

# Set Theory & Topology T11am/Th9:30am Spring 2024 SH 309

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Chair:	Jonathan White, <a href="mailto:jwhite@coe.edu">jwhite@coe.edu</a> (or Provost Ziskowski, <a href="mailto:aziskowski@coe.edu">aziskowski@coe.edu</a> )
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Office:	Stuart 311
Office Hours:	8-8:50am M-F and by appointment
Office Phone:	319-399-8280
Text:	<i>Introduction to Topology</i> , Crump Baker and <i>Principles of Topology</i> , Fredrick Croom
Participation:	Successfully presenting an exercise will earn 3 points. Occasional quizzes will earn up to 3 points each. Unexcused absences deduct 10 points each. Up to 250 points are possible.
Problem Sets:	Several problem sets will be assigned through the term, with high standards for both mathematics and formatting (i.e., .tex). 200 points are possible.
Math Culture Points:	Up to 50 Math Culture Points may be earned by participating in various activities outside of class, as detailed on page 3 of this syllabus.
Exams:	There will be a midterm exam worth 100 points and a final exam worth 200 points, with their dates listed in the schedule on page 2 of this syllabus.
Grading:	Grading will approximately follow a $[92.0\%, \infty) \mapsto A$ , $[90\%, 92\%) \mapsto A-$ , $[87\%, 90\%) \mapsto B+$ , $[82\%, 87\%) \mapsto B$ , $[80\%, 82\%) \mapsto B-$ , $[77\%, 80\%) \mapsto C+$ , $[72\%, 77\%) \mapsto C$ , $[70\%, 72\%) \mapsto C-$ , $[67\%, 70\%) \mapsto D+$ , $[62\%, 67\%) \mapsto D$ , $[60\%, 62\%) \mapsto D-$ , $(-\infty, 60\%) \mapsto F$ scale. Current grade information will be available online through Moodle at all times.
Makeups:	For fairness to those who follow the schedule, makeups for exams will be allowed only in extenuating circumstances, with documentation and advance notice when humanly possible. Late problem sets will be penalized 20% of points possible for each day late, and only accepted until others are returned.

A first course in topology serves as an ideal capstone for an undergraduate mathematics major. The material can proceed in a clear axiomatic progression, and can appear to be entirely abstract, but eventually sheds much light on a wide range of other areas of mathematics and applications. The real benefits of such a course do not come from passively receiving content from others, but instead from struggling with difficult ideas yourself. This course is designed to encourage (or force?) that. Thus, class time will be devoted almost entirely to students presenting the exercises from the textbook to the class. Proper notation and careful attention to detail will be expected at all times.

This course will give a traditional introduction to point-set topology, followed by a brief look at the fundamental elements of algebraic topology.

## Tentative Schedule

	1/11 Chapter 1 Review
1/16 §2.1 Open Subsets of $\mathbb{R}$ & §2.2 Topological Spaces	1/18 §2.3 Closed Sets and Closure
1/23 §2.4 Limit Points, Boundary, etc. & §2.5 Basic Open Sets	1/25 Chapter 2 Review
1/30 §3.1 Subspaces & §3.2 Continuity	2/2 §3.3 Homeomorphisms & §3.4 $\mathbb{R}^n$
2/6 Chapter 3 Review	2/8 §4.1 Pairwise Products
2/13 §4.2 Finite Products & §4.3 Arbitrary Products	2/15 Chapter 4 Review
2/20 §5.1 Connectedness	2/22 §5.2 Connected Subspaces
2/27 §5.3 Connected Products & §5.4 Connected Inf. Products	2/29 Chapter 5 Review
3/5 §6.1 Compactness	3/7 <b>Midterm Exam</b>
Spring Break	
3/19 §6.2 More Compactness	3/21 Chapter 6 Review
3/26 §7.1 $T_0, T_1, T_2$	3/28 §7.2 Regular Spaces & §7.3 Normal Spaces
4/2 Chapter 7 Review	4/4 §8.1 Metric Spaces & §8.2 More Metric Spaces
4/9 §8.3 Sequences & §8.4 Complete Metric Spaces	4/11 Chapter 8 Review
4/16 Croom §9.1 Algebraic Topology	4/18 Croom §9.2 Fundamental Group
4/23 Croom §9.3 $\Pi_1(S^1)$	4/25 Croom §9.4 More about $\Pi_1$
<b>Final Exam – 11am on Tuesday 4/30</b>	

Any students with disabilities which might affect their performance in this class should contact me as soon as possible to arrange accommodations.

Coe's faculty has adopted an academic integrity policy. It is your responsibility to understand and follow it.

Diversity, in all its forms, is valuable.

