

University of Colorado Boulder
Department of Mathematics
MATH 6230 - Differential Geometry
Section 1 - Spring 2017

Class Meetings. MWF 12:00–12:50 in ECCR 116

Instructor. Jordan Watts

Office Hours. MW 1:00-1:50, or by appointment

Office. Math Building, Room 202

Course Website. <http://euclid.colorado.edu/~jowa8403/math6230s17/index.php>
See the website for homework assignments, the course schedule, a copy of this syllabus, and links to additional resources.

Prerequisites: MATH 3130 (Linear Algebra) and MATH 4001 (Analysis II), or equivalents. In particular, you should be very comfortable with linear algebra and real analysis on \mathbb{R}^n . You will be expected to write proofs at the level of a graduate mathematics student; if you have little experience with this, then this course is not right for you.

Text: John M. Lee, *Introduction to Smooth Manifolds, 2nd edition*, Springer, 2012.

Course Outline: The theory of smooth manifolds is the successful attempt to do with differentiability and integration on \mathbb{R}^n what point-set topology does with continuity and sequences on \mathbb{R}^n : generalise these concepts to other spaces. Since differentiability and integration work well on \mathbb{R}^n , it makes sense to try applying them to spaces that *locally* look like \mathbb{R}^n . We will begin with simple examples, many of which are manifolds by the implicit function theorem. We then move onto differentiation: Lie derivatives, tangent bundles, and vector fields with their flows. Next up is integration: differential forms and Stokes' theorem. Finally, while a manifold is not a vector space, its tangent spaces are, and we can push the notion of a dot product from the vector space setting to the manifold one, where it becomes a Riemannian metric. From this we can talk about the curvature of a space.

Homework Assignments: There will be seven written homework assignments due (almost) every other Wednesday. You are encouraged to work on the homework assignments together, but each student must submit their own work in their own words. Your final grade will be based on these.

Pass/Fail Grades: If you are a mathematics graduate student who has the ability to take this course with a pass/fail grade, and you wish to do so, please come see me.

UNIVERSITY POLICIES AND STANDARDS

Classroom Behaviour 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, culture, religion, creed, politics, veteran's status, sexual orientation, gender,

gender identity and gender expression, age, disability, and nationalities. 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. Contact Disability Services at 303-492-8671 or by email at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Injuries guidelines under the Quick Links at the Disability Services website and discuss your needs with your professor.

Disability Services Website: <http://www.colorado.edu/disabilityservices/>

Temporary Injuries Guidelines: <http://www.colorado.edu/disabilityservices/students/temporary-medical-conditions>

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, (insert your procedures here).

See the campus policy regarding religious observances for full details: <http://www.colorado.edu/policies/observance-religious-holidays-and-absences-classes-andor-exams>

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: <http://www.colorado.edu/institutionalequity/>

Honor Code: All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the academic integrity policy of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, 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 nonacademic 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://honorcode.colorado.edu>.

Academic Integrity Policy: <http://www.colorado.edu/policies/academic-integrity-policy>