Math 367K: Undergraduate Topology
UT Austin, Spring 2024
TTh 11-12:15, PMA 5.118

Instructor: Sam Payne
Email: sampayne@utexas.edu
Office Hours: T 2-3 pm in PMA 9.156, and by appointment

Textbook: *Topology Through Inquiry* by Michael Starbird and Francis Su

Instructional strategy: This course will be taught using an **Inquiry-Based Learning** method, meaning that you, the student, will be responsible for doing the exercises and proving the theorems on your own. During class, you will present your proofs and solutions and see those of your classmates. In order to get the most out of this course, you must be willing to put in a sustained effort from the beginning of the semester to the end.

Grading: Grades in this course will be on the plus-minus system, based on:

- Homework – 25%
- Presentations and participation – 25%
- Two midterm exams and one final exam – 50%

For the exam grades, we will count the two best scores from your three exams, each of which will count 25%. If you miss or perform poorly on one exam, do your best on the other two. There will be no make-up exams. Please reserve the exam dates on your calendar when you commit to the course. For the homework grade, there will be 12 homework sets, roughly one per week, and we will drop the lowest two grades. Each of the other 10 will count 2.5%.

Homework: The textbook for this class contains neither the proofs of the theorems we will cover nor solutions to the exercises. Each week, we will assign theorems and exercises for you to work on. You will typeset your proofs of the theorems and solutions to the exercises using LaTeX and submit the compiled PDFs.

Your preliminary typed homework will be due at the beginning of class on the specified day before the problems are presented. You may not be able to prove all of the theorems and solve all of the exercises on your own. Therefore, you will be given the opportunity to receive full credit for your work on a theorem or exercise, even if you cannot solve it completely. You can receive full credit if you carefully write up and submit the strategies and techniques you tried, and then, after the problem is presented in class, you submit a complete proof or solution.

Your final write-up will be due at 5 pm on Friday after the problems are presented in class. Not every problem will be graded. Remember the crucial difference between the scratch work required to find an answer and the clarity and structure expected in a well-written solution. Your homework will be graded, in part, on this clarity and structure.

As the class progresses, you will develop an increasingly effective list of problem-solving strategies. (There is a hidden agenda in this grading system; namely, you may find that when you carefully write down what you attempted and why it did not work, some insight into the solution magically appears. Try it, and see if this is true for you.) The goal and expectation is for you ultimately to write careful and correct proofs for all of the theorems and solutions for all of the exercises.

Participation: In class, we will ask you to present proofs of theorems or solutions to exercises you have been working on. Please show up each day prepared to present the exercises and theorems scheduled for that day. If you prove one theorem that you think is particularly interesting or difficult and would like to present it, let us know.

Talking to others about a proof is different from writing a proof. The act of speaking, especially when it becomes a dialogue, gives you additional opportunities to show people how the ideas of the proof fit together and what issues you had to deal with when working on the problem. In this course, we want you to develop your skills in communicating mathematics to others. This may or may not come easily, but it is something you can cultivate through practice and will carry over to other aspects of your education and future professional life.

When your classmates are presenting, it is your responsibility to follow their line of reasoning. We also want you to listen actively and interact by asking questions to clarify, offering suggestions at impasses, or, more generally, contributing to the discussion. Keep in mind that alternate proofs are common, and the argument presented may be different from yours. If you see something in a proof you don't understand or sense a possible mistake, please ask about it. And if there is something about the proof that you find interesting or clever, feel free to comment on this as well! In all cases, please be considerate and respectful of the person who is presenting, and follow the golden rule.

Rules of the game: Most of the theorems we will prove in this course can be readily found in textbooks or on the internet. This semester, we are asking you not to use these sources. Proving theorems and solving exercises on your own is the best way to learn mathematical ideas and retain them for years to come. We want you to experience the joy of figuring things out and being a producer, rather than a consumer, of mathematics. One of the major goals of this course is for you to develop the skill of creating mathematical ideas and proofs on your own. Therefore, for the purposes of this class, turning in a solution to a homework problem you obtained through an outside source is considered plagiarism. We know that since you are not allowed to look to outside sources for help, you may get stuck from time to time and not be able to prove all of the theorems or solve all of the exercises that are assigned. This is okay; we will take this into account when determining grades.

We do encourage you to talk with your classmates when working on homework for this class, but please use the following method in doing so. First, work on proving the theorem or solving the exercise independently. If you get stuck, you may work with other students who have not solved the problem. If you ask a student in the class who has solved the problem, that is okay;

however, the student who knows the answer should not simply tell the answer. Instead, the person who knows should give a hint or helpful guidance so that you can solve the problem on your own. As a general rule, everything you turn in for this class should represent your own work; it should not be something that somebody else gave you without any work on your part, and it should, of course, never be copied from someone else's paper. If you do learn a substantial part of an idea from someone else, then please note this on your paper.

Accommodations: The University of Texas provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 512-471-6259 or ssd@austin.utexas.edu. If a personal emergency impacts your well-being or academic success during the semester, please contact Student Emergency Services at 512-471-5017 or studentemergency@austin.utexas.edu. The SES office will provide assistance and referrals to support you through unexpected challenges and, when appropriate, will contact your course instructors to arrange accommodations. Emergency situations include but are not limited to family emergencies and medical or mental health concerns.

Exams: We will have two midterm exams during the regularly scheduled class period on Thursday, February 22, and Thursday, April 11. We will also have a final exam at the time scheduled by the university. On the actual exams, there will be four major types of problems: problems that ask you to apply your understanding to examples and counterexamples, problems that ask you to describe an outline of the proof of a theorem and explain its usefulness or importance, problems that ask you to prove one of the theorems that we covered in class and problems that ask you to prove a new fact. This last type will be simpler, on average, than the theorems you have been assigned to prove at home.

Topics: The material covered in this course is an introduction to topology.

This syllabus is subject to change. Students who miss class are responsible for learning about any changes to the syllabus. All students are expected to uphold the highest standards of academic honesty and integrity and, in particular, to follow the UT Student Honor Code.

You belong here