

King Fahd University of Petroleum & Minerals
College of Computer Science and Engineering
Information and Computer Science Department
Syllabus for ICS 202 – Data Structures
Summer Semester 2008-2009 (083)

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Office Hours: SM 10:30-11:45am or by appointment

Text Books:

(1) “Data Structures and Algorithms in Java”, 2nd Edition, Adam Drozdek, Thomson Learning, ISBN 0-534-49252-5.

(2) “Data Structures and Algorithms with Object Oriented Design Patterns in Java”, Bruno R. Preiss, John Wiley & Sons, Inc., 2000. (ebook) Link: <http://www.brpreiss.com/books/opus5>

Catalog Course 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.

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, design patterns, etc.) in software design.
2. Implement various data structures and their algorithms, and apply them in implementing simple applications.
3. To analyze simple algorithms and determine their efficiency using big-O notation.
4. To apply the knowledge of data structures to other application domains like data compression and memory management.

Grade Distribution:

Activity	Weight
Laboratory	20% (see Lab Guidelines)
Home Works (2)	10%
Quizzes (4 to 5)	10%
EXAM 1: Wednesday July 29, 2009, 1-3pm	15%
EXAM 2: Wednesday August 19, 2009, 1-3pm	20%
Final Exam: Thursday September 3, 2009, 12:30pm	25%

Main Topics and Their Coverage in Lectures, Labs and the Text Books (Tentative)

Topics of Coverage	Number of Lectures	Number of Laboratories	Lecture Slides & Text Book References
Review & Introduction to Design Patterns	3	3	Lectures 1-3, Preiss Chapter 5
Introduction to Algorithm Analysis	2	0	Lectures 4-6, Preiss Chapter 3, Drozdek Chapter 2
Review of Linked Lists	3	1	Lectures 7-8, Preiss Chapter 4, Drozdek Chapter 3
Review of Stacks & Queues	2	1	Lectures 9-10, Preiss Chapter 6, Drozdek Chapter 4
Recursion and Recursive Algorithms	3	1	Lectures 11-14, Slides, Drozdek Chapter 5
Tree Structures and their Applications	9	3	Lectures 15-23, Preiss Chapter 9, Drozdek Chapter 6 and 7, Heap Sort (Drozdek pg 484)
Graphs and Graph Algorithms	8	2	Lectures 24-31, Preiss Chapter 16, Drozdek Chapter 8
Hashing Techniques	2	1	Lectures 32-34, Preiss Chapter 8
Garbage Collection	1	0	Lecture 35, Preiss Chapter 13, Drozdek Chapter 12
LZ-based Compression Techniques	1	0	

Notes:

- All course material will be made available at URL: <http://www.ccse.kfupm.edu.sa/alvif/ICS202083>
- **Attendance** will be checked each class.
- Students are expected to be courteous toward the instructor, the lab instructor and their classmates throughout the duration of this course.
- All cell phones and pagers must be turned off during class and exams.
- **No late homework** will be accepted. Discussing questions among your classmates and on WebCT is highly encouraged. Copying homework solutions from each other is NOT permitted and will be considered **CHEATING**.
- **24-Hour Policy:** One has 24 hours to object to the grade of a homework, quiz or a major from the end of the class time in which the graded exam/homework papers have been distributed. If for some reason you cannot contact the instructor within this period, send him an email requesting an appointment. The email should be sent within the 24-hour time period.
- Exams, homeworks and quizzes are generally **CHALLENGING**.
- Check the ICS 202 Webpage regularly for announcements and updates.

Detailed Schedule of Lectures, Labs, Homeworks, & Exams (Tentative)

