Math 54: Topology
Summer 2016

Class Meeting Time and Location:	MWF 12:50-1:55pm in Kemeny 105 T (x-hour) 1:20-2:10pm
Course Website:	https://math.dartmouth.edu/~m54x16
Required Textbook:	*Topology* (2nd edition) by James Munkres
Instructor:	David Freund
Office:	Kemeny 219
Office Hours:	M 4:30-5:30pm, T 2:15-3:30pm, Th 1:00-3:00pm, or by appointment
Email:	dfreund@math.dartmouth.edu

Course Information

Topology is a newcomer in mathematics, tracing its history back to the early 18th century and only coming into its own in the 20th century. By appealing to an underlying structure, it generalizes concepts and results found in other areas of mathematics (e.g., theorems of calculus, metric spaces, and geometry) and is now considered a fundamental branch of mathematics.

In this course, we will primarily study point-set topology. This subject lends itself to mathematically defining "geometric" notions such as limits, continuity, and connectedness without relying on analytic structures. In the process, we will discover that these notions are related to how the space is generally "put together" rather than a rigid structure.

As we develop the standard tools for studying spaces, we will explore the pathological extremes of the ideas that, by all appearances, accurately represent our intuition. These examples will help us navigate problems mathematically rather than blinding trusting pictures.

Towards the end of the course, we will turn our attention towards manifolds, a special class of space that arises naturally in geometry and mathematical physics. Time permitting, we will work to classify some of these spaces and develop more complicated means of manipulating spaces. Many of these mathematically precise ideas naturally lead to interesting visualizations which we will use to motivate our problem solving.

Course Goals

- Understand how topological spaces lead to generalized notions of continuity, connectedness, and compactness; be able to apply these ideas to understand more complicated problems.
- Improve problem solving and mathematical reasoning: learning new proof techniques and styles, understanding the importance of examples and counterexamples.
- Strengthen mathematical writing skills: correctly using mathematical language and notation, conveying ideas precisely, presenting mathematics using LaTeX.
- Develop mathematical reading skills: parsing mathematical text, understanding definitions and theorems both intuitively and formally, finding mathematical mistakes and omissions.

Assignments

Throughout the course, there will be four major types of assignments: in-class problem solving, textbook reading, problem sets, and exams. Feedback will be provided on all assignments and underlined sections of writing correspond to fundamental misunderstandings. Extra effort should be put toward understanding these mistakes, individually or with the instructor.

In-Class Problem Solving: During most class periods, there will be problems that are intended to be solved in small groups or by the class at-large. Any problems not solved during class are to be completed before the next class period. These problems are not due for a grade but they part of the course material and may be drawn upon for problem sets or exams.

Textbook Reading: As part of the course, everyone is expected to read specific sections of the textbook *prior to each class*. Munkres' text contains a good amount of exposition and these assignments are meant to provide exposure to new material and additional examples. In general, the examples used in the textbook will be different from those covered in class but both may be drawn upon for problem sets or exams.

Problem Sets: Every week, there will be problems posted on the course website that are due Wednesday or Friday. These are a core component of the course and they are essential to learning the course material. Unless otherwise noted, *all* such problems are due at the beginning of class on the date listed.

All problem sets must be typeset using LaTeX and should be submitted electronically. Consult the honor principle (below) as it applies to this course.

Exams: There will be a midterm exam and a final exam. Each exam will be split into in-class and take-home portions and more details will be provided closer to the exam date.

Grade Breakdown

Problem Sets	30%
Midterm Exam	35%
Final Exam	35%

Important Dates

- June 25: Special day of class 10:40-11:45am.
- July 4: Independence Day (no class).
- July 6: Last day to add/drop courses.
- July 13: Midterm Exam.
- July 15-22: No classes.
- August 9: Last day to withdraw from a course.
- August 24: Last day of summer term.
- August 25-26: Reading period.
- August 27 at 3:00pm: Final Exam.

Expectations of Students

- *Actively* attend every class. This means being on time and being prepared to work through new problems and concepts (either individually, in a group, or as a class). In the event of an absence, students are responsible for all missed material and announcements.
- Be respectful and courteous toward everyone in the classroom. For instance, give everyone a chance to contribute during class, be engaged but not disruptive, and encourage each other.
- Work with the material every day, expecting to spend at least 3-4 hours *per class meeting* outside of class. This includes reciting definitions and theorems, reading, reviewing course notes, solving homework problems, and typing solutions in LaTeX.
- Use the available resources and ask for help when it is needed. Meet with the instructor or fellow classmates to work through difficulties. Especially for those new to typesetting or proof writing (or both!), the course will require more work up front.

The Honor Principle

On Problem Sets: Collaboration on *problem solving* is permitted and encouraged. This includes working toward a solution, asking for assistance, and helping with typesetting issues. However, it is a violation of the honor code to copy solutions or for someone else to provide solutions. Do not copy from *any medium* (e.g., blackboard, scrap of paper) on which a solution has been worked out. The submitted solution must be the individual's own writing.

On each problem, mention any collaborators, people who offered help, as well as outside resources consulted. Hints or suggestions from the instructor are specifically exempt from this policy. The grade assigned to the work will be unaffected by the number of resources used but it is important to give credit to all of them.

On Exams: Receiving assistance from any source (animate or inanimate), except the instructor or sources specifically named on the exam, is strictly prohibited. Similarly, giving assistance of any kind (directly or indirectly) is not allowed. Matters of clarification are left to the instructor and he should be consulted prior to any potential conflict.

Disabilities, Religious Observations, etc.

Students with disabilities, "invisible" or not, enrolled in this course and who may need disability-related classroom accommodations are encouraged to meet with the instructor privately as early as possible in the term. Students requiring disability-related accommodations must register with the Student Accessibility Service office.

Once SAS has authorized accommodations, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to the instructor. As a first step, if students have questions about whether they qualify to receive accommodations, they should contact the SAS office. All inquiries and discussions about accommodations will remain confidential.

Some students may wish to take part in religious observances that occur during the academic term. Any religious observation that conflicts with participation in the course should be discussed with the instructor before the end of the second week of the term. If further support is required, please contact Nancy Vogele (Nancy.Vogele@dartmouth.edu).