Mathematics 651: Topology
Spring 2019

Instructor: John Rhodes, `j.rhodes@alaska.edu`, 206B Chapman, 474-5445

Office Hours: M 2:00-3:00, T 12:00–1:00, R 9:00–10:00 and by appointment.

Course web page: `https://jarhodesuaf.github.io/M651.html`

Prerequisites: Math 404 (undergraduate topology), or equivalent

Credit Hours: 4.0

Text: Topology, 2nd ed., by James Munkres, Prentice Hall

Class Meetings: Lectures M, W, F 10:30-11:30 , Lab M 3:30-4:30, both in Chapman 206

Midterm Exam: In-class on Monday, March 4 (tentative), followed by Take-home for the rest of the week

Final Exam: In-class 10:15 a.m.-12:15 p.m., Thursday, May 2; Take-home will given out about a week before classes end, and due the last day of class.

Course overview and goals:

This course rigorously studies the notions of *topological spaces* and *continuous functions*. The first two-thirds of the course focus on *point-set topology* (also called *general topology*) progressing from basic definitions to deep theorems such as Urysohn's Metrization Theorem and the Tychanoff Theorem on compactness of products. The remaining third of the course will move into the basics of *algebraic topology*, where groups are associated to spaces as a tool for understanding their structure. Together, this should develop a solid basis of knowledge of what has become a foundational area of mathematics. Though topology arose from more concrete studies of functions of real or complex variables, its modern formulation is abstract. This course will follow the modern style, but also try to build intuition through many examples.

Strictly speaking, no previous knowledge of topology is necessary as we will begin from first principals. In practice, however, it is absolutely necessary that you have the background from an undergraduate course as we will move rapidly through what you've seen before. You should gain a much more solid understanding of that material, while greatly expanding your understanding of its implications.

Along the way you should also further develop your skills at constructing proofs, and presenting them with good written mathematical style.

Mechanics of the course:

Lecture meetings will be run as interactive lectures. That means that while I will usually be lecturing using the blackboard, and you will be taking notes, I will also be asking for suggestions, ideas, and questions about the material as we go along. I don't expect 'correct' answers, but I do expect you to be actively following and participating — that makes the class more interesting for us all.

Class attendance is expected, although I will not formally take roll. Regularly missing class is sure to make this course much harder for you, and likely to lead to failure. If you have to miss a class, you should get notes from another student. Homework assignments will be given in class, but also posted on the course web page soon after class is over.

Homework will usually be assigned daily, and should be 'essentially' completed by Monday of the following week for discussion in the Lab meeting. During this meeting, students may bring up problems for discussion, and may be called on to present their solutions to the class. Homework solutions (which must be typed using LaTeX following a template provided, and turned in as a printed hardcopy) are due in class on Wednesday.

In addition, each student will be randomly assigned several of these problems to contribute to a class solution set. Files with *one* of the assigned solutions per file, containing LaTeX code beginning with

```
\item[p. 83, #1]
```

and named in the format

```
Lastname_p83_1.tex
```

if your last name is "Lastname" and the problem is page 83, #1, must be deposited to a Dropbox directory by class time Wednesday. They will be compiled into a single document by your instructor. The compiled solution will be graded by your instructor and one class member each week. Your homework grade will be based on 1) the quality of your assigned solutions, and 2) the quality of your peer reviewing of solutions. Both the instructors and the peer reviewers comments will be scanned and posted in Dropbox.

No late homework will be accepted, unless I have agreed in advance, or there is a genuine emergency (e.g., a death in the family, medical problem with doctor's excuse). You must proofread your homework before submitting it. Solution that do not follow the template or are marred by excessive LaTeX errors will be given zeros.

I encourage you to work with others on the homework, but you must *write up solutions independently.*

Examinations Your midterm exam will have two parts: An in-class hour exam will cover your knowledge of definitions, important theorems, examples, and straightforward proofs. A take-home part, which you will have several days to complete, will consist only of longer proofs and examples.

The final exam has a similar two-part format, but the take-home will be before completed before classes end, and the in-class during the exam period.

Grades: Your performance will be evaluated based on 20% homework, 15% midterm exam in-class, 25% midterm exam take-home, 15% final exam in-class, 25% final exam take-home.

Course grades will be determined according to the following cutoffs:

$$A \geq 90 - 100\%,$$
$$B \geq 80 - 89\%,$$
$$C \geq 70 - 79\%,$$
$$D \geq 60 - 69\%,$$

with $+/-$ given to grades high or low in each band. I reserve the right to move the cutoff points downward if particular exams turn out to be unexpectedly difficult. Note that you are not in competition with your peers – everyone in the class may get an A, or everyone may get an F.

University and Department Policies:

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: `www.uaf.edu/handbook/`.

Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incompletes, late withdrawals, and early final exams; see `https://www.uaf.edu/dms/policies/`.

Tentative Schedule

Week 1	Jan 14 – 18	Chapter 2
Week 2	Jan 23 – Jan 25	Chapter 2
Week 3	Jan 28 – Feb 1	Chapter 2
Week 4	Feb 4 – 8	Chapter 2/3
Week 5	Feb 11 – 15	Chapter 3
Week 6	Feb 18 – 22	Chapter 3
Week 7	Feb 25 – Mar 1	Chapter 4
Week 8	March 4– 8	MIDTERM EXAM, Chapter 4
	March 18 – 22	BREAK
Week 9	March 25 – 29	Chapter 4
Week 10	April 1 – 5	Chapter 5
Week 11	April 8 – 12	Chapter 9
Week 12	April 15 – 19	Chapter 9
Week 13	April 22 – 26	Chapter 13
Week 13+	April 29	Chapter 13