

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

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

Summer Semester 2007-2008 (073)

Syllabus

Instructor: Dr. EL-SAYED EL-ALFY

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Schedule:

	Day	Time	Room
Lecture	SUMTW	9:20am-10:20am	24-141
Lab	UT	2:10pm-5:10pm	22-416
Office Hours	UT*	10:20pm-11:00pm	22-108

* or by appointment

Catalog Description:

Introduction to Design Patterns. Introduction to Algorithm Analysis. Review and Analysis of Linear Data Structures. Recursion, Trees and Graphs. Implementations of Tree and Graph Traversals. BST, AVL, Heaps and B-Trees. Hashing Techniques. Data Compression. Memory Management. Practice in Developing Medium Scale Programs.

Pre-requisites: ICS201.

Objectives

1. Introduce students to fundamental data structures and their algorithms, implementations and applications.
2. Teach students how to analyze the efficiency of 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.

Learning Outcomes

Upon completion of the course, you should be able to:

1. Apply object-oriented concepts (inheritance, polymorphism, design patterns, etc.) in software design.
2. Implement various data structures and their algorithms, and apply them in implementing simple applications.
3. Analyze simple algorithms and determine their efficiency using big-O notation.
4. Apply the knowledge of data structures to other application domains like data compression and memory management.

Required Material

- *Data Structures and Algorithms in Java, 2nd Edition.* Adam Drozdek. Thomson Learning, 2005.

- *Data Structures and Algorithms with Object Oriented Design Patterns in Java*. Bruno R. Preiss. John Wiley & Sons, 2000. [Online].

Additional Recommended References

- *Data Structures, Algorithms, and Applications in Java, 2nd edition*. S. Sahni. Silicon Press, 2004.
- *Data Structures and Algorithms in Java, 4th edition*. M.T. Goodrich & R. Tamassia, John Wiley & Sons, 2006

Grading Policy

Activity	Weight
Laboratory [Participation = 0.5% * 12, Open Book Programming Quizzes = 14%]	20%
Practice Assignments	0 %
Project	13 %
Quizzes	12 %
Midterm	25 %
Final Exam	30 %

Detailed Schedule (Tentative)

Date	Lec #	Lectures			Laboratories			Readings
		Topics	Other Activities	Lab #	Topics	Other Activities		
5-Jul	Sat	1	Review of OO Concepts					
6-Jul	Sun	2	Design Patterns		0	Getting Started < download >		Preiss Chapter 5
7-Jul	Mon	3	Complexity Analysis I					
8-Jul	Tue	4	Complexity Analysis II		01	Design Patterns I < html > < zip >		Preiss Chapter 3, Drozdek Chapter 2
9-Jul	Wed	5	Complexity Analysis II (Cont.)	HW1 Assign				
10-Jul	Thu							
11-Jul	Fri							
12-Jul	Sat	6	Singly Linked List	Quiz 1				Preiss Chapter 4, Drozdek Chapter 3
13-Jul	Sun	7	Doubly Linked List		02	Design Patterns II < html > < zip >		
14-Jul	Mon	8	Stacks					
15-Jul	Tue	9	Queues	HW1 Due	03	Linked List < html > < zip >		Preiss Chapter 6, Drozdek Chapter 4
16-Jul	Wed	10	Recursion I	HW2 Assign				
17-Jul	Thu							Slides, Drozdek Chapter 5
18-Jul	Fri							
19-Jul	Sat	11	Recursion II					

20-Jul	Sun	12	Analysis of Recursive Algorithms		04	Stacks & Queues <html> <zip>	Lab Quiz1: Design Patterns & Linked Lists	
21-Jul	Mon	13	Trees	HW2 Due				
22-Jul	Tue	14	Binary Search Trees (BSTs)		05	Recursion <html> <zip>		
23-Jul	Wed	15	Tree Traversal Algorithms					
24-Jul	Thu							
25-Jul	Fri							
26-Jul	Sat	16	Heaps					
27-Jul	Sun	17	AVL Trees I	Quiz 2	06	Binary Trees & BST <html> <zip>		Preiss Chapter 9, Drozdek Chapter 6 and 7, Heap Sort (Drozdek pg 484)
28-Jul	Mon	18	AVL Trees II	HW3 Assign				
29-Jul	Tue	19	B-Trees		07	Binary Heaps <html> <zip>		
30-Jul	Wed	20	Huffman Coding					
31-Jul	Thu							
1-Aug	Fri							
2-Aug	Sat	21	Introduction to Graphs					
3-Aug	Sun	22	Graph Implementation		08	AVL Trees <html> <zip>		
4-Aug	Mon	23	Graph Traversals					
5-Aug	Tue	24	Graphs: Topological Sort	HW3 Due	09	Huffman Coding <html> <zip>		
6-Aug	Wed	25	Review					Preiss Chapter 16, Drozdek Chapter 8
7-Aug	Thu							
8-Aug	Fri							
9-Aug	Sat	26	Review	Midterm				
10-Aug	Sun	27	Graphs: Cycles and Connectedness		10	Review	Lab Quiz 2: Stack, Queue, BST	
11-Aug	Mon	28	Graphs: Shortest Path Algorithm					
12-Aug	Tue	29	Graphs: Minimum Spanning Tree (MST)		11	Graphs <html> <zip>		
13-Aug	Wed	30	Hashing I	HW4 Assign				
14-Aug	Thu							
15-Aug	Fri							
16-Aug	Sat	31	Hashing II					Preiss Chapter 8
17-Aug	Sun	32	Hashing III		12	Graph Algorithms <html> <zip>		

