

MATH 18.966. Geometry of Manifolds II
Tuesday, Thursday 9:30 - 11:00 AM
Room 2-147

Instructor: Tristan Collins, Room 2-273

Office Hours: 2:00-3:00 PM Mondays, and 2:30-3:30 PM Tuesdays.

Textbooks:

- (supplementary) Riemannian Geometry, by Peter Petersen
- (supplementary) Degeneration of Riemannian Manifolds Under Ricci Curvature Bounds, by J. Cheeger
- (supplementary) Comparison Theorems in Riemannian Geometry, by J. Cheeger, and D. Ebin
- (supplementary) Partial Differential Equations, by L. Evans

Course Outline:

Comparison Geometry

- The distance function on a Riemannian manifold
- Geometric Riccati equations and applications
- Cheng's diameter sphere theorem
- Toponogov's Triangle Comparison Theorem
- Gromov's Compactness Theorem
- A Brief Review of Elliptic PDE, and the maximum principle
- Elliptic Regularity in Sobolev Spaces, Schauder estimates
- The Splitting Theorem of Cheeger-Gromoll
- Harmonic coordinates
- Anderson's compactness theorems
- Selected topics in convergence and regularity theory for spaces with Ricci curvature bounds.

Prerequisites: You should probably have taken 18.965, or at least be familiar with Riemannian Geometry on the level of do Carmo's little book. Some basic measure theory, and functional analysis

will appear. I will try to supply all the necessary background from partial differential equations, though some familiarity with the Laplacian and the heat equation would be helpful.

Homework: There will be bi-weekly assignments, posted on Tuesday, which are to be turned in two weeks later on Tuesday at 5:00 pm. The homeworks will be parallel the class, and will either expand on ideas developed in class, or develop some new ideas which I won't have time to cover in class. In the latter case, the homeworks will serve as a sort of directed self-study. Please staple or paper clip your homework, and remember to write your name on it!

Grading: The final grade will be computed in the following way: Homework: 100%.

Collaboration: I encourage you to collaborate on your homework. However, it is absolutely essential that you write up your own solutions. Collaboration on the final exam is prohibited.

Student Support Services: If you are dealing with a personal or medical issue that is impacting your ability to attend class, complete work, or take an exam, please discuss this with student support services (S^3). The deans in S^3 will verify your situation, and then discuss with you how to address the missed work. Students will not be excused from coursework without verification from S^3 . You may consult with Student Support Services in 5-104, or at (617) 253-4861.

Student Disability Services: MIT is committed to the principle of equal access. Students who need disability accommodations are encouraged to speak with Kathleen Monagle, Associate Dean, prior to or early in the semester so that accommodation requests can be evaluated and addressed in a timely fashion. Even if you are not planning to use accommodations, it is recommended that you meet with SDS staff to familiarize yourself with the services and resources of the office. You may also consult with Student Disability Services in 5-104, or at 617-253-1674. If you have already been approved for accommodations, please contact me early in the semester so that we can work together to get your accommodation logistics in place.

Important Dates:

Monday Schedule Classes	Tuesday, February 19
Spring Vacation	Tuesday, March 26
Spring Vacation	Thursday, March 28
Patriots Day	Tuesday, April 16
Drop Date	Thursday, April 25
Last Day of Classes	Thursday, May 16