MAS 4316

Introduction to Commutative Algebra

Section: U01

In-Person meetings arranged

Spring Term 2026

Course Meeting Information

Schedule of classes:

Fr 10:30 am - 1:00 pm Dm 442A

Professor Information

Mirroslav Yotov

Roles: Primary Instructor

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Office Hours: TuTh 10:30-12:00 Noon (Zoom)

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Department or Academic Unit: Mathematics and Statistics

Course Prerequisites

Course prerequisites, if any, are listed below.

Prerequisite: MAS 4301

Course Description

In this course, we are introducing basic concepts of Commutative Algebra and are developing some elementary methods for studying these concepts. Numerous examples are provided in order to illuminate the theory developed.

Commutative rings are studied basically through their ideals. Finiteness conditions on ideals are used to distinguish special types of rings (Noetherian and Artinian). A rough classification of the Noetherian rings is provided by their Krull dimension. Primary factorization of ideals is proved as a generalization of the concept of unique presentation of elements of a ring as products of irreducible elements. The primary factorization is strengthened in the case of Dedekind domains. Integral extensions of rings are studied, existence of a normalization of a ring proved. Krull's Principal Ideal Theorem is proved as well.

Modules are studied. Categorical constructions involving modules and rings (such as localization, product, co-product, and tensor product) are introduced and used in the developed theory.

The course carefully introduces the concepts of commutative rings and modules over them, as well as useful constructions on them, including products, co-products, quotient modules and rings, tensor product, and localization of rings and modules. The course thoroughly studies the properties of Noetherian rings and modules, including primary decomposition, integrality, Krull dimension, normalization of a commutative ring, and properties of Dedekind domains.

Textbook and Course Materials

A Term of Commutative Algebra

Required/Recommended: Required

Authors: Allen Altman and Steven Kleiman

Publisher: Worldwide Center of Mathematics

Publication Date: 2013

Copyright Date: 2013, Worldwide Center of Mathemativs, LLC

ISBN 10: N/A

ISBN 13: 978-0-9885572-1-5

Chapters/Pages: Chapters 1-18

Panther Book Pack

Get all required course materials for $20.50 per undergrad credit hour through Panther Book Pack. You'll be charged automatically unless you opt out within 3 days after the add/drop deadline.

For more details, to compare costs, and to learn how to access your course materials, visit the Panther Book Pack information page on FIU OneStop.

Student Learning Outcomes/Objectives

- explain the fundamental concepts, constructions, and theorems related to Noetherian rings and modules, including Artinian rings and Dedekind domains;
- apply this knowledge to analyze particular rings, such as affine algebras, and modules over them;
- communicate eloquently, through an oral presentation, the material they have learned

Expectations of the Course

This is a in-person course. It has meetings once a week, but for 2-3 hours.

The book contains ample amount of interesting Exercises which not only illuminate but also add to the theory covered in the main text. The students have to put extra effort to do as many as possible of these exercises.

Assignments & Assessments

The progress of the students in class will be monitored through in-class discussions as well as several take-home assignments.

Grading

The overall grade will be based on the work of the students in class and on their results on the assignments throughout the course.

Schedule of Topics

The ultimate goal is to cover most of Chapters 1-18 of the book.

The topics covered and the pace of doing so will depend on how well and how fast the students understand the material taught.

Policies & Resources

Before starting this course, please review the Policies & Resources Page in Canvas, which includes comprehensive information on various University and Course Level Policies such as:

- University Policies
- Accessibility and Accommodations
- Online Etiquette
- Technical Requirements and Skills
- Computer & Digital Literacy Skills
- Course Technology Accessibility Statements and Privacy Policies
- Academic Integrity

- Copyright Statement
- Nondiscrimination Statement
- Panthers Care & Counseling and Psychological Services (CAPS)
- Fair Use Policy

Nondiscrimination Statement

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