

Instructor:

Prof. Jo Nelson

e-mail: jo.nelson@rice.edu

Office: 402 Hermann Brown Hall (HBH)

Office hours: 3-4pm Monday, 12-1pm Wednesday

<http://www.math.rice.edu/~jkn3/geotop.html>

Dates and Locations:

Lectures: 11-11.50am MWF

Midterm 1: take home, due 10/7

Final Exam: take home, due 12/13

Textbooks:

William S. Massey, *A Basic Course in Algebraic Topology*

John Lee, *Introduction to Smooth Manifolds, Second Edition*

Workload and Pre-requisites:

The transition from undergraduate and low level graduate coursework to this course will be challenging. This course is structured to prepare you for the rigors of mathematical research at the PhD level in analysis, algebra, geometry, and topology. Struggling with the course material is to be expected and intended to help you develop the necessary skills to teach yourself unfamiliar concepts and do mathematics at higher levels of abstraction. It is advised that you read the book ahead of class, post questions to Piazza, form study groups with your peers, prepare for the weekly TA review session, and talk to older graduate students.

Undergraduate and graduate students should expect to spend 8-10 hours a week on this course. This course is a qualifying exam course and is taught at a substantially higher level than Algebra II and other crosslisted undergrad/grad math courses. The course content is set by the graduate committee and is fixed. We will work through the better part of two graduate studies in mathematics texts.

Lemmas and theorems will NOT be worked out in detail in lectures. I will state key lemmas and theorems and summarize the main points. **You are expected to spend 1-3 hours working on understanding the proofs outside of class.** The TA will have a one hour review session each week discussing examples, which you will also be expected to attend, in addition to the weekly homework assignments.

Undergraduates are expected to complete an additional 10-15 hours of self study beyond Math 443 to prepare for Math 444. The first problem set is diagnostic in nature and intended to help you determine if you should stay in this course.

Assumed point-set material includes topological spaces, open and closed sets, basis for a topology, special topologies such as the product topology, metric topologies and the quotient topology, continuous maps, (local) compactness, one-point compactification, (local and path) connectedness, partitions of unity, the countability and separation properties. You are expected to be comfortable with Chapter 2 and Sections 23, 26, 30, 31, and 32 of Munkres, *Topology Second Edition*. You are expected to be comfortable with how to obtain $\mathbb{C}P^n$, $\mathbb{R}P^n$, and surfaces as quotient spaces.

Assumed linear and abstract algebraic material includes familiarity of free groups, commutative

diagrams, structures defined by operations and/or relations, and their homomorphisms, rank-nullity theorems, determinants, and linear functionals.

Assumed analysis material includes inverse and implicit function theorems in \mathbb{R}^n , differentiability in several variables, and basic measure theory.

Grading Policy:

Attendance is mandatory and cell phones are prohibited without prior authorization. Multiple absences and repeated use of electronic devices may result in a full letter grade lowering at the end of the term.

There will also be weekly homework assignments. The lowest homework grade will be dropped. There will be one take home midterm and one take home final.

The exams are pledged. In particular, you are not permitted to work with other students and you are not permitted to consult the internet beyond the course Piazza page when working on the exams. You are allowed to refer to the course textbooks.

The grade breakdown will be:

- Homework: 30%
- Midterm/Final: 70% = $\max(30/40, 40/30, 35/35)$

The letter grades for mathematics graduate students will be computed separately for the rest of the class. Mathematics graduate students will have additional homework problems each week.

Homework: *All homework questions should be posted to Piazza.* Written homework assignments are to be scanned and uploaded to <http://gradescope.com> on **Tuesdays** by 5pm. The homework is not pledged and you are encouraged to work together with your classmates on the assignments. However, you must write up your solutions individually. You are not allowed to look up solutions in any written form; in particular, you are not allowed to look up solutions online. Students caught violating this rule will be reported to the Honor Council. **Late homework will not be accepted, barring documented illnesses and emergencies.** Your lowest homework score will be dropped.

Exam Conflicts and Make-ups:

In the event of illness or family emergency I must be notified ideally at least 24 hours in advance and documentation from the dean/magister must be provided to me.

Disability-related Academic Accommodations:

In order to receive disability-related academic accommodations, students must first be registered with the Disability Resource Center (DRC). Students who may need accommodations in this course should give me a written letter from the DRC within the first two weeks. More information on the DRC registration process is available online at <https://drc.rice.edu/>. Registered students must present an accommodation letter to the professor before exams or other accommodations can be provided. Students who have, or think they may have, a disability are invited to contact DRC for a confidential discussion.