Fall 2022	**Math 331-01**	**9:00 MWF** **Sci A208**

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Office Hours: 10:30-11:30 MWF
or by appointment.

Texts: Hungerford, Abstract Algebra: An Introduction, 3rd ed.,
ISBN-13: 978-1-111-56962-4

Course Description:

> **MATH 331. Abstract Algebra – Rings and Fields. 3 cr.** Ring axioms, homomorphisms, subrings and ideals, polynomials, integral and Euclidean domains, field axioms, extension fields, selected additional topics. **Prereq: 230 and 300.**

Math 331 a one-semester course designed to introduce undergraduate students to the definitions, notation, and abstract properties of algebraic rings and fields. During the semester, you will be expected to gain understanding of mathematical concepts related to algebraic rings and fields and explore their properties and applications. Critical understanding of assigned readings and written assignments will be necessary in order to receive a satisfactory grade.

Calculator Policy: Although a calculator is of little use in this course, you will be allowed the use of a non-linkable scientific or graphing calculator while completing any assignments or examinations. **Any use of cell phones, or other devices capable of remote transmission, is expressly prohibited during in-class examinations.** You may use any available technnonology for assignments requiring completion outside of the classroom. You may also use your phone or tablet to take images of boardwork or screens during lectures.

Course Schedule: The topics covered during the term will roughly follow the schedule given below. Any necessary deviations will be announced during the term. All chapters referenced are from the Hungerford textbook.

The arithmetic properties of the integers are the most common example of a commutative ring with identity. The course begins with related terminology as found in Chapter 1 - *Arithmetic in* $\mathbb{Z}$ *Revisited* and Chapter 2 - *Congruence in* $\mathbb{Z}$ *and Modular Arithemetic*. You should have seen most of these topics in Math 300. The axiomatic introduction of rings, along with many additional examples, is found in Chapter 3 - *Rings.* Some these examples, such as rings of matrices and polynomials, should also be familiar to you from previous courses.
Examination I: Friday, Sept. 30, 2022

The second portion of the course explores the properties of polynomial rings, as found in Chapter 4 - *Arithmetic in* $F[x]$. We will begin by discussing properties related to factorization and irreducibility of polynomials. This extends the algebraic ideas found in elementary algebra courses, which are often used in calculus courses.
Examination II: Wednesday, Oct. 26, 2022

The third portion of the course explores congruence of polynomial rings modulo irreducible polynomials. This is found in Chapter 5 - *Congruence in* $F[x]$ *and Congruence-Class Arithmetic* and Chapter 6 - *Ideals and Quotient Rings*.
Examination III: Friday, Nov. 18, 2022

The final portion of the course covers properties of integral domains and fields. We will begin with some sections of Chapter 10 - *Arithmetic in Integral Domains* and then continue with selected sections from Chapter 11 - *Field Extensions*. As time permits, selected topics from Chapter 12 - *Galois Theory* and Chapter 15 - *Geometric Constructions* will be included.
Final Examination: Monday, Dec. 12, 2022

Evaluation and Grading: Your grade will be determined by your performance on four examinations. These exams will mainly be on definitions and factual items discussed during class and found in readings. True/False, Fill-in-the-Blank, and short-answer computational problems should be expected. **I will not give "retake" or "second-chance" examinations.**

In any mathematics course, it is essential that you regularly do problems. Simply watching me, or others, do homework is of little value. Most weeks I will distribute a list of suggested problems; your responsibility as a student is to seriously attempt to complete these problems in a timely manner. Therefore, besides the scheduled examinations, you may choose to hand in your solutions to these problems on or before stated due dates. I will read through your set and give you an overall symbolic grade of $\bigstar$, $+$, $\checkmark$, $-$, or $\emptyset$, which will respectively correspond to $1.0, 0.75, 0.5$, 0.25, or 0.0 of extra credit added to your examination score. You should expect about ten such weekly problem sets during the semester.

Your scores will be scaled according to the formula shown below to give a numerical score.

$$Score = \frac{Exam\,1}{Poss(Exam\,1)}*25 + \frac{Exam\,2}{Poss(Exam\,2)}*25 + \frac{Exam\,2}{Poss(Exam\,2)}*25 + \frac{Final}{Poss(Final)}*25 + Extra\ Credit$$

In the formula, *Poss* represents the possible points for the indicated exam. Final letter grades will be awarded according to the following curve.

Grade Item	Weight	Percentages	Minimum Grade
Examination I	25%	85-100	A−
Examination II	25%	75-84	B−
Examination III	25%	60-74	C−
Final Exam	25%	50-59	D
		0-49	F

I reserve the right to raise a student's grade if it is my determination that numerical scores are not reflective of that student's actual comprehension, but I will never give a grade lower than that determined by this stated criteria..

The last day to add/drop a 16-week class is Thursday, September 15.
The last day to withdraw from a 16-week class with a W grade is Friday, November 11.