

MATH 502 Commutative Algebra  
Fall 2020  
SYLLABUS

*Revised Sept 10 to reflect that some classes will be taught synchronously*

**Instructor:** Sheldon Katz

**Instructor contact information:** [katzs@illinois.edu](mailto:katzs@illinois.edu)

**Mode of Instruction:** This course will be taught online. There will be a weekly synchronous lecture on Tuesdays 12:30pm-1:45pm, which will be recorded. All other lectures will be pre-recorded. All lecture recordings will be made available online.

**Text:** Commutative Ring Theory, H. Matsumura

**Prerequisites:** Abstract Algebra I (Math 500) and Abstract Algebra II (Math 501) or equivalent, or permission of the instructor. In particular, students are expected to be familiar with the basics regarding commutative rings, ideals (including prime and maximal ideals), and modules.

**Lecture Management System:** All course materials will be organized and posted on Illinois Compass 2G, <http://compass2g.illinois.edu>. Compass will be your portal to the course throughout the semester.

**Discussion Forum:** A discussion forum for the class is hosted on Piazza at <http://piazza.com/illinois/fall2020/math502/home> (please sign up at <http://piazza.com/illinois/fall2020/math502> first). The purpose of this discussion forum is to encourage interaction between students as a way to mitigate the adverse effects of not being able to meet in person. The forum will not be regularly monitored by the instructor except during one scheduled hour per week, see below.

**Initial online office hours:** Mondays at 10am central time by Zoom, and Thursdays at 7pm central time by Piazza (links provided on our compass page).

**Course website:** <http://www.math.uiuc.edu/~katz/class/f20/>

**Course Description:** In addition to being an important research area by itself, commutative algebra is indispensable for other research areas including algebraic geometry and algebraic number theory. This course is designed with all of these areas in mind. The topics covered will include:

- Noetherian rings and modules
- Primary decomposition
- Flatness
- Completion
- Hilbert-Samuel polynomial
- Dimension theory
- Integral extensions
- Going-up and going-down theorems
- Noether normalization
- Regular rings
- Depth

Lectures will not necessarily follow the treatment in the text.

**Homework.** There will be two homework assignments during the semester.

**Grading:** Will be friendly and based on the homework assignments.