

The University of Western Ontario
London, Canada.
Department of Computer Science
CS 2209B - Applied Logic for Computer Science
Winter 2020

Course Description

This course presents an introduction to mathematical logic with emphasis on methodologies and applications in Computer Science. Topics include propositional and predicate logic, methods for deductive reasoning, mathematical structures related to logic, an introduction to SAT solving and programming languages based on logic.

Prerequisites

Either 1) Computer Science 1027A/B, Computer Science 1037A/B, Computer Science 2101A/B, Computer Science 2121A/B or Digital Humanities 2221A/B in each case with at least 65%, and 1.0 course with at least 60% in each from: Applied Mathematics 1201A/B, Applied Mathematics 1413, Calculus 1000A/B, Calculus 1301A/B, Calculus 1500A/B, Calculus 1501A/B, Mathematics 1600A/B; or 2) Integrated Science 1001X with at least 60%. Unless you have either the requisites for this course or written special permission from your Dean 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.

Instructor

Federico Pasini

Office hours: Thursday 1:30-2:15pm, or after classes, or by appointment.

E-mail: fpasini@uwo.ca

Course Materials

The main source for the course is a series of lecture notes uploaded by the instructor on OWL.

Recommended textbook, freely available as ebook through UWO libraries:

- M. Ben-Ari, *Mathematical Logic for Computer Science, Third Edition*, Springer, 2012.

Supplementary textbook freely available as ebook through UWO libraries:

- D. Mundici, *Logic: A Brief Course*, Springer, 2012.

Other valuable books:

- E. Mendelson, *Introduction to mathematical logic*, various editions, Van Nostrand.
- M. Huth and M. Ryan, *Logic in Computer Science: Modelling and reasoning about systems*, various editions, Cambridge University Press
- N. Nisanke, *Introductory logic and sets for computer scientists*, Addison Wesley, 1999.
- I. Copi (et. al.), *Introduction to logic*, various editions and publishers.
- B. Mates, *Elementary logic*, Oxford University Press, 1972, 2nd ed.

Course Website

<https://owl.uwo.ca>

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

class. The missing of critical information due to your failure to check the course website on OWL cannot be used as a basis for appeal.

Course Topics

Introduction to logic

Propositional logic: the language

Propositional logic: proofs (truth tables; natural deduction; tableaux; resolution)

Restricted languages: definite clauses, Horn clauses

Proof techniques for restricted languages

Predicate logic: the language

Predicate logic: proofs (natural deduction; tableaux; resolution)

Restricted languages: definite clauses, Horn clauses

Proof techniques for restricted languages

Sets, Mathematical Induction and Recursion

Other topics (SAT solving, Prolog, Answer Set Programming)

The course topics above should be thought of as guidelines. There might be minor changes to the topics as the course runs.

Class Schedule

Lessons are on Tuesday, Wednesday, Thursday 2:30-3:30pm in SEB-1200.

One additional tutorial per week. Tutorials will start on the week of January 13th. The timing and place depends on your chosen section. Please check the Western time tables for this:

<https://studentservices.uwo.ca/secure/timetables/mastertt/ttindex.cfm>

Course Work Evaluation

3 Assignments: 18% (6% each)

Midterm test: 33%

Final exam: 40%

3 Quizzes: 9% (3% each, at tutorials)

None of the components will be dropped, and it is not possible to have the components reweighed unless they were legitimately missed.

It is Faculty of Science policy that a student who chooses to write a test or exam deems themselves fit enough to do so, and the student must accept the mark obtained. Claims of medical, physical, or emotional distress after the fact will not be considered.

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

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

Computer-marked, multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Late assignments will not be accepted for marking, unless an extension has been granted. To obtain a passing grade in the course, a student must obtain at least 50% on the two exams (weighted 33% - 40%).

Every effort will be made to have assignments and tests marked and handed back within 2 weeks of the hand-in date.

If for any reason the assignment schedules given below cannot be adhered to, the assignment marks will be pro-rated. For example, the 3 assignments are worth 18% 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 18%.

Tentative Assignment and Test Schedule, and Other Test and Exam Rules

Assignment 1 (6%): due January 24th on OWL

Quiz 1 (3%): week of January 27th-31st in Tutorials

Assignment 2 (6%): due February 14th on OWL

Midterm test (33%): February 29th, 5:30pm-7:30pm, room NSC 1

Quiz 2 (3%): week of March 9th-13th in Tutorials

Assignment 3 (6%): due March 20th on OWL

Quiz 3 (3%): week of March 30 - April 3rd in Tutorials

Final exam (40%): TBD

Generally, no extensions to assignments will be given (except for lengthy illness, or other compassionate grounds). In those cases where an extension is granted, only the course instructor can grant the extension. If you have serious medical or compassionate grounds for an extension, you should take supporting documentation to the office of the Dean of your faculty, who will contact the instructor. There will be no makeup Midterm Exam. If you miss the Midterm Exam for a legitimate reason, and present valid documentation to the Academic Counselling Office or Dean's office, your Final Exam mark will be reweighed to include the weight of the Midterm Exam. You must notify the course instructor within a week of the missed Midterm Exam, and documentation must be received by your Dean's office within 2 weeks of the missed exam. For computer-marked multiple-choice tests and/or exams, use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating. If for any reason the assignment and quiz schedules cannot be adhered to, the marks will be pro-rated. No electronic devices may be in your possession during tests and exams. All exams, tests and quizzes are closed book. In case of questions regarding the marks, please note that no assignments or exams will be accepted for re-marking later than two weeks after they have been marked. We reserve the right not to re-mark assignments or exams that have been written in pencil. All students are expected to attend all classes. A student found to be missing a large number of classes without acceptable reasons risks being denied a passing grade.

Missed Test or Final Exam

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible. If you are a science student, the Academic Counselling Office of the Faculty of Science is located in WSC 191, and can be contacted at 519-661-3040 or scibmsac@uwo.ca. Their website is

https://www.uwo.ca/sci/undergraduate/future_students/academic_support/academic_counselling.html

A student requiring academic accommodation due to illness is recommended to follow the policy on Accommodation for Illness

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

(which includes a link to the Student Medical Certificate). There are no make-up tests or quizzes. If your faculty's Academic Counselling Office has approved your circumstances, the value of the missed test or quiz will be reallocated. If you miss the Final Exam, contact your

faculty's Academic Counselling Office as soon as possible. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam). You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation":

https://registrar.uwo.ca/academics/examinations/exam_conflicts.html

Assignment Submission

All assignments have to be submitted to OWL as PDF files. You can either create these files with software (for example LaTeX), or scan a paper copy, or photograph a paper copy and convert the photo to a PDF file. Be certain to submit ONLY ONE file for each assignment. It is the student's responsibility to make sure that the PDF file is uploaded correctly.

Ethical Conduct

All assignments are individual assignments. You may discuss approaches to problems among yourselves; however, the actual details of the work must be an individual effort. The standard departmental penalty for assignments that are judged to be the result of academic dishonesty is, for the student's first offence, a mark of zero for the assignment, with an additional penalty equal to the weight of the assignment also being applied. You are responsible for reading and respecting the Computer Science Department's policy on Scholastic Offences

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

and Rules of Ethical Conduct

https://www.csd.uwo.ca/current_students/undergraduate_students/rules_of_ethical_conduct.html

The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their written work and programs in electronic form for plagiarism checking.

Accessibility

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 Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

Support Services

Learning-skills counsellors at the Student Development Centre <http://www.sdc.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 for a complete list of options about how to obtain help: <https://www.uwo.ca/health/>.

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

<https://westernusc.ca/student-support/>.

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