Math 562: Introduction to Differential Geometry and Topology

Fall 2007, TTh 12pm - 1:15pm, UNIV 119.

Instructor

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URLs

Course Website: http://www.math.purdue.edu/~mleok/courses/ma562.html
Course Announcements: http://intranet.math.purdue.edu/ma562fall2007/

Course Description

This course is an introduction to the theory of differentiable manifolds, as well as vector and tensor analysis and integration on manifolds. The course is particularly useful for students interested in differential geometry, Lie groups, and global analysis, and serves as a foundation course for work in geometric mechanics and geometric control theory. In addition, it is the basis of the modern approach to applied fields such as fluid mechanics, electromagnetism, elasticity, and general relativity.

Topics will include smooth manifolds, tangent vectors, inverse and implicit function theorems, submanifolds, vector fields, integral curves, differential forms, the exterior derivative, partitions of unity, integration on manifolds. If time permits, we will also discuss the fundamentals of Riemannian geometry, the Levi-Civita connection, parallel transport, geodesics, and the curvature tensor.

Textbook

An Introduction to Differentiable Manifolds and Riemannian Geometry
William M. Boothby, Revised Second Edition, Academic Press, 2002. ISBN: 0121160513
Sections to be covered: Chapters 1-6, and time permitting, Chapters 7-8.

Additional Reading

Manifolds, Tensor Analysis, and Applications, Second Edition
(Springer Series in Applied Mathematical Sciences 75)
Ralph Abraham, Jerrold Marsden, Tudor Ratiu, Springer, 1993, ISBN: 0387967907

Grading

50 % – Homework (assigned biweekly)

20 % – Midterm (in class)

30 % – Final Exam (in class)

Collaboration Policy

Homework is an essential part of advanced mathematics courses. Most students will find that some problems will require repeated and persistent effort to solve. This process is an integral component of developing a mastery of the material presented, and students who do not dedicate the necessary time and effort towards this will compromise their performance in the exams in this course, and their ability to apply this material in their subsequent work.

A student may after working conscientiously on a problem for over 30 minutes, consult with other current Math 562 students to develop and clarify their approach to the problem. The written solution should however be an independent and individual effort that reflects the student's understanding of the problem and its solution.

As a general guide, a student should be able to independently reproduce any solution that is submitted as homework. Copying of solutions is not permitted and will be considered a violation of these guidelines.