CSCE 221: "Data Structures and Algorithms"
Fall 2015

Instructor: Dr. Teresa Leyk
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Class Time and Place for Sections 501–503: MWF 10:20 am – 11:10 am, ETB 2005
Class Time and Place for Sections 504–506: MWF 9:10 am – 10:00 am, ETB 2005

Office Hours: MW 11:30 am – 12:30 pm, other times by appointment

Course web page: (all information about the course will be there)
`http://courses.cs.tamu.edu/teresa/csce221/csce221-index.html`
Lab Time: see the course webpage

Course Description: Credit 4. Specification, analysis and implementation of abstract data types for lists, stacks, queues, trees, hash tables, graphs, and their associated algorithms. Performance trade-offs of different implementations; asymptotic analysis of running time and memory usage. Includes the execution of students programs written in C++; emphasis on adherence to good software engineering principles.
Prerequisites:

- CSCE 121 "Introduction to Program Design and Concepts" or
- ENGR 112 "Foundations of Engineering" and CSCE 113 "Intermediate Programming & Design"

Co-requisite:

- CSCE 222 "Discrete Structures" or
- MATH 302 "Discrete Mathematics"

Required Textbook:
"*Data Structures and Algorithms in C++*" by M.T. Goodrich, R. Tamassia and D. Mount, 2011, John Wiley & Sons, Inc., ISBN 13978-0-470-38327-8. `Cover`
Required i>clicker2: ISBN 1429280476
Also, you may need a textbook on C++ language from the previous semester, or any good C++ reference book(s).

Learning Objectives:

1. Provide students with knowledge of basic abstract data types and associated algorithms for stacks, queues, lists, trees, graphs, hash tables, and priority queues.
2. Provide students with C++ programming practice by specifying and implementing data structures and algorithms.
3. Provide students with skills needed to understand and analyze complexity of algorithms focusing on time performance and memory usage.
4. Provide students with exposure to the latest events in Computer Science and Engineering and their impact on society or economy.

Expected Learning Outcomes: At the end of this course students should be able to

1. Design and implement different data structures that allow easy access and manipulation of data using C++ programming language.
2. Apply the Big-O asymptotic notation to analyze and select an efficient algorithm for solving a given problem with respect to time and memory usage.
3. Identify the latest developments in the Computer Science area or be familiar with Turing awards winners.

Course Content (the topics and related chapters from the textbook):

Introduction	
Array, Linked Lists and Recursion	Chap. 1 & 3
Introduction to Analysis of Algorithms	Chap. 4
Stacks and Queues	Chap. 5
Vectors, Lists and Sequences	Chap. 6
Trees and Search Trees	Chap. 7 & 10
Priority Queues. Heaps.	Chap. 8
Dictionaries. Hashing.	Chap. 9
Sorting, Sets and Selection	Chap. 11
Text Compression	Chap. 12.4
Graphs	Chap. 13

Grading Criteria

Homework Assignments	15%
Programming Assignments	20%
Culture Assignments	4%
Quizzes	8%
Exam I	15%
Exam II	15%
Exam III	15%
Final Project	8%

Grading Scale

90–100	A
80–89	B
70–79	C
60–69	D
0–59	F

To check grades during the semester use eCampus.

Notes about Grading

- Your final grade will be determined based on written homework and programming assignments, quizzes, exams and the final project.
- All homework assignments will be announced in class and posted on the course web page.
- The written part of homework assignments or programming reports, and the Cover Page should be typed using LyX, the Document Processor, see the class web page for a tutorial.
- All programming assignments should be implemented in C++, compiled and run on a CS departmental computer (Unix machine), and transferred to a course directory for grading using the CSNet turnin program.
- Each programming assignment will be graded focus on: algorithm design, usage of data structures and/or new user-defined types and their implementation, its correctness, tests, a typed report describing implemented algorithms and data structures, and results of computational experiments.
- A late homework assignment will be accepted up to 2 days with a 5% penalty for each late day. Once solutions have been discussed or handed out the assignments will not be accepted.
- Culture assignments allow you to explore the latest developments in Computer Science and Engineering or learn about the famous computer scientists like Turing Award winners.
- Quizzes are over material covered during lectures and assigned reading from the textbook.
- 2 points will be added to your final score if you have perfect lab attendance, or 1 point if you have only one absence.

Additional Information

- **Learning process:** From the syllabus you may have noticed that this course focuses on obtaining a computer science background and developing programming skills. Programming is not something you can learn overnight by reading a textbook or lecture notes; it requires a lot of practice. The class TAs, PTs and I are willing to help you to learn and understand the course material, and help you to master your programming skills so please see us during our office hours. A few hints about how to succeed in this course:

  - attend class and lab meetings regularly
  - use the online learning forum website (https://piazza.com/) to ask questions and participate in discussions
  - read lecture notes and related material in the textbook, and feel free to ask questions
  - study for quizzes and tests
  - retype and implement in C++ examples from the lecture notes and textbook
  - complete all labs and projects

  In general, Computer Science is not an easy subject but it will pay off after graduation. I think that you are aware that the four years you spent in college set the stage for your life. You must learn how to balance school and fun.
  According to News & World Report U.S. article "The 100 Best Jobs of 2014" the #1 *is Software Developer,* and the #2. *is Computer Systems Analyst* Those offer a mosaic of employment opportunity, good salary, manageable work-life balance and job security, for more details see `http://money.usnews.com/careers/best-jobs/rankings/the-100-best-jobs`.

