Math 3012 N: Applied Combinatorics  

Course Syllabus

**Professor:** Dr. Torin Greenwood  
**E-mail:** greenwood@math.gatech.edu

**Office:** Skiles 025  
**Webpage:** [http://www.math.gatech.edu/~tgreenwood3](http://www.math.gatech.edu/~tgreenwood3)

**Office Hours:** Mondays and Fridays from 11-12, Wednesdays from 4-5, or by appointment. E-mail me to set up a time.

**Lectures:** MWF 9:05 a.m. – 9:55 a.m. in Skiles 202


**Course Description:** “Elementary combinatorial techniques used in discrete problem solving: counting methods, solving linear recurrences, graph and network models, related algorithms, and combinatorial designs.”

**Prerequisites:** Math 1502 or Math 1512 (or Math 15X2 + Math 1522). CS students should complete CS 2050 before taking Math 3012.

**Outline of Topics:**
1. **Discrete Structures:** Graphs, digraphs, networks, designs, posets, strings, patterns, distributions, coverings, partitions.
2. **Enumeration:** Permutations, combinations, inclusion/exclusion, generating functions, recurrence relations, Polya counting.
3. **Algorithms and Optimization:** Sorting, spanning trees, shortest paths, Eulerian circuits, Hamiltonian cycles, graph coloring, planarity testing, network flows, bipartite matchings, chain partitions.

**Learning Outcomes:** Students should be able to understand and prove simple combinatorial and inductive proofs. Students will be familiar with the discrete structures in the course and be able to solve basic enumerative or optimization problems and implement the algorithms discussed.

**Grading Scheme:** Grades will be based on homework (10%), three midterm exams (60%), and a final exam (30%) according to the standard scale: A (90-100), B (80-89), C (70-79), D (60-69), F (0-59).

**Homework:** 10% of the final grade will be determined by homework. Homework will be assigned weekly, and will be due the following week (including “Dead Week”), typically on Fridays. Students are encouraged to collaborate, but must write up their solutions independently. Solutions must be written neatly and stapled together.
Exam dates:
- Midterm 1: September 18, in class. (Tentative)
- Midterm 2: October 16, in class. (Tentative)
- Midterm 3: November 13, in class. (Tentative)
- Final Exam: Friday, December 11, 8:00 a.m. – 10:50 a.m. (Firm)

Exam Arrangements: Students must notify me at least one week in advance for any non-emergency exam conflicts or arrangements. This includes absences due to official representation of the Institute or ADAPTS services. Absences on exam days are excused only for official representation of the Institute or documented medical emergencies. Official documentation of a medical emergency is required to be excused from an exam. When an exam has been excused due to official representation of the Institute, an individualized make-up exam will be given. Otherwise, the relevant portion of the final exam will be used to replace the exam grade.

Attendance: Regular attendance is expected. Students will be responsible for all material covered in lecture irrespective of their attendance.

Academic Integrity: Students are reminded of the obligations and expectations associated with the Georgia Tech Academic Honor Code and Student Code of Conduct, available online through the Office of Student Integrity and the Honor Advisory Council.

Student Support: Professor Greenwood holds regularly scheduled office hours, and students are strongly encouraged to drop by for help. Please come sooner rather than later. Free tutoring is provided by Georgia Tech through OMED or 1-to-1.

More Information:
- Announcements and grades will be posted on T-Square: http://t-square.gatech.edu
- There will be a Math 3012-N Piazza forum, accessible through T-Square, for online discussion. Any questions or comments of interest to more than one student should be posted on Piazza. Of course, posts must be respectful and courteous at all times.
- Everything else will be posted on the course website, accessible through T-Square.