



# Course Specification

## — (Bachelor)

Course Title: **Data Structures**

Course Code: **APCS3210**

Program: **Programing and Computer Science Program**

Department:

College: **Applied College**

Institution: **Umm Al-Qura University**

Version: **1**

Last Revision Date: **Jan 2025**

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## A. General information about the course:

### 1. 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: (3<sup>rd</sup> level – 2<sup>nd</sup> year)

#### 4. Course General Description:

This course provides theoretical and practical knowledge of fundamental data structures. Topics covered include arrays stacks, queues, trees etc. These data structures are explained using basic sorting and searching techniques with brief overview of recursion and memory management. The course also explores the implementation of a range of data structures in the Java programming language. The knowledge and practice of these structures are of utmost importance. It will make the students able to organize, represent and manipulate the data, which is central to computing.

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

Computer Programming (2)

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

#### 7. Course Main Objective(s):

1. Describe, compare and use fundamental data structures: lists, stacks, queues, trees, and heaps.
2. Evaluate the efficiency of a data structure and its implementation
3. Design and implement and choose the most appropriate data structure and for a given problem.

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	2	66 %
2	Lab	1	34%
3	E-learning		
4	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> <li>E-learning</li> </ul>		
5	Distance learning		

### 3. Contact Hours (based on the academic semester)

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

## 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				
1.1	Outlines fundamental data structures: lists, stacks, queues, trees.	K3(I)	<ul style="list-style-type: none"> <li>Lectures</li> <li>Developing basic communicative</li> </ul>	<ul style="list-style-type: none"> <li>Homework.</li> <li>Group Discussion</li> </ul>
1.2	Recall the conceptual of trees , Recursion	K4(I)	<ul style="list-style-type: none"> <li>Ability through short and varied situated discourse.</li> <li>Team work Exercises</li> </ul>	<ul style="list-style-type: none"> <li>Presentation</li> <li>Mid-term exam</li> </ul>
...			<ul style="list-style-type: none"> <li>Lectures and Labs</li> <li>Lectures</li> <li>Developing basic communicative</li> </ul>	<ul style="list-style-type: none"> <li>Final test QUIZZ, midterm and final exam</li> <li>Homework.</li> </ul>





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			<ul style="list-style-type: none"><li>Ability through short and varied situated discourse.</li><li>Team work Exercises</li></ul>	<ul style="list-style-type: none"><li>Group Discussion</li><li>Presentation</li><li>Mid-term exam Final test</li></ul>
2.0	Skills			
2.1	Design and implement and choose the most appropriate data structure and for a given problem	S2	Problem solving Class discussion Presentation Individual meeting with the instructor (encouraging students to discuss different topics)	<ul style="list-style-type: none"><li>Class Participation</li><li>Presentation</li><li>Essay</li><li>Question Research</li></ul>
2.2	Applied data structure sorting and searching	S3		
...				
3.0	Values, autonomy, and responsibility			
3.1	Document his/her data structure project and how to write references	V1(P)	Presentation	EAXM PROJECT
3.2	Write up to date research about data structure	V2		
3.3	Work with in a team work to accomplish a data structure project	V3		

### C. Course Content

No	List of Topics	Contact Hours
1	Arrays revision	2
2	Intruduction to Algorithms	2
3	Sorting Algorithms	6
4	Searching Algorithm	2
5	Stack	2
6	Queues	2
7	Linked Lists	2
8	Recursion	4





10	Trees and Binary search trees	2
11	Balanced Trees	2
12	Hash table	2
Total		30

## D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Throughout the term	10%
2.	Practical exam	15	15%
3.	Practical Assignments	Throughout the term	15%
4.	Midterm	7	20%
5.	Final	16	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 and algorithms in Java, 6th Edition, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, 2014, ISBN13: 978-1118771334. • Introduction to Java Programming and Data Structures, Comprehensive Version 12th Edition
Supportive References	Course notes on the E-learning web-site
Electronic Materials	<a href="http://sheekh-3arb.info/islam/library/books/programming/datastructure-course.pdf">http://sheekh-3arb.info/islam/library/books/programming/datastructure-course.pdf</a> <a href="http://www.sanlp.org/malik/ads/cpcs 324 – algorithms and data structures 01.pdf">http://www.sanlp.org/malik/ads/cpcs 324 – algorithms and data structures 01.pdf</a> ♣ <a href="http://www.sanlp.org/malik/ads/cpcs 324 – algorithms and data structures 04.pdf">http://www.sanlp.org/malik/ads/cpcs 324 – algorithms and data structures 04.pdf</a> ♣ <a href="http://www.pvpsiddhartha.ac.in/syllabus_07_08/it/ii-i/advanced data structures and algorithms lab.doc">http://www.pvpsiddhartha.ac.in/syllabus_07_08/it/ii-i/advanced data structures and algorithms lab.doc</a>
Other Learning Materials	Other learning material such as computer-based programs/CD, professional standards or regulations and software. ♣ A CD is available for the book: Thinking Mathematically; Robert Blitzer; 4th Edition; Prentice Hall; 2008. A complete electronic course is available.

### 2. Required Facilities and equipment



Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> <li>Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) Lecture rooms are well equipped with:</li> <li>air conditioned with at least 20 adequate seats.</li> <li>Interactive/smart Board.</li> <li>Up-to-date projector.</li> <li>An Auditorium is well equipped with:</li> <li>Air conditioned with at least 100 adequate seats.</li> <li>Interactive/smart Board.</li> <li>Up-to-date projector</li> </ul>
<b>Technology equipment</b> (projector, smart board, software)	<ul style="list-style-type: none"> <li>Personal computer with necessary up-to-date software.</li> <li>DBS Smart Systems.</li> <li>Interactive Board.</li> <li>Laptop.</li> </ul>
<b>Other equipment</b> (depending on the nature of the specialty)	<ul style="list-style-type: none"> <li>Colored Printer (needed).</li> <li>Central Laser-Printer, and Scanner.</li> <li>Wall Boards (are essentially needed.).</li> <li>Internet inside the classroom (missed.).</li> <li>Library: Up to date scientific books, in the library.</li> <li>Wi-Fi and internet connections are available inside the teaching staff rooms, and the seminar room.</li> </ul>

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Program Leaders	Course report
Effectiveness of Students assessment	Program Leaders	Course report
Quality of learning resources	Program Leaders	Course report
The extent to which CLOs have been achieved	Students	Survey
Other		

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

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

COUNCIL /COMMITTEE	Umm Al-Qura University Council
REFERENCE NO.	851141114462/190365
DATE	1446/11/22



