
Department of Computer Science, University of Western Ontario

CS3331A - Course Outline

1. Course Information

Course Information

- CS3331A - Theory of Computing -- Fall 2026
 - Class time
 - Wednesdays, 11:30am - 1:30pm, [REDACTED]
 - Fridays, 11:30am - 12:30pm, [REDACTED]
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List of prerequisites

- Computer Science 2214A/B or Mathematics 2155F/G
Unless students have either the prerequisites for this course or written special permission from the Department of Computer Science to enroll in it, they may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on their academic record. This decision may not be appealed.
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2. Instructor information

- Prof. [Lucian Ilie](#)
 - Office hours: [REDACTED], [REDACTED]
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3. Course Syllabus, Schedule, Delivery Mode

Course description

We live during the computer revolution, which is changing fast everything around us. While programming languages change quickly, the fundamental underlying theory does not. This course covers the basic concepts of the theory of computing. To study computation thoroughly, we need models, ideally, the simplest models that can solve the problem at hand. This is what the theory of computation is about: computational models and their power, with a vast array of applications. The practical models we study in this course include finite state machines, regular expressions, push-down automata, and context-free grammars. A crucial aspect is studying the limits of computations, which involves investigating all powerful models, such as Turing machines. Some problems are intractable, that is, it takes ages to solve them, others are provably impossible to solve even on an infinitely powerful computer. Good news: AI will never be able to solve all problems! Theory of computing sheds light on these issues of fundamental importance to anyone attempting to understand what computers can do for us.

Topics

- Regular Languages
 - Finite State Machines (FSM), Deterministic (DFSM), Nondeterministic (NDFSM), Regular Expressions, Regular Grammars
 - Minimizing DFSM, Conversions between DFSM, NDFSM, Reg. Exp., and Reg. Grammars
 - Proving regularity, Closure properties
 - Proving nonregularity, Pumping theorem, Using closure properties
 - Decision Problems, Membership, Emptiness, Totality, Finiteness, Equivalence, Minimality
 - Context-free Languages
 - Pushdown Automata (PDA), Context-free Grammars (CFG)
 - Conversions, $PDA \leftrightarrow CFG$, $CFG \rightarrow$ Chomsky Normal Form
 - Ambiguity
 - Proving context-freeness, Closure properties
 - Proving noncontext-freeness, Pumping theorem, Using closure properties
 - Decision Problems, Membership, Emptiness, Finiteness
 - Turing Machines and Undecidability
 - Turing Machines (TM), Deterministic TM
 - Decidable languages (D), Semidecidable languages (SD)
 - Multi tape TM, Nondeterministic TM
 - Universal TM, Halting Problem
 - D and SD, Enumeration
 - Reduction, Using reduction to prove undecidability
 - Rice's Theorem, Non-SD languages
 - Unrestricted Grammars
 - Non-TM Problems, Post Correspondence Problem (PCP), Context-free language problems
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TAs and office hours

- TBD
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4. Course Materials

Textbook (required)

- Elaine Rich, *Automata, Computability, and Complexity. Theory and Applications*, © Person Prentice Hall (2008), ISBN 978-0-13-228806-4.
 - The textbook is out of print but a [free PDF](#) is available. You can find a hard copy from previous students or from [AbeBooks](#).
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Lecture Notes

- Click "Lecture notes" button at the top of the page
 - Username and password are given in the Announcements
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Tools

- [JFLAP](#)

- You are allowed to use any external tools, such as JFLAP, ChatGPT, etc., as a source of information to help you solve the assignments. Make sure you understand the solutions as no tools will be available during the exams!

Class email

- All questions are to be sent to this email address: [REDACTED]. For long questions, please attend the office hours.

OWL

- Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.
- If students need assistance with the course OWL site, 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 [REDACTED] or [REDACTED].

5. Methods of Evaluation

Evaluation

- Assignments will be available in [OWL](#). The assignments will consist of a set of exercises related to the material covered in class. The solutions for the exercises should be neatly written or typed.
- Assignments -- best 3 out of 4 will be considered; these due dates are tentative - the date on the assignment supersedes this:
 - Assignment 1 (6.67%) -- due Oct. 7
 - Assignment 2 (6.67%) -- due Oct. 31
 - Assignment 3 (6.67%) -- due Dec. 2
 - Assignment 4 (6.67%) -- due Dec. 7
- Exams - written format, closed book, no cheat sheet, **no devices**
 - Midterm Exam (30%) - November, Nov. 4, 11:30am - 1:30pm
 - Material required for midterm: everything taught in class before the exam
 - *There is no midterm makeup (see below)*
 - [REDACTED]
 - Final Exam (50%) - **cumulative**
 - TBD
 - Material required for final: everything taught in class during the entire term
 - Final exam makeup: TBD

Exam passing rule

- In order to pass the course you **must pass the exams**, that is, your *weighted average* grade for the two exams should be at least 50/100. Otherwise, your final grade for the course will be the weighted average of the exam grades.

Exams

- This course has one midterm test and a cumulative final exam. There is no makeup test for a missed midterm. If a student misses a midterm, its weight will shift automatically to their final exam grade. If

their final exam grade is higher than their midterm grade, their final exam grade will replace the midterm's weight in their overall grade. They do not need to request Academic Consideration for a missed midterm; the reweighing will be done automatically. The only exception is an early sitting, offered solely for a university-sanctioned schedule conflict (e.g., conflict of two midterms, Varsity competitions) or a religious accommodation that prevents a student from writing the midterm at its scheduled time. If a student requires this accommodation, they must notify their instructor in writing no later than one week before the test. No other circumstance, including illness, qualifies for an early sitting or makeup; these are addressed through the automatic reweighing described above.

