



Hankuk University of Foreign Studies

2024 Summer Session

MATH 430 Introduction to Modern Algebra

Course Outline

Course Code: MATH 430

Instructor: Vadim Olshevsky

Home Institution: University of Connecticut

Office Hours: TBA

Email: olshevsky@gmail.com

Credit: 4

Class Hours:

This course will have 52 class hours, including 32 lecture hours, professor 8 office hours, 8-hour TA discussion sessions, 4-hour review sessions.

Prerequisites: MATH 200 Linear Algebra and Differential Equations

Course Description:

List of topics: Modular arithmetic, generalities on rings and ring homomorphisms, Principal Ideal domains, and Euclidean domains focusing on the examples of \mathbb{Z} , $k[x]$, $\mathbb{Z}[i]$.

Homework will be assigned twice a week. Due online on Wednesday and Friday at 23:00. The homework problems will be lifted directly from the textbook. **NO LATE HOMEWORK WILL BE ACCEPTED.** One homework assignment can be dropped.

Exams: two exams, a midterm and a final.

Required Course Materials:

Thomas Hungerford Abstract Algebra, An Introduction, Third Edition. We will cover chapters 1-6, 10 and 13.



Grading & Evaluation: (HW+Midterm+Final)/3

Grading System (1 ~ 100)

A+ : 96 - 100	A : 91 - 95
B+ : 86 - 90	B : 81 - 85
C+ : 76 - 80	C : 71 - 75
D+ : 66 - 70	D : 60 - 65
F : 0 - 59	
Pa : Pass	Fa : Fail

Course Schedule

Week 1.

- Monday:** The division algorithm. Divisibility
- Tuesday:** Primes and Unique factorization.
- Wednesday:** Congruence. Congruence classes. Modular arithmetic.
- Thursday:** The structure of \mathbb{Z}_p and \mathbb{Z}_n .

Week 2.

- Monday:** Rings. Definition, examples, basic properties.
- Tuesday:** Isomorphisms and homomorphisms.
- Wednesday:** Polynomial arithmetic and divisibility in $\mathbb{F}[x]$. Unique factorization.
- Thursday:** Polynomial functions. Irreducibility in $\mathbb{Q}[x]$, $\mathbb{R}[x]$, $\mathbb{C}[x]$.

Week 3.

- Monday:** Congruence in $\mathbb{F}[x]$ and congruence classes.
- Tuesday:** The structure of $\mathbb{F}[x]/(\mathfrak{p}[x])$ when \mathfrak{p} is irreducible.
- Wednesday:** Ideals and congruence. Quotients rings. Homomorphisms.



Thursday: The Structure of $\mathbf{R/I}$ When \mathbf{I} is Prime or Maximal

Week 4.

Monday: Euclidean domains. Principal ideals domains and factorization.

Factorization of quadratic integers.

Tuesday: The Field of Quotients of an Integral Domain. Unique Factorization in Polynomial Domains.

Wednesday: Public Key Cryptography

Thursday: Chinese Remainder Theorem

