

Title: **Number Theory** (MAS 4203, Section U01A, Class Number 58308, Summer A, 2017)

Lecture Notes: MAS 4203 Number Theory (provided by the Instructor)

Description of the course (syllabus):

The course is an algebraic introduction to the elementary theory of numbers.

In the first third of the course (Sections 1-5 in the current version of the Notes), we will cover the standard topics on divisibility of integers. These include the long division algorithm and the related concepts of greatest common divisor and least common multiple, solving linear Diophantine equations (of two and more unknowns), and the Fundamental Theorem of the Arithmetic of the rational integers.

The second part of the course (Sections 6-12) develops the modular arithmetic, and is the heart of the course. This part is devoted to two fundamental results: the Quadratic Reciprocity Law of Gauss, and the structure of the groups of units modulo any integer $n > 1$. This includes in particular finding all integers $n > 1$ for which primitive roots modulo n exist. In this part, we prove the Chinese Remainder Theorem as an important tool in our considerations further in the course.

The third part of the course covers the classical topic of representation of integers as sums of two squares, and develops the fundamentals of Arithmetic Functions. In particular, we find the number of different presentation of an integer in a sum of two squares. We use one of the arithmetic functions to describe all even perfect numbers (after Euler).

Teaching Policy

After every section of the Notes covered in class, there will be a homework assignment posted on the web site of the course. Some of the problems from those assignments will be graded (there will be three "turn-in" assignments). The students' success in learning the material will also be assessed based on three Quizzes, one Midterm, and a Final Exam. These are scheduled as follows: Quiz #1 on May 15th, Quiz #2 on May 22nd, Midterm on May 31st, Quiz #3 on June 7th, Final Exam on June 16th. In forming the overall grade, the lowest graded quiz will be dropped out from consideration.

Grading policy

The overall grade of the students will be determined by taking

- 15% of the HW grades
- 15% of the Quizzes' grades
- 30% of the Midterms' grade
- 40% of the Final Exam grade.

Example: Suppose a student has A points total on the HW, B points total on the Quizzes, C points total on the Midterm Exams, and D points on the Final Exam. Suppose further that the maximal possible points one can get on these are A' , B' , C' , and D' respectively. Then, one computes a number S by the formula

$$S = [15*A + 15*B + 30*C + 40*D] / [15*A' + 15*B' + 30*C' + 40*D']$$

The overall grade of the student above is determined now by the scale:

$0.92 < S$: A	$0.89 < S < 0.92$: A-	$0.86 < S < 0.89$: B+
$0.78 < S < 0.86$: B	$0.75 < S < 0.78$: B-	$0.71 < S < 0.75$: C+
$0.62 < S < 0.71$: C	$0.58 < S < 0.62$: C-	$0.55 < S < 0.58$: D+
$0.49 < S < 0.55$: D	$0.46 < S < 0.49$: D-	$S < 0.46$: F

Make-up exams: No make-up exams will be given.

Note: The Instructor reserves the right to make changes in this Syllabus whenever academically acceptable.