21–752
Algebraic Topology
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Carnegie Mellon University

Syllabus — Algebraic Topology — Fall 2018

Lectures: MWF 11:30 – 12:20 in WEH 5328
Units: 12

Instructor: Florian Frick, frick@cmu.edu, WEH 7115
Office hours Wed 2:00 – 3:00 and by appointment

Assistant: Zoe Wellner, zwellner@andrew.cmu.edu, WEH 6205
Office hours Wed 12:30 – 2:00, Thu 1:00 – 2:00, and by appointment

Course Description: Topology is a less rigid variant of geometry that studies shapes of spaces. Algebraic topology associates algebraic invariants, such as groups or rings, to such spaces. This is achieved by building a space from simpler ones or by algebraically keeping track of how to map a simple space into a given space. This course will cover

- the fundamental group and covering spaces,
- homology theories, and
- the cohomology ring of a space (time permitting).

Learning Objectives: At the end of this course, you should be able to

- compute algebraic invariants associated to topological spaces and maps between them,
- prove topological results by using algebraic methods, and
- apply methods from algebraic topology to problems in a broader mathematical context.

Prerequisites: 21–356 Principles of Real Analysis II, 21–373 Algebraic Structures; in addition 21–651 General Topology or some fundamental knowledge of topology recommended.

Textbook: Allen Hatcher, *Algebraic Topology*, Cambridge University Press, 2002,
available online at `http://pi.math.cornell.edu/~hatcher/AT/ATpage.html`

Other textbooks include:

- Glen E. Bredon, *Topology and Geometry* (Graduate Texts in Mathematics). Springer, 1993.
- James F. Davis and Paul Kirk, *Lecture Notes in Algebraic Topology* (Graduate Studies in Mathematics, 35). American Mathematical Society, 2001.
- J. Peter May, *A Concise Course in Algebraic Topology* (Chicago Lectures in Mathematics Series). University of Chicago Press, 1999.
- James R. Munkres, *Elements of Algebraic Topology*, Addison Wesley Publishing Company, 1984.
- Edwin H. Spanier, *Algebraic Topology*, McGraw Hill, 1966.

Course Website: On Canvas, `https://canvas.cmu.edu/courses/7069`

Grade Breakdown:

- 10% for each 50-minute in-class quiz
- 70% homework

Important Dates:

- August 27, first day of classes
- September 3, no class, Labor Day
- September 21, first 50-minute in-class quiz
- October 19, no class, mid-semester break
- October 24, second 50-minute in-class quiz
- November 5, drop and pass/fail grade option deadline
- November 19, third 50-minute in-class quiz
- November 21–23, Thanksgiving; no classes
- December 7, last day of classes, course withdrawal deadline

Homework: Homework will be due weekly on Fridays before class. During weeks without lectures on Friday, the homework will be due on the following Monday. No homework is due on the Monday after Thanksgiving break. There are no extensions on homework, but we will drop your lowest two scores automatically. If you use any sources to help you with the homework, please give appropriate references on your homework. You are encouraged to collaborate, but homework must be written up individually. Please write the names of anyone you collaborated with on the first sheet of your homework.

Quizzes: There will be no make-up quizzes. If special circumstances arise or if you need special accommodations, let me know as soon as possible. Regarding conflicts with exams in other classes, the relevant passage from the examination policy is:

"No student shall be required to take more than two full-period in-class or out-of-class examinations on the same day. It is the responsibility of the student to notify the instructor in a timely manner of his/her circumstance so that appropriate accommodations can be made."

You can bring one standard sheet of paper (front and back) of notes to all quizzes. No other resources will be allowed. Problems on quizzes will be similar to simple homework problems. Each quiz will focus on the material covered after the previous quiz.

Attendance: I do my best to make lectures worth your time. They will usually be interactive, so your participation and contribution is important. I will not check attendance.

Code of Academic Integrity: Students must abide by CMU's Code of Academic Integrity:
`https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html`.