Course Specification
(Bachelor)

Course Title:	Data Structures
Course Code:	321CCS-3
Program:	Bachelor of Science in Computer Science
Department:	Department of Computer Science
College:	Computer Science and Information Systems
Institution:	Najran University
Version:	2.0
Last Revision Date:	August 2022

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

3 (2, 2, 1) [Theory, Lab, Tutorial]

2. Course type

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

3. Level/year at which this course is offered: (Level 5/Year 3)

4. Course General Description:

Study of common Abstract Data Types (ADTs), basic data structures and design and analysis of algorithms. Common ADTs: stack, queue, list, tree, priority queue, map and dictionary. Basic Data structures include arrays, linked lists, heaps, hash tables, and search trees. Basic design and analysis of algorithms cover asymptotic notation, recursive algorithms, searching and sorting, tree traversal, and graph algorithms.

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

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

None

7. Course Main Objective(s):

Upon the successful completion of this course, students will be able to:

1. Describe basic ADTs (stack, queue, array, list, node list, priority queue, tree, map and dictionary) and their related data structure implementations (array, single linked structure, double linked structure, heap, hash table, binary search tree, AVL tree).
2. Distinguish between Abstract Data Types (ADTs), data structures and algorithms.
3. Calculate the costs (space/time) of data structures and their related algorithms, both source code and pseudo-code, using the asymptotic notation (O()).
4. Recognize basic concepts and techniques (recursive, sorting, searching, graph) used in the design of basic algorithms.
5. Implement basic algorithms and ADTs using different data structure strategies.
6. Decide which type of data structures and algorithms best suits the problem they are solving.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		75

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 basic ADTs (stack, queue, array, list, node list, priority queue, tree, map and dictionary) and their related data structure implementations (array, single linked structure, double linked structure, heap, hash table, binary search tree, AVL tree)..	K_1	TS-1: Relate Course Learning Outcomes (CLOs) to the topics TS-2: Lectures: using PPT presentation to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed.	- Class Quizzes. - Assignments. - Midterm exams (Each exam consists of multiple choice questions, true/false, fill-in-the-blanks, and theoretical questions.)

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.2	Distinguish between Abstract Data Types (ADTs), data structures and algorithms.	K_1	TS-3: Motivating students to work at home, to search from the internet, to read related reference books by giving them assignments related to the analysis of algorithms and data structures. TS-4: Let students solve the problems related to the complexity of different algorithms in small groups and give corrections on their solutions during class. TS-5: Motivating students to be active during class by asking questions regularly. TS-6: Giving students tutorials related to the importance of data	- Final Exam
1.3	Recognize basic concepts and techniques (recursive, sorting, searching, graph) used in the design of basic algorithms	K_1, K_3		
2.0	**Skills**			
2.1	Calculate the costs (space/time) of data structures and their related algorithms, both source code and pseudo-code, using the asymptotic notation (O( )).	S_1	TS-1:lectures TS-2:Giving students tutorials related to the importance of data	- Assignments. - Midterm exams - Final Exam. - Lab assessment - Final lab Exam
2.2	Decide which type of data structures and algorithms best suits the problem they are solving.	S_1, S_2, S_5		
2.3	Implement basic algorithms and ADTs using different data structures strategies.	S_2, S_5		
3.0	**Values, autonomy, and responsibility**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
3.1				
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to data structures and algorithms analysis	5
2.	Algorithms Analysis (cont.)	10
3.	Stacks and Queues	10
4.	Single and Node (double linked) Lists	5
5.	Trees	5
6.	Binary Search Trees, AVL Tree	10
7.	Priority Queues and Heaps	10
8.	Sorting	10
9.	Maps and Hashes	10
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Assignment	5th	10%
2.	Mid Lab Exam	7th	10%
3.	Quizzes	2th & 7th	5%
4.	Lab Assessment	continuous	10%
5.	Final Lab Exam	14th	15%
6.	Final Exam	16th	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	1. Data Structures and Algorithms in Java, 6th Edition, by Michael Goodrich, RobertoTamassia, and Michael Goldwasser, 2014

Supportive References	1. Mark Allen Weiss: Data Structures and Algorithm Analysis in Java, 3rd Edition, Pearson 2012. 2. Robert Lafore, Data Structures & Algorithms in Java, Latest Edition. Note: Handouts will also be distributed in class.
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms to accommodate 30 students per classroom with desks and chairs, and labs to accommodate 30 students per lab with advanced computers.
Technology equipment (projector, smart board, software)	Data show, stationaries, smart board, suitable IDE
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Collecting students' suggestions to facilitate more during the class.	Students	Verbal discussion
Student's questionnaire once during the semester about course learning outcomes.	Students	Indirect Survey
Achievement percentage of course learning outcomes, direct evaluation using CLO assessment sheet	Course Instructor	Direct evaluation using CLO achievement calculation
Teaching strategies	Quality unit	Indirect
Assessment methods	Quality unit	Indirect
Instructor performance	Quality unit	Indirect
Course content	Quality unit	Indirect

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Computer Science Departmental Council

REFERENCE NO.	14440203-0185-00002
DATE	1st Sep, 2022