

The University of Western Ontario

MATH 4152 / 9052 – Algebraic Topology – Winter 2020

Algebraic topology is the study of topological spaces using tools of an algebraic nature, such as homology groups, cohomology groups and homotopy groups. It is one of the major cornerstones of mathematics and has applications to many areas of mathematics and to other fields, such as physics, computer science, and logic. This is a first course in algebraic topology which will introduce the invariants mentioned above, explain their basic properties and develop geometric intuition and methods of computation.

Schedule: Tu. 09:30–11:30 and Th. 09:30 – 10:30, in MC-108.

Course Instructor: M. Pinsonnault.

Email: mpinson@uwo.ca

Office: MC-132

Prerequisite: Group Theory (Math 3120) and General Topology (Math 3132 or Math 4121). Students are responsible for verifying that they have the correct prerequisites.

Course Outline: Homotopy, fundamental group, Van Kampen's theorem, covering spaces, simplicial and singular homology, homotopy invariance, long exact sequence of a pair, excision, Mayer-Vietoris sequence, degree, Euler characteristic, cell complexes, projective spaces. Applications include the fundamental theorem of algebra, the Brouwer fixed point theorem, division algebras, and invariance of domain.

Required Textbook:

- Algebraic Topology, by Allen Hatcher, Cambridge University Press, ISBN 0-521-79540-0

The book is available at the UWO bookstore, and is also available online. The book's webpage also contains a list of errata for the printed copy.

We will cover parts of chapters 0, 1, 2, and 3. The textbook is a valuable resource that gives more examples and details than can be given during lecture. Students are expected to read the textbook, going over what we have covered, reading ahead to what comes next, and studying additional examples.

Website: References and announcements will be posted on the OWL website of the course.

Evaluation of Student Performance:

- Homeworks: $6 \times 5\% = 30\%$
- Presentation and written report: $10\% + 15\% = 25\%$
- Final examination: 45%

Notes:

- Homework will be given every two weeks, starting on January 13. Doing problems and talking about the material are both essential for learning the material in this course, so you are encouraged to discuss the problems with classmates and with me. But you must write up the solutions on your own and must not look at other students' written solutions nor should you attempt to find solutions to problems online or in textbooks. Your solutions should be clear and carefully written and you should give credit to those who helped you and to any references you used. Homework will be graded based on both correctness and clarity. Late problem sets will not be accepted unless arranged in advance for a good reason.

Copying solutions from other students, online sources, textbooks, etc., or showing your work to other students constitutes a scholastic offense and will result in a grade of negative 100% for the assignment and in some cases expulsion from the program. All academic offenses are added to your student record.

- Each student will give a presentation on a topic related to the course and will have to submit a written version. A list of possible topics will be posted on OWL. Presentations will be scheduled after the reading week.
- The final examination will be 3 hours and will be cumulative. It will be scheduled during the exam weeks in April.
- All examinations will be closed book. No notes, no calculators, nor any other electronic devices will be permitted.

Senate Policy on Prerequisites: 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.

Academic Accomodation: If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reporting of absence or via the Dean's Office/Academic Counselling unit of your Home Faculty. If you are unable to attend the final exam due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor. For further information please see this link and the Student Services web site.

If homework is missed and sufficient documentation is provided, the homework can be handed in later. If an exam is missed and sufficient documentation is provided, a make-up exam will be offered.

Failure to follow these rules may result in a grade of zero.

Academic 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.

Accessibility: Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 for any specific question regarding an accommodation.

Health and Wellness: As part of a successful student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your degree. Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Key sessional dates:

Jan. 06	Classes begin
Jan. 14	Last day to add a second-term full course or second-term half course
Feb. 15–23	Reading week
Feb. 29	Date by which students in a second-term half course must receive assessment for work totaling 15% of their final grade
Mar. 07	Last day to withdraw from a second-term half course without academic penalty
Apr. 03	Winter Term classes end
Apr. 04-05	Study Day
Apr. 06–26	Final examinations period

See <http://westerncalendar.uwo.ca/SessionalDates.cfm?SelectedCalendar=Live&ArchiveID=> for a complete list of sessional dates.