Math 360: Topology
203 Hayes Hall
MWF 9:10-10:00am
Spring 2020

Professor: Marie Snipes
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Office Hours: M 10:10-11am and 2:10-3pm, T 2:40-3:30pm, W 10:10-11am, F 3:10-4pm, and by appointment.

Webpage: http://www2.kenyon.edu/Depts/Math/Snipes/Math360

Text: There is no required text for this course. In fact, use of any textbook or web resource is strictly forbidden. Rather, a carefully constructed set of problems (provided by the instructor) will be used as the basis for developing your understanding of the field of topology.

Prerequisite: Math 222 (Foundations of Mathematics) or instructor permission.

Content: Topology is the study of "continuous deformations" of objects. What is a continuous deformation? Imagine an object that is made of a very stretchy rubber (or Play-Doh). A continuous deformation of the object is some warping (stretching, shrinking) of the object that doesn't involve tearing or gluing. We will start by developing a sufficiently general notion of a continuous function using set theory. We will then consider the problem of identifying when two spaces are equivalent (i.e., when they can be continuously deformed into each other) using notions of compactness and connectedness. We will also learn about and explore the "separation axioms" that in some sense classify the degree to which topological spaces behave like Euclidean space. Finally, we will turn our attention to the set of paths (closed loops, specifically) in a topological space, and use this set of paths to construct what is known as the FUNdamental group of the space.

Learning Objectives:

- Work with topological definitions and theorems related to the content described above.
- Read and evaluate the correctness of topological proofs.
- Produce examples and counterexamples that illustrate why theorem hypotheses are necessary or why a statement is untrue.
- Draw pictures to represent topological ideas.
- Formulate conjectures about topological concepts, and test these conjectures.
- Prove topological statements.
- Use topological ideas (e.g., homeomorphisms, fundamental group) to classify spaces.
- Present mathematical arguments both orally and in writing.

Course Philosophy and Rules of Engagement (ROE)

In this class you will learn mathematics primarily by doing, rather than watching or reading. Classes will consist primarily of discussions between students in which you ask questions of each other and present solutions to problems.

Problems will be given at a range of difficulty levels, and I do not expect you to solve every problem immediately. The process of trying hard problems, getting stuck, talking to others, and getting "unstuck" is all part of learning mathematics!

In order to facilitate your learning, the following "rules of engagement" will be in effect for the duration of the course.

- Other than class handouts, outside sources, including but not limited to textbooks and websites (including but not limited to Wikipedia and YouTube), are expressly forbidden, with the following exception.
    - You are specifically permitted to look up definitions, theorems, and proofs that were covered in Foundations from *Chapter Zero*; please ask me if you have any questions.

- Study groups are great!!! Learning with and from each other outside of class can be both fruitful and fun! I strongly encourage you to work with others on these problems.
    - Note: If you find that working in groups is not effective for you, it may be because you and/or other group members are not spending enough time familiarizing yourself with the problems before your group meets; see me if you want other tips on more effective study groups.

- Due to the nature of the course, it is imperative that everyone comes to class prepared for the discussion. You should have seriously thought about and attempted the problems, and be prepared to articulate your work to the class. If you were unable to make progress on your own or with study partners, you should see me before the class meets (c.f. the next bullet)!

- Office hours are an integral part of this course! I am here to help you grow as a mathematician, and can provide hints, leading questions, or other feedback to you to help you learn the material and improve both your mathematical thinking and communication skills.

- Have fun, and enjoy the journey!

Grading Policy:

In-class Midterm	15%
Take-home Final	5%
Cumulative Final Exam	25%
Class Participation and Presentations	25%
Homework	15%
Portfolio	15%

Exams:

In-class Midterm	Friday, February 28
Take-home Final Exam	Fri, May 6 – Thurs, May 7 (8:30am)
Cumulative Final Exam	Thursday, May 7 (8:30 – 11:30am)

Class Participation: A major part of this course consists of in-class presentations by students of problems announced in advance. Students will be evaluated on their level of preparation for presentation problems, their actual presentations to the class, and their active participation as audience members when others are presenting.

