Math 5041-Fall 2016

Geometry I

General information

Location: Cupples I Room 207
Time: TuTh 2:30-4pm
Professor: Greg Knese
Office location: Cupples I room 211A
Office hours: TBA or by appointment.
Email: geknese at wustl dot edu

Course description

An introductory graduate level course including differential calculus in n-space; differentiable manifolds; vector fields and flows; differential forms and calculus on manifolds; elements of Lie groups and Lie algebras; Frobenius theorem; elements of Riemannian geometry. This course is one half of the Geometry qualifying exam sequence. The second semester will be Math 5043, Algebraic Topology. Prerequisites: Math 4121, 429, and 4181, or permission of the instructor. The most important prerequisites are rigorous multivariable calculus, determinants, ordinary differential equations, topology of R^n, metric topology and some point-set topology.

Textbook

Lectures on the Geometry of Manifolds, 2nd ed, by Liviu I. Nicolaescu

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Exams

The midterm exam is Thursday, October 13 in class.
The final exam is December 21, 3:30-5:30pm in our usual classroom.

Homework

There will be weekly homework assignments. These should be written up clearly and in detail preferably typed using LaTeX. You may discuss the homework verbally with other students provided you have already given the homework a serious attempt. If you have already solved a problem and someone asks you about it, then any help you provide should consist of hints or suggestions and not complete solutions.

In particular, homework should be written up independently and it should not be possible to tell who worked with whom. Do not search or post requests for solutions to HW. Do not post any course materials online without my permission.

Grade breakdown

Homework: 40%
Midterm exam: 20%
Final exam: 40%

Letter grade breakdown: A+=(97,100], A=(93,97], A-=[90,93], similar for B,C,D, F=[0,60).

Course topics

Inverse/Implicit function theorem, definition of a manifold, tangent space/bundle, partitions of unity, tensors, flows, Lie derivative, exterior derivative, integration on manifolds, and time-permitting some Riemannian geometry.

Supplementary References

Introduction to Smooth Manifolds by John M. Lee
Analysis and algebra on differentiable manifolds (a workbook)
An introduction to manifolds by Loring Tu
All of the above books are available at link.springer.com
Foundations of Differentiable Manifolds and Lie Groups by Frank Warner