CSC225: Algorithms and Data Structures: I

Course Dates

CRN(s):	Section A01 CRN: 20754
	Section A02 CRN: 20755
Term:	Spring 2022
Course Start:	2022-01-10
Course End:	2022-04-29
Withdrawal with 100% reduction of tuition fees:	2022-01-30
Withdrawal with 50% reduction of tuition fees:	2022-02-13
Last day for withdrawal (no fees returned):	2022-02-28

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	HSD A240	2022-01-10	2022-04-07	TWF	09:30-10:20	Hosna Jabbari
A02	HSD A240	2022-01-10	2022-04-07	TWF	09:30-10:20	Hosna Jabbari
B01	ECS 258	2022-01-17	2022-04-07	M	12:00-12:50	
B02	ECS 258	2022-01-17	2022-04-07	M	13:00-13:50	
B03	ECS 258	2022-01-17	2022-04-07	T	14:30-15:20	
B04	ECS 258	2022-01-17	2022-04-07	T	15:30-16:20	
B05	ECS 258	2022-01-17	2022-04-07	W	10:30-11:20	
B07	ECS 258	2022-01-10	2022-04-07	R	10:30-11:20	

Instructor(s)

Name: **Hosna Jabbari**
Office: ECS 532
Phone: (250) 472-5760
Email: jabbari at uvic dot ca
Office Hours: **TBD**

Office Hours

By appointment only.

Course Overview

Steps applied when solving a problem using the computer include:

- clearly defining the problem,
- choosing an algorithm and data structures,
- developing pseudocode,
- implementing the algorithm,
- ensuring correctness using code verification and testing, and
- evaluating the effectiveness of the solution.

The goal of this class is to illustrate this process and develop these skills starting with some traditional problems, algorithms and data structures. The performance of a program on small inputs (typical in introductory computer science courses) gives no indication of how an algorithm will perform on the large inputs often found in real applications. Paper and pencil techniques are presented for analysing algorithms for time and space requirements on large inputs without requiring the effort of implementation. Algorithms are compared with respect to their worst, average, and best case performances.

The techniques learned in the course are applied to well-studied classical problems including searching, sorting, and some graph theory applications. The study of abstract data types is continued from CSC 115 but the focus changes from that of understanding the data types to being able to make knowledgeable choices as to the best data structures for a particular application.

A word about course delivery

This spring course is given as **a flipped classroom**.
Recordings of the lectures will be provided for your review, and class time will be used to answer questions and solve examples.
You are expected to watch the lectures before class time and attend and participate during the scheduled lectures and labs.

A word about students and their IT
All students are expected to fully participate in this course. This will require reliable and consistent access to a relatively new computer (desktop or laptop, made in 2014 or later, with at least 8GB of DRAM and at least 250 GB of disk space. You must also have a reliable internet connection, although we will do our best to ensure work on assignments can be completed on your computer. If you cannot ensure your access to these items for the entire semester, we strongly suggest you consider a future offering of this course. It will not be possible to adjust the course expectations, due dates or learning outcomes for students who do not have the technological resources available to complete the course.
Information on student numbers, student grades, submitted work, etc. will be stored in file systems and computers under the physical control of UVic.

Topics

Algorithm Design and Analysis

- Algorithm design techniques
- Fundamental algorithm analysis
- Time and space complexity
- Asymptotic analysis
- Recursive analysis and recurrence relations
- Proof techniques
- Basic data structures: arrays, lists, stacks and queues

Searching and Sorting

- General purpose sorting algorithms, such as Heap sort, Insertion sort, Merge sort, Quick sort, and Selection sort

- Special purpose sorting algorithms, such as lexicographical sorting and Radix sort
- Priority Queues (including Heaps)
- Binary Search Trees
- Balanced Search Trees

Graphs

- Mathematical foundations
- Problem abstraction with graphs
- Data structures for graph representation
- Fundamental graph traversal algorithms and applications
- Connectivity and strong connectivity
- Topological sorting

Course Objectives And Learning Outcomes

Students will learn the skills required for algorithm development for the algorithms and data structures studied in the class, and should be able to apply these same steps to new situations which are similar.

The skills developed include improved competence in all steps for the problem solving process:

- precision in problem specification,
- understanding the algorithms and data structures presented in class,
- showing what happens on examples of these,
- setting up and solving recurrences for time and space complexities,
- writing recursive algorithms,
- proving program correctness, and that recurrence solutions are correct by induction,
- faithful (preserving time and space complexity) translation of pseudocode to working code, and
- comparisons of alternate solutions to a problem based on time and/or space requirements.

Textbooks

The following textbook will be used throughout the course. It is available in the bookstore as an optional textbook for the course.

Optional:	**Algorithm Design and Applications**
	by Michael Goodrich and Roberto Tamassia,
	Wiley, 2014.

For a review of Discrete Math you may want to refer to the following textbook (available online for free)

Optional:	**Discrete Mathematics: An Open Introduction**
	by Oscar Levin,
	http://discrete.openmathbooks.org/

Other Materials

Please refer to the Brightspace pages and the web pages for the class for other course materials.

Assignments

There will be up to 5 assignments worth 30% of the final grade. Each assignment will have an equal weight. The tentative schedule is as follows:

Assignment	(Tentative) Assigned Date	(Tentative) Due Date
Assignment 1	Jan 10	Jan 24
Assignment 2	Jan 24	Feb 7
Assignment 3	Feb 7	Feb 28
Assignment 4	Feb 28	Mar 14
Assignment 5	Mar 14	Apr 4

It is to your advantage to start assignments early enough so that you have time to seek help if you encounter difficulties. Hand in your best effort at **11:59 p.m.** on the due date. No late assignments will be accepted. Students are encouraged to work in study groups. However, final assignment submissions should be generated independently. You are expected to solve the problems yourself. Copying solutions from others, the web, or any other source will be considered a serious academic offense and may result in failure of the course.

Quizzes

There will be weekly online quizzes to review the course materials. You can take the quizzes multiple times.
The combination of all of these quizzes throughout the semester will make up 5% of your final grade.

Exams

There will be three online midterm exams taken in person during the normal class time, following the tentative schedule below.

Exam	Date	Weight
Midterm 1	Feb 16	20%
Midterm 2	Mar 16	20%
Midterm 3	Apr 6	15%

This course will not have a final exam during the April exam period. **Missing an exam will result in a score of zero being assigned for that exam, except in cases where an academic concession (with appropriate documentation) applies.**
If you do not have access to a laptop computer to bring to class for exam, you are required to contact the instructor as soon as possible for accommodation.

Grading

Coursework	Weight (out of 100%)
Assignments	30%
Quizzes	5%
Labs	10%
Midterm Exams (3)	55%

Note: To receive a passing grade in the course, each student must achieve a final percentage of at least 50%, and also **must receive a passing grade on the average of the exams combined.** Students who do not achieve at least 50% overall, and students who do not meet the exam average threshold for the exam component will receive a letter grade of F.

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/engineering/assets/docs/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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