Math 520: Commutative and Homological Algebra
Fall 2016

Meeting Times: MWF 10:00-10:50 AM, TH 312

Instructor: Chris Skalit

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Texts: This course has no official text. Lectures will be cobbled together from the following sources:

- Atiyah and Macdonald's *Introduction to Commutative Algebra*

- Serre's *Local Algebra*

- Matsumura's *Commutative Ring Theory*

- Weibel's *Introduction to Homological Algebra*

Overview: I intend to cover the following core topics during the first half of the course:

- Prime ideals and localization

- Spec, affine varieties, Zariski topology

- Chain conditions, Noetherian/Artinian rings and modules

- Exact sequences, resolutions, derived functors, flatness

- Dimension theory, Hilbert polynomials, Noether normalization, Cohen-Seidenberg theorems

- Dedekind rings, DVRs, Picard groups

- Adic-topologies, completion, Artin-Rees lemma

The latter half of the course shall be devoted to a few more advanced topics. These may include:

- Regular sequences, depth, Koszul homology

- Homological dimension, Serre's characterization of regular rings

- Formal smoothness and the Cohen Structure Theorem

- Spectral sequences, hyper-(co)homology, applications

- Syzygies, Groebner bases

- Multiplicity theory, integral closure of ideals, Rees' Theorem

Homework: Assigned weekly. Problem sets will be posted to the course website.

Final Exam: Izzet/Kevin might force me to give one to you. We'll cross that bridge when we get there...