Department of Mathematics

College of Science

University of Salahaddin-Erbil

Subject: Number Theory

Course Book: 4ᵗʰ year students

Lecturer's Name: Prof. Herish O. Abdullah

Academic Year: 2024/2025

Course Book

1. Course name	Number Theory
2. Lecturer in charge	Herish O. Abdullah
3. Department/ College	Mathematics, College of Science
4. Contact Email: Tel:	herish.abdullah@su.edu.krd 0750 455 0470
5. Time (in hours) per week	3/Group
6. Office hours	Sunday 10:30-12:30 am
7. Course code	
8. Teacher's academic profile	Dr. Herish Omer Abdullah is a Professor in the Department of Mathematics at the College of Science, Salahaddin University-Erbil. He completed his Ph.D. in Graph Theory at the same institution in 2007, with a thesis titled "Hosoya Polynomials of Steiner Distance of Some Graphs." He holds an M.Sc. in Applied Algebra (Group Representation Theory) from the University of Technology-Baghdad, earned in 1998, and a B.Sc. in Mathematics from Salahaddin University-Erbil, awarded in 1991.
9. Keywords	Graph Theory, topological indices of graphs, authentication

10. Course overview:

This course provides an introduction to the important basic topics of number theory: prime numbers, factorization, congruence and representation of numbers, Quadratic Residues and Reciprocity and Diophantine equations.

11. Course objective:

To give the students an introduction to basics of number theory. On successful completion of the course students will be able to:

1. Explain some of the concepts of number theory, a primary area of mathematics, using examples.
2. Apply mathematical ideas and concepts within the context of number theory.
3. Solve a range of problems in number theory.

12. Student's obligation:

In their academic year, students are obliged to take exams, do assignment and quizzes. There will be optional projects and programming assignments, which may add extra marks to the students overall performance.

13. Forms of teaching:

The lectures are taught through projector and whiteboard.

14. Assessment scheme:

Assessed works include midterm exam(s), quizzes, optional projects, final exam related to the materials studied.

Distribution of marks:
Midterm exam: 20%
Quizzes: 10%
Class assignments, homework & reports: 10%
Final exam: 60% marks

15. Student learning outcome:

16. Recommended Course Reading List and References:

Joseph H. Silverman, a Friendly introduction to Number Theory, (Fourth Edition), 2012. Titu Andreescu, Dorin Andrica, Number Theory, Structures, Examples, and Problems (2009).	
17. The Topics:	**Lecturer's name**
Weekly Topics: **Introduction:** Historical overview and significance of number theory Divisibility and prime numbers The Fundamental Theorem of Arithmetic **Congruences and Modular Arithmetic:** Modular arithmetic operations Congruence relations and properties Solving linear Congruences Chinese Remainder Theorem Linear Diophantine equations Pythagorean triples Fermat's Last Theorem (statement and historical background) **Arithmetic Functions:** Euler's totient function Möbius function Summation formulas (e.g., divisor function, sum of squares) **Quadratic Residues:** Quadratic residues and non-residues Euler's criterion Quadratic reciprocity theorem **Prime Number Factorization (Optional)** Prime distribution and prime counting functions Prime factorization methods: Trial division, Pollard's rho algorithm The Sieve of Eratosthenes and its role in prime factorization The Fundamental Theorem of Arithmetic and unique factorization Factoring large composite numbers: Fermat's factorization method, Quadratic Sieve, General Number Field Sieve (GNFS) Primality testing vs. factorization	Prof Dr Herish O Abdullah
18. Practical Topics (If there is any)	
19. Examinations:	
20. Extra notes:	

21. Peer review پێداچوونەوەی هاوەڵ	

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم کۆرسبووکە دەبێت لەلایەن هاوەڵێکی ئەکادیمیەوە سەیر بکرێت و ناوەرۆکی بابەتەکانی کۆرسەکە پەسەند بکات و چەند ووشەیەک بنووسێت لەسەر شیاوی ناوەرۆکی کۆرسەکە و واژووی لەسەر بکات.

هاوەڵ ئەو کەسەیە کە زانیاری هەبێت لەسەر کۆرسەکە و دەبیت پلەی زانستی لە مامۆستا کەمتر نەبێت.