Mathematics 434 Lie Theory I Section 101 Mathematics Annex 1118, TTh 9:30-11:00

- Instructor: Z. Reichstein
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- Course website: http://www.math.ubc.ca/~reichst/534syll.html

Textbook: James E. Humphreys, Introduction to Lie algebras and representation theory, Springer, 1972.

Course description: Lie theory is the study of continuous group of tranformations. These groups play an important role in various areas of mathematics, from PDEs to number theory, as well as in physics. Their structure is most easily understood by in studying their "linear approximations", otherwise known as Lie algebras. This course we will focus on the study of finite-dimenional Lie algebras and their representations by algebraic methods. We will discuss nilpotent, solvable, and semisimple Lie algebras, classify the root systems, talk about weights, highest weight modules, and universal enveloping algebras. Our ultimate goal will be the classification of simple complex Lie algebras. This material is foundational for many areas of pure mathematics. Our textbook is concise and beautifully written. I plan to follow it closely through much of the term, and cover most of the material in it.

Next term's follow up class, Math 535 (Lie Theory II) will focus on the theory of algebraic groups. It will be taught by Julia Gordon.

Prerequisites. High comfort level with linear algebra, including Jordan canonical form of a matrix. Familiarity with abstract algebra will also be helpful.

Evaluation. I plan to assign problem sets roughly every other week. Each student will be expected to complete a class project on a topic related to Lie Theory and write an expository paper on it during the term. Depending on the nature of the project and the size of the class, I will also ask some (and possibly all) students to present the highlights of their projects in class. The final course mark will be based on homework and this project.

Students with disabilities: Students with documented disabilities who may need special accommodations should make an appointment with me early in the term.