

**Western University**  
**Department of Computer Science**  
**CS4445/9544 Analysis of Algorithms II**  
**2024**

**Instructor**

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*Email:* solis@csd.uwo.ca

*Lectures:* Fridays from 1:30 pm to 3:30 pm ██████████

*Office hours (through Zoom):* Tuesday and Thursday 5:00 pm to 6:00 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

**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.

**Key Sessional Dates**

- Classes begin: September 5, 2024
- Reading Week: October 12–20, 2024
- Classes end: December 6, 2022

**Contingency Plan**

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

## Course Materials

All course material will be posted to OWL: (<https://westernu.brightspace.com>). 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 Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## Reference Material

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

## Methods of Evaluation

The overall course grade will be calculated as listed below:

- 3 assignments, worth 42% of the final mark
- midterm exam, worth 23% of the final mark.
- final exam, worth 35% of the final mark

## General information about missed coursework

Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs posted on the Academic Calendar:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/academic\\_consideration\\_Sep24.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf)

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person. The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education. For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

[https://registrar.uwo.ca/academics/academic\\_considerations/](https://registrar.uwo.ca/academics/academic_considerations/)

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline. All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm Exam

When a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above or those in the Coursework with Assessment Flexibility section below, the request cannot be recalled and reapplied. This privilege is forfeited.

### Academic Work Schedule

**Tentative.** Some of these dates might change

- Assignment 1, due October 10.
- Assignment 2, due November 7.
- Assignment 3, due December 5.
- Midterm Exam October 26
- Final exam, scheduled by the university

**There will not be a makeup exam.** If you cannot write the midterm for a valid reason (i.e. exam conflict, medical, or religious reasons), you will have to contact your home faculty's academic advising office to request an academic consideration for your absence. If you receive their approval, the weight of the midterm will be shifted to the final exam, making it worth 58%. Without such an academic consideration, missing the midterm will result in a mark of zero on the midterm and it cannot be made up.

The final exam will be scheduled by the University. The final exam is cumulative, meaning it covers topics from the entire semester.

Electronic devices will not be allowed during the exams.

### 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 42% of the overall mark for the course. If an assignment has to be canceled for any reason, the remaining assignment weights will be prorated to add up to 42%. The midterm exam is worth 23% of the overall mark for the course; if the midterm has to be canceled, its weight will be transferred to the final exam.

### Appeals of Assignment/Exam Marks

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

### Evaluation Scheme for Missed Assessments

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedure below. Whenever you need an academic consideration for an absence (as explained below), you must contact the Academic Advising 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/academic\\_consideration.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration.pdf)

The Student Medical Certificate is available at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf)

Students should also note that 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 weight of the missed component will be transferred to the final exam) 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.

Assignments will not be accepted after one week of the original deadline. If an academic accommodation has been granted beyond this date, the weight of the assignment will be transferred to the final exam..

### **Midterm Exam**

If you are unable to write the midterm, you must contact your home faculty's academic advising office to request an academic consideration. If they approve, the weight of your midterm will be shifted to the final exam. Without approval from an advisor, missing the midterm will result in a mark of 0 on the midterm.

### **Final Exam**

If you miss the Final Exam, please contact the Academic Advising Office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam). If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

**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.

### **Religious Accommodation**

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 Advising 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>.

### **Accommodation Policies**

Students with disabilities work with Accessible Education (formerly SSD), 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/AcademicAccommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/AcademicAccommodation_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](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.

In the event of health lock-down, tests and exams in this course may 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>.

## Scholastic Offences

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](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](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. 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.

## 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>

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](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](mailto: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](mailto:MentalHealth@Western)

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

for a complete list of options about how to obtain help.

Western University is committed to a thriving campus. We encourage you to check out the Digital Student Experience website to manage your academics and well-being:

<https://www.uwo.ca/se/digital/>.

Additional student-run support services are offered by the USC,

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