

Course Number: PMATH 945 (Topics in Algebra)

Title: Category O: a second course in Lie algebras

Description: This course will be an introduction to the representation theory of Lie algebras, focused on a special class of infinite dimensional representations called "category O." The study of this category has driven many advances, from Kazhdan-Lusztig polynomials to the Beilinson-Bernstein localization theorem and the theory of Soergel bimodules. We'll cover a short (re)introduction to the necessary structure theory of Lie algebras, the basics of category O, Verma modules, an algebraic proof of the Weyl character formula, and the very powerful tool of translation functors.

As time allows, we'll discuss more advanced topics, like localization to the flag variety, and generalizations to category O for Cherednik algebras and symplectic singularities.