

Western University
Department of Computer Science
CS4445/9544 Analysis of Algorithms II
2022

Instructor

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Lectures: Wednesday from 11:30 am to 12:30 pm and Friday from 1:30 pm to 3:30 pm at MC-105B.

Office hours (through Zoom): Monday from 3:00 pm to 4:00 pm and Friday from 3:30 pm to 4:30 pm.

Tentative List of Topics

- Maximum flows and applications
- Approximation algorithms
- Randomized algorithms
- Online algorithms
- Parallel algorithms

Course Learning Outcomes

- Model and solve optimization problems through the use of network flows
- Design and analyze approximation algorithms for NP-hard combinatorial optimization problems
- Use randomization to solve optimization problems
- Understand and analyze online algorithms and their limitations
- Design parallel algorithms that take advantage of multiprocessor systems for efficiently solving problems.

References

- *Introduction to algorithms*, Cormen, Leiserson, and Rivest. The MIT Press, Third edition, 2009.
- *The design of approximation algorithms*, Williamson and Shmoys, Cambridge University Press, 2011. Available at <https://www.designofapproxalgs.com/download.php>
- *Randomized algorithms*, Motwani and Raghavan. Cambridge University Press, 1997.
- *Online computation and competitive analysis*, Borodin and El-Yaniv. Cambridge University Press, 1998.
- *An introduction to parallel algorithms*, JaJa. Addison Wesley, 1992.
- *Algorithm Design*, Kleinberg and Tardos, Addison Wesley, 2005.
- *Algorithm Design*, Goodrich and Tamassia, Addison Wesley, 2001.

Prerequisites

- CS3340 Analysis of Algorithms I, or

- Software Engineering 2205A/B and Software Engineering 3310A/B.

Unless you have either the requisites for this course or written special permission to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Student Evaluation

Grades will be based on

- 4 assignments, worth 76% of the final mark
- 2 quizzes, worth 24% of the final mark.

Schedule

Tentative. Some of these dates might change

- Assignment 1, due October 6.
- Assignment 2, due October 27.
- Assignment 3, due November 17.
- Assignment 4, due December 7.
- Quizz 1, October 21.
- Quizz 2, December 2.

There will not be makeup quizzes. Electronic devices will not be allowed during quizzes.

OWL

All course material will be posted to OWL: (<http://owl.uwo.ca>). Students are responsible for checking the course OWL site on a regular basis for course material, assignments, news and updates. This is the primary method by which information will be disseminated to all students outside the classroom.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Late Policy

The late penalty for assignments is 2.5^i (2.5 to the i th power), where $i > 0$ is the number of days you are late. So if you hand in your assignment 1 day late, you will be penalized 2%, a delay of 2 days will decrease your grade by 6%, 3 days is penalized 16% and 4 days takes 39% off your grade. You cannot be more than 4 days late.

The assignments are worth 76% of the overall mark for the course. If an assignment has to be cancelled for any reason, the remaining assignment weights will be prorated to add up to 76%. The quizzes are worth 24% of the overall mark for the course; if a quiz has to be cancelled, the weight of the remaining one will be worth 24%.

Appeals of Assignment/Quizzes Marks

Appeals of assignment/quizzes marks must be addressed first to the T.A. who marked your assignment. If you and the T.A. cannot agree, then please discuss the situation with the lecturer.

Appeals **must occur within 1 week** from the first day that the marked work was made available to students. After that 1 week period has gone by, no more appeals will be considered.

Contingency Plan for Pivoting to 100% Online Learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

If the course needs to be moved online, any remaining quizzes will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

<https://remoteproctoring.uwo.ca>.

If the course delivery needs to be moved online, you need to satisfy these technical requirements:

- a computer or tablet able to run a recent version of a web browser
- a webcam and microphone, and
- reliable high-speed internet connection

Academic Consideration for Student Absences

Students who experience an extenuating circumstance (like illness or injury) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration. You must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. All documentation required for absences must be submitted to the Academic Counselling office of a student's Home Faculty.

If a student receives academic accommodation, depending on the circumstances the instructor will determine whether the missed components will be excused (so that the completed components will be re-weighted) or if deadlines will be extended for submitting the missing academic work. Accommodation for any work missed must be requested to the student's Dean's Office/Academic Counselling unit.

Note: missed work can only be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is not sufficient on its own.

Ethical Conduct

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Students must write their assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence.

All assignments are individual assignments. You may discuss approaches to problems among yourselves; however, the actual details of the work (assignment coding, answers to concept questions, etc.) must be an individual effort. Assignments that are judged to be the result of academic dishonesty will be penalized and the Department of Computer Science and the Dean's office will be informed of this offence. Notice that the Department or the Dean's office might impose additional penalties. You are responsible for reading and respecting the Computer Science Department's policy on Scholastic Offences and Rules of Ethical Conduct

https://www.csd.uwo.ca/undergraduate/current/policies/ethical_conduct.html

Email Contact and OWL

Students should check the course's OWL site on a regular basis for news and updates. This site is the primary method by which information will be disseminated to all students outside the classroom.

Students are responsible for checking OWL and their email messages on a regular basis.

Email messages will be sent to the UWO email address assigned to students by Information Technology Services (ITS), i.e. your email address @uwo.ca. It is each student's responsibility to read this email on a frequent and regular basis, or to have it forwarded to an alternative email address if preferred. See the ITS website for directions on forwarding email. However, you should note that email at ITS (your UWO account) and other email providers such as hotmail.com or yahoo.com may have quotas or limits on the amount of space they can use. If you let your email accumulate there, your mailbox may fill up and you may lose important email from your instructors. Losing email that you have forwarded to an alternative email address is not an excuse for not knowing about the information that was sent.

Students must use their Western (@uwo.ca) email addresses when contacting the instructor. If you send email to the instructor from a commercial account, send a carbon copy (cc) to your UWO email address. The instructors will respond to your UWO address.

In accordance with University policy, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that email received from the University at his/her official university address is attended to in a timely manner.

Accommodation and Accessibility

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

No electronic devices will be allowed during the exams.

Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling>

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Student Accessibility Services (SAS) at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital>.

Learning-skills counsellors at the Student Development Centre (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western

<http://www.uwo.ca/health>

for a complete list of options about how to obtain help. Additional student-run support services are offered by the USC,

<http://westernusc.ca/services>.