CSCI 2421 - Syllabus

Data Structures and Program Design

Term: Summer 2021

Instructor

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Office: Working Remote

Office Hours: Fri 8-10am; appointments are required. *Schedule here*.

Catalog Description

Topics include a first look at an algorithm, data structures, abstract data types, and basic techniques such as sorting, searching, and recursion.

Textbook

- **Data Abstraction & Problem Solving with C++**. *F. Carrano, T. Henry. 7th edition. Pearson. ISBN-13: 978-0-13-446397-1.* **Required**

- For language reference as needed: *Absolute C++. W. Savitch, K. Mock. 6th ed. Pearson. ISBN-13: 978-0-13-397139-2.*

Learning Objectives

Expected Knowledge at the Start of the Course

The student will need expertise in the following to be able to complete the course:

- Basic understanding of object-oriented programming in C++.
- C++ Language, including: pointers, dynamic arrays, file i/o and stream process, inheritance, polymorphism, virtual functions and templates.
- Dynamic classes and value semantics.

Prerequisites

- **CSCI1410** – Fundamentals of Computing
- **CSCI1411** – Fundamentals of Computing Laboratory
- **CSCI2312** – Object Oriented Programming

Students need to **sign *prerequisite agreement form* by 5pm on June 08, 2021.**

Learning Outcomes

The student will master the common data structures in terms of specification, design and implementation, in addition to gain knowledge on the Standard Template Library.

- Solid understanding in specifying, designing and implementing common data structures.
- Solid understanding of container classes, linked list, Standard Template Library (STL), stack and queue, trees, hashing, searching, and sorting.

ABET Assessment Criteria: (2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

Course Objectives

- Obtaining a solid foundation in specifying, designing, implementing, and using widely used data structures.
- Learning basic algorithms.
- Learning how to choose and apply appropriate data structures.

Class Details

This course will be delivery under an accelerated schedule, and its dynamics and assessment is described in this section.

Students should consider that this particular characteristic of the accelerated schedule will require a minimum dedication between ten to fifteen hours of work per week.

Course Delivery

Each week the student will review pre-recorded lectures, and interact with other students via a conversation forum and communication channels. At the end of the week, **each Friday,** we will convene on zoom for a Laboratory session designed to apply the knowledge of the reviewed materials that week.

All the materials and assessments will be posted and submitted on Canvas.

- **Theory Lectures:** will be pre-recorded weekly for the student to review during the week.
    - Each Lecture will have an associated reading from out textbook. Lectures and Lecture notes will be complementary to the required readings from our textbook.
- **Laboratory Session:** will be conducted over Zoom, every **Friday 10-11:35am** accordingly with the course schedule. *Check the Zoom Tab on Canvas and the Schedule.* **Please make sure you have a microphone and webcam in working conditions,** *you can get one from the library otherwise (check this link).*
- **Course Pace:** Although students can review the lecture recordings any time of their choosing, the course pace will be defined by the posted schedule and

assignment deadlines. Therefore, students should keep the pace on reading and reviewing the materials weekly. In addition, due to the accelerated nature of this course, falling behind will have a strong impact on the student's performance.

Assessments

The course will be assessed in two fronts. The first one will measure the understanding of the materials, and the second one the application of those concepts. Therefore, the course will have the following evaluations.

- **Laboratories**. Weekly laboratories will be conducted synchronously over zoom. Students will work with one or two partners to complete short tasks based *on the topics presented during the week*. *Attendance to the laboratory will be required.* The lowest graded lab (x1) will be dropped from the final grade. All labs will have the same weight and count towards 30% of the final grade.
- **Final Exam**. There will be one final exam to test the student's ability to apply the acquired knowledge to specific problems. The final exam will be a timed (2h) take-at-home exam. The student will have a 24hrs-window to complete the final exam. The exam counts towards 25% of the final grade.
- **Quizzes**. There will be weekly short quizzes (total of 7) in the form of true/false and/or multiple choice questions, that will cover cover the understanding of the week's materials. The lowest graded quiz (x1) will be dropped from the final grade. All quizzes will have the same weight, and count towards 15% of the final grade.
- **Homework.** There will be a total of 4 homework during the semester. Homework will be automatically graded based on a set of tests. However, students may submit as many times as they need in order to improve their submission before the deadline. Only the final submission to Canvas will be graded. Homework count towards 10% of the final grade.
- **Programming Assignment.** The will be a final programming that will be conducted in teams of two students, which will consist on putting together all the concepts into a single larger development. The programming assignment count towards 20% of the final grade.

