CSC226: Algorithms and Data Structures II

Course Dates

CRN(s):	Section A01 CRN: 10813 Section A02 CRN: 10814
Term:	2023
Course Start:	2023-09-06
Course End:	2023-12-20
Withdrawal with 100% reduction of tuition fees:	2023-09-19
Withdrawal with 50% reduction of tuition fees:	2023-10-10
Last day for withdrawal (no fees returned):	2023-10-31

Scheduled Meeting Times (M=Mon, T=Tue, W=Wed, R=Thu, F=Fri)

Section:	Location:	Classes Start:	Classes End:	Days of week:	Hours of day:	Instructor:
A01	DSB C103	2023-09-06	2023-12-04	MR	10:00-11:20	Rich Little
A02	DSB C103	2023-09-06	2023-12-04	MR	10:00-11:20	Rich Little
B01	ECS 258	2023-09-11	2023-12-04	M	12:00-12:50	
B02	ECS 258	2023-09-11	2023-12-04	M	13:30-14:20	
B03	ECS 258	2023-09-11	2023-12-04	M	14:30-15:20	
B04	ECS 258	2023-09-11	2023-12-04	T	11:30-12:20	
B05	ECS 258	2023-09-11	2023-12-04	W	11:30-12:20	

Instructor(s)

Name: **Rich Little**
Office: ECS 516
Phone: (250) 472-5752
Email: rlittle at uvic dot ca

Office Hours:		Comments
Tue	12:30pm-01:30pm	or by appointment
Thu	12:30pm-01:30pm	or by appointment

Course Overview

This course is the continuation of Algorithms and Data Structures I (CSC 225). Students will learn a variety of important data structures, algorithms and algorithm design techniques. Relevant mathematical concepts are an integral part of this course, as are detailed algorithm implementations in Java. Advanced problem solving with the computer requires choosing, developing and implementing appropriate algorithms and data structures, as well as testing and proving correctness of algorithms and implementations. Efficiency of the algorithms and data structures is essential.

Calendar description: Advanced techniques for design, analysis, and implementation of algorithms and data structures with an introduction to algorithm engineering. Algorithmic design paradigms: greedy, divide-and-conquer, dynamic programming, backtracking, branch and bound. Advanced Analysis techniques, such as amortization. Advanced data structures: hashing, disjoint sets. Advanced graph algorithms: network flow, connectivity, minimum spanning trees, shortest paths. Mathematical tools: graphs and digraphs, graph properties, planar graphs, networks; discrete probability, counting techniques, recurrences.

Topics

Advanced Graph Algorithms

- minimum spanning tree
- disjoint set data structure
- shortest path
- network flow

Use of Divide and Conquer and Randomized Algorithms

- review quicksort, selection
- discrete probability and randomized algorithms
- hashing

String Algorithms and Dynamic Programming

- substring search algorithms
- dynamic programming
- longest common subsequence

Course Objectives And Learning Outcomes

- Describe fundamental algorithm design paradigms (Divide and Conquer, Greedy, Dynamic Programming)
- Describe advanced data structures (Weighted Graphs, Union-Find)
- Apply mathematical techniques and tools (such as recurrence relations, counting, graph theory) to analyze the running times of algorithms
- Reason about the correctness of algorithms
- Compare and choose the most appropriate design paradigm and data structure(s) to solve a given problem by studying its structure and resemblance to previously studied problems
- Implement correctly the best solution to a given problem obtained after the design and analysis stage

Textbooks

Optional:	**Algorithms (Fourth Edition)**
	Robert Sedgewick and Kevin Wayne
	Addison-Wesley, 2011

Optional:	**Algorithm Design and Applications**
	Michael T. Goodrich and Roberto Tamassia
	Wiley, 2015

Consult the Brightspace course page for more resources.

Assignments

In this course there will be **6** assignments, each worth **6%**. The best five out of six assignemnts will count, for a total of **30%**. Typically, you will have 1 week to solve an assignment. A missed assignment will be assigned 0%, no other concessions will be granted for missed assignments.

Exams

There will be a midterm and a final exam. The midterm exam is worth **20%** and will take place on **Monday, October 23, 2023**. The final exam is worth **40%** and will be scheduled by the University.

For courses which have final exams, students are strongly advised not to make final plans for travel or employment during the exam period since special arrangements will not be made for examinations that may conflict with such plans.

The final exam is a must pass final, if you get less than 50% on the final exam you will fail the course.

In the event that you cannot write the midterm exam due to unexpected and unavoidable circumstances or conflicting responsibilities (as described here - https://www.uvic.ca/students/academics/academic-concessions-accommodations/request-for-academic-concession/index.php), then you must submit a request for an in-course

extension (https://www.uvic.ca/students/academics/academic-concessions-accommodations/request-for-academic-concession/index.php#ipn-request-an-in-course-extension) to me *prior* to the exam.

In the event that you cannot write the final exam due to unexpected and unavoidable circumstances or conflicting responsibilities (as described here - https://www.uvic.ca/students/academics/academic-concessions-accommodations/request-for-academic-concession/index.php), then you must submit a request for a deferral (https://www.uvic.ca/students/academics/academic-concessions-accommodations/request-for-academic-concession/index.php#ipn-request-a-deferral) to student support services after the final grades have been submitted.

You will not be granted academic concession for both exams.

