Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Math 3070
Theory of Numbers
Fall 2017

Instructor

Name	E-mail	Office
Dr. Rob Noble	rnoble@mathstat.dal.ca	CHASE 205

Lectures

Days	Time	Location
TR	1:05 PM – 2:25 PM	LSC-COMMON AREA C216

Course Description

Topics include: 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.

Course Prerequisites

MATH 2040.03 (or MATH 2135.03)

Course Objectives/Learning Outcomes

The main goal of this course is to understand how to solve polynomial congruences modulo arbitrary moduli. This will require the use of most of the material presented in the course, detailed below in the "Course Content" section.

Course Materials

- Textbook: Elementary Number Theory, 2nd Edition, by Underwood Dudley ([Dud08]).

- Course notes (as well as all other important course materials) will be made available on BrightSpace.

Course Assessment

The Final Grade will be computed as the maximum of the grades obtained from the following two schemes:

Scheme I:

Component	Weight (% of final grade)	Date
Midterm Exam	30%	In class on October 26, 2017
Final Exam	50%	(Scheduled by Registrar)
Assignments	20%	Weekly

Scheme II:

Component	Weight (% of final grade)	Date
Final Exam	80%	(Scheduled by Registrar)
Assignments	20%	Weekly

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

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

Course Policies

- Missed exams can be made up for documented illness or upon receipt of equivalent proof of inability to write at the scheduled time.

- Extensions may be provided for assignments for a good reason (as determined by the professor) as long as the solutions have not yet been posted.

- Calculators will NOT be allowed during the midterm or the final examination. In fact, only writing utensils (pencils, lead, erasers, pens, white-out) will be allowed.

- Information about the course may be given during class. It is the responsibility of the students to ensure that they are made aware of what occurs during classes.

- Students may collaborate on assignments, but must write up their own solutions, in their own words.

Course Content

The contents of the provided course notes will be covered. They consist of the majority of the sections of the textbook as well as some additional material:

1. Mathematical Induction and the Least Integer Principle

2. Integers ([Dud08, §1])

3. Unique Factorization ([Dud08, §2])

4. Linear Diophantine Equations ([Dud08, §3])

5. Congruences ([Dud08, §4])

6. Linear Congruences ([Dud08, §5])

7. Fermat's and Wilson's Theorems ([Dud08, §6])

8. The Divisors of an Integer ([Dud08, §7])

9. Perfect Numbers ([Dud08, §8])

10. Euler's Theorem and Function ([Dud08, §9])

11. Primitive Roots ([Dud08, §10])

12. Quadratic Congruences ([Dud08, §11])

13. Quadratic Reciprocity ([Dud08, §12])

14. Pythagorean Triangles ([Dud08, §16])

15. Infinite Descent and Fermat's Conjecture* ([Dud08, §17])

16. Sums of Squares ([Dud08, §18, 19] and [Ser73, Appendix to Ch. 4])

17. $x^2 - Ny^2 = 1$** ([Dud08, §20])

*As of 1994, and due to Andrew Wiles, "Fermat's Conjecture" is now "Fermat's Last Theorem."
**This diophantine equation is known as "Pell's equation."

University Policies and Statements

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information:
https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information:
https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code Of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students dont follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal mannerperhaps through a restorative justice process. If an informal resolution cant be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code:
https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness.

Statement:
http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information:
https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising: https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Research Lab Safety https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program

https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

References

[Dud08] Underwood Dudley, *Elementary number theory*, 2nd ed., Dover Publications, 2008.

[Ser73]   Jean-Pierre Serre, *A course in arithmetic*, Springer, 1973.