



SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
MAT	626	Number Theory	4	3	0	1	8		3	English

A. Course Description

This course describes the most important ideas, theoretical results, and basic methods of the theory of modular arithmetic. The course includes the canonical problems with their solution algorithms. It covers classical topics in elementary theory of multiplicative functions, and also some miscellaneous questions demonstrating variety of directions in this subject.

B. Course Outcomes

At the end of this course the student will be able to:

1. Give basic methods of the theory of modular arithmetic,
2. Provide canonical problems with their solution algorithms,
3. Introduce elementary theory of multiplicative functions and some miscellaneous questions.

C. References

Required Textbook

An Introduction to the Theory of Numbers, I. Niven, H. Zuckerman, and H. Montgomery, 5th Ed., Wiley 1991.

Other references

1. *A Comprehensive Course in Number Theory*; A. Baker, Cambridge Univ. Press. 2012.
2. *Number Theory*, G. Andrews, 1st Ed., Dover Publications, 1994.
3. *Elementary Number Theory in Nine Chapters*, J. Tattersall, 2nd Ed., Cambridge University Press, 2005.

Course Website: Google Classroom Webpage: <http://www.imamm.org/>



D. Topics Outline

- 1. Basics:** Divisibility and Ideals, Congruencies and their Properties, Chinese Remainder Theorem, Hensel's Lemma, Quadratic Residues, Gauss' Lemma, Quadratic Reciprocity Law, Arithmetic Functions.
- 2. Quadratic Forms:** Definitions and Basic Properties, Equivalence of Quadratic Forms, Reduced Quadratic Forms, Quadratic Representation, Two Squares Sum Representation, Sums of Four Squares Sum Representation and Lagrange's Theorem.
- 3. Elliptic Curves:** Pythagorean Triples, the Method of Descent, Rational Points on Curves, The Projective Line, The Projective Plane, Elliptic Curves.
- 4. Continued Fractions:** Definitions and Basic Properties, Characterizing Rationales by Finite Continued Fractions, Finding a Particular Solution of the Linear Congruence Equation, Continued Fractions Approximation of a Real Number, Purely Periodic Continued Fraction, Pell's Equations.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm:** 8th or 9th week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm : 30 %	Final Exam: 40 %
4 Quizzes + 4 Homeworks, Attendance & Participation: 30 %	

The grading distribution:

A ⁺	A	B ⁺	B	C ⁺	C	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[0, 70)



G. Student Workload:

#	Teaching/learning activities	Contact Hours	Frequency	Total Contact hours	Self-study hours	Total self-study hours	Student Learning Time
1	Lecture	3	15	45	1.5	22.5	67.5
2	Tutorial	1	15	15	3	45	60
3	Lab\Practical	0	0	0	0	0	0
4	Homework	0	4	0	1.5	22.5	22.5
5	Quiz	0.25	4	1	1	4	5
6	Test (Midterm)	2	1	2	12	12	14
7	Final Exam	2	1	2	12	12	14
Total				65		118	183

Independent self-study = $118/15 \cong 8$ hrs per week

H. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Examsgoo.gl/ykm7t3](https://www.Examsgoo.gl/ykm7t3)

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