

# Math 445 - Introduction to Topology I

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Spring 2019



## 1. BASIC COURSE INFORMATION

**Course web page** <http://dumas.io/math445/>

Textbook	<i>Topology</i> , 2ed, by James R. Munkres
Location	Taft Hall 309
Meeting Time	MWF 1pm
CRN	39509 (undergraduate), 39510 (graduate)
Instructor Email	<a href="mailto:david@dumas.io">david@dumas.io</a>
Office Hours	MWF 11am
Office	503 SEO

## 2. COURSE DESCRIPTION

This course provides an introduction to topology, which is the field of mathematics concerned with a formalization of the notion of “shape”. Most of the course will focus on the area within topology known as *point set topology*.

We will define topological spaces and discuss some important examples, such as metric spaces. We will study a variety of properties of topological and metric spaces, including compactness and connectedness. We will also discuss general methods for constructing new topological spaces from existing ones, such as products, quotients, and subspaces.

We will cover chapters 2–4 in the textbook and selected topics from chapters 5–8.

Chapter 1 of the textbook (“Set theory and logic”) contains some preliminary material that is not part of topology *per se*. Much of the material we will use from this chapter is covered in prerequisite courses such as Math 215 and Math 313. If topics from chapter 1 that are not usually covered in earlier courses are needed later in the semester, we will spend some time discussing the necessary background.

## 3. PREREQUISITES

The official prerequisite for Math 445 from the UIC course catalog is:

- Math 313 (Analysis I) with a grade of C or higher.

In practice we will not often use material from Math 313 directly, and a more accurate (but unofficial) statement of the prerequisites for success in the course would be:

- Experience reading and writing rigorous mathematical proofs and manipulating logical statements with quantifiers
- Basic theory of sets and functions (properties of intersection, union, complement; Cartesian products; relations, equivalence relations, functions, injections, surjections; countable and uncountable sets)
- Integers, rational numbers, and real numbers (definitions and basic properties)
- The  $\epsilon$ - $\delta$  definition of continuity for a function of a single real variable

#### 4. IMPORTANT DATES

Jan 14	Mon	First day of class
Jan 21	Mon	No class (Martin Luther King, Jr. day)
Jan 25	Fri	Add/drop deadline
Mar 6	Wed	Midterm exam (in class)
Mar 22	Fri	Late drop deadline
Mar 25-29	Mon-Fri	No class (spring break)
May 3	Fri	Last day of class
May 6	Mon	Final exam (1:00pm – 3:00pm)

#### 5. GRADING

The final grade for the course will be based on the homework assignments, an in-class midterm exam, and a cumulative final exam. These components will be weighted as follows:

- 50% Homework (average after two lowest scores dropped)
- 20% Midterm (Wed Mar 6, in class)
- 30% Final exam (Mon May 6, 1–3pm)

All graded assessments in the course (including the final course grades assigned at the end of the semester) will use the followed fixed grading scale:

- A = score of 85% or higher
- B = score of 75% or higher, but less than 85%
- C = score of 65% or higher, but less than 75%
- D = score of 55% or higher, but less than 65%
- F = any score less than 55%

No rounding or other adjustment of scores is performed. Thus, for example, a student whose overall average in the course is 84.9892% will receive a grade of B.

Students can monitor their course performance using the course gradebook on blackboard, and by using the scale above to determine the final letter grade they would receive based on any assumptions about their future performance on homework or exams. Since the information necessary for these calculations is available to all students, the instructor will not respond to requests for grading calculations (e.g. “What score do I need to receive on the final exam to get a B in the course?”).

#### 6. HOMEWORK

Problems sets will be posted on the course web page, with each problem set indicating the date when it is due. Some problems will be taken from the textbook. The usual schedule will be one problem set per week, due on Monday.

Complete instructions on how to submit homework will be given on the course web page.

Typesetting solutions to problem sets is not required, but handwritten assignments must be legible. (If you plan to go on to graduate school in mathematics, learning to typeset mathematical writing in  $\text{\LaTeX}$  is a good idea, and this might be a good time to learn!)

Students in the course may work on the problem sets in groups. However, each student must:

- Write, understand, and submit their own solutions
- Acknowledge collaborators by name on the assignment (e.g. write “in collaboration with Jane Doe” at the top of the page)

Note that this collaboration policy is specific to the regular course homework. Collaboration is *not* allowed on the part of the final exam which is given to students in advance, nor on the midterm or final exams themselves. See [Section 7](#) and [Section 8](#) for details about these exam policies.

Solutions to problems are works of mathematical writing—where clear communication is essential—and they will be evaluated as such. Thus, in order to receive full credit, a solution must be complete, correct, concise, and written in full sentences.

At the end of the semester, each student’s homework grade will be determined by converting all problem set scores to percentages, dropping the two lowest percentages, and averaging the remaining percentages.

Submission of homework on paper is required. Please staple multi-page submissions.

The grade assigned to homework upon first submission is final. Homework cannot be resubmitted for additional credit.

## 7. MIDTERM EXAM

There will be an in-class midterm exam on Wednesday, March 6, during the regular lecture time.

