

UNOFFICIAL SYLLABUS FOR MATH 7313

MATH 7313. Representation theory: modern introduction.

Lecturer: Ivan Loseu.

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Meeting times and locations: MW, 4.10-5.40pm, 509 LA.

Office hours: MW, 2.50-3.50.

What is this about? It's about introducing students to some modern aspects of representation theory, in other words, what representation theorists cared about chronologically around 90's on average. It's also about a bunch of surprising connections between seemingly unrelated topics in Representation theory.

Topics.

- 1) The representation theory of the symmetric groups in zero characteristic (following Okounkov and Vershik).
- 2) The representation theory of semisimple Lie algebras and semisimple algebraic groups over algebraically closed fields of zero and positive characteristic.
- 3) The complex representation theory of reductive algebraic groups over finite fields. Hecke algebras.
- 4) Quantum groups and applications to link invariants.
- 5) Representations of quivers. Deformed preprojective algebras and applications to linear algebra.
- 6) The representation theory of the symmetric groups in positive characteristic. Introduction to Lie algebra actions on categories.

Grading: There will be 5 homework problem sets on the first five topics. A problem set is posted after the topic is covered and is due two weeks after that. The grade is based entirely on homework. The final grade is determined as follows: A $\geq 90\%$, A- $\geq 87\%$, B+ $\geq 85\%$, B $\geq 75\%$, B- $\geq 72\%$, C+ $\geq 70\%$, C $\geq 60\%$, C- $\geq 55\%$, D+ $\geq 50\%$, D $\geq 45\%$, D- $\geq 40\%$.

Prerequisites and corequisites. A definite prerequisite is a graduate “abstract algebra” class. Representation theoretic prerequisites will be covered in the first lecture. Some familiarity with C^∞ -manifolds/ algebraic varieties will be useful.

As an additional reading, a text by Etingof et. al. available at

<http://math.mit.edu/~etingof/relect.pdf>

is highly recommended. Comparing to our course, this should be viewed as a “classical introduction”.

Literature/textbooks: Not really. Lecture notes will be posted. They will contain references for further reading.