

# كلـية العلـوم

**دائرة الرياضيات**

**Math435 (Number Theory)**

**Course Outline \_\_\_\_\_\_\_\_\_\_ Second Semester 2023/2024**

**Text Book:** Elementary Number Theory and its Applications, Fifth Edition , by Kenneth Rosen

In this course, we study basic properties of integers this includes: divisibility, prime numbers and representation of integers, Euclidean algorithm, the fundamental theorems of arithmetic, Factorization methods and the Fermat numbers, congruences, Chinese remainder theorem, systems of linear equation, applications of congruences, divisibility tests, special congruences: Wilson and Fermat little theorems, Euler’s theorem, multiplicative functions: Euler Phi function, the sum and number of divisors, primitive roots, Quadratic Residues

**Our Grading policy for this course is as follows:**

Two hour exams **50%** (**30%** for the best mark and **20 %** for the other)

Homework & Quizzes **10%**

Final Exam **40%**

**Exams:** The university policy regarding excuses for not attending an exam will be applied in this course. There will be a makeup exam for the final exam only; In case of missing one of the tests, with acceptable excuses, the formula in the student guide for grades will be used.

Check your personal Ritaj account daily.

**Topics:**

**Chapter 1: The Integers**

1.3 Mathematical Induction (self study)

1.5 Divisibility

**Chapter 3: Primes and Greatest Common Divisors**

3.1 Prime Numbers

3.3 Greatest common divisors

3.4 The Euclidean Algorithm

3.5 The Fundamental Theorem of Arithmetic

3.7 Linear Diophantine Equations

**Chapter 4: Congruences**

4.1 Introduction to Congruences

4.2 Linear Congruences

4.3 The Chinese Remainder

4.5 Systems of Linear Congruences

**Chapter 5: Applications of Congruences**

4.1 Divisibility Tests

**Chapter 6: Some Special Congruences**

6.1 Wilsons Theorem and Fermat’s Little Theorem

6.3 Euler’s Theorem

**Chapter 7: Multiplicative Functions**

7.1 The Euler Phi-Function

7.2 The Sum and Number of Divisors

7.3 Perfect Numbers and Mersenne Primes

**Chapter 9: Primitive Roots**

9.1 The Order of an Integer and Primitive Roots

9.2 Primitive Roots for Primes

**Chapter 11: Quadratic Residues**

11.1 Quadratic Residues and Nonresidue