SYLLABUS

MATH – UNOFFICIAL TOPICS IN ALGEBRAIC GEOMETRY – 2010
UNIVERSITY OF UTAH

- Instructor: Karl Schwede
- Class web page: http://www.math.utah.edu/∼kschwede/frob
- Text: *Frobenius Splitting Methods in Geometry and Representation Theory* by Michel Brion and Shrawan Kumar (we will only be using this 30-40% of the time.)
- Additional texts: I will link to various papers on the course webpage (as we reference them). Notes for recent lectures will also appear on the course webpage.
- Contacting the instructor:
  - Email: kschwede@math.utah.edu
  - Office: 209 JWB

Course Content:

In this class, I will explain how the action of Frobenius can be used to study the singularities of algebraic varieties and also how special conditions on the action of Frobenius (such as Frobenius splitting) can prove interesting properties of varieties in positive characteristic (such as vanishing theorems and projective normality).

Topics will include

a) characterizations of rational singularities (and other singularities of the MMP) without use of resolutions of singularities.
b) local and global consequences of Frobenius splittings (and generalizations thereof)
c) applications to Schubert varieties and other more representation theoretic constructs
d) links to commutative algebra (ie. tight closure theory) and more arithmetic topics (ie. ordinarity vs supersingularity)

For parts (maybe 30-40%) of the course we will follow the book of Brion and Kumar, "Frobenius splitting methods in geometry and representation theory". This seems to be freely available for download (chapter by chapter) on springerlink.com.

Notes and references

Notes to many lectures will be posted on the course webpage. Similarly, links to many references will also appear on the course webpage.