Syllabus
Math 637: Differential Geometry
Fall 2016

Instructor: Dr. Micah Warren, Fenton 318, 541-346-5618, email: micahw.

Time and Location: M„W, F. 10:00 - 10:50, 104 Dead. Hall

Office Hours: Tuesday 2:00 - 3:00, Thursday 10:00 - 11:00 or by appointment.

Textbook: Introduction to Smooth Manifolds, Second Edition, John M. Lee. [ISM]
see: http://www.math.washington.edu/~lee/Books/ISM/.
You should be able to download the entire book, via the above link, if you're logged in from UO or using a VPN. The above link also includes a page of corrections to the book, which is frequently updated.
Material: Chapters 1, 2,3,4,5,6,8,10 (11,12,14) From the Intro to Smooth Manifolds (Final three listed will be covered lightly, if there is time.)
Prerequisites: Most of the prequisites are in the appendix to [ISM].

Real Analysis: A senior level year-long course in real analysis, including basic set theory and metric topology. Analysis in $\mathbb{R}^n$, including differentiation, integration, Taylor's theorem, uniform convergence, and the inverse and implicit function theorems, and basics of elementry differential equations, as reviewed in Appendicies C and D of the text, Lee's Introduction to Smooth Manifolds [ISM].

Algebra: Basic understanding of group theory. Linear algebra plays a surprisingly large role; the needed facts are reviewed in Appendix B of [ISM].

Vector Calculus. While the vector calculus theorems are not used directly, students who remember them well usually find the generalized versions a bit easier to learn and work with.

Course Description :

Manifolds are arbitrary-dimensional generalizations of curves and surfaces—spaces that locally look like Euclidean space but globally may not, just as the sphere locally looks like the plane but is globally very different. They are the basic subject matter of differential geometry, but also play a role in many other branches of pure and applied mathematics. In the fall and winter quarters we will concentrate mostly on the differential geometry of manifolds, i.e., properties that are invariant under smooth deformations. We will study the basic flora and fauna that live on them: tangent vectors and covectors, submanifolds, vector and tensor fields, vector bundles.

Learning Goals: After Fall quarter, every student should be able to:

- Define a smooth manifold.
- Do calculus on manifolds in an invariant way: This involves understanding invariant objects such as the tangent space, vector fields, tensors, bundles, differential forms, etc

Grading: There will be weekly problem sets. These will be worth 2/3 of the grade. There will be an in-class final worth 1/3. The idea with the final is that it is to prep you for qualifying exams next fall.

Homework: Homework will be assigned on Canvas. It will be due on Wednesday at the beginning of class. No late homework accepted. Lowest score will be dropped. Only a few randomly selected problems will be scored. You are encouraged to work with each other on the homework, but each assignment should be written up on your own. LaTex is great, but not required: If you find yourself making time management decisions, I would prefer you learn the mathematics rather than a markup language.

Academic dishonesty: Any type of academic dishonesty will not be tolerated. In the event of academic dishonesty, the offense will be reported to the Office of Student Conduct and Community Standards and the student will be sanctioned up to receiving a failing grade in the course.

Students with Disabilities: If you are a student with a documented disability, please meet with me during the first week of class to discuss your needs. If you have not already requested a notification letter from Disability Services outlining recommended accomodations, please do so soon.