SYLLABUS FOR MA 745, FALL 2020

Professor:	Macie (Matt)j Szczesny
Email:	szczesny@math.bu.edu
Office Hours:	MF 2:15-3:00 on Zoom
Lecture:	MWF 1:25-2:15 via Zoom

Text: "Foundations of Algebraic Geometry" by Ravi Vakil, available at

- http://math.stanford.edu/ vakil/216blog/FOAGnov1817public.pdf

Other suggested references:

- "Algebraic Geometry" by Robin Hartshorne. Springer.
- "Basic Algebraic Geometry" by Igor Shafarevich. Springer.
- "The Geometry of Schemes" by David Eisenbud and Joe Harris. Springer.
- "Undergraduate Algebraic Geometry" by Miles Reid. Cambridge University Press.
- "Commutative Algebra With a View Toward Algebraic Geometry" by David Eisenbud. Springer
- "Undergraduate Commutative Algebra" by Miles Reid. Cambridge University Press.
- "Introduction to Commutative Algebra" by Michael Atiyah and Ian Macdonald. Addison-Wesley.

Mode of instruction: This course will be taught synchronously via Zoom. You will be able to access all information, including recorded lectures and lecture notes via the Blackboard site. There will also be a Piazza site set up for class discussion.

Prerequisites: Algebraic geometry converts geometric problems into the language of commutative algebra. You should have a command of the basics of commutative rings and modules, such as prime/maximal ideals, localization, tensor products, Noetherian properties, etc.

Brief Synopsis: Algebraic geometry can be provisionally defined as the study of the geometry of solution sets to polynomial equations. The subject relies on a rich dictionary between geometry and commutative algebra. It is a central subject in many areas of mathematics such as number theory, arithmetic geometry, representation theory, algebraic topology, differential geometry etc. Moreover, the structured/functorial approach to mathematics adopted in this subject has been very influential.

The course develops the geometry of schemes, which are spaces "glued from prime spectra of commutative rings". These provide a flexible language suitable for both geometric and arithmetic applications.

Material to be covered:

(1) Sheaves
(2) Affine schemes - geometric and arithmetic examples. Basic properties: integrality, reducedness,
(3) Projective schemes and Proj.
(4) Morphisms and various properties of morphisms.

(5) Dimension
(6) Smoothness
(7) Quasicoherent sheaves and operations on them: pullback and push-forward
(8) Cech cohomology

Grading: Your grade will be based 70% on homework, and 30% on an oral exam held at the end of the course.

Homework: Weekly homework will be assigned and collected.