

Math 439: Differential Geometry of Curves and Surfaces

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Differential Geometry is one of the central areas of the modern Mathematics. It provides the standard language for the Theoretical Physics (e.g. for General Relativity and Elementary Particles Theory) and has many applications in Engineering (the analysis of stress and strain in materials, Continuum Mechanics, Control Theory) and Computer Science. The course is the first introduction to this exciting subject. In the first part of the course on the simplest examples of curves and surfaces in \mathbb{R}^3 we will examine several fundamental concepts such as moving frames, curvatures, covariant derivatives, parallel transport, geodesics and etc. If the time will permit we will make an introduction to manifolds, tensors, and Riemannian Geometry.

Prerequisites: The only prerequisite is multivariable Calculus (Math 221/251/253) and some basic knowledge on matrices (within what is taught in Differential Equations course MATH308).

The main textbook of the course *Differential Geometry of Curves and Surfaces* by Manfredo Do Carmo, Prentice Hall, 1976.

This textbook will serve as a resource for a lot of examples and exercises.

The additional recommended textbook *Lectures on Differential Geometry* by Iskander A. Taimanov, EMS Series of Lectures in Mathematics, 2008.

This textbook will serve as a concise and focused resource for the theoretical part of the course.