Labs

There will be **8** lab exercises throughout the semester, each one worth **1%**. The best six lab exercises will count, for a total of **6%**. The labs start the week of Monday, Spetember 11 and end the week of Monday, Novemebr 27. There are no labs any week in which there is a Monday holiday nor the week of the midterm. A missed lab will be assigned 0%, no other concessions will be granted for missed labs.

Quizzes

There will be **5** quizzes throughout the semester, each one worth **1%**. The best four quizzes will count, for a total of **4%**. The quizzes will be online using the Brightspace Quizzes tool. A missed quiz will be assigned 0%, no other concessions will be granted for missed quizzes.

Term Schedule

This schedule is subject to change.

Assessment	Weight	Due Date
Assignment 1	6%	Sep 18
Quiz 1	1%	Sep 20
Assignment 2	6%	Sep 29
Quiz 2	1%	Oct 4
Assignment 3	6%	Oct 16
Quiz 3	1%	Oct 18
Midterm	20%	Oct 23
Assignment 4	6%	Nov 3
Quiz 4	1%	Nov 8
Assignment 5	6%	Nov 20
Quiz 5	1%	Nov 29
Assignment 6	6%	Dec 1
Final Exam	40%	Dec 7 to 20, To be scheduled by the University

Grading

Coursework	Nominal Weight (out of 100%)
Labs	6%
Quizzes	4%
Assignments	30%
Midterm Exam	20%
Final Exam	40%

Policy On Collaboration

Students are encouraged to work together and discuss homework. However, all solutions must be written individually **from scratch** and all programming must be done individually. No sharing of written code is allowed.

Grading System

The University of Victoria follows a percentage grading system in which the instructor will submit grades in percentages. The University will use the following Senate approved standardized grading scale to assign letter grades. Both the percentage mark and the letter grade will be recorded on the academic record and transcripts.

F	D	C	C+	B-	B	B+	A-	A	A+
0-49	50-59	60-64	65-69	70-72	73-76	77-79	80-84	85-89	90-100

Grades	Description
A+, A, A-	**Exceptional**, **outstanding** or **excellent** performance. Normally achieved by a minority of students. These grades indicate a student who is *self-initiating*, *exceeds expectation* and has an *insightful* grasp of the subject matter.
B+, B, B-	**Very good**, **good** or **solid** performance. Normally achieved by the largest number of students. These grades indicate a *good* grasp of the subject matter or *excellent grasp in one area balanced with satisfactory grasp in the other areas*.
C+, C	**Satisfactory**, or **minimally satisfactory**. These grades indicate a *satisfactory performance and knowledge* of the subject matter.
D	**Marginal Performance**. A student receiving this grade demonstrated a *superficial grasp* of the subject matter.
F	**Unsatisfactory performance**. Wrote final examination and completed course requirements; no supplemental.

Posting of Grades

Typically marks for assignments, examinations, and provisional final grades, are made available through a Learning Management System (LMS) like Brightspace, where each student will be able to view only their own grades. Sometimes numerical marks/grades may be posted publicly to the entire class. In that case, full student numbers or names will not be included with the posted information.

Course Experience Survey (CES)

I value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to the CES site

You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. I will remind you closer to the time, but please be thinking about this important activity, especially the following three questions, during the course.

- What strengths did your instructor demonstrate that helped you learn in this course?
- Please provide specific suggestions as to how the instructor could have helped you learn more effectively.
- Please provide specific suggestions as to how this course could be improved.

Csc Student Groups

The Computer Science Course Union (https://onlineacademiccommunity.uvic.ca/cscu/) serves all students who are either in a computer science program or taking a class in computer science. Please sign yourself up on their mailing list if you would like to be informed about their social events and services.

The Engineering Students' Society (ESS) serves all students registered in an Engineering degree program, including Software Engineering (BSEng). For information on ESS activities, events and services navigate to http://www.engr.uvic.ca/~ess .

Course Policies And Guidelines

Late Assignments: No late assignments will be accepted unless prior arrangements have been made with the instructor **at least 48 hours before** the assignment due date. ***Coursework Mark Appeals:*** All marks must be appealed **within 7 days** of the mark being posted. ***Attendance:*** We expect students attend all lectures and labs. It is entirely the students' responsibility to recover any information or announcements presented in lectures from which they were absent. ***Electronic devices in labs and lectures:*** No unauthorized *audio* or *video* recording of lectures is permitted. ***Electronic***

devices in midterms and exams: Calculators are only permitted for examinations and tests if explicitly authorized and the type of calculator permitted may be restricted. No other electronic devices (e.g. cell phones, pagers, PDA, etc.) may be used during examinations or tests *unless explicitly authorized*. ***Plagiarism:*** Submitted work may be checked using plagiarism detection software. Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult the link given below for the UVic policy on academic integrity. Note that the university policy includes the statement that "A largely or fully plagiarized assignment should result in a grade of F for the course."

The Faculty of Engineering and Computer Science Standards for Professional Behaviour are at https://www.uvic.ca/ecs/_assets/docs/student-forms/professional-behaviour.pdf U.Vic guidelines and policy concerning fraud and academic integrity are at http://web.uvic.ca/calendar/undergrad/info/regulations/academic-integrity.html ***U. Vic Privacy Policy:*** If any student has concerns about their private information being stored or accessed outside of Canada, they are required to inform the course instructor about their concerns before the end of second week of classes.

Equality

This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.

Copyright Statement

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