General Topology
Department of Mathematics & Statistics
MATH 4170/5170 Fall 2024

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Suresh Eswarathasan	sr766936@dal.ca	TBD

Course Description

* Taken from the Dalhousie Academic Calendar: An introduction to topological spaces that includes the following topics (should time permit): classification in terms of cardinality of bases, separation, product spaces, Tychonoff theorem, compactness, compactifications, Tychonoff spaces, metrization.

Note: Some of the content has been subjected to change.

Course Prerequisites

MATH 2505, MATH 2110 (or an equivalent)

Student Resources

The MATH/STAT Learning Centre is located in Chase 119 and will be operating in-person and remotely. It opens on Sept. 3 and support is available Monday through

Friday from 11:30am - 4:30pm and Monday through Friday evenings from 6:30-7:30pm, until mid-December. Register for the Brightspace ``course'' at https://www.dal.ca/faculty/science/math-stats/about/learning-centre.html

Course Structure

Course Delivery: The lectures will be held in-person and will not be recorded. However, all my lecture notes, from which the in-person lectures will be based, will be uploaded at the end of the week. I will follow Janich's book but add some supplemental material to the lecture notes.

Lectures: TTh, 10:05am-11:25am AST in Chase 227

Tutorials: No tutorials

Course Materials

- In-class notes. Uploaded lecture notes.
- Required textbook: K. Janich, Topology, UTM, Springer-Verlag (1984).
- Course website on Brightspace is accessed through dal.brightspace.com

Assessment

For 4170 students:
- 45 % - biweekly homework assignments, starting September 5
- 5% - biweekly journals - briefly describe the material covered the previous two weeks, how much time was spent on it, the difficulties experienced, and how the issues were ultimately resolved. You can also simply write "I have no thoughts to report" and receive all points.
- 25 % - In-class midterm; tentative date: October 10, 2024
- 25% - Final exam; date TBD in Dalhousie's predetermined exam period.

For 5170 students:
- 45 % - biweekly homework assignments, starting September 5
- 5% - biweekly journals - briefly describe the material covered the previous two weeks, how much time was spent on it, the difficulties experienced, and how the issues were ultimately resolved. You can also simply write "I have no thoughts to report" and receive all points.
- 25 % - In-class midterm; tentative date: October 10, 2024

- 25% - Final exam; date TBD in Dalhousie's predetermined exam period.

Conversion of numerical grades to final letter grades follows the
[Dalhousie Grade Scale](#)

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

- Students are expected to use the Student Declaration of Absence form for homework extension requests, and can be used as many times as needed. See more below.
- If a student misses a deadline, arrangements can be made (following one-on-one discussions) for later submissions or substitutions. See more below.
- Regarding missed HWs, the instructor must be contacted and a one-on-one discussion with a legitimate excuse, as per Dalhousie University guidelines. As of July 1, 2023, physicians in Nova Scotia are not permitted to write 'doctor's notes' for illnesses lasting fewer than 5 days.
- On missed midterm: Student's final grade will now constitute a 50% weight on their final exam.

Course Policies related to Academic Integrity

Students are expected to work on their own, consult regularly with the instructor as they progress through the exercises, and submit individual homework assignments. If students do work together on assignments, they must include the names of the other students with whom they collaborated on their submitted material. If you use ChatGPT or another type of AI, please indicate this on your submitted assignments.

Learning Objectives

- Students can reason abstractly about topological spaces and continuity and are able to analyze the properties of a multitude of examples provided.
- Students can describe and work with relevant topological models for various concrete applications.
- Students will understand the subspace, product and quotient topologies and how their definitions are related to continuous functions.

- Students will understand the connection between metric spaces and topological spaces.
- Students will understand and be able to work with various notions of compactness and know the relations with other topological and metric properties, and be familiar with various compactification constructions.
- Students know the result and are able to prove that any product of compact spaces is compact.
- Students are able to determine for a given topology which countability and separation properties it has.
- Students know the definition of connectedness and various theorems surrounding it.
- Students know the concept of covering spaces and various examples.
- Students know the concept of a fundamental group and are able to do compute the fundamental groups of certain topological spaces.
- Students know the definition of homotopy and can use Brouwer's Fixed Point Theorem.
- Students are able to apply the topological concepts and constructions to some chosen real world problems.

Course Content

The following schedule is tentative:

Week 1: definition of a topological space, bases, subbases and lots of examples.
Week 2: closed sets, subspace topology, product topology
Week 3: metric topologies, continuous functions,
Week 4: product topology continued, Hausdorff separation
Week 5: connectedness, path connectedness and components
Week 6: Midterm
Week 7: compactness
Week 8: quotient topologies and maps
Week 9: homotopy and equivalence
Week 10: categories and functors
Week 11: countability axioms
Week 12: CW complexes
Week 13: CW complexes continued

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the

Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: http://www.dal.ca/cultureofrespect.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at:
https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to

seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.