Math 382D – Differential Topology
UT Austin, Spring 2024
TTh 9:30-10:45, PMA 5.118

Instructor: Sam Payne
Email: sampayne@utexas.edu
Office Hours: T 3-4 pm in PMA 9.156, and by appointment
TA: Will Stewart, wbstewart@utexas.edu

Subject and prerequisites: Subject his class introduces smooth manifolds, the theory of calculus on smooth manifolds, and basic differential topology. The topics covered are essentially those in the book of Guillemin and Pollack, though we will not exactly follow their treatment. You should have a solid grasp of linear algebra and calculus in several variables, undergraduate analysis, and undergraduate topology. The level of mathematical sophistication will be appropriate for a graduate class.

Textbooks: The recommended texts for this class are: *Differential Topology* by Guillemin and Pollack, *Topology from a Differentiable Viewpoint* by Milnor, and *Foundations of Differentiable Manifolds and Lie Groups* by Warner. I will not follow any particular text closely.

Course structure: The main learning components of the course are lectures and problem sets. Problem sets will be due on Fridays at 5 pm and are submitted online as a PDF. There will be two in-class exams, on Thursday, February 22 and Thursday, April 18.

Term paper: One course requirement is to write a term paper about a theorem in differential topology. This can be done individually or collaboratively in groups of $N \leq 4$ students. Pick a theorem in differential topology (e.g. a theorem from one of the recommended texts that we have not covered in class) and explain its history, the ideas behind the statement and its proof, applications of the theorem, elementary interpretations, etc. Say something interesting. The paper should be between $3 + N$ and $4 + 2N$ TeX pages, where N is the number of people in the collaboration. Term papers are due on Friday, April 19. The final week of class will be devoted to student presentations based on these term papers.

Grading: Grades in this course will be on the plus-minus system, based on:

- Homework – 30%

- First exam – 20%

- Second exam – 30%

- Term paper – 20%

Homework: You are encouraged to discuss the homework with other students, form study groups, and support each other in learning the material and solving the assigned problems. You may also consult textbooks and other resources. The solutions that you turn in must be

written individually and reflect your own understanding. Preparation of homework solutions in LaTeX is encouraged but not required.

Accommodations: The University of Texas provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 512-471-6259 or ssd@austin.utexas.edu. If a personal emergency impacts your well-being or academic success during the semester, please contact Student Emergency Services at 512-471-5017 or studentemergency@austin.utexas.edu. The SES office will provide assistance and referrals to support you through unexpected challenges and, when appropriate, will contact your course instructors to arrange accommodations. Emergency situations include but are not limited to family emergencies and medical or mental health concerns.

Disclaimers: This syllabus is subject to change. Students who miss class are responsible for learning about any changes to the syllabus. All students are expected to uphold the highest standards of academic honesty and integrity and, in particular, to follow the UT Student Honor Code. Sharing of course materials is prohibited. No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission.

You belong here