

Mathematics 411 (and 711): Topology

Spring 2020 Tuesdays, Thursdays 8:30–9:45am Physics building 119

Professor: Lenny Ng

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My office: Physics 216

Course web site: Assignments and other information will be posted to Sakai, <https://sakai.duke.edu/>. There is also a rudimentary course web page at <https://services.math.duke.edu/~ng/math411/> where you can find a link to lecture notes from a previous iteration of Math 411.

Textbook: *Topology* by James R. Munkres, 2nd edition.

Munkres' book is very detailed and on the dry side. For those who prefer a more informal treatment that emphasizes geometric intuition, I recommend *Basic Topology* by M. A. Armstrong as a supplementary text. I'll be teaching somewhere in between the two books, roughly speaking. Both books should be on reserve at Perkins.

Office hours:

- Mondays 2:00–3:00 pm
- Thursdays 9:45–11:00 am

and by appointment (set up in person or by email). If you want to set up an appointment via email outside of scheduled office hours, please keep in mind that I can't usually answer email immediately; on occasion it may take a day for me to respond.

Course synopsis: This course is a broad introduction to point set topology, differential topology, and algebraic topology. Topics that I hope to cover include:

- Topological spaces, connectedness, compactness, product and quotient topologies.
- Homotopy, the fundamental group, covering spaces.
- Triangulations, classification of surfaces, Euler characteristic.
- Jordan curve theorem, Brouwer fixed point theorem, Borsuk–Ulam theorem.

Assignments: There will be homework sets due most weeks on Tuesdays, as well as exams (two midterms and a final). You are allowed and encouraged to work with fellow students on the homework; if you do collaborate, please indicate the name(s) of your collaborator(s) on your problem set. Each student must *write up* their problem sets on their own.

Your grade will be based on a weighted average of your grades in these components: homework 15%, each midterm 25%, final 35%.

Special note for Math 711 students: You will also be required to write a short essay (under 1 page) explaining the relevance or potential relevance of this course to your particular course of study. This will be due at the time of the final exam.

Prerequisites: Officially, the only prerequisite for this course is Mathematics 221, and I expect to provide any necessary mathematical background beyond this level. However, you may find the course to be more fulfilling and pleasant if you have a reasonable familiarity with proofs (on the level of Math 401, 431, or essentially any course > 400). It may also help to be acquainted with the notion of a group (Math 401 again) and some basic real analysis (Math 431 again). In particular, some concepts in this course will seem vastly more motivated if you've already taken a real analysis course.

Please consult with me if you have questions about whether this course is appropriate for you.