

MATH 510
NUMBER-THEORETIC AND DISCRETE STRUCTURES

Nicholls State University, Fall 2006

Instructor: Dr. Brian Heck
Office: 106-E Peltier
Phone: 448-4383
Email: brian.heck@nicholls.edu
Webpage: blackboard.nicholls.edu

My office hours will be 9-1 and 2-3 (M, W) and 2-3 (T, Th). Please contact me (phone, email, or in person) during these times if you have any questions. If you need assistance at a different time, contact me and we'll work something out.

Prerequisite: Completion of or enrollment in MATH 509.

Text: There is no required text. We will use notes posted to Blackboard routinely throughout the semester.

Course Description (catalog): Primes, congruences, algebraic number theory, diophantine equations, and theory of algebraic equations. Applications of the theory of number systems to problem solving. Representation of phenomena via finite graphs, recursive relations, and combinatorial structures.

Course Description (instructor): This is one of four required MATH courses in the MCCM program. This program is uniquely designed to prepare students to teach mathematics at the community college/technical college level. It is the only program of its kind in the state. However, it is also useful to secondary teachers (providing additional mathematics content-area knowledge) and to students intending further graduate work. It is a very flexible and content-rich program.

In this course, our primary aim will be number theory. We will begin studying numbers in general, and in particular prime numbers, and then progress to congruences and equations. Using these essential tools, we'll then cover algebraic number theory, which is a mathematical field that studies abstract number systems similar in structure to the rational numbers and the integers. We will study other discrete mathematical objects (such as graphs) as time allows.

A few words need to be said about the Internet aspect of this course. All assignments, notes, announcements, etc will be posted on Blackboard. All students enrolled in an Internet course should have basic computer skills (such word processing, e-mail, navigating the Internet, etc). Some tips on preparing yourself for an online course are available at www.nicholls.edu/distance/requirements.htm. (As I write this, the Nicholls Website is in the process of being overhauled, so it is possible that this link may

change sometime during semester. I will update you to the new link if necessary.) As an online student, you will be self-paced. This therefore requires self-discipline and self-motivation. The problem sets need to be turned in on time. It is the responsibility of the student to notify the instructor of technical and/or personal problems that may interfere with online participation. All students must have an e-mail account that they check regularly. E-mail will be our primary means of communication. If you need more personalized assistance, I invite you to visit my office during office hours. Just like a typical class, instances of academic dishonesty, such as plagiarism, will not be tolerated.

Course Objectives: At the completion of the semester, a student will be able to:

- test integers for primality
- solve linear congruences
- solve algebraic equations, including diophantine equations
- classify numbers as prime, composite, algebraic, transcendental, arithmetic, perfect, etc...
- classify sets of numbers as a group, ring, or field
- find primitive roots, units, and quadratic residues
- prove theorems of number theory in a variety of methods, including mathematical induction
- evaluate and examine recursive functions
- analyze graphs
- perform permutations and combinations
- apply covered topics to problems involving cryptography, tournaments, and network flows

Grading Policy: Your course grade will be composed of a problem set grade (50%), an in-class midterm exam grade (25%), and a take-home final exam grade (25%).

Disability: If you have a documented disability that requires assistance, you will need to register with the Office of Disability Services for coordination of your academic accommodations. The Office of Disability Services is located in Peltier Hall, Room 100-A. The phone number is (985) 448-4430 (TDD 449-7002).