King Fahd University of Petroleum & Minerals
College of Computer Sciences and Engineering
Information and Computer Science Department

ICS 202: Data Structures and Algorithms (3-3-4)

Syllabus – First Semester 2023-2024 (231)

Website: Blackboard.

Class Time, Venue and Instructor Information:

Lecturer				
Sec.	**Time**	**Venue**	**Instructor**	**Office Hours**
01	UTR 08:00 - 08:50am	22-119	**Mustafa Alturki** Office: 23-64-02 Phone: 013-860-2175 E-mail: mustafa.alturki@kfupm.edu.sa	TR: 10:00-10:50am; Also by appointment
02	UTR 09:00 - 09:50am	22-130		
04	UTR 11:00 - 11:50am	59-1003		
05	UTR 1:00 - 1:50pm	22-127		
03	UTR 08:00 - 08:50am	24-156	**Wasfi G. Al-Khatib** Office: 22-328 Phone: 013-860-1715 E-mail: wasfi@kfupm.edu.sa	UTR: 1:00 – 2:00pm; Also by appointment
F11	UTR 10:00 - 10:50am	7-116	**Rashad Othman** Office: 22-106 Phone: 013-860-8839 E-mail: rashad.othman@kfupm.edu.sa	UTR: 1:00 – 2:00pm; Also by appointment
F12	UTR 11:00 - 11:50am			
54	U 02:00-04:40pm	22-335	**M Faisal Nurnoby** Office: 22-115 Phone: MS Teams (By appointment) E-mail: g201706690@kfupm.edu.sa	MW: 8:30am - 9:30am Also, by appointment
52	T 02:00-04:40pm	22-335	**Md. Kamrul Hossain** Office: via Teams Phone: 0547792129 E-mail: g202215400@kfupm.edu.sa	T: 01:00 – 1:50pm; Also, by appointment.
53	R 02:00-04:40pm	22-335	**Mohammed Ayub** Office: 22-115 Phone: MS Teams (By appointment) E-mail: g201707490@kfupm.edu.sa	R: 12:30 – 01:50 pm; Also, by appointment
51	U 2:00-04:40pm	22-339		
55	T 2:00-04:40pm	22-339	**A.B.M. Ashikur Rahman** Office: 22-115 Phone: 0536227244 E-mail: g202204800@kfupm.edu.sa	TR: 01:00 – 1:50pm; Also, by appointment.
56	R 2:00-04:40pm	22-339		
F61	T 11:00-01:40pm	7-137	**Sulafah Noruldeen** Office:22-219 Phone: 0502717971 E-mail: s.noruldeen@kfupm.edu.sa	Sunday 1-1:50 PM; Also, by appointment
F62	T 2:00-04:40pm	7-137		

Text Books:

Adam Drozdek, "Data Structures and Algorithms in Java", Thomson Learning, 4th edition, 2013, ISBN 978-981-4239-23-3.

Catalog Course Description:

Review of object-oriented concepts; Basic algorithms analysis; Fundamental data structures - implementation strategies for stacks, queues and linked lists; Recursion; Implementation strategies for tree and graph algorithms; Greedy Algorithms; Hash tables; Applications of data structures (e.g. data compression and string matching).

Prerequisite: ICS 108

Course Objectives:

The objectives of this course are to:

1. Introduce students to fundamental data structures; their algorithms, implementations and applications.
2. Teach students how to analyze the efficiency of the fundamental data structures in terms of both time and space so that they are able to decide what data structure is suitable for a given problem.

Course Learning Outcomes:

After completion of this course, the student shall be able to:

1. Apply object oriented concepts (inheritance, polymorphism, etc.) in software design. [SO 2]
2. Implement various data structures and their algorithms, and apply them in implementing simple applications. [SO 2]
3. Analyze simple algorithms and determine their efficiency using big-O notation. [SO 1]
4. Analyze the efficiency of the fundamental data structures in terms of both time and space. [SO 1]
5. Decide which data structures are suitable for which applications. [SO 2]
6. Apply the knowledge of data structures to other application domains such as data compression and hashing. [SO 2]

Assessment Plan:

Assessment Tool (Lecture)	Weight
Homework Assignments	**10%**
Quizzes Quiz 1: Sunday 10 September 2023, in class. Quiz 2: Sunday 1 October 2023, in class. Quiz 3: Sunday 29 October 2023, in class. Quiz 4: Sunday 12 November 2023, in class. Quiz 5: Sunday 3 December 2023, in class.	**10%**
Midterm Exam: Monday 9 October 2023 at 6:00pm.	**25%**
Final Exam: TBA	**30%**

Assessment Tool (Lab)	Weight
Two (2) Lab Quizzes (Before and After Midterm)	**2 * 4% = 8%**
One (1) Lab Project	**7%**
Lab Assignments	**10%**

