DIFFERENTIAL GEOMETRY

MATH 4600/8606

Course Description:

Curvature, torsion, Frenet frames, Fundamental theorem of curve theory, Frenchel's theorem, tangent spaces, first and second fundamental forms, shape operator, Fundamental theorem of surfaces theory, covariant derivative, parallel transport, geodesics. **3 credits**

Prerequisites:

MATH 1970 with a C- or better, MATH 2050 with a C- or better, and MATH 2350 with a C- or better, or permission of instructor.

Overview of Content and Purpose of the Course:

Differential geometry uses the tools of Calculus, and multi-linear algebra to understand the geometry of space curves and surfaces. Curvature, torsion, Frenet frames, Fundamental theorem of curve theory, Frenchel's theorem, tangent spaces, first and second fundamental forms, shape operator, Fundamental theorem of surfaces theory, covariant derivative, parallel transport, geodesics, form the topics of the course. Understanding these topics allows students to have a direct understanding of some basic phenomena such as the rotation of Foucault's pendulum and curvature restrictions on knotted space curves. A classical area of mathematics differential geometry also has many applications in physics.

Anticipated Audience/Demand:

This course is primarily for Mathematics and Physics majors.

Major Topics:

1) Curvature

2) Fundamental Forms

3) Covariant Differentiation

4) Geodesics

Methods:

This course will be presented by lectures, exams, homework assignments, and computer-aided simulations.

Student Role:

Students should be active readers and fully engaged with their homework problems.

Textbook:

Oprea, John. *Differential Geometry and its Applications, 2nd ed*. Upper Saddle River: Prentice Hall, 2004.

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