

King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 427, Number Theory, Term 242 (2024-2025)

Instructor: Ibrahim Al-Rasasi

Title: Math 427, Number Theory

Credit: 3-0-3

Textbook: An Introduction to the Theory of Numbers, by Niven, Zuckerman, and Montgomery, 5th edition, Wiley & Sons, 1991.

Course Objectives:

- To introduce students to the basic results of elementary number theory rigorously that will prepare them to take more advanced courses in algebra and number theory.
- To provide students with some applications of elementary number theory.

Course Description: Divisibility and primes. Congruences. Primitive roots. Quadratic reciprocity. Arithmetic functions. Diophantine equations. Applications (e. g., cryptography or rational approximation).

Prerequisite: Math 210 or senior standing.

Learning Outcomes: Upon completion of this course, students should be able to

1. Solve questions about divisibility and primes both theoretically and computationally
2. Apply the theorems of Fermat, Euler, and Wilson in computing and/or proving some statements in number theory
3. Solve polynomial congruences and systems of linear congruences in one variable.
4. Find the order of integers and primitive roots modulo primes.
5. Use Quadratic Reciprocity Law in computing and proving some statements in number theory
6. Solve problems involving arithmetic functions.

7. Solve some types of Diophantine equations and problems on selected applications of number theory.

Grading Policy:

- Exam I: 20% (7th week)
- Exam II: 20% (12th week)
- Homework (weekly): 15%
- Project (Report & Presentation): 15%
- Final Exam: 30%

Attendance Policy:

- A DN grade will be awarded to any students who accumulates 9 unexcused absences.
- You are responsible for any announcement made in class during your absence.

Letter Grades:

	A+	A	B+	B	C+	C	D+	D	F
Starts at	90	83	76	70	65	60	55	50	< 50

Office Hours:

- Office location: 5-326
- Office phone number: 1268
- Days & Time: UT: 12:00-1:50 pm
M: 9:00-9:50 am
R: 12:00-12:50 pm
Also, by appointment.
- E-mail: irasasi@kfupm.edu.sa
- Resources: Check Blackboard.

Undergraduate Attributes: Please check the following link

<https://math.kfupm.edu.sa/bsinmathematics/graduate-attributes>

Math 427 Syllabus (Term 242)

Week	Date	Sec.	Topics
1	Jan. 12-16	1.1 1.2	Introduction Divisibility (GCD, LCM)
2	Jan. 19-23	1.3 1.4	Primes (FTA) The Binomial Theorem; Fermat's Factorization Method
3	Jan. 26-30	5.1 2.1	The equation $ax + by = c$ Congruences (properties, complete and reduced residue systems, Fermat's, Euler's and Wilson's Theorems, Pseudoprimes and Carmichael numbers)
4	Feb. 2-6	2.1 2.2	Continued Solutions of Congruences
5	Feb. 9-13	2.3	The Chinese Remainder Theorem
6	Feb. 16-20		Cryptography (Handout)
Feb. 23, 2025: Saudi Founding Day Holiday			
↓ Exam I: Wednesday, Feb. 26, 2025.			
7	Feb. 23-27	2.6	Cryptography Prime Power Moduli
8	March 2-6	2.7	Prime Modulus
9	March 9-13	2.8	Primitive Roots and Power Residues
10	March 16-20	3.1	Quadratic Residues
March 13- April 3: Eid Al-Fitr Holidays			
11	April 6-10	3.2	Quadratic Reciprocity
↓ Exam II: Wednesday, April 16, 2025.			
12	April 13-17	4.1 4.2	Greatest Integer Function Arithmetic Functions and Perfect Numbers
13	April 20-24	4.2 4.3	Continued The Mobius Inversion Formula
14	April 27- May 1	5.3	Pythagorean Triangles Diophantine Equations (Handout)
15	May 4-8		Diophantine Equations
16	May 11		Project Presentations
Final Exam: Comprehensive			