Math 930, Fall 2014

Riemannian Geometry

Class meets: 9:1—10 am MWF in C-304 Wells Hall.

Professor:	T. Parker	Office hours:	Monday: 1:30-2:30
Office:	C-346 Wells Hall 353-8493		Wednesday 3-4
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Class Web page: math.msu.edu/~parker/RG. Bookmark this!

This course is an introduction to Riemannian geometry. The emphasis is on quickly acquiring a working knowledge of the tools and ideas of the subject.

Prerequisites: Math 868 or a familiarity with manifolds (vector fields, differential forms, tangent and tensor bundles).

Course Content: The course will begin will the "classical differential geometry" of surfaces in $\mathbf{R}^n$. We will then start anew, casting things in the modern, more abstract language of manifolds, differential forms and connections. At the end, we will return to surface theory, which by then should be easy.

1. The geometry of surfaces in $\mathbf{R}^3$ and Riemann's thesis.
2. Riemannian metrics, length, and geodesics.
3. Connections, parallel transport, and curvature on vector bundles.
4. Jacobi fields and normal coordinates.
5. A working man's introduction to elliptic theory.
6. Finding geodesics via Morse theory.
7. The Hodge Theorem and the Bochner technique.

Textbook: *Riemannian Manifolds, an introduction to curvature*, by John M. Lee. We will cover the entire book.

Additional books: The following books are cover the same topics, with varying styles.

1. M. do Carmo, *Riemannian Geometry.*
2. M. Spivak, *A Comprehensive Introduction to Differeintial Geometry*, Vols. 1,2,3.
3. S. Gallot, D. Hulin, and J. Lafontaine, *Riemannian Geometry.*
4. J. Cheeger and D. Ebin, *Comparison Theorems in Riemannian Geometry.*

Grades: There will be homework assignments, assigned and collected every 1-2 weeks; the course grade will be based on these.