

## MAT 731 - Rings and Modules Fall 2014

Instructor: Professor Dan Zacharia

Office: 229C Physics

Phone: 443-1580

Email: [zacharia@syr.edu](mailto:zacharia@syr.edu)

Lecture: MW 12:45–2:05, Carnegie 316.

Office hours: MW 10:00–11:30. Also by appointment, and any time my door is open.

**Text:** We will not follow a particular textbook so the class notes will be the main source. They can be supplemented by reading *Algebra* by Hungerford, which will be on reserve in the library, although the order of the material is slightly different there. (The book is written in slightly more generality as he does not assume rings have an identity element, but you can easily ignore that issue). However, the book has a completely different approach to the noncommutative rings material near the end of the course, so do not use it for that part.

**Prerequisites:** MAT 631 and MAT 632.

**Course description:** The plan is to cover the following topics:

- ✓ **Set-up:** Modules and homomorphisms. Direct sums and products. Free modules. Universal properties. Projective and injective modules. Exact sequences. Diagram chasing. Hom and Tensor. Composition series. Noetherian and Artinian rings and modules.
- ✓ **Noncommutative Ring Theory:** Semisimple rings and modules. Artin-Wedderburn Theory. Jacobson radical. Nakayama's lemma.
- ✓ **Special Modules:** Projective, Injective and flat modules.
- ✓ **Commutative topic:** Localization

**Homework and grades:** Homework will be assigned in class. Your grade will be based on the regular homework sets. You may work together, but you may find that you mature the most mathematically by doing *as much as possible by yourself*. You are always welcome to come to me for help.

**Academic Integrity:** The Syracuse University Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the Policy and know that it is their responsibility to learn about instructor and general academic expectations with regard to proper citation of sources in written work. The policy also governs the integrity of work submitted in exams and assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. Serious sanctions can result from academic dishonesty of any sort. For more information and the complete policy, see <http://academicintegrity.syr.edu>.

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