# Math 681, Spring 2020
# Introductory Topology

**Credit hours:** 3
**Department:** Mathematics
**Time/location:** MWF, 9AM – 9:55AM in Phillips 301

**Instructor:** David Rose
**Office hours:** Priority: 5pm–6pm on Wednesdays,
                 Secondary: 4:30pm–5:30pm on Thursdays
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**Teaching Assistant:**

- Andrew Adair
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  Office hours: 11:00am–12:00pm on Tuesday and Thursday

**Target audience:** First-year mathematics graduate students, and others with similar background in undergraduate topology.
**Course prerequisites:** An undergraduate degree in mathematics, or equivalent background in set theory, algebra, and topology. More specifically, I expect everyone to be comfortable with set theory, rudimentary notions in topology, and some abstract algebra.
**A note for undergraduates:** This is a graduate course, and I will assume that undergraduate students in the audience have the same background and mathematical maturity as that of students in our incoming graduate class. These students will typically have taken six (or more) senior level classes, and most of them will have earned straight A's in these classes. This is the target audience. Consequently, this class will be more difficult than the most challenging undergraduate classes at UNC, and you should think carefully about whether you are ready for this challenge. (Caution: I've given C's to undergraduates who've earned this grade in my graduate courses before; there is no separate "undergraduate curve" for this course.) An alternative at the undergraduate level is Math 550 (Topology)
**Course goals and learning objectives:** To develop a working knowledge of topological spaces and invariants, and to apply this material to concrete problems in topology and beyond.
**Course requirements** To demonstrate knowledge of the above, via homework assignments and examinations.

**Textbook:** We are using the $2^{nd}$ edition of *Topology* by Munkres.

**Course content:** We aim to cover the material in Chapters 2-4 and 9-13 in Munkres, and additional topics if time permits. Here is a preliminary schedule:

|              | Dates            | Topics                            |
| ------------ | ---------------- | --------------------------------- |
| Week 1       | 1/8, 1/10        | Point-set topology                |
| Week 2       | 1/13, 1/15, 1/17 | More point-set                    |
| Week 3       | 1/22, 1/24       | Connectedness and Compactness     |
| Week 4       | 1/27, 1/29, 1/31 | Countability and Separation       |
| Week 5       | 2/3, 2/5, 2/7    | Wrap-up on point-set              |
| Week 6       | 2/10, 2/12, 2/14 | Modern examples                   |
| Week 7       | 2/17, 2/19, 2/21 | Homotopy and the fundamental group |
| Week 8       | 2/24, 2/26, 2/28 | Computations and van Kampen       |
| Week 9       | 3/2, 3/4, 3/6    | Covering spaces                   |
| Spring Break | 3/9, 3/11, 3/13  | Whoooooo!                         |
| Week 10      | 3/16, 3/18, 3/20 | More on covering spaces           |
| Week 11      | 3/23, 3/25, 3/27 | Applications                      |
| Week 12      | 3/30, 4/1, 4/3   | Topological surfaces              |
| Week 13      | 4/6, 4/8         | Classification of surfaces        |
| Week 14      | 4/13, 4/15, 4/17 | Preview of (co)homology           |
| Week 15      | 4/20, 4/22, 4/24 | More cohomology                   |

Professor Rose reserves the right to deviate from the posted schedule as needed.

**Grades:** Your grade will be based on the following:

- Homework (30%)

- Mid-term examination (30%): tentatively scheduled for **February 28th**.

- Cumulative final examination (40%) on **Monday, May 4th at 8:00AM**.

Although not a formal component of the grading scheme, students are expected to regularly attend and actively participate in lectures.

**Missed midterm exams** will be treated on a case-by-case basis. If the absence is excused, the final exam grade will be substituted in place of the missed midterm. **No** make-up midterm will be given.

**Homework:** In order to properly learn the course material, it is crucial to develop the necessary problem-solving skills. As such, homework will be assigned every Friday, on the course website, and will be collected in lecture the following week. Students are allowed to work on homework collaboratively, but everyone should write up their own solutions. No late homework will be accepted.

As is the case with many standard textbooks, you may be tempted to search for homework solutions online; I urge you **not** to do so, as 1) you will learn best by struggling with the

problems, and eventually fighting through your confusion (which won't happen if you look up solutions), and 2) it is a violation of the UNC Honor Code.

**Academic integrity:** Don't cheat. Don't act dishonestly.

**Device policy:** Phones and laptops may not be used during lecture. Tablets may only be used for note-taking.

**Syllabus changes:** Professor Rose reserves the right to make changes to the syllabus, including test dates, should any unforeseen circumstances occur. These changes will be announced as early as possible so that students can adjust their schedules.