DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus (Section A)
Department of Mathematics & Statistics
MATH 3070 – Theory of Numbers
Fall 2022

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.

Instructor(s): Xiaohang Chen (Shane Chern) xh375529@dal.ca

Office Hours: Chase 254 – Tuesday & Wednesday 03:30-05:00

Lectures: Tuesday & Thursday – 08:35-09:55 – CHEMISTRY 223

Course delivery: In-person

Course Description

The following topics are discussed: congruences and residues; elementary properties of congruences, linear congruences, theorems of Fermat, Euler and Wilson, Chinese remainder theorem, quadratic residues, law of quadratic reciprocity, Legendre, Jacobi and Kronecker symbols, arithmetic functions, algebraic fields, algebraic numbers and integers, uniqueness of factorization, elementary properties of ideals, and class number.
(Note: The material starting with "properties of ideals" will not be covered).

Course Prerequisites

MATH 2040.03 (or MATH 2135.03)

Learning Objectives

The student will gain a solid understanding of classical elementary number theory, especially the theories of divisibility of integers, congruences, and solving quadratic congruences, with both classical and modern applications. This course also serves as a partial prerequisite for MATH 4070/5070: Algebraic Number Theory.

Course Materials

- Lecture notes (available at the **Course Brightspace page**)
- Recommended textbooks:
    1. U. Dudley, *Elementary number theory. 2nd edition*, Dover Publications, Mineola, NY, 2008.
    2. G. H. Hardy and E. M. Wright, *An introduction to the theory of numbers, 6th edition*, Oxford University Press, Oxford, 2008.
- **Course Brightspace page:** https://dal.brightspace.com/d2l/home/231156

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Course Assessment

Assessment	Weight (% of final grade)	Date
Assignments	*30%*	*Weekly (usually assigned every **Thursday**; due the next **Thursday**)*
Midterm exam	*30%*	*To be announced*
Final exam	*40%*	*(Scheduled by Registrar)*

* An instruction sheet for assignments can be found in the ***Assignment Instructions*** posted under "Content -> Assignments" on Brightspace.
* There will likely be **10** (tentative) assignments. The one with the lowest grade, including any missed assignment (= 0 points), will be **dropped** from the final homework score.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	**B+** (77-79)	**C+** (65-69)	**D**	(50-54)
A (85-89)	**B** (73-76)	**C** (60-64)	**F**	(<50)
A- (80-84)	**B-** (70-72)	**C-** (55-59)		

Course Policies on Missed or Late Academic Requirements

Late assignments or makeup exams will normally not be accepted.

If there are valid special circumstances (medical reasons, etc.), please talk or write to me, and I may, or may not, accept a late assignment. If I do, no points will be taken off.

Also, in the event that you have a valid reason that you are unable to attend the midterm or final exam, please notify me via email in advance to determine what alternatives may be possible.

Course Policies related to Academic Integrity

Students may work together on the homework assignments. However, submitted assignments are expected to be written in students' *own* words. Wholesale copying will be detected, and will not be tolerated.

Course Content

1. Introduction
2. The Factorization of Integers
3. Congruences
4. Quadratic Residues
5. Sums of Squares
6. Continued Fractions
7. Number Theoretic Function
8. Algebraic and Transcendental Numbers
9. Applications of Number Theory (if time allows)