

Math 60670, Spring 2010
Course Information
Basic Riemannian Geometry

Instructor: Jianguo Cao, 279 Hayes-Healy, 631-8847 (office)

Time to meet: M W F 8:30a-9:20a

classroom assigned: Hayes Healy Center 125

Course Description:

This is a graduate course on Riemannian geometry. Topics include but not limited to the following:

- 1) Brief review of surface theory, and explains why Gauss curvature is intrinsic.
- 2) Brief review of smooth manifold theory (concepts without proofs).
- 3) Connections and curvatures on general vector bundles.
- 4) Affine connections and their geodesics.
- 5) Riemannian metrics and Levi-Civita connections.
- 6) Geodesics, exponential maps, and Hopf-Rinow theorem.
- 7) Sectional, Ricci, and scalar curvatures.
- 8) Second fundamental forms for submanifolds of Riemannian manifolds and Gauss equation.
- 9) Jacobi fields, conjugate points, Cartan-Hadamard Theorem and Synge Theorem.
- 10) Second variation formula and Bonnet-Myers Theorem.

Homework and Exam: None.

Reference books:

1. Chavel, I.: “Riemannian Geometry: A modern introduction”, Cambridge University Press, Paper cover, Reprinted 1996. around \$ 39.
2. Jianguo Cao, Hongyan Tang and Youde Wang “Lectures on modern metric differential geometry”, to be published jointly by AMS and International Press. Free.