The problems on the midterm will be similar to homework problems, but they will be somewhat shorter to allow for completion of the exam in the 50-minute class period. Students will not be allowed to use notes or books during the midterm exam, and collaboration of any kind on the exam is prohibited.

The midterm exam will have a total of four problems, of which students will be required to complete any three. Each problem will be worth 10 points. It is not recommended for students to attempt more than three problems, but in any case, the exam score will be the sum of the three highest problem scores.

## 8. FINAL EXAM

The final exam will be held at the time set by the registrar, which is Monday, May 6, 1:00pm–3:00pm. It is important that students avoid making plans (e.g. travel) that conflict with the exam. The location of the final exam will be set by the registrar about one week before the end of the semester; it will be announced in class and on the course web page.

The final exam will be cumulative, with emphasis on material covered after the midterm exam. Problems on the final exam will be similar to the homework problems. Students will not be allowed to use notes or books during the final exam, and collaboration of any kind on the exam is prohibited.

The final exam will have a total of six problems, of which students will be required to complete any four. Each problem will be worth 10 points. It is not recommended for students to attempt more than four problems, but in any case, the exam score will be the sum of the four highest problem scores.

Two of the final exam problems will be posted to the course web page on Monday, April 29. The purpose of posting these problems is to allow students to plan some of their solutions in advance. However, students must still write their solutions to these problems from scratch during the exam period. Furthermore, collaboration on preparing solutions for these final exam problems is prohibited.

## 9. COMMUNICATION PREFERENCES

Email is the preferred and most reliable method of communication with the instructor outside of lecture and office hours.

## 10. PARTICIPATION

Students are encouraged to ask questions in lecture about the material currently under discussion, and to answer questions asked by the instructor.

Questions specific to a single student (such as requests to clarify comments on returned problem sets) are better left to office hours.

## 11. ATTENDANCE

Students are responsible for all of the material covered in the lectures, including any lectures they miss. Any student who misses a lecture is advised to ask classmates for notes and information about any assignments or course announcements. Lecture notes are not provided by the instructor.

## 12. POLICY ON MISSED OR LATE WORK

In most cases:

- Late homework is not accepted (i.e. a homework assignment not received by the stated deadline will result in a score of zero)
- Missing an exam results in a score of zero

Exceptions are made with instructor approval and only under extraordinary circumstances, such as a severe illness, injury, or similar emergency. Documentation may be required. Students should contact the instructor as soon as possible regarding any missed or late work if they believe this policy applies.

## 13. CLASSROOM BEHAVIOR

In order to provide a classroom environment most conducive to learning, and to minimize distractions, students are asked to follow these guidelines:

- Use of electronic devices during class should be limited to purposes directly related to the course, such as note-taking<sup>1</sup>.
- Electronic devices should be silenced during class.
- Making or receiving phone calls in the classroom is prohibited.
- Please do not to eat in class. (If this policy creates a hardship, please contact the instructor.)

## 14. UNIVERSITY POLICIES

UIC requires that every syllabus mention the following university policies.

14.1. **Academic deadlines.** The UIC academic calendar can be found at:

<http://catalog.uic.edu/ucat/academic-calendar/>

In particular this calendar includes the deadlines for adding and dropping courses.

14.2. **Academic honesty and standards of conduct.** All UIC students are required to abide by the rules and standards of conduct described in the [Student Disciplinary Policy \(https://go.uic.edu/DisciplinaryPolicy\)](https://go.uic.edu/DisciplinaryPolicy). In particular, this policy prohibits academic misconduct such as plagiarism.

14.3. **Disability accommodation.** The University of Illinois at Chicago is committed to maintaining a barrier-free environment so that students with disabilities can fully access university programs, courses, services, and activities. Students with disabilities who require accommodations for access or participation in this course are welcome, but must be registered with the Disability Resource Center (DRC). Students may contact the DRC at 312-413-2183 (voice) or 312-413-0123 (TTY). Further information is available from the DRC web page (<http://drc.uic.edu/>).

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<sup>1</sup>Taking notes by typing on a computer keyboard is *not* recommended, though it is permitted.

14.4. **Religious holidays.** The UIC Senate Policy on religious holidays (approved May 25, 1988) is as follows:

“The faculty of the University of Illinois at Chicago shall make every effort to avoid scheduling examinations or requiring that student projects be turned in or completed on religious holidays. Students who wish to observe their religious holidays shall notify the faculty member by the tenth day of the semester of the date when they will be absent unless the religious holiday is observed on or before the tenth day of the semester. In such cases, the students shall notify the faculty member at least five days in advance of the date when he/she will be absent. The faculty member shall make every reasonable effort to honor the request, not penalize the student for missing the class, and if an examination or project is due during the absence, give the student an exam or assignment equivalent to the one completed by those students in attendance. If the student feels aggrieved, he/she may request remedy through the campus grievance procedure.”

The University Holidays and Religious Observances calendar can be found at:

<http://oae.uic.edu/religious-calendar/>

#### 15. REVISION HISTORY OF THIS DOCUMENT

- 2019-01-13 Initial syllabus publication.