

Course Information

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Resources. There is no textbook. We will work from the following lecture notes and research articles:

- V. Ginzburg, *Lectures on Nakajima's quiver varieties*, arXiv:0905.0686.
G. Lusztig, *Canonical bases arising from quantized enveloping algebras*, J. Amer. Math. Soc. **3** (1990), 447–498.
C.M. Ringel, *The Hall algebra approach to quantum groups*, XI Latin American School of Mathematics (Mexico City, 1993), 85–114, Aportaciones Mat. Comun., no. 15, Soc. Mat. Mexicana, México, 1995.
O. Schiffman, *Lectures on Hall algebras*, arXiv:math/0611617.

Course outline. A rough schedule of topics for the semester is as follows.

Background on quivers and Lie theory	1–2 weeks
Hall algebras and quantum groups	1–2 weeks
Lusztig quiver varieties, perverse sheaves, and canonical bases	3–4 weeks
KLR algebras	1 week
Some symplectic geometry	1 week
Nakajima quiver varieties	3 weeks
Borel–Moore homology and convolution	1–2 weeks
Other topics: Slodowy slices, affine Grassmannians, etc.	1–2 weeks

Homework & Grading. Homework exercises will be due approximately once every week or two. All the homework exercises will be posted on my webpage. I expect substantial efforts on each problem set, but of course, I do not expect perfect solutions to every problem, nor is it likely that every problem will be graded. The grade for the semester will be based on the number of problem sets submitted with substantial work:

- A Substantial work on at least 80% of the problem sets
- B Substantial work on more than half the problem sets, but missing more than 20%
- C Substantial work on at least 20% of the problem sets, but fewer than half
- D Less than 20% of the problem sets submitted
- F No work submitted

Under normal circumstances, I expect everyone to earn an ‘A’. If you feel that you are getting behind, please come see me as soon as possible.

Exams. There will be no timed exams. In lieu of a final exam, the last homework assignment will be due at the scheduled time for the final exam: Saturday, May 9, 7:30am.