



MA 338 Aug. 3:0

Differentiable manifolds and Lie groups

Instructor

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Department: Mathematics

Course Time: Mon., Wed., Fri., 2:00-3:00 PM

Lecture venue: LH-5 in the Mathematics department

Detailed Course Page: http://math.iisc.ac.in/~vamsipingali/338_2017.html

Announcements

Brief description of the course

The course is meant for PhD, Integrated PhD, and advanced undergraduate students. It is a first course on manifolds covering definitions, examples, and some basic theorems. As such, the focus is on the language rather than on applications to other areas. It is expected to be useful to anyone who wants to work in Geometry, Topology, Algebraic geometry, Lie groups and representation theory, Mathematical Physics, Complex analysis, and Harmonic analysis.

Prerequisites

Multivariable calculus and point-set topology.

Syllabus

Definition of smooth manifolds, examples through the implicit function theorem, submanifolds (embedded and immersed), Sard's theorem, tangent and cotangent bundles as examples of vector bundles, vector fields, flows, Frobenius' theorem, differential forms, exterior derivative, Stokes' theorem, Poincare lemma, De Rham cohomology, and definition of Riemannian metrics.

Course outcomes

Students taking this course ought to

- a) Know why we care about defining manifolds and what we expect to do with them.
- b) Give examples of manifolds.
- c) Understand how to construct diffeomorphisms using vector fields.
- d) Understand why to care about differential forms and the Stokes theorem and how to prove the latter.
- e) Know how differential calculus can help with distinguishing different objects (through De Rham cohomology).

Grading policy

20% for HW

30% for Midterm

50% for Final

Assignments

Resources