## Math Culture Points

A portion of the grade for this course will take the form of Math Culture Points. These will be earned through activities outside of class including, but not necessarily limited to, those listed below:

Activity	Points	Max #
Colloquium Attendance	5	--
Colloquium Presentation	5-15	2
Conference Attendance Nebraska Conference for Undergraduate Women in Mathematics Midwest Undergraduate Mathematics Symposium – 4/20/24	5-15 15	2
Mathematics Competition Participation Iowa Collegiate Mathematics Competition – 2/24/24	15	2
Math Culture Reading Specific readings will be posted, typically around 6 each semester Any article from Math Horizons With approval, any relevant article from Math Magazine, CMJ, etc.	5	-- 3 3
Math Club Activities (when appropriate) Movies, Math Club portion of the Playground of Science, Speakers, Workshops, etc.	5	--
Other Appropriate Coe or Outreach Activities Chess Club Meeting Job Shadowing in any relevant field Other Volunteer Outreach (Garfield, McKinnley, etc. – talk to Jon for information!)	5 10 5	3 1 4

You should plan to spread your participation throughout the semester. In each case above, credit assumes both full participation and posting a brief summary/response on Moodle in a **timely manner**. These reflections should generally be between 100 and 300 words, and include both a brief summary and your personal thoughts on the event, and **must be submitted within one week of the event**, or within the specified time window for other activities. Up to three units of credit may be submitted after normal deadlines in the “Math Culture – Late” category on Moodle, but otherwise exceptions will not be made without serious extenuating circumstances.

# Learning Outcomes

By the end of this class each student should be able to demonstrate:

- understanding of topology as an axiomatic system
- understanding of continuity and homeomorphism
- understanding of topological properties of product spaces
- understanding of compactness
- understanding of metric spaces
- understanding of the fundamental groups of some basic spaces

The Provost has mandated that the material below this line appear on all syllabi:

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## Mission Statement:

Coe College is a national, residential liberal arts college offering a broad array of programs in the arts, sciences, and professions. Our mission is to prepare students for meaningful lives and fulfilling careers in a diverse, interconnected world. Coe's success will be judged by the success of our graduates.

## Academic Integrity

At Coe College, we expect academic integrity of all members of our community. Academic integrity assumes honesty about the nature of one's work in all situations. Such honesty is at the heart of the educational enterprise and is a precondition for intellectual growth. Academic dishonesty is the willful attempt to misrepresent one's work, cheat, plagiarize, or impede other students' academic progress. Academic dishonesty interferes with the mission of the College and will be treated with the utmost seriousness as a violation of community standards. Please refer to the Coe College Academic Catalog for complete information regarding Academic Integrity: [www.coe.edu/academics/academic-resources/provosts-office/academic-integrity-policy](http://www.coe.edu/academics/academic-resources/provosts-office/academic-integrity-policy)

## FERPA

Students should be aware of their rights regarding the privacy of their educational records. Detailed information about your rights can be found under the FERPA (Family Educational Rights and Privacy Act of 1974) section in the Academic Catalog and online here: <https://www.coe.edu/academics/academic-resources/registrar/ferpa>. In line with FERPA restrictions, students should be aware that an instructor cannot publicly post grades by student name, institutional student identification number, or social security number without first having obtained students' written permission.

## The Definition of a Course Credit & Expected Workload

One course credit at Coe College constitutes 180 hours' worth of student work over the course of the term. "The Department of Education has defined one hour to be 50 minutes, so 150 60-minute hours is equivalent to 180 50-minute hours." This figure includes both the time spent in class and out of class completing course work. In other words, students are expected to devote a considerable amount of time outside of class to this course. For courses that meet in a standard MWF or T-Th slot, students should be expected to work seven hours a week outside of the three hours in class.

## Requesting Academic Accommodations

Coe College is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning in this course, please visit my office hours to discuss these concerns with me. If you have a medical, physical, psychological, or learning need documented by a healthcare provider, or experience an unforeseen obstacle during the semester, you can make an appointment with Laura Hayes, Accessibility Services Coordinator, to request an official accommodation under the Americans with Disabilities Act. You can find more information about the Accessibility Services Office by visiting the Learning Commons website or by emailing [accessibility@coe.edu](mailto:accessibility@coe.edu). If you have already been approved for accommodations through Accessibility Services, please meet with me so we can develop a plan for your success together.

## Reporting of Sexual Assault or Misconduct

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility related to my role as a faculty member. It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in any one-on-one meetings. I will keep the information you share with me private to the greatest extent possible. However, I am required to share information regarding sexual misconduct or students who may be in danger to themselves or to others. Students may speak to someone confidentially by contacting Student Life at 319-399-8843 or emailing [titleix@coe.edu](mailto:titleix@coe.edu), Safety, and Security at 319-399-8888, Emily Barnard (college counselor) at 319-399-8843, or visit Coe's Title IX website for more information.