CIS*3490 The Analysis and Design of Computer Algorithms
Winter 2024

School of Computer Science

1 INSTRUCTIONAL SUPPORT

Section 01

Instructor: See WebAdvisor

Instructor contact information: cis3490@socs.uoguelph.ca

Instructor office hours:
By appointment only. Details will be posted on the course website. Note: weekly instructor office hours may vary during the semester to better accommodate student demand and instructor availability.

Pre-requisites: [CIS*1910 or (CIS*2910 and ENGG*1500)], CIS*2520
Credit Weight: 0.5

Teaching Assistants:

Email: cis3490@socs.uoguelph.ca
Office Hours: See lab times on WebAdvisor. Any changes to the TA office hours will be announced on the course website.

Timetable

Lectures:
See WebAdvisor

Lab times:
See WebAdvisor (virtual - tentative)

The lab times will be used for advising and consulting with the Teaching Assistants, which will be done online. Students will be able to schedule one-on-one online meetings with the Teaching Assistants.

Please note that, if necessary, the lab times may also be used for additional tutorials. These tutorials will be announced in advance.

2 LEARNING RESOURCES

2.2 Course Website

Course material, news, announcements, and grades will be regularly posted to the CIS*3490 website which can be found at https://moodle.socs.uoguelph.ca. You are responsible for checking the site regularly.

- Lecture Information: Selected notes will be posted on the course website as instructors have time to make them available. You are expected to take your own notes during lecture.
- Labs and Tutorials: Selected tutorial and lab materials will be available on the course website.
- Assignments: Assignment descriptions will be posted on the course website. Assignments are submitted via the course website.

2.3 Required Textbook

"Introduction to the Design and Analysis of Algorithms", 3rd edition, by A. Levitin (ISBN: 978-0132316811). Physical and e-copies (permanent and rental) are available from the UofG Campus Bookstore and the Co-op Bookstore, as well as the publisher (Pearson).

2.4 Calendar Description

The design and analysis of efficient computer algorithms are studied. Topics which will be studied include: standard methodologies, asymptotic behaviour, optimality, lower bounds, implementation considerations, graph algorithms, matrix computations (e.g. Strassen's method), NP-completeness.

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: http://www.uoguelph.ca/registrar/calendars/index.cfm?index

3 ASSESSMENT

3.1 Dates and Distribution

Assessments

Homework (25%: best 7 out of 10)
- Homework 1: Friday, January 19
- Homework 2: Friday, January 26
- Homework 3: Friday, February 2
- Homework 4: Sunday, February 11 (extended to accommodate Midterm 1)
- Homework 5: Friday, February 16
- Homework 6: Friday, March 1
- Homework 7: Friday, March 8
- Homework 8: Friday, March 15
- Homework 9: Sunday, March 24 (extended to accommodate Midterm 2)
- Homework 10: Monday, April 1 (extended to accommodate Good Friday)
 	
Midterm tests (40%, 2 @ 20% each)
- Midterm 1: Friday, February 9
  - Alternative date for midterm 1: Friday, February 16
- Midterm 2: Friday, March 22
  - Alternative date for midterm 2: Monday, April 1
 	
All midterms will be held during the regular class hours in the regular classroom on the dates specified above. There will be no lectures on the alternative test dates.
 	
NOTE: the alternative dates above apply only if the midterm was missed due to legitimate extenuating circumstances. Accommodations for missed midterms may be granted **only if** they were discussed with the course instructor **prior** to the date of the midterm - i.e. before February 9 for Midterm 1 and before March 22 for Midterm 2.
 	
Please see Section 3.2 for details on accommodations and missed assessments
 	
Final exam (35%):
- Date: Monday, April 15, 2:30 PM - 4:30 PM
- Room: TBA - See WebAdvisor

3.1.1 Final grade calculation

The final grade is the weighted sum of all assessments shown above, using the weights indicated in the list above. Please note that the homework grade will be based on the best seven submissions out of the 10 total.

3.2 Course Grading Policies

Late assessments: No late assessments will be accepted. All missed assessments will automatically receive the grade of **zero** (0). See below for compassionate exceptions.

