Math 349/549: Introduction to Number Theory

Spring 2020
Swart Hall 326
10:20-11:20 MWF

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Office Hours: 2:30-3:30 MTWF, or by appointment

Text: We will use a set of online course notes that I have prepared.

Grading: Homework 20%, Three tests 20% each, Final exam 20%

Grading scale (Math 349): A: 92-100 A-: 90-91 B+: 88-89 B: 82-87 B-: 80-81
C+: 78-79 C: 70-77 D: 62-69 D-: 60-61 F: 59 and below

Homework: Homework will typically be assigned after every class, with subsets of the assigned problems collected periodically for grading. Working hard on homework, keeping up and getting help when you need it are the most important ingredients for succeeding in this class. Students enrolled in Math 549 will be assigned additional problems during the term, and will also complete a capstone project.

Tests and Final Exam: Three tests will be given during the term, on the following dates: 2/28, 4/3 and 5/1. The final exam will be given on 5/15, the last day of class, and will be cumulative. No makeup tests are scheduled. Contact me as soon as possible if an emergency or special circumstance will make it impossible for you to take a test. In the event that classes are officially canceled on the day of a test, you should assume that the test will be given the next day that the class meets.

Attendance Policy: Regular attendance and punctuality are expected. If you miss a class, you are responsible for all assignments and announcements made on that day.

Academic Integrity: Students are expected to adhere to the highest standards of academic honesty, integrity and respect at UW Oshkosh, and failure to do so can result in either academic or administrative penalties. The main tenet of this is that one should never represent the work of another as their own. See me or consult the Student Discipline Code if you have any questions.

Course Description: Number theory is a branch of mathematics that involves the study of properties of the integers. Topics covered include factorization, prime numbers, continued fractions and congruences, as well as more sophisticated tools such as quadratic reciprocity, Diophantine equations and number theoretic functions. However, many results and open questions in number theory can be understood by those without an extensive background in mathematics. Additional topics might include Fermat's Last Theorem, twin primes, Fibonacci numbers and perfect numbers.

Prerequisite: Math 222 with a grade of C or better

Learning Outcomes: Upon successful completion of Math 349/549, students should have the following knowledge and abilities.

- Elementary algorithms for primality testing and prime factorization, applications of the uniqueness of prime factorizations in the integers, and the failure of unique factorization in other number systems.

- Fluency in the language and arithmetic of congruences, skill in translating between the notions of congruence and divisor, and an appreciation for the computational advantage afforded by congruential arithmetic. Euler's phi function, Fermat's Theorem, and a constructive proof of the Chinese Remainder Theorem.

- Elementary techniques for the solution of Diophantine equations, including local and global approaches and parametrization. The existence of primitive roots and techniques for constructing them.

- The Legendre symbol and methods for computing it, including Gauss' law of quadratic reciprocity.

Academic Accommodations: The University of Wisconsin Oshkosh supports the right of all enrolled students to a full and equal educational opportunity. Reasonable accommodations will be provided to students presenting proper documentation in a timely manner through the appropriate campus office (Accessibility Center or Project Success).

Disclosure Statement: Students are advised to see the following URL for disclosures about essential consumer protection items required by the Student Right-to-Know Act of 1990: https://uwosh.edu/financialaid/consumer-information/