Syllabus: MTH 596/696
Intro to Differential Geometry

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NOTE: This document contains hyperlinks (in red) to various resources.
Why Study Classical Differential Geometry

In a nutshell, Differential Geometry is the area of mathematics where the Calculus is applied to the study of geometrical questions. As such, this course can be viewed as a takeoff from the study of curves and surfaces in third semester Calculus. A motivating idea is to understand how curves and surfaces bend in space. The essential idea is to associate a frame of vector fields at every point and study natural differentiation processes related to them. From a historical perspective, differential geometry provides the tools needed to construct models of geometries where Euclid’s Fifth Postulate (the Parallel Postulate) is not valid. Alternatively, the ideas and methods of differential geometry play a key role in geodesy, provide a fundamental language and concept base for modern physics, and have numerous applications in the biological sciences, e.g., the structure of DNA. Further, a solid understanding of the differential geometry of surfaces provides a solid base for the study of manifolds and their geometry.

The prerequisite for this course is MAT 302, Multivariate Calculus. Some knowledge of differential equations, linear algebra, and point set topology are useful and will be presented as needed.

Course Tools

Primary Text Resources  The primary text for this course is as follows.

- Barrett O’Neill, Elementary Differential Geometry, 2nd edition, Academic Press (2006). (Available in electronic form on Vitalsource. It is available in the campus bookstore; Amazon may be a good place to obtain the book.) Our focus will be Chapters 1, 2, 4-7.
- Supplemental notes of the instructor that will be periodically posted.

Supplemental Texts


Software  Throughout the course we will make use of Mathematica for the purposes of graphic illustration and computation. Some homework assignments/projects will be given in the form of Mathematica notebooks. Mathematica is available on all campus clusters and student software licenses are available. (NOTE: You will have to create an account at this link with Wolfram Research.) A great screencast introduction to using Mathematica is found at: Hands-on Start to Mathematica. Other useful screencasts are at: Mathematica Screencasts. Mathematica notebooks will be used at various times in class and will be posted for your use and reference.

Assessment

Homework, 40%  Homework will be collected and graded regularly. Part will be in the form of written homework, part will be in the form of Mathematica notebooks.

Projects, 20%  I plan on having two collaborative projects over the course of the semester. These can be done in groups of 2-3 with one write up for each group.

Midterm Exam 20%  This will be given before the break in March and will have a takehome component.

Final, 20%  A take-home final will be given a week before classes end and will be Wednesday of finals week.

NOTE  Graduate students enrolled in MTH 696 will be expected to meet higher expectations in all four components above. This will take the form of additional problems emphasizing theorems and proof and more open ended projects.
University Policies

Attendance/Participation I expect you to attend every class and become engaged in discussion periods and problem solving. If you need to miss class due to illness, family emergency, or other reasonable reason, please let me know. By all means, do not miss an exam or due date without notifying me beforehand.

Nondiscrimination Missouri State University is an equal opportunity/affirmative action institution, and maintains a grievance procedure available to any person who believes he or she has been discriminated against. At all times, it is your right to address inquiries or concerns about possible discrimination to the Office for Institutional Equity and Compliance, Park Central Office Building, 117 Park Central Square, Suite 111, (417) 836-4252. Other types of concerns (i.e., concerns of an academic nature) should be discussed directly with your instructor and can also be brought to the attention of your instructor's Department Head. Please visit the OED website at www.missouristate.edu/equity/.

Disability Accommodation To request academic accommodations for a disability, contact the Director of the Disability Resource Center, Plaster Student Union, Suite 405, (417) 836-4192 or (417) 836-6792 (TTY), www.missouristate.edu/disability. Students are required to provide documentation of disability to the Disability Resource Center prior to receiving accommodations. The Disability Resource Center refers some types of accommodation requests to the Learning Diagnostic Clinic, which also provides diagnostic testing for learning and psychological disabilities. For information about testing, contact the Director of the Learning Diagnostic Clinic, (417) 836-4787.

Academic Dishonesty Missouri State University is a community of scholars committed to developing educated persons who accept the responsibility to practice personal and academic integrity. You are responsible for knowing and following the university’s student honor code, Student Academic Integrity Policies and Procedures and also available at the Reserves Desk in Meyer Library. Any student participating in any form of academic dishonesty will be subject to sanctions as described in this policy.

Cell Phones Let’s keep it simple: they are disruptive and interfere with the learning process. Leave them off/on vibrate and put away.

Emergency Response At the first class meeting, students should become familiar with a basic emergency response plan through a dialogue with the instructor that includes a review and awareness of exits specific to the classroom and the location of evacuation centers for the building. All instructors are provided this information specific to their classroom and/or lab assignments in an e-mail prior to the beginning of the fall semester from the Office of the Provost and Safety and Transportation. Students with disabilities impacting mobility should discuss the approved accommodations for emergency situations and additional options when applicable with the instructor. For more information go to Emergency Response Guide and Emergency Response Plan.