DISCRETE STRUCTURES

Math 574, Secs. 401/501 Fall, 2009

Course Syllabus

Professor: Jerry Griggs
Email: griggs@math.sc.edu or j@sc.edu
Office: LeConte 409 (x-7-4225)
Off. Hrs.: M 2:30–4:00, Th 2–3:30 (tent.) unless a seminar or trip interferes; If I'm around (which is most afternoons) and not tied up, I'll be happy to meet you! Just drop by and chat. You can also make an appointment. Enter through the main office, and tell the secretary you need to see me.

Text: *Discrete Mathematics and its Applications* 6th edition (2007), by K. H. Rosen. An additional reference, highly recommended by students in past terms, is the text, *Discrete Mathematics with Applications* by S. Epp. There is a *Schaum's Outline* book in discrete math that contains many worked examples.

Material: The course is intended in part as an introduction to the language and methods of "higher mathematics" The distinctive feature of the course is its emphasis on purely combinatorial methods, especially counting, and discrete structures (graphs or posets). This is in sharp contrast to the continuous (infinitesmal increment) arguments in calculus. The field has broad applications to such disciplines as

- Computer Science (design and analysis of efficient algorithms)
- Operations Research (scheduling, transport networks)
- Molecular Biology (sequencing and alignment of DNA; phylogenic trees)

Goals: Course Goals: Students will make progress with logical thinking, communicating mathematical ideas, and developing problem-solving skills (especially for a variety of "word problems").

Students will master the basic material on foundations of mathematics (logic and sets). They will learn how to do proofs by induction, not only for summation formulas, but for other types of mathematical statements. They will learn to master combinatorial problems about arrangements and selections of finite sets using the theory of permutations and combinations. Students will become familiar with basic properties of graphs.

Three special topics included in this honors course are:

(1) We will learn methods for attacking a range of beautiful problems about covering game boards by dominoes.

(2) We will be introduced to mathematical game theory through the classic game of *Bridg-it*. There will have a tournament, and we will consider whether there are any winning strategies.

(3) We will consider the problem of the cardinality of infinite sets (especially learning which of these sets, the integers, the rationals, and the reals, have the same cardinality).

Example: Pascal's Triangle

The course will be lecture-based, but we will often parallel the text and take many homework problems from it. The text contains many more examples than we have time to study in class. Most of our material is treated there in Chapters 1,3–6,8. Students often appreciate Epp's book or the Schaum Outline book for more worked out examples.

Homework: Homework assignments will be given weekly. It will NOT be collected. Instead, homework will be the basis for the quizzes. Students should make every effort to complete these assignments. Reading the material in the text corresponding to the assigned exercises is considered part of the assignment. Sudents are responsible for this material, whether or not it is discussed in lectures.

Grading: There will be three midterm exams and a comprehensive final.

Quiz average	100 points
3 exams	100 points each
Final Exam	200 points
Total	600 points

Each exam will be assigned letter grades on a separate curve based on the difficulty of the particular test. The same holds for the quizzes. The sum of the scores (out of a possible 600) will be compared to the sum of the grade cutoffs to determine the final grade. Classroom participation and any bonus credit will be also be considered in deciding the final grade.

I plan to give 7 quizzes (each announced in advance). The best 5 quizzes will determine the quiz average. *There are no make-up quizzes.*

By University requirement, graduate students in the class are required to complete additional work in the form of a project, which will be a paper or presentation on some application or research in discrete mathematics, or solutions of some challenging exercises. Other proposals will be welcomed. All sources must be carefully cited; your report needs to be original. The due date is **December 3**.

Bonus problems will be assigned occasionally, and opportunities exist for optional projects or presentations (meet with me).

Policies: Regular *attendance* is essential for success in math classes. So attendance will be checked at each class.

It is important that every answer be justified by showing enough reasoning or computations so that someone else can understand how it was obtained. I want you to make progress in communicating mathematical ideas.

Students are encouraged to form study groups to go over the course material and examples. Please be inclusive of class members.

Example: Venn Diagram