MATHEMATICS 563 A1
Introduction to Differential Geometry
Fall Semester 2006

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Lectures: MWF 1-2 in MCS B33

Text: *Differential Geometry*, by Andrew Pressley, Springer-Verlag, 2002, 3rd Printing; ISBN 182331526

My Office Hours: TBA

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Content: Geometry, of course, is the study of "shapes" such as lines and surfaces as well as their higher dimensional analogs. Differential geometry is an application of the ideas from calculus to characterize geometric objects. Calculus can be used to define basic geometric notions such as length, volume, and curvature. This subject is an active area of research and has various applications in science and engineering, *e.g.* computer graphics, Einstein's theory of gravitation (general relativity), quantum physics, to name just a few. We study curvature, torsion, and Frenet of curves in $\mathbf{R}^3$. We then study surfaces in $\mathbf{R}^3$ in some detail including tangent bundles, normals, orientability, the first and second fundamental forms, Gaussian and mean curvatures, the Gauss map, geodesics, minimal surfaces, and the Gauss-Bonnet Theorem.

Prerequisites: The material in the course is nontrivial so please make sure that you satisfy the prerequesites. The prerequisites to this course are multivariate calculus and some linear algebra. A knowledge of analysis or topology is useful but is not necessary.

Homework: Generally, homework will be assigned on a weekly basis and will be due the following week. Late homework will not be accepted. Students may discuss homework with each other (and are encouraged to do so) but all written work must be prepared independently.

Exams: There will be two exams and a final exam.

Grading: The two exams are collectively worth a third, the homeworks are worth another third, and the final exam is worth a third of the grade.

Academic Conduct: All students are expected to maintain high standards of academic honesty and integrity and it is the responsibility of every student to abide by the provisions of the Academic Conduct Code. In particular, if work is done with another then the name of the collaborator should be stated.