Assignments

- This course has 4 assignments. Students are expected to complete 3 to receive full credit for this component. If they miss 1 of these 3, they do not need to request Academic Consideration; the missing assignment grade will be calculated as the average of their 2 submissions. If a student completes fewer than 2 of the total (i.e., 1 or 0 assignment submissions), the missing items (up to 3) will be recorded as a zero and included in their grade for this component. They are encouraged to submit all work, even if incomplete, since a partial mark is always better than a zero. If their final exam grade is higher than their grade on the assignment component, their final exam grade will replace it. (The grade for the assignment component is the sum of the 3 assignment grades multiplied by 20/100.)

Deadlines: The 48-Hour No-Late-Penalty Period

- All assignments carry an automatic 48-hour no-late-penalty period built into that deadline. After this 48-hour period, no further submissions will be accepted, and students do not need to request Academic Consideration for a missed deadline; their grade for this component will be calculated as described above.

Mark inquiries

- The goal is to make grading as objective and consistent as possible. The assignments and exams will have detailed evaluation schemes. For consistency, the same question will be graded, whenever possible, by the same grader for all students.
- Inquiries for marks will be addressed first to the TA who graded the question. In case of disagreement, the complaint will be resolved by the instructor. In case of multiple complaints for one exam from a student, the entire exam of that student will be regraded from scratch by the instructor.
- Mark inquiries can be made only within **one week** from the day the marks are made available. Assessments at the end of the term may have a shorter period of time, due to constraints related to final grade submission. Check the regrade requests settings for each assessment.

Special Examination

- Per university policy, Academic Consideration requests with supporting documentation are required for the final examinations scheduled during official examination periods by the Registrar's Office.
- If the student has been approved by the Academic Advising Office to write a Special Examination (SPC) and the final exam is their only outstanding course component, an SPC will be assigned to them and scheduled by the instructor per university policy.
- If the student misses their SPC exam and is approved for Academic Consideration, they will be withdrawn from the course without academic penalty. If they experienced extenuating circumstances such as prolonged illness, they may appeal to the Associate Dean (Academic), on a case-by-case basis, for the opportunity to write the final exam the next time the course is offered. An outstanding SPC will reduce their course load for the term in which the exam is deferred, as outlined in the Definitions of Types of Examinations policy.
- If the student misses their SPC exam and Academic Consideration is not approved, or was not requested, they will receive a grade of zero on the exam.

6. Additional Statements

6.1 Religious Accommodation

When a recognized religious holiday either requires a student to be absent from the University, or requires or prohibits an activity that makes it impossible for them to complete an academic requirement scheduled that day, they are entitled to accommodation. No student will be penalized for an absence for religious reasons, and an alternative means of satisfying the requirement will be arranged. This accommodation is provided in accordance with the University's policy on Accommodation for Religious Holidays:

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

The student should submit their requests through the Student Absence Portal (SAP), identifying the conflict and the specific course component(s) affected (e.g., test, midterm, exam).

- **Midterms and Tests:** If a religious observance conflicts with a midterm test, they must submit their request no later than one week before the test. Their instructor will arrange an early sitting of the test. As set out above, no makeup test is offered for any other reason; this early sitting is available specifically for this accommodation.
- **Final Examinations:** If a religious observance conflicts with the final exam, the student must submit their request no later than two weeks before the exam. Their instructor will arrange a Special Examination to take place no later than one month after the end of the examination period.

Students are responsible for finding out what was covered in any class they miss due to a religious observance, and for taking the appropriate steps to keep up with the course.

If a suitable arrangement cannot be reached between a student and their instructor, they should consult the Undergraduate Chair of the department offering the course, and if necessary, the Associate Dean (Academic) of the Faculty of Science.

For a list of recognized religious observances, please visit the calendars posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca> (About Us ð Resources ð Additional Resources ð Calendars).

6.2 Academic Accommodation Policies

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.

6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

Use of @uwo.ca email: 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 email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as 'Appeals') Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences: https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments In courses offered by the Faculty of Science, the **possession** of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is **strictly prohibited**. This includes, but is not limited to: mobile phones, smart watches, smart glasses, hidden cameras and wireless earbuds.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at a student's desk, on their person, or within reach during an assessment will be treated as a scholastic offence, **even if the device is not in use**.

Effective September 2026, **the typical penalty for this offence is a failing grade in the course AND a 12-month prohibition on retaking the course**. Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is their responsibility to review and comply with these expectations.

Use of Generative AI Tools Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is the student's responsibility to seek clarification before using any AI tools in academic work.

6.5 Support Services

Academic Advising. Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/advising/>.

Mental Health Support. Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Gender-Based and Sexual Violence. Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If a student has experienced GBSV (either recently or in the past), they can 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 [REDACTED].

Accessibility for Coursework. A student may contact the course instructor if they require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to them. If they have any questions regarding accommodations, they may also contact Accessible Education at

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

Learning Development and Success. Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help students improve their learning skills. The facility offers 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.

Student Councils. Student-run support services are offered by the University Students' Council (<https://westernusc.ca>) and the Science Students' Council (<https://www.westernssc.ca>).