18-Aug	Mon	33	Data Compression: LZ78						
19-Aug	Tue	34	Data Compression: LZW	HW4 Due	13	Hashing <html> <zip>	Lab Quiz 3: Heaps, Huffman, Graphs	Slides, Drozdek Chapter 10	
20-Aug	Wed	35	Memory Management					Preiss Chapter 13, Drozdek Chapter 12	
21-Aug	Thu								
22-Aug	Fri								
23-Aug	Sat	36	Garbage Collection	Quiz3					
24-Aug	Sun	37	Review & Project Presentations			14	Review		
25-Aug	Mon	38							
27-Aug	Wed	Final Exam As Posted by the Registrar							

Additional Notes

- **Course Website.** Students are required to periodically check the course website and download course materials as needed. Lecture notes will be made available ahead of time for students to read, print out, and bring to class. It is much easier to take additional notes this way, and gain the most out of class. Several resources will be posted through the website as well. Keys to quizzes and exams are generally discussed during class as time permits but solutions will not be posted. WebCT will be used for communication and interaction, posting and submitting assignments, posting grades, posting sample exams, etc. Also it is expected that you get benefit of the discussion board by raising questions or answering questions put by others.
- **Attendance:** It is very important to attend all classes. Attendance will be checked at the beginning of each class. More than 9 lectures will result in a DN grade without prior warning. To avoid being considered as absent, an official excuse must be shown no later than one week of return to class. There is no penalty for the first two absences, after that you lose one full percentage per absence.
- **Class participation:** Students are expected to be active and collaborative in the discussion of the topics. Homework assignments are given for you for practice but it is expected that you hand in a typed solution before or on the due date. You will not do well in the quizzes and exams if you do not do the homework assignments.
- **No make up quizzes or exams will be given.**
- **Re-grading policy:** If you have a complaint about any of your grades, discuss it with the instructor no later than a week of distributing the grades (except for the final). Only legitimate concerns on grading should be discussed.
- **Office Hours.** Students are encouraged to use the office hours to clarify any part of the material that is not clear; however the instructor will only provide hints if it is an assigned task but not solve it.
- **Lab Guidelines.** For the Labs, you must store all your work in a package ics202 on your z-drive. We shall be adding files to this package in each lab. Your lab exercises should be stored in sub-packages lab01, lab02, etc. You are required to observe this package structure throughout the semester. A student is required to prepare himself for a laboratory session by reading the laboratory document for that session, by studying the code, and by reading all lecture material related to the session. THIS PREPARATION IS ESSENTIAL FOR A STUDENT TO BE ABLE TO DO THE LABORATORY TASKS. The lab instructor will not conduct lectures; he may just elaborate on specific issues related to the current lab session.

- **Academic honesty:** Students are expected to abide by all the university regulations on academic honesty. Cheating will be reported to the Department Chairman and will be severely penalized. Although collaboration and sharing knowledge is highly encouraged, copying others' work without proper citation, either in part or full, is considered plagiarism. Whenever in doubt, review the university guidelines or consult the instructor.
- **Courtesy:** I will expect students to be courteous toward the instructor and their classmates throughout the duration of this course. Talking while someone else is speaking will not be tolerated. Furthermore, all cell phones must be turned off during class. In addition, students are expected to be in class on time. Late arrivals will disrupt the class session. If you are 15 minutes late, you will be marked as absent and will not be permitted to enter the class. More importantly, you are not allowed to leave the class unless it is of an urgent matter. To contact me, please use email through WebCT whenever possible and avoid using phone calls or written notes. When necessary to send an email through the university email system, please indicate ICS202-073 in the "Subject" field of your email, e.g. ICS202-073: Question about HW1.

☺☺☺ **Best of luck!!** ☺☺☺