

MATH 4121A / 9021A - Topology

Course Outline - 2022-09-09

Course Information

Lectures: Monday, Wednesday, Friday, 11:30 – 12:30, in room MC 108

Prerequisites: Mathematics 3122A/B

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may 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 Information

Instructor: Martin Pinsonnault

Email: mpinson@uwo.ca

Communication with the instructor: In order to facilitate communication and ensure timely responses, please follow the following guidelines in every email to your instructor:

- For any email communication, always use your **UWO account**.
- In your emails, always include **MATH 4121A** in the title.
- Always include your **full name** and your **student number** in the email.
- If you have questions, **never reply directly to a global OWL announcement**. Always write a separate email following the above protocol.

Office hours: We will schedule the (in-person) office hours through an online pool during the 2nd week. Details will be posted on OWL.

Course Syllabus and Schedule

Description from the Academic Calendar: Topological spaces, neighbourhoods, bases, subspaces, product and quotient spaces, connectedness, compactness, separation axioms.

Tentative Schedule:

- Fundamental concepts: review of convergence in metric spaces, topological spaces, continuity, basic constructions.
- Convergence: sequences, nets, and filters.
- Separation and countability: T_1 , T_2 , T_3 , T_4 , and normal spaces, countability properties, theorems of Tietze, Urysohn, and Hanh-Banach.
- First assignment.
- Compactity: compactness, local compactness, compactification, paracompactness, the Tychonoff theorem.
- Metrizable: metrizable, completeness, the Baire theorem.

- Midterm.
- Connectedness: connectedness, local connectedness, path connected spaces, the Cantor set, the theorem of Jordan.
- Introduction to homotopy: homotopy, winding numbers in \mathbb{R}^2 , fundamental group, applications to fixed points and algebra.
- Second assignment.
- Function spaces: pointwise convergence, uniform convergence, compact-open topology, the Stone-Weierstrass theorem.
- If time permits, we may be able to briefly discuss other topics such as coverings spaces, topological dimension, topological category, or transformation groups.
- Final exam.

Course Materials

Textbook: The course will be based on

- *General Topology*, Stephen Willard, ISBN 978-0486434797

which can be purchased at the UWO Bookstore. The following textbooks are useful references:

- *Topology*, J. Dugundji, Allyn & Bacon Inc., 1966, QA611D8
- *Topology*, Schaum Outline Series, S. Lipschutz, McGraw-Hill, 1981, QA611.19L514.
- *Algebraic Topology*, A. Hatcher, available at <http://pi.math.cornell.edu/~hatcher/AT/ATpage.html>

Problem sets will be distributed regularly for self assessment. They will not be marked, but partial solutions will be provided.

Students are responsible for checking the course OWL site <http://owl.uwo.ca> 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. All course material will be posted to OWL. If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Methods of Evaluation

The overall course grade will be calculated as listed below.

- Assignment #1: 15%, due 2022-10-09, 23:59.
- Midterm Test: 35%, 2022-10-20.
- Assignment #2: 15%, due 2022-11-27, 23:59.
- Final Exam: 35%, during the exam week.

Additionally, **graduate students** will have to write a report (of approximately 10 pages) on a topic related to the course. The choice of the topic should be made before **October 29th**, and the final report should be handed in no later than **December 2nd**. This report will add another 15 marks to the course grade that will be calculated out of 115.

Assignments and reports will be submitted online through Gradescope.

Note that **cellphones, calculators, cheat sheets, textbooks, and any other aids will NOT be allowed during examinations.**

Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

By policy, academic considerations for work totalling 10% or more of the final course grade can be granted only by the student's Faculty of Registration (typically by their academic counsellors). In such cases, students should be directed as follows.

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling 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/accommodation_medical.pdf. The Student Medical Certificate is available at https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Students who are granted an academic consideration **no later than 5 days after the due date** of an assignment will get an extension. Students who are granted an academic consideration **no later than 5 days after a missed midterm** will get an a make-up exam. Students who are granted an academic consideration and who are not able to complete the evaluation component **within 7 days** after the sheduled date will get their evaluation reweighted.

Absences from Final Examinations: If you miss the Final Exam, please contact the Academic Counselling 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).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

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.

Online Learning Contingency plan

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). In the case the courses moves online, each student will need:

- Laptop or desktop computer

- A browser meeting the requirements for OWL, Gradescope, and Proctortrack
- Stable internet connection
- Working microphone
- Working webcam
- Device for scanning (either a scanner or an app that can be used in conjunction with your phone's camera)

The grading scheme will not change. Tests and examinations will 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. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>. Assessments will also be conducted online as determined by the course instructor.

If students need assistance with any of the above items, they can seek support on the OWL Help page <https://owlhelp.uwo.ca/students/index.html>. Alternatively, they can contact the Western Technology Services Helpdesk <https://wts.uwo.ca/helpdesk/>. Phone: 519-661-3800 or Ext 83800.

Key Sessional Dates

2022-09-08 Classes begin.

2022-09-16 Last day to add a full course, a first-term half course, a first-term full course, or a full-year half course on campus and Distance Studies.

2022-09-16 Last day to drop a full course, a first-term half course, a first-term full course, or a full-year half course with no fee penalty; course will be removed from your transcript.

2022-10-10 Thanksgiving Holiday.

2022-10-31 to 2022-11-06 Fall Reading Week.

2022-11-12 Last day to drop a first-term half course or a first-term full course on campus and Distance Studies without academic penalty.

2022-12-08 Classes end.

2022-12-10 to 2022-12-22 Exam period.

Accommodation and Accessibility

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 Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays at <https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

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/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, 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 their official university address is attended to in a timely manner.

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.

Support Services

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

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

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. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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 Accessible Education at http://academicsupport.uwo.ca/accessible_education/index.html if you have any questions regarding accommodations.

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.

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/>.

Additional student-run support services are offered by the USC, see <https://westernusc.ca/services/>.