A Course Title & Number

MTH 313 – Number Theory and Its Applications

B Pre/Co-requisite(s)

Prerequisite: MTH 203 or MTH 213 or MTH 221

C Number of credits

3-0-3

D Faculty Name

Ayman Badawi

E Term/ Year

Fall 2024

F Sections

Section Number	Course	Days	Time	Location
01	MTH313	TR	12:30—13:45	Nab 08

G Instructor's Information

Instructor	Office	Email
Ayman Badawi	NAB 262	abadawi@aus.edu

Office Hours: My office hours are listed on this table; others can be arranged through an advanced appointment.

Monday	Tuesday	Wednesday	Thursday
13:00 – 14:15	14:30 – 15:30	13:00 – 14:15	-----

H Course Description from Catalog

Covers the Euclidean algorithm, linear congruences, the Chinese Remainder Theorem, Fermat's Little Theorem, quadratic residues and quadratic reciprocity, Pythagorean triples and sums of squares, includes applications in communication, public key cryptography, computer arithmetic and random number generator.

I Course Learning Outcomes

Upon completion of the course, students will be able to:

Learning Outcomes Upon completion of this course, students will be able to:	Assessment Instruments
1. CLO1: An understanding of the difference Between solving an equation in integers and solving it in real or other number systems	**Exam1, Exam2 or Final**
2. CLO2: Knowledge of how to solve linear congruences, the Chinese remainder theorem	**Exam1, Exam2 or Final**
3. CLO3: Familiarity with the Euclidean algorithm and its uses	**Exam1, Exam2 or Final**
4. CLO4: Understanding of the Legendre symbol in relation to quadratic reciprocity	**Exam1, Exam2 or Final**
5. CLO5: The use of number theory in coding and decoding	**Exam1, Exam2 or Final**

J Textbook and other Instructional Material and Resources

Class notes are crucial; material on I—Learn

(optional) Kenneth Rosen, Elementary Number Theory, Any Version

K Teaching Methods

Lectures, oral presentations, questions, and solutions on I-learn

L Grading Scale, Grading Distribution, and Due Dates

Cut-off (%)	Grade Points		Cut-off (%)	Grade Points
91 ≤ A ≤ 100	4.0		71 ≤ C+ < 74.99	2.3
88 ≤ A- < 90.99	3.7		66 ≤ C < 70.99	2.0
84 ≤ B+ < 87.99	3.3		61 ≤ C- < 65.99	1.7
80 ≤ B < 83.99	3.0		45 ≤ D < 60.99	1.0
75 ≤ B- < 79.99	2.7		F < 44.99	0

Assessment	Weight	Due Date and Remarks
Test I	23%	Thursday, September 26, in class
Test II	23%	Thursday October 24, in class
Test III	23%	Tuesday, November 26, in class
Final Exam	31%	TBA
Total	100%	

Mapping CLO's to PLO's

Course Learning Outcomes	Program Learning Outcome: *The BSMTH CLOs are listed at the end of this document*
1. CLO1—CLO5	PLO1, PLO2, PLO3, PLO4, PLO5, PLO6, PLO7, PLO8, PLO9

M Explanation of Assessments

Exams: There will be three midterm exams and a final exam.

Help: Students must consult their instructor during office hours or by appointment.

Remarks, Rules and Regulations:

- With a valid written excuse and making immediate arrangements with the instructor, a missed exam might be replaced with a make-up exam or the grade of the final exam and the average grade of all tests (including final) and quizzes

N	Student Academic Integrity Code Statement	Students MUST read the Student Academic Integrity Code outlined in the *AUS Undergraduate* Catalog and abide by the standards for academic conduct, students' rights and responsibilities, and procedures for handling allegations of scholastic dishonesty. **It is considered an academic integrity violation to represent the output of a generative artificial intelligence tool as your work.**

We will cover the concepts below (but not in order)

Week	CHAPTER	NOTES
1	Solving linear equations over different planets, introduction	
2	Greatest common factor, least common factor, distribution of prime integers	
3	Find the roots of a polynomial over Z_n.	
4	Fibonacci Numbers	
5	The Fundamental Theorem of Arithmetic	
6	Linear Diophantine Equations Congruences	
7	Linear Congruences	
8	Chinese Remainder Theorem 3 Classical Theorems	
9	Multiplicative Functions, in particular Euler function	
10	Representation Problems	
11	Cryptology and RSA Systems	
12	Primitive Roots	
13	Theorems of Lucas, Lagrange, and Wilson	
14	Quadratic Reciprocity Law	
15	The Legendre Symbol	
16	**Final Exam**	**COMPREHENSIVE**

O	**Attendance Policy**	Students in this course must follow the AUS Attendance Policy as outlined in the *AUS Undergraduate Catalog.*

BSMTH Program Learning Outcomes

PLO1: Demonstrate knowledge and understanding of diverse areas in mathematics such as analysis, algebra, discrete mathematics, and applied mathematics.

PLO2: Construct and effectively communicate valid mathematical arguments.

PLO3: Demonstrate a solid grounding in the ideas and techniques of mathematics.

PLO4: Apply mathematical analysis and mathematical skills to problems in other disciplines.

PLO5: Use discrete mathematical concepts in a variety of contexts such as algorithm development, computer programming and network development and implementation.

PLO6: Demonstrate the ability to identify and carry out thoughtful approaches to problem solving.

PLO7: Define and execute simple research tasks, and assist in more complex research tasks as required for professional work.

PLO8: Formulate a problem in mathematical terms from descriptions written in language specific to disciplines associated with engineering, finance and the natural sciences.

PLO9: Obtain the research skills necessary to adapt to change and remain current in the field and continue to learn new information, skills and concepts.