Compiler errors/warnings: Program code which does not compile will not be accepted for marking and a grade of **zero** (0) will be assigned. Code that does not compile "clean" will lose marks for compiler warnings. Code **must** compile and run on the platform specified in the assignment description.

Submission errors: Failure to submit assignments correctly (e.g., incorrect file names, faulty/missing build scripts, etc.) will result in a mark penalty.

Regrades: Students may request a regrade of a homework problem if the marker has made an error in grading. The original submission will be entirely regraded and a new mark will be assigned. It is possible for a mark to go down, go up, or remain unchanged as a result of a regrade.

Students must request a regrade via the Regrade dropbox on the course website within 5 calendar days of receiving the assignment grade. No other regrade requests will be accepted. If an assignment has been regraded, it will not be regraded again. Regrade requests will only be processed twice in the course of a semester - in the middle of the semester and after the last class.

Accommodation: When You Cannot Meet a Course Requirement: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, contact the instructor. Please note that work commitments will not constitute grounds for academic consideration. Academic consideration will not be granted for reasons related to deliverables in other courses.

Please note that **all** requests for academic consideration - including those made by students registered with SAS - **must** be made prior to the assessment (assignment/test/project/homework/etc.) due date and time. **No** academic consideration requests will be accepted once the assessment due date and time have passed. This means that no requests will be accepted during the grace period (if the assessment has one) - they must be made prior to the assessment deadline.

NOTE: **no extensions** will be provided for the homework problems for any reason. Each homework will be due on the date specified in the course outline, at the time stated in the homework description. The "best seven out of ten" grade calculation scheme for the homework is provided to account for this.

Please see below for specific details and consult the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please make an appointment with your course instructor to discuss this matter. This must be done at least 24 hours prior to the assessment (assignment/test/project) due date and time. Please see below for specific details and consult the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

COVID-19 and Safety: For information on current safety protocols, follow these links:
https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/
https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course email address within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

3.3 Course Learning Outcomes

1. Develop a strong understanding of algorithm design techniques, including brute force technique, divide-and-conquer, decrease-and-conquer, transform-and-conquer, space and time trade-off, dynamic programming, greedy techniques, iterative improvement, backtracking, and branch-and-bound.
2. Develop a strong understanding of some commonly used algorithms for manipulating data structures of lists, matrices, trees, graphs, etc. and for solving problems like sorting and searching.
3. Apply mathematical methods for analyzing non-recursive and recursive algorithms.
4. Obtain basic knowledge about problem classes of P, NP, and NP-completeness.

4 TEACHING AND LEARNING ACTIVITIES

4.1 Lecture Schedule

Please note that the list and schedule of topics below is approximate and may be revised and updated as necessary to better fit the flow of the course and assessments.

Lectures	Lecture topics	Assessments
Week 1 (Jan 8 - 14)	Course overview Review of relevant math topics	
Week 2 (Jan 15 - 21)	Overview of algorithms and problem types	Homework 1
Week 3 (Jan 22 - 28	Fundamentals of the Analysis of Algorithm Efficiency	Homework 2
Week 4 (Jan 29 - Feb 4)	Fundamentals of the Analysis of Algorithm Efficiency	Homework 3
Week 5 (Feb 5 - Feb 11)	Brute Force and Exhaustive Search	Midterm 1, Homework 4
Week 6 (Feb 12 - 18)	Decrease-and-Conquer	Homework 5
	Reading week	
Week 7 (Feb 26 - Mar 3)	Divide-and-Conquer	Homework 6
Week 8 (Mar 4 - 10)	Transform-and-Conquer	Homework 7
Week 9 (Mar 11 - 17)	Space and Time Trade-Offs	Homework 8
Week 10 (Mar 18 - 24)	Dynamic Programming	Midterm 2, Homework 9
Week 11 (Mar 25 - 31)	Advanced topics	
Week 12 (April 1 - 7)	Review	Homework 10
Examination period		Final exam

4.4 Important Dates

Monday, January 8: First day of class
Monday, February 19 - Sunday, February 25 - NO CLASS
Friday, March 29: No Classes Scheduled -- classes rescheduled to Monday, April 8.
Monday, April 8: Last day to drop classes, last day of CIS*3490. Friday schedule in effect.