- **Extra Credit.** 5 marks in the final grade will be offered (optional) based on the student engagement during the semester. This will be measured by the lecture recording review progress reported by the platform as well as any in-video questions answered. It is recommended that the student use Chrome browser without any plugin to block the site functionalities (such as tracker blockers or cookies blockers). The progress will be revised weekly on Mondays at 8am, meaning that for the extra credit the student will have a week to review the materials.

*In general there will **no make up assessment**. However mitigating circumstances may be considered if discussed with the instructor before the assessment. No arrangement can be done after July 31st, 2021.*

Topics

- AbstractDataType
- Containerclasses
- Recursion
- List, linked list
- Templates
- Standard Template Library
- Stack and queues
- Tree structures
- Graphs
- Searching & Sorting

Schedule

The following is a tentative schedule for the semester.

Week	Date	Topics	Readings	Lab (Zoom)	Due
Week01	Jun 7, 2021 → Jun 11, 2021	Introduction. Data Abstraction. Recursion.	Chp. 1 & 2	F:10-11:35am	Quiz Pre-Req
Week02	Jun 14, 2021 → Jun 18, 2021	ADT Bag: Arrays & Link Implementations	Chp. 3 & 4	F:10-11:35am	Quiz Hwk
Week03	Jun 21, 2021 → Jun 25, 2021	Stacks and Lists	Chp. 6 through 9	F:10-11:35am	Quiz
Week04	Jun 28, 2021 → Jul 2, 2021	Algorithm Efficiency. Sorting	Chp. 10 & 11	F:10-11:35am	Quiz Hwk
Week05	Jul 5, 2021 → Jul 9, 2021	Queues	Chp. 13 & 14	F:10-11:35am	Quiz
Week06	Jul 12, 2021 → Jul 16, 2021	Trees	Chp. 15 & 16	F:10-11:35am	Quiz Hwk
Week07	Jul 19, 2021 → Jul 23, 2021	Heaps. Hashing.	Chp. 17 & 18	F:10-11:35am	Quiz
Week08	Jul 26, 2021 → Jul 30, 2021	Balanced Search Trees (AVL). Graphs	Chp. 19 & 20	F:10-11:35am	Project Hwk Final Exam

Grading Policies

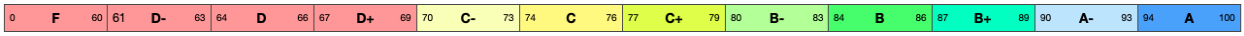
The course final grade will be distributed between the different assessments as described above. The following table summarizes that.

- Laboratories: 30%
- Final Exam: 25%
- Programming Assignment: 20%
- Quizzes: 15%
- Homework: 10%
- *Extra Credit: 5% (optional)*

Grade Dissemination: grades will be posted and announced on Canvas.

Grade Review: you are welcome to meet with your instructor/T.A. within a week after the grades are posted to review corrections and markings.

Letter Grade: the final grade (marks) will be translated (automatically by Canvas) to a corresponding letter grade using the following scale:



Communications & Announcements

All communications will be conducted through Canvas. **Make sure you have your Canvas settings properly in place not to miss notifications**. You can set email notifications or use the Canvas app in your mobile device with push notifications.

If you need to contact me, you can email me through Canvas or directly to my university email. Please note that I usually reply within 48 hours. However, to discuss exercises, please schedule an appointment during my office hours using the given link above, I will usually not be able to answer those questions over email.

A supporting communication platform (Slack) will be in place for a more dynamic and informal communication, oriented mainly for having a collaborative environment for students.

Code of Conduct

I encourage you to review material and discuss ideas with other students while preparing for quizzes. Moreover, I strongly recommend you to set a study group to go over practice exercises and problems from the textbook.

However, **make sure you create your own work** when taking assessments (like quizzes, homework, labs, exams, etc.) and follow the guidelines depicted in each one. It's important that you go through the analysis and implementation of your own solution to develop the required skills and achieve the best understanding of the topic. For team assessments, "working together" does not mean that one student does the majority of the work while others just put their names on it! If you have any questions about what this means, please meet with me.

We reserve the rights to use automated similarity metrics in order to detect plagiarism in this course as **all students must create their own work!**

Any instances of cheating will result in a zero for the assignment, a grade of zero (an "F") in the course, or sanctions determined by the college (including probation, suspension and expulsion).

All students must follow the College of Engineering, Design and Computing - Student Honor Code.

Last Updated on: June 1st, 2021.-