Math 600 - Geometric Analysis and Topology, Fall 2020
Instructor: Davi Maximo

Contact information
I can be contacted at dmaxim@math.upenn.edu. The class website will be https://canvas.upenn.edu/courses/1544803. It should be checked periodically.

Introduction
This course is an introduction to the theory of smooth manifolds. These are generalizations of curves and surfaces to arbitrarily many dimensions and they provide the framework for understanding mathematical spaces in all of its manifestations.

The course will be designed for first-year graduate students or advanced undergraduates. The requirements are: general topology, basic linear algebra, and real analysis.

Content
We will cover: smooth manifolds, smooth structures, smooth maps and differentials, bump functions, vector fields, tangent bundle, general vector bundles, group actions, tensors, differential forms, submanifolds, implicit function theorems, integration theory.

We may cover some other topics, time permitting: Sard’s theorem, transversality, Frobenius theorem, de Rham cohomology, Whitney's embedding theorem, basic Lie groups, Poincaré-Hopf theorem, Morse theory.

Instruction
Classes will be nonsynchronous: videos will be posted on Canvas. We will hold office hours and discussion sections over Zoom at a time to be determined (as to fit everybody’s schedule).

Text
We will use (the purchase of these books will not be required to follow the class)

- John M. Lee’s Introduction to Smooth Manifolds.

Other useful references are:

- John Milnor, Topology from the Differentiable Viewpoint. This book is a gem, a must-read!
- Guillemin and Pollack, Differential Topology.
- L. Tu, An Introduction to Manifolds.
Grades

*Homework.* There will be a number of homework assignments over the semester. They will be posted on the course Canvas website. Homework will consist of 40% of your grade.

*Discussion Sections.* Students will be expected to present solutions of certain homework problems during discussion sections over Zoom. This will consist of 10% of your grade.

*Midterm.* There will be one take-home midterm, worth 25% of your grade.

*Final.* There will be one take-home final exam, worth 25% of your grade.

Polices

The abilities to take existing ideas, refine them, generalize them, and adapt them to new situations are vital to research mathematics. So it is being able to discuss your thoughts and ideas with your peers. Thus, when doing homework, you may use reference works and discuss problems with one another. However, *all work you submit must be your own.* Your proofs must be in your own words, not plagiarized from a classmate or reference text. And you must be able to explain and justify your proofs, if requested. The midterm and final exams will be completely individual; only texts may be consulted.

*Honor code:* The highest levels of academic integrity, as detailed in the Pennbook, must be upheld in all activities related to this course. Students are encouraged to discuss homework problems with each other, but are required to write their solutions independently. The university-wide policies and procedures that are in effect regarding academic integrity, attendance, student conduct, secular and religious holidays, students with disabilities, etc are clearly stated in the Pennbook, and will be followed strictly. Absence from an exam will result in a zero grade for that exam, except in extraordinarily unusual circumstances, with both a valid written excuse and instructor approval. Any requests for grade revision must be submitted in writing.

*Accommodations:* The University of Pennsylvania provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact the Student Disabilities Services (SDS). If you fall under the SDS accommodation policy, it is your responsibility to deliver their certification of that fact to me as early in the semester as possible, and no later than one week prior to the first exam.