Date	Day	LECTURES			LABS		
		No	Topic	Appointment	No	Topic	Appointment
11-Jul	Sat	1	Review of OO Concepts				
12-Jul	Sun	2	Design Patterns		0	JCreator & Packages	
13-Jul	Mon	3	Design Patterns (Cont.)				
14-Jul	Tue	4	Complexity Analysis		1	Design Patterns	
15-Jul	Wed	5	Complexity Analysis				
18-Jul	Sat	6	Singly Linked Lists	Quiz 01			
19-Jul	Sun	7	Singly Linked Lists		2	Design Patterns	
20-Jul	Mon	8	Doubly Linked Lists				
21-Jul	Tue	9	Stacks	HW1 Assign	3	Linked Lists	Lab Quiz 01: Design Patterns
22-Jul	Wed	10	Queues				
25-Jul	Sat	11	Recursion	Quiz 02			
26-Jul	Sun	12	Recursion		4	Stacks and Queues	
27-Jul	Mon	13	Analysis of Recursive Algorithms				
28-Jul	Tue	14	Review	HW1 Due	5	Recursion	Lab Quiz 02: Linked Lists, Stacks and Queues
29-Jul	Wed	15	Major Exam 01	1-3pm			
1-Aug	Sat	16	Trees				
2-Aug	Sun	17	Binary Trees		6	Binary Trees & BST	
3-Aug	Mon	18	Tree Traversal Algorithms				
4-Aug	Tue	19	Heaps		7	Binary Heaps	
5-Aug	Wed	20	AVL Trees				
8-Aug	Sat	21	AVL Trees	Quiz 03			
9-Aug	Sun	22	Huffman Coding		8	AVL Trees	
10-Aug	Mon	23	B-Trees				
11-Aug	Tue	24	B-Trees	HW2 Assign	9	Huffman Coding	Lab Quiz 03: Trees
12-Aug	Wed	25	Graphs (Intro)				
15-Aug	Sat	26	Graphs (Implementation)	Quiz 04			
16-Aug	Sun	27	Graphs (Traversals)		10	Graphs	
17-Aug	Mon	28	Graphs (Topological Sort)				
18-Aug	Tue	29	Review	HW2 Due	11	Graphs Algorithms	Lab Quiz 04: Graphs
19-Aug	Wed	30	Major Exam 02	1-3pm			
22-Aug	Sat	31	Shortest Path Algorithm				
23-Aug	Sun	32	Minimum Spanning Trees		12	Hashing	
24-Aug	Mon	33	Graphs (Cycles, Connectedness)				
25-Aug	Tue	34	Hashing				
26-Aug	Mon	35	Hashing				
29-Aug	Wed	36	Garbage Collection				
30-Aug	Sat	37	LZ78 and LZW Compression	Quiz 05 (Time Permitting)			
31-Aug	Mon		Review				

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.

1. Grade Distribution:

- 6 % Participation (0.5% * 12)
- 14 % Four Laboratory Quizzes (3.5% + 3.5% + 3.5% + 3.5%)

(a) There will be no make-up for missed laboratory quizzes.

(b) Being able to configure the Software used in the lab, being able to fix the common ICS 202 laboratory errors (as explained in Laboratory session 0), and making sure a student's Z drive is properly configured (before coming for a quiz) is considered part of a quiz.

(c) A student will be given zero in a quiz if he misses a lab quiz in his section without an official excuse or if he copies even a small portion of his quiz from another student. All students involved in a cheating offence will get a zero grade. It is a student's responsibility to protect his work.

(d) A student will be given a grade of zero (out of 0.5) for the participation part of the laboratory if he does any of the following:

- (1) He is absent without an official excuse
- (2) He is late by more than 15 minutes
- (3) He does not come back promptly to the lab after a prayer break
- (4) He leaves the laboratory session without the instructors permission
- (5) **He does not attempt to do the current laboratory tasks**
- (6) He does anything not related to the current laboratory session, like connecting to a Web site other than the ICS 202 WebCT site without the instructor's permission, or reading other material. **A STUDENT MUST BE DOING THE LABORATORY TASKS EVEN IF THE LABORATORY INSTRUCTOR IS LATE OR HE IS NOT PRESENT IN THE LAB**
- (7) He does not pay attention when the instructor is explaining something
- (8) He disrupts the laboratory session. Discussions are allowed (except during a quiz); but they must be done in a manner that does not disturb other students. **A STUDENT IS REQUIRED TO PUT HIS MOBILE PHONE IN SILENT MODE DURING THE LABORATORY SESSIONS.**

2. **Announcement of Laboratory quizzes:** The dates and the topics that will be covered in each quiz are in the course syllabus. You are required to know these dates. Students Aug or Aug not be reminded about the quizzes.

3. **Preparation for each laboratory session:** 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 Aug just elaborate on specific issues related to the current lab session.

4. **Laboratory Quiz solutions** will be discussed in the appropriate laboratory sessions. Solutions will not be posted. This is to encourage student participation.

5. **Complaints regarding Laboratory quiz grades** must be submitted to the laboratory instructor within one week of the posting of the grades for that particular quiz.

6. **Laboratory Instructor's Office Hours:** Students are encouraged to use the office hours to clarify any part of the laboratory tasks that is not clear; however the instructor will only provide hints and not solve a task.

7. **Some aspects of the laboratory tasks may be asked in the ICS 202 major exams and the final exam.** Students are thus required to take the laboratory part of this course seriously.