- **Computer Science Account:** You need to have a Computer Science account in order to use any CS computing resources: the labs, UNIX, printing, email, and web resources, see Getting Started Guide `https://wiki.cse.tamu.edu/index.php/Getting_Started_Guide`

- **Attendance Policy:** Student class and lab attendance is required and is counted as part of the final grade, see the grading section above. Class attendance will not be taken, but you are responsible to learn all material covered in class, read the assigned text from the textbook and do homework assignments. Make-up exams and quizzes will only be given with documented University-approved excuses, see University Regulations `http://student-rules.tamu.edu/`.

- **There are no make-up quizzes or exams.** Please discuss unusual circumstances in advance with the instructor.

- **Scholastic Dishonesty:** Discussion of solutions is encouraged, but all assignments must be done on your own. If you use sources other than the textbook or lecture notes, list them in a homework cover page. Any homework or project, which in the opinion of the instructor shows evidence of copying, will receive a lower grade or even zero. See the latest issue of the "Texas A&M University Student Rules" under the section "Scholastic Dishonesty" posted on `http://student-rules.tamu.edu/`.

- **Academic Integrity Statement and Policy:** "*An Aggie does not lie, cheat or steal, or tolerate those who do.*" See the link for the Honor Council Rules and Procedures `http://aggiehonor.tamu.edu`.

- **Campus Emergencies or Code Maroon**: see the link `http://studentaffairs.tamu.edu/emergency`.

- **Americans with Disabilities Act (ADA):** The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Disability Services in Cain Hall, Rm. B118 or call 845-1637. For more information visit `http://disability.tamu.edu`.

Listing of course topics with major assignments dates (*tentative*).
All changes in the schedule will be announced in class and the class calendar

No.	Date	Day	Topic	Reading	HW	Quiz
1	Aug. 31	Mo	Introduction	Week 1	HW 1	
2	Sep. 02	We	Vectors, Arrays, Sequences		CA 1	
3	Sep. 04	Fr	Analysis of Algorithms		PA 1	1
4	Sep. 07	Mo	Complexity of Search and Sorts	Week 2		
5	Sep. 09	We	The Best, Worst, Average Cases			
6	Sep. 11	Fr	The Lower Bound Theorem			2
7	Sep. 14	Mo	Linear Sorting	Week 3	HW 2	
8	Sep. 16	We	Stacks and Queues ADT		PA 2	
9	Sep. 18	Fr	Amortized Analysis			3
10	Sep. 21	Mo	Stack and Queue (cont.)	Week 4		
11	Sep. 23	We	**Exam 1**			
12	Sep. 25	Fr	Parsing and Evaluating of Expressions			4
13	Sep. 28	Mo	Linked Lists in C++	Week 5		
14	Sep. 30	We	Linked Lists for Stack & Queue			
15	Oct. 02	Fr	Deques		CA 2	5
16	Oct. 05	Mo	Recursive Algorithms	Week 6	PA 3	
17	Oct. 07	We	Merge and Quick sorts		HW 3	
18	Oct. 09	Fr	Iterating and Master Methods			6
19	Oct. 12	Mo	Tree ADT	Week 7		
20	Oct. 14	We	Expressions Trees			
21	Oct. 16	Fr	Binary Search Trees		PA 4	7
22	Oct. 19	Mo	BST Algorithms Midterm Grades Due	Week 8	HW 4	
23	Oct. 21	We	Balanced BST			
24	Oct. 23	Fr	Balanced BST (cont)			
25	Oct. 26	Mo	Priority Queue ADT	Week 9		
26	Oct. 28	We	**Exam 2**			
27	Oct. 30	Fr	Binary Heap. Heap Sort.		CA 3	8
28	Nov. 02	Mo	Text Compression	Week 10	PA 5	
29	Nov. 04	We	Dictionaries ADT. Skip Lists. Maps		HW 5	
30	Nov. 07	Fr	Hash Tables			9
31	Nov. 09	Mo	Graph ADT. Terminology	Week 11		
32	Nov. 11	We	Graph Representations			
33	Nov. 13	Fr	Graphs Search Operations			10
34	Nov. 16	Mo	Graph Algorithms	Week 12		
35	Nov. 18	We	Shortest Path Algorithms		HW 6	
36	Nov. 20	Fr	Shortest Path Algorithms The last day to Q-drop / withdraw from University		PA 6	11
37	Nov. 23	Mo	Minimum Spanning Tree	Week 13		
	Nov. 25/27	We/Fr	No Classes			
38	Nov. 30	Mo	Minimum Spanning Tree (cont)			
39	Dec. 02	We	Review			13
40	Dec. 04	Fr	**Exam 3**			
41	Dec. 07	Mo	P and NP Problems (Friday schedule)			
42	Dec. 09	We	**Project Presentation**			14
43	Dec. 16/17		Final Exam (waived by the final project)			