Course Specifications

Course Title:	**Data Structures**
Course Code:	**321CCS-3**
Program:	**Computer Science**
Department:	**Computer Science**
College:	**Computer Science and Information System**
Institution:	**Najran University**

Table of Contents

A. Course Identification

1. Credit hours:	3 (2, 2, 1) [**Theory, Lab, Tutorial**]
2. Course type	
a.	University ☐ College ☑ Department ☐ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	Year 3 / Level 5
4. Pre-requisites for this course (if any)**:**	Fundamentals of Programming (211CCS-4)
5. Co-requisites for this course (if any)**:**	N/A

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	75	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	15
4	**Others** (specify)	
	Total	75
Other Learning Hours*		
1	**Study**	25
2	**Assignments**	10
3	**Library**	10
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	45

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course 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, search trees. Basic design and analysis of algorithms covers asymptotic notation, recursive algorithms, searching and sorting, tree traversal, graph algorithms.

2. Course Main Objective

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

- 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, AVLtree).
- Distinguish between Abstract Data Types (ADTs), data structures and algorithms.
- Calculate the costs (space/time) of data structures and their related algorithms, both source code and pseudo-code, using the asymptotic notation (O()).
- Recognize basic concepts and techniques (recursive, sorting, searching, graph) used in design ofbasic algorithms.
- Implement basic algorithms and ADTs using different data structures strategies.
- Decide which type of data structures and algorithms best suits the problem they are solving.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	**CLO_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)..	a,i
1.2	**CLO_2:**Distinguish between Abstract Data Types (ADTs), data structures and algorithms.	a
1.3	**CLO_4:**Recognize basic concepts and techniques (recursive, sorting, searching, graph) used in design of basic algorithms	a, k
1...	**CLO_5:**Implement basic algorithms and ADTs using different data structures strategies.	c, k
2	**Skills :**	
2.1	**CLO_3:**Calculate the costs (space/time) of data structures and their related algorithms, both source code and pseudo-code, using the asymptotic notation (O()).	a, b
2.2	**CLO_6:**Decide which type of data structures and algorithms best suits	b, j

CLOs		Aligned PLOs
	the problem they are solving.	
2.3		
2...		
3	**Competence:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to data structures and algorithms analysis	5
2	Algorithms Analysis (cont.)	5
3	Stacks and Queues	8
4	Single and Node (double linked) Lists	5
5	Trees	4
6	Binary Search Trees, AVL Tree	8
7	Priority Queues and Heaps	5
8	Sorting	8
9	Maps and Hashes	5
Total		66

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
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).	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.	Following methods are used to assess student's knowledge acquire in this course. • ClassQuizzes. • Assignments. • Midterm exams (Each exam consists of multiple choice FinalExam
1.2	Distinguish between Abstract Data Types (ADTs), data structures andalgorithms.	TS-3: Motivating students to work in home, to search from internet, to read	

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		related reference books by giving them assignments related to analysis of algorithm and data structures. TS-4: Let students to solve the problems related to complexity of different algorithms in small groups and giving correction on their solution during class. TS-5: Motivating students to be active during class by asking questions regularly. Use of virtual class through blackboard collaborate. TS-6: Giving students' tutorials related to importance of data	
…			
2.0	**Skills**		
2.1	Following are the cognitive skills which are developed in this course: Calculate the costs (space/time) of data structures and their related algorithms.	TS-1:lectures TS-2:Giving students' tutorials related to importance of data	• Assignments. Midterm exams Final Exam. Lab assessment Final lab
2.2	Decide which type of data structures and algorithms best suits the problem they are solving.		
2.3	Implement basic algorithms and ADTs using different data structures strategies.		
3.0	**Competence**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes (Quiz 01 and Quiz 02)	2rd week and 7th week	4%
2	Project and Assignments (Two assignments)	6th week and 9th week	6%
3	Mid Term Exam-I	6th week	15%
4	Mid Term Exam-II	10th week	15%
5	Lab homework lab assessment	7th week	10%
6	Final Lab Exam		10%
7	Final Exam		40%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

During the whole semester, 10 hours/week are reserved for students to guide them, to help them and to explain them topic which is not clear to them during lecture.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Data Structures and Algorithms in Java, 5th Edition, by Michael Goodrich and RobertoTamassia
Essential References Materials	• Mark Allen Weiss: Data Structures and Algorithm Analysis in Java, 3rd Edition2006. • Robert Lafore, Data Structures & Algorithms in Java, Latest Edition. Note: Handouts will also be distributed in class.
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture Rooms with 20 seats with smart table, Mic, Speaker, PC, Auto Projector with Screen and a white board or a smart board (male Section).
Technology Resources (AV, data show, Smart Board, software, etc.)	Desktop/ Laptop computer Multimedia Projector
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Collecting students' questionnaire about the faculty	Students	Survey

Evaluation Areas/Issues	Evaluators	Evaluation Methods
and teaching methods.		
Collecting students' suggestions to facilitate more during the class.	Students	Verbal discussion
Student's questioner once during 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

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council
Reference No.	Session No. 10 (441-38-43300)
Date	17/02/2020