

Algebraic Groups, Lie Groups and Lie Algebras, MAT 5907, Spring'14

The course is devoted to the theory of Lie algebras and the topology of Algebraic and Lie groups. Lie groups and algebras are widespread throughout math and physics. So, the course would be of interest to math and physics majors (advanced undergraduate students and graduate students).

The geometry of groups is developed with the help of Lie algebras associated with the groups. The theory of Lie algebras is based on Linear Algebra knowledge. The material on Lie algebras should be accessible to everyone who has taken any version of Advanced Linear Algebra course. The geometric aspects of the course are more demanding. Some acquaintance with Differential Geometry would be helpful. For the theory of algebraic groups one needs knowledge from rudimentary Algebraic Geometry.

The theory of Lie algebras will be carried over up to a classification of semi-simple complex Lie algebras. This will help eventually in classifying the Lie groups. Studying the topology of groups will include action of such groups on topological spaces, with elements of Geometric Invariant Theory.

The main source for our course will be the classical book

Onishchik and Vinberg, "Lie Groups and Algebraic Groups"

ISBN-10: 3642743366, **ISBN-13:** 978-3642743368

The book contains all the needed knowledge from Algebraic Geometry and the Differential Geometric concepts are carefully used.

The work for the course will include doing small projects on the theory taught.