

Course Description

Topology is the study of continuous functions: informally a function is continuous when a little mistake in the input corresponds to a correspondingly small mistake in the output. You've seen these in calculus, but we now vastly expand the notion of what a continuous function can be. First, we introduce metric spaces, which aren't usually sets of numbers but still have a notion of distance between any two points. Finally, we expand to general topological spaces, which have no intrinsic notion of distance at all, but have a vague notion of "nearby". These seemingly abstract theories are grounded in applications, from the existence of solutions to differential equations to the formulation of general relativity to certain questions about fuzzy tennis balls.

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Email	damaxwell@alaska.edu
Phone	474-1196
Web	damaxwell.org
Required Text	Introduction to Metric and Topological Spaces, <i>W. A. Sutherland</i> , Oxford University Press

Prerequisites:

The course prerequisite is a C or better in Math 256 (Calculus III) and Math 265 (Proofs).

Student Learning Outcomes

Students will:

- work fluently with metric space theory: open and closed sets, closure, interior, boundary, convergence, and continuity
- prove facts involving various notions of continuity: ϵ - δ , sequential, and open-set formulations,
- prove facts about compactness and connectedness, and recover the familiar associated theorems of calculus (IVT, EVT) as instances of these results,
- construct new spaces from old ones by passing to subspaces, products, and quotients, and identify standard surfaces from their gluing diagrams.

Class Time

There will be three hours of class lecture each week.

Lecture Times

MWF 10:30–11:30 Chapman 204

Office Hours

I will schedule 3 hours a week of formal office hours. Some of these will be held in the Engineering building, but I will be available by Zoom on demand.

Discord

A Discord server has been set up for this class. We will use it as the primary means of group communication.

Communication in Discord will be on-topic, polite and collegial as is suitable for a workplace setting.

As a courtesy to everyone you are communicating with, please sign in to the server with a handle that identifies yourself. As much as I am fond of my dog Frog, a handle of RedFrog2016 would not be a great user id.

Homework

There will be a homework assignment due roughly every week, usually on Tuesdays. Each week's assignment and due date will be posted on my web page. The first assignment is available.

Homework will be graded solely on completion. Some problems, typically one per set, will be labeled AI-free. For these problems you may not use AI to assist in any form. I will grade AI-free problems, but the grade is FYI only and will not impact the completion grade.

Homework will have a brief "AI Use" section at the end documenting how you used AI tools. This exercise allows you to reflect on your own relationship with the technology, and it helps me understand how to better incorporate its use in my future classes.

Regarding late homework, I will accept from each student a single late homework with no questions asked. Simply hand in a note indicating you are using your free late homework in place of your actual assignment. You must notify me no later than the time the homework is due that you intend to take advantage of this opportunity, and you must hand in the homework no later than one week after it was due. Subsequent late homeworks will be accepted only under extenuating circumstances to be determined at my discretion.

The late homework freebie cannot be used for the first two homework sets, nor can it be used for the final assignment.

Quizzes

There will be a weekly 15 minute quiz on most Wednesdays based on the homework handed in on the previous Tuesday. Usually it will be a problem, or a closely related problem from the homework.

Quizzes cannot be made up unless there are extenuating circumstances (e.g. a school sponsored absence, a death in the family, a hospitalization). Your lowest quiz score will be dropped.

Math Lab

The Math Lab on the library 5th floor has tutors available at scheduled times throughout the week. The tutors are most experienced at answering calculus questions, but you might find that some of the tutors (especially the graduate students) would welcome the opportunity to discuss something other than calculus.

Midterms

There will be two in-class midterm exams.

Final Exam

There will be a comprehensive final exam at the time scheduled for this class by the university.

Evaluation

Course grades will be determined as follows:

Homework	15%
Quizzes	15%
Midterm 1	20%
Midterm 2	20%
Final	30%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A+	97–100%	C+	77–79%	F	≤ 59
A	93–96%	C	73–76%		
A-	90–92%	C-	70–72%		
B+	87–89%	D+	67–69%		
B	83–86%	D	63–66%		
B-	80–82%	D-	60–62%		

Artificial Intelligence (AI)

AI is rapidly, profoundly changing how we learn and how we teach. You are *encouraged* to use it. It can explain topology to you at 2am. It can give you hints on your homework as you need them. Aside from certain clearly-labeled AI-free problems, you may use AI as you complete your homework. You are expected, however, to write your proofs in your own words and to document your use of AI; see the Homework section. In the event that AI significantly disrupts the course, I may need to adjust this policy and the syllabus itself. Any such changes will be announced in advance and will not be retroactive. We are living through interesting times together.

Tentative Schedule

The following is a tentative list of the topics to be covered in this class. As we proceed in the course, the course web page will list specific sections to be read for each week.

Week	Topics and Events
8/24 – 8/28	Chapters 2, 3
8/31 – 9/4	Chapter 4
9/7 – 9/11	Chapter 5 Monday: Labor Day
9/14 – 9/18	Chapter 6
9/21 – 9/25	Chapter 7,8
9/28 – 10/2	Chapter 9,10 First Midterm (Chapters 1–8)
10/5 – 10/9	Chapter 11,12
10/12 – 10/16	Chapter 13
10/19 – 10/23	Chapter 14
10/26 – 10/30	Chapter 15 Friday: Last day to withdraw with a 'W'
11/2 – 11/6	Chapter 16 Second Midterm (Chapters 9–14)
11/9 – 11/13	Chapter 17
11/16 – 11/20	Catchup
11/23 – 11/27	Homotopy Wednesday-Friday: Thanksgiving Break
11/30 – 12/4	Homotopy Last day of class

Rules and Policies

Collaboration

You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams

You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance

Attendance is not included directly as part of your grade.

Cell Phones

Turn off your cell phone before you come to class.

Disabilities Services

I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade

Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals

A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty

Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.

Official UAF Syllabus Addendum

Student protections statement: UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site: <https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

Disability services statement: I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

Student Academic Support:

- Speaking Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507)
- Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 8th floor)
- UAF Math Services, uafmathstatlab@gmail.com, Chapman Building (for math fee paying students only)
- Developmental Math Lab, Gruening 406
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, <https://www.ctc.uaf.edu/student-services/student-success-center/>)
- For more information and resources, please see the Academic Advising Resource List (https://www.uaf.edu/advising/lr/SKM_364e19011717281.pdf)

Student Resources:

- Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208)
- Student Health & Counseling [6 free counseling sessions] (907-474-7043, <https://www.uaf.edu/chc/appointments.php>, Whitaker 203)
- Center for Student Rights and Responsibilities (907-474-7317, uaf-studentrights@alaska.edu, Eielson 110)
- Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119)

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