Math 547 **Geometric Structures** **Fall 1996**

SYLLABUS

Lectures: MWF 1:30–2:20
Padelford C-401

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Web site: `http://www.math.washington.edu/~lee/Courses/547`
(or from the Math Department home page, follow the links **Courses** → **Math 547**)

Books:

The only required text for Math 547 will be the notes that I've written for this course, titled *Riemannian Manifolds*. They can be purchased very inexpensively at Professional Copy 'n' Print, 4200 University Way NE (634-2689).

For further information, you are encouraged to consult the following sources (all on reserve in the Mathematics Research Library):

- W. M. Boothby, *An Introduction to Differentiable Manifolds and Riemannian Geometry, 2nd ed.*, Academic Press, Orlando, 1986.
- J. Cheeger and D. G. Ebin, *Comparison Theorems in Riemannian Geometry*, North-Holland, Amsterdam, 1975.
- M. do Carmo, *Riemannian Geometry*, Birkhäuser, Boston, 1992.
- S. Kobayashi and K. Nomizu, *Foundations of Differential Geometry, Vols. I–II*, Interscience, New York, 1963.
- W. S. Massey, *Algebraic Topology: An Introduction*, Springer-Verlag, Berlin, 1989.
- F. Morgan, *Riemannian Geometry: A Beginner's Guide*, Jones and Bartlett, Boston, 1993.
- A. J. Sieradski, *An Introduction to Topology and Homotopy*, PWS-Kent, Boston, 1992.
- M. Spivak, *A Comprehensive Introduction to Differential Geometry, Vols. I–V*, Publish or Perish, Berkeley, 1979.

Prerequisites:

Mathematics 544/545/546, *Topology and Geometry of Manifolds*; specifically, the material in Chapters 1–5 of Massey and Chapters 1–6 of Boothby.

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*. 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.

Homework:

The homework problems will all be taken from the notes. There are two types of problems in the notes: *Exercises*, which are integrated into the text, and *Problems*, grouped at the end of each chapter.

1. *Exercises:* These include some background material that you should have already seen in an earlier course, some proofs that "fill in the gaps" from the text, some simple but illuminating examples, and some intermediate results that will be used in the lectures or in other problems. They are, in general, elementary, but they are *not optional*. I expect you to do them all carefully as you read the text. A few of them might be assigned to write up and hand in.

2. *Problems:* These are mostly more difficult than the exercises, some of them considerably so, and constitute the heart of the course. Most of them will be assigned to write up and hand in for a grade. Those that are not assigned may also be written up and handed in for extra credit (see *Grading*, below). If you really want to understand the subject, or if you intend to go on to do research in differential geometry, I strongly encourage you to do *all* of them.

You are encouraged to work together on the homework problems (it's usually the best and fastest way to learn). However, when you write up your solutions to hand in, *you must write your own solutions in your own words.*

Grading:

Your grade will be based on the homework problems you write up and hand in. Roughly speaking, getting 90% of the required problems correct will get you a 4.0, 70% will get you a 3.0, and grades in between will be linearly interpolated. Unassigned Problems (not Exercises) that are written up and handed in will be counted for extra credit if they are mostly correct. A grade lower than 3.0 means you are not performing at the level expected of a graduate student.