5 ROLES AND RESPONSIBILITIES

5.1 Communication & Email Policy

Please use lectures, lab sessions, and the website discussion forum as your main opportunities to ask questions about the course. Questions that are specific to your particular situation may be emailed to cis3490@socs.uoguelph.ca and will be answered by one of the instructional team. Technical questions related to the programming assignments should be sent to the discussion forum on the course website. Extremely private communication should be conducted by making an appointment with the course instructor.

Please note that the in-class discussions, course email, course forums, and the instructor / TA office hours are the only means of communications for this course. Any other attempts at communication will not get a response.

Major announcements will be posted to the course website and the discussion forums. It is your responsibility to check the course website regularly. As per university regulations, all students are required to check their <mail.uoguelph.ca> e- mail account regularly: e-mail is the official route of communication between the University and its students.

5.2 Recording of materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course and may not be posted on any public space unless further permission is granted.

5.3 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected notes will be made available to students on the course website but are not intended to be stand-alone. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for exams and assignments.

5.4 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures, labs and help sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed as early as possible. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

5.5 General course policies

Do not redistribute recorded interactive discussions that involve your classmates. This includes advising times and question and answer sessions with the instructor.

Online activities such as advising times, question and answer sessions, and interactive lectures may be recorded by the instructor or TAs and posted to the course website. By taking this course you are agreeing that your participation in these activities can be used in this manner. If you do not wish to have your image or voice recorded as part of these activities then either do not take this course or do not ask verbal questions during these activities.

A reliable internet connection that is sufficient for online learning is necessary for this course. If you do not have a sufficiently fast and reliable internet connection, then you may not be able to view or download lectures or other course material. It may also not be possible to attend online advising with teaching assistants or the instructor.

This course is offered in the eastern standard time zone (EST). While taking this course then you may be required to attend online activities such as interactive lecture components, advising times, labs, and assignment evaluation sessions between 8:30am and 5:00pm EST. The lectures and labs are an integral par of the corse,

and you are expected to be available during the scheduled lecture times and lab times for consultation with the instructor and TAs.

Keep copies of assignments which you have submitted. You may be asked to resubmit assignments at a later time.

6 ACADEMIC INTEGRITY

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. All students who take a SOCS course must pass the **Academic Integrity Self Test.**

Please note: whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

The SOCS Academic Integrity Unit:
http://moodle.socs.uoguelph.ca/course/view.php?id=2 Login with your central login credentials. The key to use is "imhonest".

6.1 Including the work of others

For educational purposes, instructors impose conditions on assignments that may limit students' permission to collaborate with others or to utilize external sources (including, but not limited to, software, data, images, text, etc.). Any permitted utilization must be done with proper references. Aiding and abetting is a punishable offence; students must be careful not to help others commit offences by giving out solutions or providing to access computer accounts. Instructors may use automated tools to detect possible cases of academic misconduct.

6.2 Requesting grades based on personal circumstances

Grades are given based on demonstrated proficiency in the course material. Personal circumstances may interfere with opportunities to demonstrate this proficiency. Course accommodations in terms of adjusted or alternate methods to demonstrate proficiency may be arranged with SAS or the course instructor **well in advance of the due dates of the relevant assessment**. Please see the accommodation policy discussed in Section 3.2.

Personal circumstances **never** result in a change of grading after the fact, under any conditions whatsoever. In fact, requesting a change to a grade based on personal circumstances is a type of academic fraud. It will be referred for discipline under academic misconduct.
Note the difference here:

- accommodation for personal circumstances to allow proficiency to be demonstrated is supported, as stated in Section 3.2
- requests for direct grade accommodation when the proficiency has not been demonstrated is fraud.

7 ACCESSIBILITY

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their midterm and final examinations in advance. More information: www.uoguelph.ca/sas