Syllabus for Modern Algebraic geometry.

**Instructor’s info:**
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**Course info:**
*Academic term:* Fall 2017.  
*CREDIT HOURS:* 4.  
*Course schedule:* TBA.  
*Course location:* TBA.

*Course description:* The course introduces students to modern techniques of Algebraic geometry including those coming from Lie theory, Symplectic and Differential geometry, Complex analysis, Number theory. The course covers subjects related to Invariant theory, homological algebra questions of Algebraic geometry including derived categories, complex analytic, differential geometric and arithmetic aspects of the geometry of algebraic varieties.

*Course prerequisites:* MATH 7314 or MATH 7361 or permission of instructor.

*Required textbooks:* None.  
*Other required resources:* None.  

*Course objectives:* To introduce students to important topics of active current interest in Algebraic Geometry. To cover relatively modern techniques that are now essential to work in the subject.

*Learning outcomes:* Students successfully completing the course will be able to do research in Algebraic Geometry as well as related areas of Representation theory, Differential geometry and Mathematical Physics that are among the traditional strengths of the department.

*Course format:* the course will consist of lectures only. Students are expected to attend the lectures, take notes and do the homework assignments.

*Course calendar:*
1) Week of Sept 6-8: Some classical constructions and questions of Invariant theory.  


10) Week of Nov 6-Nov 10: $U$-invariants and applications. Moduli spaces in Algebraic geometry via GIT.

11) Week of Nov 13-Nov 17: Actions with good invariant theoretic properties. Vinberg’s $\theta$-groups.


13) Week of Nov 27-Dec 1: Classical Invariant theory.

14) Week of Dec 5-Dec 9: Cont’d.

Final exam: none.

Evaluation and grading:

There will be five homeworks, each worth 20% of the total grade. Homeworks will be given approximately once every two weeks and will be due two weeks after they are given. Submitting any homework up to one week after the deadline yields 10% penalty for the first such homework and 25% afterwards. Homeworks submitted more than one week after the deadline are not accepted and if the homework is missing, it is counted as 0.

Grading scale: 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%.