Department of Mathematic

College of Basic Education

Salahaddin University

Subject: Number theory

Course Book – *Fourth* Year – First semester

Lecturer's name: Payman A. Rashed

Academic Year: 2023-2024

Course Book

1. Course name	Number theory
2. Lecturer in charge	Payman A. Rashed
3. Department/ College	Mathematic Department / College of Basic Education
4. Contact	e-mail : payman.rashed@su.edu.krd
5. Time (in hours) per week	Theory: 2
6. Office hours	
7. Course code	
8. Teacher's academic profile	Specialization Pure Mathematic /Algebraic graph theory Degrees & Certificates • B. Sc. in Mathematics, Mathematics Department - College of Science – Mosul University - Mosul in 1987. • M. Sc. in Mathematics. Mathematics Department - College of Science Salahaddin University - Erbil in 2002. • Ph. D. in Mathematics. Mathematics Department - College of Computer Sciences and Mathematics – University of Mosul in 2015.
9. Keywords	Integer Numbers, Prime Numbers, Mathematical induction, Divisibility, Functions

10. Course overview:

     This is an introductory course in Number Theory for students interested in mathematics and the teaching of mathematics. The course begins with the basic notions of integers and sequences, divisibility, and mathematical induction. It also covers standard topics such as Prime Numbers; the Fundamental Theorem of Arithmetic; Euclidean Algorithm; the Diophantine Equations; Congruence Equations and their Applications (e.g. Fermat's Little Theorem); Multiplicative Functions (e.g. Euler's Phi Function

11. Course objective:

     To present a rigorous development of Number Theory using axioms, definitions, examples, theorems and their proofs.

12. Student's obligation

1. Students have an obligation to arrive on time and remain in the classroom for the duration of scheduled classes and activities. 2. Students have an obligation to write, homeworks, tests and final examinations at the times scheduled by the teacher or the College. Students have an obligation to inform themselves of, and respect, College examination procedures. 3. Students have an obligation to show respectful behaviour and appropriate classroom deportment. Should a student be disruptive and/or disrespectful, the teacher has the right to exclude the disruptive student from learning activities (classes) and may refer the case to the Director of Student Services under the Student Code of Conduct. 4. Electronic/communication devices (including cell phones, mp3 players, etc.) have the effect of disturbing the teacher and other students. All these devices must be turned off and put away. Students who do not observe these rules will be asked to leave the classroom

13. Forms of teaching

Using one of the following or may be using all of the following:
1.   The lecture method.

2. Discussion method.
3. The method of exploration.
White board, notes of teacher

14. Assessment scheme
The assessment is divided up as follows:
1. 30% from two 2-hour class tests during the year;
2. 10% from example classes.

15. Student learning outcome:
Students will be able to : 1) effectively express the concepts and results of Number Theory. 2) construct mathematical proofs of statements and find counterexamples to false statements in Number Theory. 3) collect and use numerical data to form conjectures about the integers. 4) understand the logic and methods behind the major proofs in Number Theory. work effectively as part of a group to solve challenging problems in Number Theory.

16. Course Reading List and References:
▪ **Key references**:
 1. Elementary Number Theory, David M. Burton (1980)
2. Elementary Number Theory, W. Edwin Clark, 2002

17. The Topics:

Week 1: Some preliminary considerations.

Week 2: Mathematical induction with permutation

Week 3:Divisibility theory in the integers(The division algorithm).

Week 4: Greatest common divisor.

Week 5: Euclidean algorithm.

Week 6: Diophantine Equation ax+by=c.

Week 7: The fundamental theorem of arithmetic.

Week 8: The theory of congruences (Basic properties of congruence).

Week 9: Special divisibility tests.

Week 10: Linear congruences.

Week 11: Fermat's little theorem.

Week 12: Wilson's theorem.

Week 13: Number theoretic functions (The functions $\tau\tau$ and $\sigma\sigma$).

Week 14: The Mobius inversion formula

19. Examinations:

1. Compositional: In this type of exam the questions usually starts with Explain how, What are the reasons for…?, Why…?, How….?

With their typical answers Examples should be provided

2. True or false type of exams: In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided.

3. Multiple choices: In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.

Will do

20. Extra notes:

Note About office Hours: I encourage you to come by my office if you have any questions, need help with homework problems, or would just like to talk about the material. I will be in my office during my office hours, but if you plan to come by it may help to send an email before to let me know to expect you. If you want to meet with me but cannot make it to office hours, email me and we can set up a mutually convenient time to meet.

21. Peer review