

Math 5863: Topology II
Spring 2019

Course Instructor: Andy Miller

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Office Hours: will be posted at the course web site.

Subject: This course is a continuation of Math 5853. It will primarily focus on developing principal ideas of algebraic topology related to homotopy theory, fundamental groups and covering space theory. These concepts provide elementary tools that can be used to analyze the basic properties of spaces that arise naturally via geometric or analytic constructions. Examples of such spaces that we will discuss include topological manifolds and CW-complexes. The general goal of algebraic topology is to construct and calculate algebraic invariants that can distinguish topologically between two spaces. The ideal would be to determine algebraic conditions that can guarantee precisely when two topological spaces in a certain family of spaces are homeomorphic.

A solid grounding in the basic concepts of point-set topology as developed in the Math 5853 course will be essential for this course. In addition students will be assumed to be very familiar with the basic algebraic theory of groups—this would include such topics as: axioms for a group, cyclic groups and other examples, abelian groups, subgroups and normal subgroups, quotient groups, and group homomorphisms.

Textbook: We will use *Algebraic Topology* by Allen Hatcher (Cambridge University Press, 2002), and *Topology (2nd edition)* by James Munkres (Prentice Hall, 2000, 2013) as principal textbooks for this course.

The topics for this course are entirely contained in the first chapter of Hatcher's book and some portions of the introductory Chapter 0. (Much of the extensive additional material in the book constitutes the subject matter for the Algebraic Topology sequence, Math 6813-6823.) A free electronic version of the relevant sections of Hatcher's book is available at <http://www.math.cornell.edu/~hatcher/AT/ATch0.pdf> and <http://www.math.cornell.edu/~hatcher/AT/ATch1.pdf>.

An additional, excellent resource for this course (but not required) is the book *Algebraic Topology: An Introduction* by William Massey (Springer Graduate Texts in Mathematics vol. 56, 1990).

Course Grading: Course grades will be determined by performance on written homework assignments (50% of grade), a midterm and a final exam (50% of grade). Assignments will be posted at the course web site <http://www.math.ou.edu/~amiller/5863>. Written work will be graded for accuracy, thoroughness and conciseness—all of which are essential ingredients for the effective communication of mathematical results.

PhD Qualifying Exam: The Math 5863 course and its precursor Math 5853 develop subject matter which is covered by the PhD Qualifying Exam in Topology. See the graduate student pages at the departmental web site <http://www.math.ou.edu/grad> for dates and other information about the qualifying exams. This web site also has links to samples of recent exams, which can be indispensable in preparing for them.