

# Math 9052B / Math 4152B

## Algebraic Topology (Winter 2021)

### Essential information

Instructor	<a href="#">Apurva Nakade</a>
Email	<a href="mailto:anakade@uwo.ca">anakade@uwo.ca</a>
Lectures	T 9:30-11:30 am, Th 9:30-10:30 am, on Zoom (Meeting ID: 947 1739 6649)
Office hours	M 2:00 - 4:00 pm on Zoom + any (reasonable) time on Discord
Textbook	<i>Algebraic Topology</i> , by Allen Hatcher. Published by Cambridge University Press. ISBN 0-521-79540-0. The book is available online <a href="#">here</a> .
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 Websites	OWL + Discord

### Evaluation

- 30% Final
- 60% Homework
- 10% Final paper / project

### Exams

The final exam will be an oral exam conducted on Zoom. Students are required to have some means of showing their work on Zoom e.g. a tablet or a webcam.

### Homework

There will be weekly homework in this course posted every Thursday after class. Students will be required to type up their solutions in LaTeX. Instructions for uploading the homework will be posted along with the homework set.

There will be no deadline extensions. The lowest homework grade will be dropped.

### Final paper / project

This part of the evaluation is to be construed very broadly. Students are encouraged to find topics that interest them personally. Here are some instructions for the final report:

1. The report should be  $[5 - \epsilon, 10 + \epsilon]$  pages long (in standard latex font).
2. It should be written in a definition-theorem-proof-examples format.
3. The grading will be similar to the homework - you'll be graded for the details and not ideas.
4. You'll have to upload your reports on gradescope before the last day of classes (**April 12**).

## Mode of Delivery

The classes will be held online over Zoom. Students are required to attend the lectures under their full legal name and to have their webcams on. If a student is unable to do so, they must obtain prior written permission of the instructor.

## Technical Requirements

Completion of this course will require you to have a reliable internet connection and a device that meets [the system and technical requirements for Zoom](#). Tests and examinations in this course will be conducted either in-person or on Zoom. There might also be an oral component. Students are required to have some means of showing their work on Zoom e.g. a tablet or a webcam.

## Academic Integrity

Scholastic offenses are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, [here](#). Students are allowed to discuss assignment problems, but each student should write their solutions separately. **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 component and in some cases expulsion from the program.** All academic offenses are added to your student record.

## Course Description

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.

Here is a brief list topics covered in this course: 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 space. Time permitting we might talk about cohomology and homotopy. Applications include the fundamental theorem of algebra, the Brouwer fixed point theorem, division algebras, and invariance of domain.

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## 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 Academic Accommodation for Students with Disabilities policy can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

## Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year.

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

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 that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Consideration\\_for\\_absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf)

and for the Student Medical Certificate (SMC), see:

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

## Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

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

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see [http://www.registrar.uwo.ca/examinations/exam\\_schedule.html](http://www.registrar.uwo.ca/examinations/exam_schedule.html)).

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 Academic Calendar for details (under [Special Examinations](#)).

## Academic Policies

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

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, 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.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

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).

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link:

<https://support.zoom.us/hc/en-us>

Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination.

## 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 (519) 661-2147 if you have any questions regarding accommodations.

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 (<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 ([http://www.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_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>.