

Algebraic Groups and Finite Groups of Lie Type

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Algebraic groups and their finite counterparts -- finite groups of Lie type -- play an important role in mathematics, particularly in group theory and number theory. By the classification theorem of finite simple groups (CFSG), every finite non-abelian simple group, aside from the alternating and the 26 sporadic groups, arises from a finite group of Lie type. One of the most fundamental achievements in the area is the Deligne-Lusztig theory of representations of finite groups of Lie type. Together, the CFSG and the Deligne-Lusztig theory have made it possible to resolve many problems arising from important applications outside of group theory, particularly in number theory and algebraic geometry.

The goal of this course is to give an introduction to the theory of linear algebraic groups (mostly over algebraically closed fields of positive characteristic) and finite groups of Lie type. We will explain these basic notions, prove some fundamental theorems about them, and then introduce the audience to the basic ideas of the Deligne-Lusztig theory.

This topic course should be of interest to the students specialized in algebra, group theory, number theory, and algebraic geometry.

Prerequisites include mostly basic facts on groups, commutative rings, and fields covered by a standard algebra course. It continues, but does *****not***** assume, some of the topics covered by the Math 517 (Group Theory) and Math 559 (Lie Groups and Lie Algebras) courses offered in the academic year 2012-13.