DIFFERENTIAL GEOMETRY
MATH 4600/8606

1.0 Course Description

1.1 Overview of Content and Purpose: (3 hours) Curves, surfaces, Gaussian curvature, surfaces with constant mean curvature, holonomy and the Gauss-Bonnet theorem, minimal surfaces and complex variables, hyperbolic surfaces.

1.2 For whom Intended: To present the ideas, techniques, and applications of modern differential geometry to mathematics and physics majors.

1.3 Prerequisite: MATH 1970, MATH 2050, MATH 2350

2.0 Content and Organization

2.1 Topics:

1. Curves and the Serret-Frenet equations.
2. The geometry of surfaces
   a. normal, principal and Gaussian curvature
3. Mean curvature and area minimization
4. Holonomy and parallel vector fields
   a. Foucault's pendulum, Gauss-Bonnet theorem
5. Minimal surfaces and complex variables
   a. Weierstrass-Enneper representations
6. Hyperbolic surfaces
   a. negative curvature and the Poincaré plane
   b. the psendosphere and punctured sphere

3.0 Teaching Methodology

3.1 Methods to be Used: The course will be taught by the lecture method with questions and discussion encouraged.

4.0 Evaluation

4.1 Basis for Evaluating Student Performance: Students will be evaluated on the basis of written assignments and examinations. Graduate students will be expected to complete additional assignments.

5.0 Resource Material

5.1 Textbook(s) or Other Required Readings:

6.1 Current Bibliography of Resources:

1. Faber, R.L., *Differential Geometry and Relativity Theory*, Marcel Dekker, 1983.
2. Gray, Alfred, *Modern Differential Geometry*, CRC, 2nd Ed., 1998.
3. Oprea, John, *Differential Geometry and its Applications*, Prentice Hall, 1997.
4. Stillwell, John, *Geometry of Surfaces*, Springer, 1992.