

## Math 439 Introduction to Differential Geometry, Fall 2020

TEXT: Manfredo do Carmo, Differential Geometry of Curves and Surfaces, revised and updated second edition 2016 Dover paperback (available from Amazon)

This is an introductory course in differential geometry of curves and surfaces in 3-space. We will cover Chapters 1-4 of the text and selected topics from Chapter 5. We will begin with the study of curves in the plane and space, which already introduces the important ideas of curvature and torsion in a simplified setting. We will then define surfaces (with the eventual goal of defining an abstract surface) and study the first and second fundamental forms, Gauss map, and the mean curvature  $H$  (extrinsic), Gauss curvature  $K$  (intrinsic), geodesics and the famous Gauss- Bonnet theorem.

Students should have taken Calculus III and have some linear algebra background, but I will try to keep the course self-contained. **There will be about 10 problem sets during the semester** (*which will count as 50% of your grade*). **Only problems marked with a \* need be handed in** although you should attempt all assigned problems. Differential geometry requires intensive computational skill based on a good understanding of the material. You are encouraged to discuss problems with your peers **but you are responsible for writing your problem sets independently**. *There will be two midterms (each 25% of your grade) and there will not be a Final exam.*

Academic integrity is very important especially in the present epidemic environment. You may use the text book and course materials for doing your homework and exams **but no looking up solutions on the internet**. It is important to keep in touch with me (I am available for private Zoom sessions with you) and let me know if you are having any difficulties. This course is not easy since it requires an integration of a broad base of mathematical ideas but I hope you will find it rewarding.