

## Course announcement: Fall 2009

**Math 595.SFM:** Symmetric functions and Macdonald polynomials

**Instructor:** Rinat Kedem

**Days/time:** MWF 4-4:50 141 Altgeld Hall

**Prerequisites:** Some knowledge of Lie algebras

**Text:** None is required. See I. Macdonald, *Symmetric functions and Hall polynomials*, and *Hecke algebras and orthogonal polynomials*, as well as review articles by Haiman, Kirillov Jr., and others which will be mentioned in class.

Symmetric polynomials are basic objects in representation theory, commutative algebra, algebraic geometry, combinatorics and mathematical physics. Despite their simple definition, there are many interesting applications, connections and open problems. Macdonald polynomials are currently the most active subject of research in this field.

The course will start with the basics of symmetric functions (for example, as covered in the Appendix to Fulton and Harris, *Representation Theory*, or Macdonald's classic and highly recommended book on *Symmetric Functions and Hall Polynomials*). We will approach the subject of Macdonald polynomials from the combinatorial and the algebraic points of view. We will also explain the connection to commuting difference operators, affine Hecke algebras and representations of the quantum affine algebra.

All of this will be done for the algebra  $\mathfrak{sl}_n$ , if there is interest from the students, we will introduce the generalization to other root systems.

The course will introduce some problems suitable for graduate research. Class participation involves working out suggested proofs/applications which will be introduced in class, and class attendance.