Math 547 **Geometric Structures** **Fall 2020**

SYLLABUS

Lectures:	MWF 1:30–2:20 Zoom link available on Canvas
Instructor:	Jack Lee 206-543-1735 (leave a message) johnmlee@uw.edu
Course Websites:	www.math.washington.edu/~lee/Courses/547-2020 canvas.uw.edu/courses/1400234

General description:
This course introduces the most important concepts and tools of Riemannian geometry. The central focus of the course is developing an intimate acquaintance with the geometric meaning of *curvature*, and the technical tools for working with it. After introducing the definitions and studying local properties of curvature, we will proceed to some of the "big theorems" relating curvature to global topological properties.

Text:
The required text is the following:

> [IRM] John M. Lee, *Introduction to Riemannian Manifolds*, second edition, Springer, 2018.

Unfortunately, by the time this book was published, UW Libraries had been forced to cancel their contract for online access to Springer math texts, so there is no free online access for UW students. If you purchase a copy of the book, email me a copy of the receipt and I'll reimburse you for my portion of the price (14.40 for the hardcover, 10.80 for the e-book).

Prerequisites:
Mathematics 544/545/546, *Topology and Geometry of Manifolds*; specifically, the material in my books *Introduction to Topological Manifolds* [ITM] (except Chapter 13) and *Introduction to Smooth Manifolds* [ISM] (except chapters 18 & 22).

Lectures:
I'll lecture via Zoom at our scheduled class times. Lectures will be recorded for those who can't join during the scheduled time. Student audio and video will be recorded if you turn on your microphone and/or camera during the recorded session, but without identifying names. The recordings will only be accessible to students enrolled in the course. Usually, I'll show up ten minutes early for Q & A before the recording starts.

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. Any time I pause, just 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.

Homework:
I'll assign problem sets at irregular intervals, usually every couple of weeks. You should do all the assigned reading, and try to figure out how to do all the *Exercises* included in the text, whether assigned or not. The problems listed as "to write up and hand in" are to be submitted via Canvas for grading. 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. Otherwise, homework uploaded more than ten minutes after the start of lecture will get a 10% deduction for lateness, and after lecture is over the deduction increases to 50%.

When you write up your solutions, please follow these guidelines:

> **Citing results:** You may freely cite theorems, propositions, corollaries, lemmas, and exercises from earlier in the book. (For this purpose, the appendices are considered to be earlier than all the other chapters.) But (unless I announce otherwise) the result of a *problem* can only be used if it has been previously assigned, or if you give its solution. You may also use anything from [ITM] or [ISM],

including the results of problems and exercises, unless they are substantially identical to what you're being asked to prove. If you look up and use something proved in any other book or on the internet, please explain what you found and where you found it, and write up a proof in your own words of any result that you need to use to solve a homework problem. Do not look up specific solutions to the assigned problems, and do not copy specific language that anyone else has written.

Collaboration: I strongly encourage you to work with other students on the homework. Discussing problems and ideas with your classmates is one of the best ways to absorb new ideas. But when writing up solutions to hand in, you must *write your own solutions in your own words.*

Writing it up: Always start by writing the problem number (from the book), and stating what you're going to prove. You don't have to copy the whole problem statement verbatim; often it's better just to state the theorem that you're being asked to prove. Don't be stingy with white space: start each problem on a new page, and leave one-inch margins on all sides of your pages. Arrange your solutions in numerical order, just as they appear on the assignment page. Problems that are out of order might not get credit. I've posted a link on Canvas to an essay I wrote titled "Some Remarks on Writing Mathematical Proofs"; I strongly urge you to read that and follow its advice.

Typesetting vs. handwriting: If you are comfortable doing so, I encourage you to submit computer-typeset assignments. I highly recommend LaTeX, since that is the de facto standard in mathematics; but any typesetting program will do. I've posted some helpful typesetting links on Canvas. I'm also happy to accept handwritten assignments, as long as they are 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 a/α, $b/6$, $C/\subset$, $\in/\varepsilon$, $g/q/9$, h/n, $I/l/1$, p/ρ, r/γ, $s/5$, $t/+$, $u/v/\nu$, $U/\cup$, $x/\times/\chi$, $y/4$, $z/2$, ζ/ξ, and uppercase/lowercase letters. Unless mathematical ideas spring fully and impeccably realized from your pen, your first draft is not acceptable.

Submission: When you've finished the assignment, create a PDF copy of the assignment and upload it to Canvas. If you need to scan handwritten pages and don't have a regular scanner, try the smartphone app called Genius Scan, which is available free for iPhone and Android.

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/).

Disability Accommodations:
It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations, contact DRS at disability.uw.edu.

Grading:
Your grade will be based on the required homework problems; there are no exams. The cutoff for a 4.0 will be approximately 80%, and the cutoff for a 3.0 approximately 50%.

If you are a second-year graduate student or beyond, or if you are in a department other than math, you may register for this course on an S/NS basis. You have to make this registration change through MyUW by November 17. Be sure to tell me if that's what you're doing. In this case, if you attend (or listen to) lectures regularly and hand in complete written solutions to at least three homework problems taken from three different assignments, I'll record your grade as a 2.7 (for grad students) or 2.0 (for undergrads), which will be converted by the registrar to S (satisfactory).