

Lectures: MWF 1:30–2:20
Padelford C-36

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Course Web site: <http://www.math.washington.edu/~lee/Courses/545>
(or from the Math Department home page,
Selected Course Web Pages → Math 545)

Texts: [ITM] J. M. Lee, *Introduction to Topological Manifolds*, Springer-Verlag, 2000. We'll be covering Chapter 12 in this book during Winter quarter, so don't sell your copy yet!

[ISM] J. M. Lee, *Introduction to Smooth Manifolds*, Springer-Verlag, to be published in 2002. (A draft version of the complete book should be available for purchase by the end of January at Professional Copy, 4200 University Way NE, 634-2689. Meanwhile, I'll hand out photocopies of individual chapters as they are needed.)

Prerequisites:

- *Topology*: All the material covered in Math 544. REFERENCE: [ITM, Chapters 1–11].
- *Linear algebra*: Abstract vector spaces, subspaces, bases, dimension, matrices, determinants, change of basis formulas, linear maps, kernel and image, norms and inner products, orthonormal bases. REFERENCE: any abstract linear algebra text, such as *Linear Algebra* by Friedberg, Insel, and Spence; Appendix to [ISM].
- *Multivariable calculus*: Partial derivatives; the total derivative as a linear approximation; Taylor's formula in several variables; multiple integrals and the change of variables formula; gradient, divergence, and curl; the theorems of Green, Gauss, and Stokes; uniform convergence. REFERENCES: *Basic Multivariable Calculus* by Marsden, Tromba, and Weinstein; *Principles of Mathematical Analysis* by Rudin, Chapters 5,6,7; Appendix to [ISM].
- *Differential equations*: Basic facts about existence and uniqueness of solutions to ODEs; elementary techniques for solving first-order equations and systems at the level of Math 307 and 309. REFERENCE: *Elementary Differential Equations and Boundary Value Problems* by Boyce and DiPrima.

Homework:

There will be some slight changes to the homework assignments this quarter. A typical assignment will consist of the following:

1. *Reading*: About one chapter each week.
2. *Reading Report*: Once a week, send me a one- or two-paragraph report by e-mail about your reading in the textbook. Answer the following questions:
 - What do you think are the one or two most important concepts in the section you read, and why? (Evaluative comments, not just a book report!)
 - What are one or two questions that the reading raised in your mind?
3. *Exercises*: As before, I expect you to work through all the exercises in the text.
4. *Practice Problems*: This is new for this quarter. These will be problems at the ends of the chapters that you should do for your own good, in addition to the exercises woven into the chapters. Practice problems do not have to be turned in, and will not be graded.
5. *Required Problems*: As before, problems and/or exercises for you to write up and hand in.
6. *Optional Problems*: Occasional problems to do for extra credit; they can make a difference in your grade if it's near a borderline.

If you work on the required and/or optional problems with a study group, you must write your own solutions in your own words.

Outside Reading:

Like last quarter, I will hand out a list of suggested outside sources at the beginning of the course. This quarter, you must send me the title of the book you plan to read, and which chapters in that book, by Friday, Feb 1. You may read a book not on the suggested list with my approval. The final reading report is due Friday, March 8. It should be a few paragraphs long, and should include (brief) answers to the following questions:

- What material did your reading cover?
- In what ways were the author's approach, presentation, definitions, statements of theorems, proofs, etc. similar to and different from those in our textbook?
- Why do you think the author and I made the decisions we did about how to present the material?
- Was there anything in your reading that you found particularly interesting, particularly enlightening, or particularly confusing?
- Did your reading raise any questions in your mind that you might like to pursue?

Final Exam:

The take-home final exam will be handed out in class on Monday, March 11, and will be due in my office on Wednesday, March 20, by 5:00 pm.

Grading:

As in fall quarter, your grade will be based 2/3 on the required homework problems and 1/3 on the exam. The weekly reading reports and outside reading reports together will count as one homework assignment. (You may miss one weekly reading report without lowering your grade, however.)