SYLLABUS

CSCI 2270: COMPUTER SCIENCE II - DATA STRUCTURE

SUMMER 2018, 4 CREDITS, JUNE 4 – JULY 27, 2018

Lecture
When: Monday, Tuesday, Wednesday 5:30-7:15 pm
Where: ECES 114
Recitation
When: Thursday 5:30-6:50 pm
Where: ECES 114

INSTRUCTOR INFORMATION

Name: Camilla Lambrocco
Email: camilla.lambrocco@colorado.edu
Office Location: ECOT 524
Office Hours: F 6 - 8pm

TA INFORMATION

Name: Jessica Finocchiaro
Email: jessica.finocchiaro@colorado.edu
Office Location: ECCS 1B21
Office Hours: TBD by class vote or by appointment

PRE-REQUISITES

Requires prerequisite courses of CSCI 1300 or CSCI 1310 or CSCI 1320 or ECEN 1030 or ECEN 1310 and APPM 1345 or APPM 1350 or MATH 1300 or MATH 1310 (all minimum grade C-). COURSE TOPICS Studies data abstractions (e.g., stacks, queues, lists, trees) and their representation techniques (e.g., linking, arrays). Introduces concepts used in algorithm design and analysis including criteria for selecting data structures to fit their applications.

TEXTBOOKS AND MATERIALS

Course materials, such as lecture notes and assignments, will be available in electronic form on the Moodle site for the course: http://moodle.cs.colorado.edu/.

Required text: The textbook for this course is an ebook, which will be distributed on the course Moodle site. Hoenigman, R. 2015. Visualizing Data Structures. Lulu Press.

It is highly recommended that you get a Dropbox account or invest in a USB memory stick for saving your files. Don't lose your hard-earned progress if your computer crashes!

Course Structure

- Lectures 3 times a week
- Recitation 1 time a week
- Problem sets assigned weekly, due the following week
- Moodle lecture quizzes after every lecture, due before the next lecture
- One midterm exams
- One final project/exam

Course Objectives

In this course, students will:
1. Document code including precondition/postcondition contracts for functions and invariants for classes.
2. Create and recognize appropriate test data for simple problems, including testing boundary conditions and creating/running test cases.
3. Design and test new classes using the principle of information hiding for the following data structures: array-based collections (including dynamic arrays), list-based collections (singly-linked lists, doubly-linked lists, circular-linked lists), stacks, queues, binary search trees, hash tables, graphs, and at least one balanced search tree.
4. Identify features and applications of common data structures, including records/structs, lists, stacks, queues, trees, graphs, and maps.
5. Implement algorithms for standard operations on common data structures and discuss the complexity of the operations.
6. Comment on the features of different traversal methods for trees and graphs, including pre-, post-, and in-order traversal of trees.
7. Describe the principles of recursion and iteration and implement recursive and iterative solutions for a problem.
8. Formulate and implement solutions to problems using fundamental graph algorithms, including depth-first and breadth-first search and a shortest-path algorithm.
9. Explain the features of at least one tree balancing algorithm and how tree balancing affects the efficiency of various binary search tree operations.
11. Correctly use and manipulate pointer variables to change variables and build dynamic data structures.
12. Explain the differences between dynamic and static data structure implementations, and justify the use of static and dynamic implementations in different applications.
13. Practice explaining design choices and algorithm features in small-group settings.

*Hash tables will be optional, resources will be provided.

GRADING

Lecture Quizzes	10%	(3 times/week, due by 5pm of the following day)
*Recitation	20%	(Weekly, due by 11:59pm on Thursday)
Homework	35%	(Weekly, due by 11:59pm on Friday)
**Exam	15%	
Project/Final	20%	(Interview grading)

**Recitation is required. Recitation activities must be submitted by the end of recitation. You can drop one recitation grade*

***ADDITIONAL EXAM GRADE REQUIREMENTS TO PASS THE CLASS You must get at least a 65% average on your midterm and project to receive better than a D+ in this class, regardless of your grades on other parts of the class. A grade of a C- in this class is required to take the next class in the computer science sequence.*

EXAM INFORMATION

The midterm exam for this class will be held as two-hour evening exam on Friday in Week 4 of the semester. Students with a scheduling conflict need to inform their course instructor as soon as the exam date is announced. The format of the Final Project/Exam will be discussed later in the class.

GRADING CRITERIA:

The grades for this class follow the standard percentage breakdown for the College of Engineering:

93-100%	A	73-77%	C
90-93%	A-	70-73%	C-
87-90%	B+	67-70%	D+
83-87%	B	63-67%	D
80-83%	B-	60-63%	D-
77-80%	C+	0-60%	F

Course Calendar

Week 1, June 4 - 10

Topics:

Introduction, C++ Review, Arrays, Structs, File I/O
Algorithms and pseudocode
Pointers, Dynamic memory

Chapters:

1, 2, 3

Due:

Recitation 1

Week 2, June 11 - 17

Topics:

C++ Classes introduction
Sorting
Linked Lists

Chapters:

4, 5

Due:

Recitation 2
Assignment 1

Week 3, June 18 - 24

Topics:

Linked Lists
Stacks, queues
Binary trees
Binary search trees

Chapters:

6, 7, 8, 9.1, 9.2

Due:

Recitation 3
Assignment 2

Week 4, June 25 - July 1

Topics:

Binary trees
Binary search trees
Tree-traversal algorithms

Chapters:

9, 10

Due:

Recitation 4

Assignment 3

Midterm June 29; 5-7pm

Week 5, July 2 - 8

Topics:

Tree-traversal algorithms

Tree balancing

Graphs

Chapters:

10, 11, 12.1, 12.2, 12.3

Due:

Recitation 5

Assignment 4

Week 6, July 9 - 15

Topics:

Graphs

Breadth-first search

Depth-first search

Chapters:

12

Due:

Recitation 6

Assignment 5

Week 7, July 16 - 21

Topics:

Graphs

Dijkstras algorithms

Priority queues

Chapters:

12

Due:

Recitation 7

Assignment 6

Week 8, July 22 - 28

Topics:

Priority queues

Review

Chapters:

All

Due:

Assignment 7

Project

Honor Code: As members of the CU academic community, we are all bound by the CU Honor Code. I take the Honor Code very seriously, and I expect that you will, too. Any significant violation will result in a failing grade for the course and will be reported. Here is the University's statement about the matter: All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at http://www.colorado.edu/policies/ student-honor-code-policy or http://www.colorado.edu/honorcode/student-information.

Special Accommodations: If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu.
If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with your professor. Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, I will make reasonable efforts to accommodate such needs if you notify me of their specific nature by the end of the 3rd week of class. See full details at http://www.colorado.edu/policies/observance-religious-holidays-and-absences-classes-andor-exams

Classroom Behavior: Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veterans status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the

semester so that I may make appropriate changes to my records. For more information, see the policies at http://www.colorado.edu/policies/student-classroom-and-course-related-behavior Discrimination and

Harassment: The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CUs Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulders Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at http://www.colorado.edu/policies/discrimination-and-harassment-policy-and-procedures