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M 326.01: Number Theory

Bharath Sriraman
University of Montana, Missoula, bharath.sriraman@umontana.edu

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MATH 326: Introduction to Number Theory Spring 2022
Time: MWF 1.10 – 2:00 and Moodle
Place: Math 306
Instructor: Dr. Sriraman
TA/LA: Kenton Ke
Office Math 310
Contact email sriramanb@mso.umt.edu
Description: The goal of the course was to familiarize students with basic number theory. Topics that are normally covered in this course are: congruence, multiplicative functions, properties of divisors and primes, quadratic residues, continued fractions, and algebraic numbers.

Texts: There are several texts available that cover the basic topics of this course. The relevant texts will be provided on Moodle from which homework problems will be routinely assigned.

Course Learning Goals:
1. To construct elementary proofs in number theory.
2. To explore the multiplicative structure of the integers.
3. To define congruence modulo n; and find solutions of linear congruences, quadratic congruences, and quadratic reciprocity.
4. To calculate values and properties of multiplicative functions
5. To construct representations of irrational numbers in terms of continued fractions.

Course Agenda: Number theory is often referred to as the "queen of mathematics" (attributed to Gauss) because it is an area of mathematics where questions are very easily stated and understandable, but answers are difficult to find and require new areas of mathematics being invented (e.g., homological algebra). In this course, we will adopt a very basic and classical approach, and among other things will cover properties of integers, the division algorithm and divisibility, continued fractions, prime and perfect numbers, the fundamental theorem of arithmetic, theory of congruences, special theorems (Fermat and Wilson), and number theoretic functions. We will derive results through basic computation [followed by proof]. You will improve your proof writing skills.

Academic Misconduct: Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. Academic misconduct is defined as all forms of academic dishonesty and the Student Conduct Code. In particular, Student Conduct Code Section IV.a.5 identifies the following violations: Submitting false information: Knowingly submitting false, altered, or invented information, data, quotations, citations, or documentation in connection with an academic exercise. All students need to be familiar with the Student Conduct Code. You can find it in the A to Z Index on the UM home page.

DISABILITY MODIFICATIONS: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Office of Disability Equity (ODE) for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with ODE, please contact them at 406-243-2243 or ode@umontana.edu. The ODE webpage is available at

https://www.umt.edu/disability/

Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.

ADD / DROP POLICIES and IMPORTANT DATES: **All dates are found at the Registrar's Webpage. Visit: https://www.umt.edu/registrar/calendar/spring-2022.php**
Acceptable reasons for a late drop are listed in the university catalog and include reasons such as accident, illness, family emergency or a change in work schedule. The following examples are not considered sufficient for a late drop: protecting GPA, forgetting to turn in the change slip, losing financial aid, losing eligibility to engage in sports.

Grading Distribution:

Homework/Recitation:	100 [10 x 10]
1 Mid-term:	100
1 Project:	50
Final Exam:	150
Total:	**400**

Grading Scale: 90-100 A ; 80-89.9 B ; 70-79.9 C ; 60-69.9 D ; Below 60 F

Homework/Recitation
In order to succeed in this course, it is important to attend lectures, take lecture notes and complete the homework assignments which include reading sections of the texts used in the course. Homework will be assigned regularly on Mondays and will be compiled by you in a homework notebook. The homework notebook will be collected before the mid-term and before the Final exam. It is important you maintain this book exclusively for your homework in an orderly manner. On Fridays there will typically be a recitation, run by the TA/LA at which time homework problems will be covered. The recitation is meant to be collaborative. In other words the TA/LA will not simply do the homework problems for you but discuss the concepts from the homework, encourage you to volunteer to present problems, and guide you towards solutions. This is the only way to become proficient at writing proofs- by subjecting them to scrutiny from your peers. Please do not copy other's homework- instead understand the process and write it up in your own words.

Mid-term and Final: A mid-term will be given in March, and a Final in May. It will cover the content from the lectures/homework. The format of the exams will be announced as the course progresses.

Project: Each of you will be assigned a "small" project in February that will be due on April 8. The project involves you working on one extended problem and maintaining a folder with materials I ask you to periodically put into it. After April 8, each of you will also be given 25 minutes each to present your project to the class. A write up of your solution/work is expected in the folder. A schedule will be given.

COVID-19 University Policies

- Drinking liquids and eating food is discouraged in the classroom
- Mask use is required within the classroom or laboratory.
- If you feel sick and/or are exhibiting COVID symptoms, please don't come to class and contact the Curry Health Center at (406) 243-4330.
- If you are required to isolate or quarantine, you will receive support in the class to ensure continued academic progress.
- Up-to-Date COVID-19 Information from the University of Montana is available at the UM Coronavirus Website: https://www.umt.edu/coronavirus
- The Office for Disability Equity (ODE) can provide additional service to students if their quarantine is extended.

SOME "FREE" ADVICE : *Factors that affect your grade*

• Readings/Lectures : It is your prerogative to keep up with the material.
• Attendance: Students are expected to attend class, and although class attendance is NOT a component of the course grade, absences will impact your performance since you will miss the material covered in the lectures and recitations. Late assignments will NOT be accepted.
• Make-ups: THERE ARE NO MAKE-UPS regardless of the reason. Exam make-ups will ONLY be given under special and extenuating circumstances, such as a death in the family or illness, provided that a note from the Health Service or doctor is furnished by the student AND permission is given by me prior to the exam.
• Come to class, work hard, participate in the planned activities, and you will do well in this course. Good luck and welcome to 326.