

University of Colorado Boulder
Department of Mathematics
MATH 6240 - Differential Geometry 2
Section 1 - Fall 2017

Class Meetings. MWF 11:00–11:50am in MATH 220

Instructor. Jordan Watts

Office Hours. M 1:00-1:50pm and 3:00-3:50pm; W 3:00-3:50pm; F 1:00-1:50pm

Office. MATH 327

Course Website. <http://euclid.colorado.edu/~jowa8403/math6240f17/index.php>

See the website for presentation information, the course schedule, a copy of this syllabus, and links to additional resources.

Prerequisites: MATH 6230 (Differential Geometry 1) or equivalent. You should be comfortable with smooth manifolds and smooth maps, tangent bundles, immersions, submersions, smooth embeddings, submanifolds, differential forms, orientations, integration on manifolds, de Rham cohomology.

Suggested Texts (none required): All of these are available on Springer's website as free ebooks via your CU Boulder Library account.

- John M. Lee, *Riemannian Manifolds - An Introduction to Curvature*, Springer, 1997.
- Nicole Berline, Ezra Getzler, and Michèle Vergne, *Heat Kernels and Dirac Operators*, 2nd Printing, Springer, 1996.
- Jürgen Jost, *Riemannian Geometry and Geometric Analysis*, 5th Edition, Springer, 2008. [6th edition now?]

Course Summary: We will begin by covering Riemannian manifolds; in particular, vector bundles, Riemannian metrics, connections, geodesics, and curvature, with the goal of proving the Gauss-Bonnet Theorem. Next, we will move towards defining spin structures and Dirac operators, covering topics such as principal bundles, heat kernels, maybe Stiefel-Whitney classes? There are a few possibilities, and we will decide which path to take later. The unattainable goal is the Atiyah-Singer Index Theorem; while there probably will not be time to reach it, a sufficient foundation should be created for the interested student to pick up where we left off, with many texts on the subject available.

Presentations: Everyone will be expected to give a 20 minute presentation in class (with 5 minutes of questions afterward) at some point during the course. Your grade will be based on this.

UNIVERSITY POLICIES AND STANDARDS

Classroom Behavior and Respect for Diversity: Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation, or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the student code.

Accommodation for Disabilities and Temporary Medical Conditions: If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu for further assistance.

If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website and discuss your needs with your instructor.

Religious Observances: Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, students are required to check the dates of exams, homework due dates, etc., ahead of time, and inform their instructor as soon as possible so that alternate arrangements can be made. In the case of homework, the assignment can be handed in late; in the case of an exam, the student will be given a different exam later.

See the campus policy regarding religious observances for full details.

Discrimination and Harassment: The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment, or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking, or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment, or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation, or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the

Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment, or related retaliation can be found at the OIEC website.

Honor Code: All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to non-academic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at <http://www.colorado.edu/honorcode>.