorials.	Written exams (midterms and quizzes). Lab Exams Assignments



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.3	Design and implement the appropriate Classes/Interfaces/Functions for a small to medium-level problem with space/time efficiency in mind.	S4	1. In-class lectures. 2. In-class tutorials. 3. Lab tutorials.	Written exams (midterms and quizzes). Lab Exams Assignments
2.4	Apply basic and advanced sort algorithms to solve a problem	S2	1. In-class lectures. 2. In-class tutorials. 3. Lab tutorials.	Written exams (midterms and quizzes). Lab Exams Assignments
2.5	Apply a variety of search algorithms to solve a problem	S2	1. In-class lectures. 2. In-class tutorials. 3. Lab tutorials.	Written exams (midterms and quizzes). Lab Exams Assignments
3.0	Values, autonomy, and responsibility			
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Review of Encapsulation, Inheritance, and Simple Data Structures in Java. This will address the basic Java classes and interfaces	6
2.	Introduction to Algorithm Analysis	6
3.	Linked Lists 1. Single linked list 2. Double link list 3. Circular linked list	14
4.	Stacks 1. Basic concepts and implementation 2. RPN (Postfix expression) evaluation	6
5.	Queues	6



	1. Basic concepts and implementation 2. Circular array implementation using arrays.	
6.	Trees 1. Binary Tree 2. Binary Search Tree 3. Expression Trees	12
7.	Priority Queue and Heap Sort- Self-study	6
8.	Searching 1. Linear search 2. Binary Search	6
9.	Hash Tables 1. Hash function implementation 2. Collision concept (i.e. double hashing, separate chaining, linear probing)	8
10.	Graph Data Structures 1. Shortest Path 2. Minimum Spanning Tree	10
11	Sorting 1. Bubble Sort 2. Insertion Sort 3. Quick Sort 4. Selection Sort	6
Total		90

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz	5, 12	15%
2.	Midterm Exams	9	20%
3.	Lab Quizzes	6, 13	15%
4.	Lab work: Assignments	4, 11	10%
5.	Final Exam	Final Week	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	Java How To Program-Early Objects, Third Edition, Deitel, P. and Deitel, H., Publisher: Prentice Hall Press, 2015, ISBN-10: 0132576279, ISBN-13: 978-0132576277. Open Data Structures (in Java), Pat Morin, Publisher: UBC Press; 31st ed. Edition, 2013, ISBN-10: 1927356385, ISBN-13: 978-1927356388. Data Structures and Algorithms in Java, Robert Lafore, 2nd Edition, Publisher: Sams Publishing, 2012, ISBN-10: 0672324539, ISBN-13: 978-0672324536. Java Structures: Data Structures in Java for the Principled Programmer, Duane A. Bailey, Second Edition, Publisher: McGraw-Hill Science/Engineering/Math, 2007, ISBN-10: 0072399090 ISBN-13: 978-0072399097
Supportive References	Data Structures and Algorithm Analysis in Java, Third Edition, Mark Allen Weiss, Publisher: Pearson, 2012, ISBN-13: 978-0132576277, ISBN-10: 0132576279.
Electronic Materials	Blackboard (Learning Management System)
Other Learning Materials	N/A

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with: - At least 35 seats - A projector connected to a PC preferably with Internet connection - Sliding board
Technology equipment (projector, smart board, software)	Lab for programming practice with suitable development environment (NetBeans, Eclipse, ... etc)
Other equipment (depending on the nature of the specialty)	N/A



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Instructors, Program Leaders	1. Students feedback (collected through course evaluation surveys) 2. Course report submitted by instructors. 3. Reviewing course reports by the program leaders
Effectiveness of Students assessment	Students, Instructors, Program Leaders	1. Students feedback (collected through course evaluation surveys) 2. Course report submitted by instructors 3. Reviewing course reports by the program leaders
Quality of learning resources	Instructors, Program Leaders	1. Direct assessments for students' grades related to CLOs 2. Reviewing course reports (including CLOs achievement) by instructors and program leaders
The extent to which CLOs have been achieved	Program Leaders	1. Reviewing Course Specification and Reports by program leaders
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	COMPUTER SCIENCE DEPARTMENT COUNCIL
REFERENCE NO.	1446/3101
DATE	29-4-2025

