Mathematics G4403y
Modern Geometry II
Spring 2014

Instructor:	Prof. Michael Thaddeus	**Lectures:**	M.W. 4:10–5:25
Office:	Mathematics 414	**Office hours:**	Th. 11:00–12:00
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Prerequisites: Modern Geometry I, Math G4402x, or the instructor's permission.

Texts: Manfredo do Carmo, *Riemannian Geometry*, chapters 1–9; John M. Lee, *Riemannian Manifolds*, chapters 2–11; Raoul Bott and Loring Tu, *Differential Forms in Algebraic Topology*, chapter IV; S. Ramanan, *Global Calculus*, chapter 5; John Milnor and James Stasheff, *Characteristic Classes*, Appendix C; Johan Dupont, *Fibre bundles and Chern-Weil theory*, available via the course home page. All but the last have been placed on reserve in the Mathematics Library.

Course outline: The elements of Riemannian geometry — Riemannian metrics, the Levi-Civita connection, the Hopf-Rinow theorem, curvature and second fundamental form, theorema egregium, Jacobi fields, the theorems of Gauss-Bonnet, Cartan-Hadamard, and Bonnet-Myers, spaces of constant sectional curvature. Rudiments of gauge theory — connections and curvature on vector bundles, characteristic classes by the Chern-Weil method, flat connections on vector bundles.

Assignments: A substantial assignment will be given every other week, and graded in part. I encourage you to discuss assignment problems with your peers, subject to the following ground rules: (1) make a serious effort to think through each question for yourself first; (2) list the names of all collaborators at the head of each assignment; (3) write up all solutions in your own words; (4) do not exchange any written work with others.

Assignments will be due on Wednesdays at noon in my mailbox on the 2 1/2th floor of Mathematics. You must use a staple or paper clip and submit all problems together (not piecemeal). Late assignments will be penalized by 7% of their point value for each day (or part of a day) they are late.

Roundtables: There may be a roundtable discussion each week, at a time to be arranged, led by Phil Engel ⟨engel@math.columbia.edu⟩. Once or twice each semester, you may be asked to make a brief presentation at the roundtable.

Exam: Final exam Monday, May 12, 4:10–7 pm (tentative). If you foresee conflicts with this date, such as a religious holiday or a language exam, you must let me know immediately. You can be excused from an exam only in a medical or family emergency, documented by a note from your doctor or dean.

Grading: Homework 50%, final 50%.

Course home page: `http://www.math.columbia.edu/~thaddeus/geometry.html`