Math 548 **Geometric Structures** **Winter 2008**

SYLLABUS

Lectures:	MWF 1:30–2:20 Padelford C-401
Instructor:	Jack Lee Padelford C-546, 206-543-1735 *lee@math.washington.edu*
Course Web site:	*www.math.washington.edu/~lee/Courses/548-2008* (or from the Math Department home page, **Class Web Pages → Math 548**)

Text:

The only required text is the notes I will be writing and handing out in class. The cost is $15 per copy, payable to Mary Sheetz in the Math Department Office (PDL C-138). Please pay no later than noon Friday, January 11, so that you can get the first installment of notes as soon as they're ready.

Prerequisites:

Prerequisite: Math 546. Math 547 (Riemannian Geometry) and/or Math 564 (first quarter of Algebraic Topology) would be helpful, but are not required.

General description:

This course will be a (mostly topological) introduction to the theory of fiber bundles, which are indispensable tools in differential geometry, algebraic geometry, topology, and theoretical physics. Specifically, I hope to cover the following topics:

- Vector bundles and fiber bundles
- Structure groups, G-structures, and reduction of structure groups
- Whitney sums, tensor products, pullback bundles
- Principal bundles and associated bundles
- Classifying maps and universal bundles
- Sheaves, sheaf cohomology, the long exact sheaf sequence, acyclic sheaves
- The generalized de Rham theorem
- Characteristic classes

Homework:

Problem sets will be assigned at irregular intervals, usually every two weeks or so. When you write them up, please follow the guidelines on the handout titled *Conventions for Writing Mathematical Proofs*, and also the following specific expectations:

- **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 learn the material. But when writing up solutions to hand in, please *write your own solutions in your own words*. If you collaborate to a significant degree on any assignment, list the names of any people with whom you collaborated on that assignment.
- **Citing results:** You may freely cite theorems, lemmas, propositions, and exercises from the notes. You may also use anything from my books *Introduction to Topological Manifolds* and *Introduction to Smooth Manifolds*, including problems and exercises. If you look up and use something proved in any other book, be sure to state the result completely, and say where you found it. I discourage you from looking up solutions to the assigned problems.
- **Problem Statements:** You need not copy the entire problem statement, but be sure to state clearly what you are proving. I prefer that you state each result in the form of a theorem.
- **Assembly:** Arrange your solutions in numerical order, just as they appear on the assignment sheet, with *each problem starting on a new page*. Problems that are out of order might not get credit. Please staple the pages of each assignment together.
- **Identification:** Make sure the first page of each homework packet is clearly labeled with your name and the assignment number.
- **Typesetting vs. handwriting:** If you are comfortable doing so, I encourage you to submit computer-typeset assignments. I highly recommend LaTeX, since that has become the de facto standard in mathematics; but any typesetting system will do. 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.
- **White space:** Don't be stingy with white space. *Leave one-inch margins on all sides of your pages.*

Grading:

Your grade will be based on homework; there are no exams. Roughly speaking, the cutoff for a 4.0 will be somewhere in the 80–90% range, and the cutoff for a 3.0 somewhere around 50–60%.

If you wish, you may register for this course on an S/NS basis (for example, if you have passed prelims and chosen a PhD committee, and are therefore no longer required to register for graded courses). In this case, if you attend regularly and hand in at least one or two written problem solutions, I will record your grade as a 2.7, which will be converted by the registrar to S (satisfactory).