

MTG 6346: Topology 1

University of Florida, Department of Mathematics
Course Syllabus, Fall 2025

Instructor: Peter Bubenik

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Lectures: MWF 6th period (12:50–1:40pm), Little Hall Room 221

Textbook: Kevin Knudson. *Algebraic topology — a toolkit*. De Gruyter, 2024. ISBN:978-3-11-101481-4. PDF available via UF library.

Course overview: This course is the first part of a two semester introduction to algebraic topology. We will cover the first two chapters of the textbook in the first semester and the second two chapters in the second semester. In the first semester, we will study the fundamental group, covering spaces, elementary homotopy theory, cofibrations and fibrations, homotopy groups, cell complexes, singular homology, cellular homology, axiomatic homology, and persistent homology. Some of the main tools include the Seifert-Van Kampen Theorem, excision, and the Mayer-Vietoris sequence.

Schedule:

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| Weeks 1–3 | Topological spaces, homotopy extension and lifting |
| Weeks 4–5 | Fundamental group and covering spaces |
| Weeks 6–10 | Homology: simplicial, singular, relative, cellular, axiomatic |
| Week 11 | Homology of manifolds |
| Weeks 12–13 | Persistent homology |

Goals: To understand the basic concepts in algebraic topology and be able to apply them in calculations and proofs. To understand and formulate mathematical arguments and to apply them in proofs. To be able to discuss mathematics. To be able to communicate mathematics in writing and orally. To be able to use resources to learn mathematical concepts.

Prerequisites: Background material includes general topology and abstract algebra (at the level of our 4000/5000 courses). We will use some but not all of this material and review it quickly when needed. Everyone has gaps in what they know and students will be expected to catch up on their own on background material.

Additional resources:

- Allen Hatcher. *Algebraic Topology*. Cambridge University Press, 2002. ISBN 0-521-79540-0. <https://pi.math.cornell.edu/~hatcher/AT/ATpage.html>
- Glen E. Bredon. *Topology and Geometry*. Springer, 1993. ISBN 0-387-97926-3.
- James R. Munkres. *Elements of Algebraic Topology*. Perseus Publishing, 1984. ISBN 0-201-62728-0.
- J. Peter May. *A concise course in algebraic topology*. University of Chicago Press, 1999. ISBN:0-226-51182-0
- Tammo tom Dieck. *Algebraic Topology*. European Mathematical Society, 2008. 978-3-03719-048-7
- Anatoly Fomenko and Dmitry Fuchs. *Homotopical Topology*, 2nd edn. Springer, 2016. ISBN 978-3-319-23487-8.
- [Wikipedia](#) has good articles on many of the topics covered in this course.

Requirements: The grading for the course will be based on homework 30%, and two exams, 35% each.

Grading scheme: A: 90% – 100%, A-: 85% – 89%, B+: 80% – 84%, B: 75% – 79%, B-: 70% – 74%, C+: 65% – 69%, C: 60% – 64%, D+: 57% – 59%, D: 54% – 56%, D-: 50% – 53%, E: 0% – 49%.

Homework The clarity of your solutions is as important as their correctness. Working in groups on homework and to study is encouraged. However, your submitted homework should be written up individually, in your own words, and without consulting anyone else's written solutions in any form.

Exams: The dates for the exams (all in-class) are:

- Exam 1, Wed Oct 1, during class.
- Exam 2, Wed Dec 3, during class.

Class demeanor Students are expected to arrive to class on time and behave in a manner that is respectful to the instructor and to fellow students. Please avoid the use of cell phones and restrict eating to outside of the classroom. Other students should be respected in discussion.

Academic policies and resources This course complies with all UF academic policies. For information on those policies and for resources for students, please see <https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/>.