Main Topics and Their Coverage (Tentative)

1. Review of Object Oriented Principles (1 Lecture and 1 (review) lab, SDF/Algorithms and Design)
2. Introduction to Algorithm Analysis (4 Lectures, AL/Basic Analysis)
3. Linked Lists (4 Lectures and 1 Lab, SDF/Fundamental Data Structures)
4. Stacks & Queues (3 Lectures and 1 Lab, SDF/Fundamental Data Structures)
5. Recursion (4 Lectures and 1 Lab, SDF/Algorithms and Design)
6. Trees, Binary Trees, Binary Search Trees & Tree Traversal Algorithms (4 Lectures and 1 Lab, AL/Fundamental Data Structures and Algorithms)
7. Binary Heaps (2 Lectures and 1 Lab, AL/Fundamental Data Structures and Algorithms)
8. AVL Trees & B/B+-Trees (6 Lectures and 1 Lab, AL/Advanced Data Structures, Algorithms, and Analysis)
9. Graphs, Graph Traversal Algorithms (7 Lectures and 1 Lab, AL/Fundamental Data Structures and Algorithms)
10. Hashing and String Matching (6 Lectures and 2 Labs).
11. Data Compression (3 lectures).

Notes:

- All course material will be made available on Blackboard.
- **Attendance** will be checked for each class.
- An **unexcused absence** can become an **excused absence** ONLY by an official letter from the Students Affairs office.
- Students are expected to be courteous toward the instructor and their classmates throughout this course.
- All mobile phones must be turned off during class and exams.
- Soft copies of homework assignments (according to the instructions given with each assignment) are to be submitted, through Gradescope, by the due date and time indicated. **No late homework** will be

accepted. Discussing questions among your classmates and on Blackboard is highly encouraged. Copying homework solutions from each other is NOT permitted and will be considered **CHEATING**.

- Material covered in homework assignments, which maybe outside the material presented in class, are required to be mastered by the students and can be tested on in quizzes, midterm and/or final exams.
- Check the Blackboard course page regularly for announcements and updates.

Course Weekly Schedule[1]

Week #	Date	Lecture Topic	Lab Topic	Notes
W #1	Aug 27	Overview	Introduction	
	Aug 29	Complexity Analysis		
	Aug 31	Complexity Analysis		
W #2	Sep 3	Complexity Analysis	Review of Object-Oriented Concepts	HW #1 is posted
	Sep 5	Complexity Analysis		
	Sep 7	Singly Linked Lists		
W #3	Sep 10	Singly Linked Lists	Singly Linked Lists	
	Sep 12	Doubly Linked Lists		
	Sep 14	Doubly Linked Lists		
W #4	Sep 17	Stacks	Doubly Linked Lists	HW #1 is due HW #2 is posted
	Sep 19	Stacks		
	Sep 21	Queues		
W #5	Sep 24	National Day Holiday		
	Sep 26	Recursion	Stacks and Queues	
	Sep 28	Recursion		
	Oct 1	Recursion		
W #6	Oct 3	Recursion Analysis	Lab Quiz 01	
	Oct 5	Binary Trees		
	Oct 8	Binary Trees		
W #7	Oct 10	Binary Search Trees	Recursion	HW #2 is due HW #3 is posted
	Oct 12	Binary Search Trees		
	Oct 15	AVL Trees		
W # 8	Oct 17	AVL Trees	Binary and Binary Search Trees Lab Project Assigned	
	Oct 19	Binary Heaps		
	Oct 22	Binary Heaps		
W #9	Oct 24	B Trees	AVL Trees	
	Oct 26	B Trees		
	Oct 29	B+ Trees		
		Midterm Exam Sunday 29 October 2023 at 6:00pm		
W #10	Oct 31	B+ Trees	Binary Heaps	HW #3 is due HW #4 is posted
	Nov 2	Graph Representations and Traversals		
	Nov 5	Graph Representations and Traversals		
W #11	Nov 7	Graph Representations and Traversals	Lab Quiz 02	
	Nov 9	Graph Representations and Traversals		
	Nov 12	Hashing		
W #12	Nov 14	Hashing	Graphs and Graph Algorithms	
	Nov 16	Hashing		
	Nov 19 – Nov 23	Midterm Break		
	Nov 26	String Matching		
W #13	Nov 28	String Matching	Hashing	HW #4 is due
	Nov 30	String Matching		
	Dec 3	Graph and Greedy Algorithms		
W #14	Dec 5	Graph and Greedy Algorithms	String Matching	
	Dec 7	Graph and Greedy Algorithms		
	Dec 10	Data Compression		
W #15	Dec 12	Data Compression	No Lab Lab Project Demos Due	
	Dec 14	Data Compression		
	Dec 17	Review		

[1] Lab tasks may not be accurate due to the breaks. Please consult your lab instructors for exact dates