

Campbellsville University
MTH 305-01
Number Theory

TEXTBOOK: Elementary Number Theory 7th edition by Burton

INSTRUCTOR: Chris Bullock
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OFFICE HOURS: MWF 11-12, 1-2 and TR 11-12:15 or by appointment

1. DESCRIPTION OF COURSE: This is a good introductory course to higher level mathematics. It is particularly appropriate for use in the teacher education program. The topics studied are divisibility properties of integers, prime numbers, congruencies, conditional congruencies, Fermat's theorem, The Quadratic Reciprocity Law, and Cryptography. Prerequisite: MTH 210 or consent of instructor.
2. STUDENT LEARNING OBJECTIVES: Students will gain an understanding of the fundamental concepts related to properties of number systems (particularly the integers). Students will demonstrate critical thinking skills by analyzing properties of number systems such as divisibility, prime numbers, and congruence modulo a natural number. (Mathematics program goal 1). Students will be able to prove theorems establishing mathematical truths by constructing logical arguments using appropriate mathematical language. (Mathematics program goal 2). Also, students will use technology to evaluate large powers of integers modulo a given natural number. Students will use technology readily available online to encrypt/decrypt messages intended to be securely understood only by the sender and receiver. (Mathematics program goal 4). Students' achievement of this goal will be measured by a project in which the students are to decode an encoded message provided to them by the instructor. All other objectives above will be assessed by homework and exams.
3. COURSE OUTLINE: Topics to be covered include:
 - Chapter 1: Preliminaries (Induction, Binomial theorem)
 - Chapter 2: Divisibility theory (division algorithm, greatest common divisor, Euclidean algorithm, Diophantine equations)
 - Chapter 3: Primes (fundamental theorem of arithmetic, sieve of Eratosthenes)
 - Chapter 4: Congruences (properties of congruences, linear congruences, Chinese remainder theorem)
 - Chapter 5: Fermat's theorem (Fermat's little theorem)
 - Chapter 6: Number-theoretic functions (sum and number of divisors)
 - Chapter 7: Euler (Euler's phi function, Euler's theorem)
 - Chapter 9: Quadratic reciprocity law (Legendre symbol, quadratic congruences)
 - Chapter 10: Cryptography (Public key cryptography)

4. **EVALUATION:** There will be a total of four tests including a final exam. Each test will be worth 100 points. Also, there will be a homework grade worth 100 points. Thus, there will be a total of 500 attainable points in this class. The grading scale will be as follows:

90-100% A
80-89% B
70-79% C
60-69% D
0-59% F

Homework will be assigned and graded after almost every class meeting. The percentage of earned points out of the total points will be recorded for each assignment. At the end of the semester, these homework grades will be averaged to get the final 100-point homework grade. This grade will then be averaged with the four test grades to obtain the final grade for the class.

5. **REQUIREMENTS:** The tentative dates for the exams are as follows:

Exam #1: Feb 3

Exam #2: Mar 3

Exam #3: Apr 7

Final: Thursday, May 7 from 11-12:30

6. **BOOKLIST:** Elementary Number Theory 7th ed. by Burton (required)
Elementary Introduction to Number Theory 3rd ed. by Long

7. **ATTENDANCE:** Campbellsville University has an attendance policy which states that a student who misses two weeks worth of a class (for any reason) receives a warning. Thus, any student missing 4 class periods in this class will receive a warning. Any student who misses four weeks worth of a class (for any reason) is automatically withdrawn from the class with a failing grade. Thus, any student missing 8 class periods in this class will be withdrawn from the class. PLEASE NOTE THAT, BY THIS POLICY, ANY ABSENCE COUNTS, WHETHER EXCUSED OR UNEXCUSED.

Attendance will be recorded by me every class period at the beginning of class. If you are late for class, you will be counted as absent. Also, if you leave class early, leave your seat, disrupt class, or distract anyone else in class by talking, you will be counted absent. The actions above show disrespect for others in class and thus will be penalized as noted.

You must notify me in advance if you are going to miss a test. You may contact me by phone or by e-mail. Make-up exams are possible if I am notified in advance and if I think the excuse is reasonable.

8. **DISABILITIES:** Campbellsville University is committed to reasonable accommodations for students who have documented physical and learning disabilities, as well as medical and emotional conditions. If you have a documented disability or condition of this nature, you may be eligible for

disability services. Documentation must be from a licensed professional and current in terms of assessment. Please contact the Coordinator of Disability Services at 270-789-5192 to inquire about services.

If you have a documented disability, you must provide the instructor with the paper from Disability Services. At that time, the instructor will give you a copy of the mathematics department disability guidelines.

9. EMERGENCY PHONE NUMBERS:
Security Cell Phone: 270-403-3611
Security Office Phone: 270-789-5556