Please note that each unexcused absence will reduce your overall final course grade by 1/3 of a letter grade, and students with excessive unexcused absences may be expelled from the course.

Homework: Some additional problems not presented in class will be assigned to be handed in. This homework will be turned in electronically approximately every other week. Please see the additional requirements at the end of this document.

Portfolio: You are required to obtain a 3 ring binder and to maintain in it a portfolio of all of your work throughout the course. All proofs, exercises, and examples presented in class or proven for homework will be part of the portfolio. You should take pride in maintaining a quality piece of work that you can reference during and after the course!

Academic Honesty: Students are encouraged to work with other students on outside assignments. However, every piece of written or computer-generated work that you submit must be your own. Acknowledgements of collaboration (or help received) are required.

Special Arrangements: A student with a disability who thinks they need an accommodation to access a campus program, activity, or service should contact Erin Salva in Student Accessibility and Support Services (SASS) at salvae@kenyon.edu to discuss specific needs. Advance notice is required to review documentation, evaluate accommodation requests and provide notice or arrangements for any accommodation.

Other Resources: Kenyon College seeks to provide an environment that is free of bias, discrimination, and harassment. If you have experienced any form of harassment/misconduct/assault, interpersonal violence, or stalking we encourage you to report it. If you report the incident to a faculty member, they must notify Kenyon's Civil Rights & Title IX coordinator of any information about the incident you provide. More information can be found on the following College web pages:

Sexual Misconduct & Harassment Policy: Title IX, VAWA, Title VII:

https://www.kenyon.edu/directories/offices-services/ocr/title-ix-vawa/kenyon-policies/title-ix-policy/

Discrimination & Discriminatory Harassment Policy:

https://www.kenyon.edu/directories/offices-services/ocr/discrimination/

ADA/504 Student Grievance Procedures:

www.kenyon.edu/directories/offices-services/ocr/discrimination/504-ada-grievance/student-grievance-procedure-resolving-complaints-under-ada-section-504/

Written Assignment Policies

Assignments are listed on the course webpage at
http://www2.kenyon.edu/Depts/Math/Snipes/Math360/agenda.html.

The written assignments are designed to give you practice with concepts from the course and to give you feedback on your understanding of the material. Assignments will help you pull together course material, and you should look at them as opportunities to make connections and practice explaining your mathematical thoughts.

- Assignments will be turned in in electronic form, to a designated folder on the P: drive. In order to receive credit, assignments must be submitted by the specified date and time. In order to account for illness, extracurricular activities, etc. each student may utilize two, 48-hour extensions over the course of the semester. Please email me by the assignment deadline to let me know that you are using an extension for that assignment.

- At the top of each assignment, please include the following:
  Your Name
  Math 360
  Date due
  Homework #
  Collaborators: (specify "none" if you worked independently)

- Homework must be typed or neatly handwritten, and scanned in the form of a PDF file. The file MUST be named in the format top_hw1_lastname.pdf (with the correct homework number and your last name).

- Problem statements must be included with your work.

- You should include carefully written explanations and proofs, rather than unsubstantiated claims. I encourage the use of diagrams and cartoons as appropriate.

- Please see the ROE for this course for more information on resources allowed for this class.

- I encourage you to work with other students in the class on homework assignments, but you should attempt all the problems on your own before collaborating. If you do work with other students in the class, you should still understand the solutions well enough to write them up independently (without, for example, a picture of the whiteboard with the group's work in front of you). And you must credit any students you talk with in the header of your assignment. Your final write-ups must be your own work – turning in identical assignments constitutes a breach of academic integrity.

Please also follow the Mathematics and Statistics Department guidelines on healthy collaboration. These can be found at
http://www.kenyon.edu/academics/departments-programs/mathematics/academic-program-requirements/guidelines-for-collaboration-on-homework/