Math 546 **Topology and Geometry of Manifolds** **Spring 2020**

SYLLABUS

Course Websites: www.math.washington.edu/~lee/Courses/546-2020
canvas.uw.edu/courses/1373514

Lectures: MWF 1:30–2:20
Zoom link available on Canvas

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Required Textbook:
Introduction to Smooth Manifolds, 2nd edition, by John M. Lee [ISM]

UW students can download a free PDF copy of the text for your personal use from the UW Libraries website. If you purchase a printed copy of [ISM] and show it to me with your name written in ink, I'll reimburse you for my share of the list price ($3.75 for a paperback, $14.85 for hardcover). Be sure to download the latest list of corrections to the text (linked from the course web page), and mark them in your copy.

General description:
The three-quarter sequence Math 544-545-546 is a graduate-level introduction to topology and differential geometry, with primary focus on *manifolds*. These are arbitrary-dimensional generalizations of curves and surfaces—spaces that locally look like Euclidean space but globally may not, just as a sphere looks like a plane if you zoom in far enough, but is globally very different. They are the basic subject matter of differential geometry, but also play a role in many other branches of pure and applied mathematics.

In Math 546, we'll cover the following chapters of [ISM]:

- Chapter 9, pp. 217-236
- Chapters 10–17
- Chapter 19, pp. 490-507
- Chapters 20 & 21

Class Recordings:
This course is scheduled to run synchronously at our scheduled class time via Zoom. These Zoom class sessions will be recorded. The recording will capture my audio, video, and computer screen. Student audio and video will be recorded if you share your computer audio and video during the recorded session. The recordings will only be accessible to students enrolled in the course to review materials. These recordings will not be shared with or accessible to the public.

The University and Zoom have FERPA-compliant agreements in place to protect the security and privacy of UW Zoom accounts. Students who do not wish to be recorded should:

- Change their Zoom screen name to hide any personal identifying information such as their name or UW Net ID, and
- Not share their computer audio or video during their Zoom sessions.

Religious Accommodations:
Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at *Religious Accommodations Policy* (registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the *Religious Accommodations Request form* (registrar.washington.edu/students/religious-accommodations-request/).

Other Accommodations:
If you need disability accommodations, please make arrangements through Disability Resources for Students (depts.washington.edu/uwdrs). If you must turn in an assignment late due to medical or other compelling reasons, contact me for permission in advance, or as soon as medically possible thereafter.

Lectures:
The lectures will occur via Zoom at our regular class times. If you can't join them live, you can watch the recorded versions later via Canvas.

During a lecture, feel free to ask questions. If I'm in the middle of explaining something, use the Zoom "raise hand" button to get my attention. But any time I pause, you're welcome just to speak up (after unmuting your microphone). Your video camera will be turned off by default; it's your choice whether to turn it on or not.

Reading:
As in past quarters, I'll be assigning approximately one chapter to read each week, usually before we cover the material in class.

Exercises:
As before, I expect you to at least try all of the *Exercises* in the text, and figure out what's involved in solving them. If you get stuck on an exercise, please ask!

Things to work out on your own:
Most weeks, I'll post some Problems that you should work out for your own educational benefit, in addition to the Exercises.

Written homework:
Each Friday, I'll post a written homework assignment, due by the beginning of the next Friday's class. All homework assignments are to be turned in electronically in PDF format via Canvas. If you write your solutions by hand, you'll need to scan them and convert them into a single PDF. If you don't have access to a regular scanner, try installing the Genius Scan app on your phone. It's available for both iOS and Android phones. Homework that's uploaded more than ten minutes after the start of class will get a 10% deduction for lateness.

Final Exam:
As in past quarters, there will be no midterm; just a take-home final exam covering all the material from spring quarter.

Grading:
Your 546 grade will be based on a weighted average of homework and exam scores:

- 60% written homework problems
- 40% final exam

Homework guidelines:

The general homework guidelines are the same as in previous quarters.

- **Collaboration:** I strongly encourage you to work with other Math 546 students on the homework. You'll get the most benefit from working with others if you make a good-faith effort to solve the problems on your own first; but once you've thought about them for a while, you'll learn a lot from discussing them with other classmates. When writing up solutions to hand in, *you must write your own solutions in your own words.* Don't look at anyone's written solutions (including other students' homework papers, published proofs, or solutions posted on the internet) before turning in your homework. Any unattributed use of material from any written source, including the internet, constitutes plagiarism.

- **Problem statements:** For each written homework problem, please include a clear statement of what you're proving. You need not copy the entire problem statement, but be sure to include enough that the grader can tell exactly what you're claiming to prove. I prefer that you state each result in the form of a theorem (e.g., "Theorem: Every closed subspace of a paracompact space is paracompact") instead of a command ("Prove that every closed subspace of a paracompact space is paracompact") or a question ("Is every closed subspace of a paracompact space paracompact?").

- **Citing results:** You may freely use the results of Exercises, Theorems, Propositions, Corollaries, and Lemmas from earlier in the book. (For this purpose, consider the appendices to be earlier than all the other chapters.) Unless otherwise stated, you may only use another Problem if it has been previously assigned (either to work out on your own or to hand in), or if you give its solution. Results from other books or the internet can be used only if you prove them, or if they are part of the undergraduate prerequisites (abstract algebra, linear algebra, real analysis).

- **Proof-writing conventions:** On the class web page, there's a link to a short note describing standard conventions for writing mathematical proofs. Learn them and follow them! The sooner you get used to following them, the easier it will be for you to develop effective mathematical writing habits.

- **Typesetting vs. handwriting:** I encourage you to submit computer-typeset assignments. I recommend LaTeX, since it's the de facto standard in mathematics, and you'll have to learn it sooner or later if you continue doing math research or teaching; but any typesetting program will do. On the class website, there's a link to some helpful references about mathematical typesetting. I'm also happy to accept handwritten assignments, as long as they're neat and legible (see below).

- **Legibility:** If you write by hand, write your answers neatly and legibly, not too small, with as few erasures or crossouts as possible. Be sure to distinguish clearly between similar symbols, such as $l/1$, $b/6$, $\in/\varepsilon$, $g/q/9$, h/n, p/ρ, r/γ, $s/5$, $t/+$, v/ν, $x/\times$, $y/4$, $z/2$, $\subset/C$, $\cup/U$, and uppercase/lowercase letters. Unless mathematical ideas spring fully and impeccably realized from your pen, your first draft is not acceptable.

- **Assembly:** Arrange your solutions in numerical order, just as they appear on the assignment page, with *each problem starting on a new page.* Problems that are out of order might not get credit.

- **Identification:** Make sure the first page of each homework packet is clearly labeled with your name and the assignment number.

- **White space:** Don't be stingy with white space. *Leave one-inch margins on all four edges of your pages.* If you don't, the graders will be annoyed because they don't have room to write comments, and you don't want your paper being evaluated by an annoyed grader!