

Math 315 Combinatorics Fall 2010

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Office Hours: Monday 12:30 – 1:20, 2:30 – 3:20
 Tuesday 10:30 – 12:00, 1:30 – 3:00
 Wednesday 12:30 - 1:20, 2:30 – 3:20
 Thursday By Appointment
 Friday 12:30 - 1:20

During these times I will try to always be in my office or nearby. You are also welcome any other time I'm in my office. Special appointments may be arranged as well.

Text: Alan Tucker, (2007), *Applied Combinatorics*, 5th Edition, Wiley.

Objectives: Combinatorics is the branch of mathematics that is concerned with arrangements of the elements of a set into patterns. Combinatorial problems can be loosely grouped into the following three general classes.

- *Existence*— Is there an arrangement that satisfies certain specified conditions?
- *Enumeration*— How many arrangements satisfy certain specified conditions?
- *Optimization*— Of all the arrangements that satisfy certain specified conditions, which are best?

In this course we will study a variety of combinatorial models and examine the classes of problems that can be solved using these models. Through the course activities you will expand your set of “mathematical tools” and hone your problem solving and analytical skills.

Structure: The class will consist of lectures/discussions and collaborative learning exercises. The material presented will overlap that of the text but will contain additions and variations.

We will have 2 exams during the semester — a midterm and a final. We will also have three or four short quizzes. The quizzes and exams will be designed to reinforce the material presented in the lecture as well as evaluate your mastery of the material.

You will be given a variety of homework assignments throughout the semester. Some of them may involve using the computer to implement methods discussed in class. You will usually have at least three or four days to work on them. You may also be asked to present material to the class as part of an assignment.

Due dates for the homework assignments will be announced when they are given. Assignments must be turned in at the **beginning** of class on the day due. A penalty of 15% per class period will be assessed on late assignments.

Attendance: While you are not graded directly on attendance, you are expected to attend each class. Your attendance has a strong indirect impact on your grade. Also, your attendance will be used to boost your grade as follows. The attendance portion of your grade will be the percentage of classes for which you are actively present. This percentage will replace 5% of the lowest of the other four components. If you must miss a class for any reason, you are responsible for any material covered in your absence. If you must miss an exam or quiz, you will need to contact me before the next class period to schedule a make-up.

Grades: Final grades will be based on the following percentages.

Homework assignments	20 - 25 %
Quizzes	20 - 25 %
Mid-term Exam	20 - 25 %
Final Exam	20 - 25 %
Attendance & Participation	5 % (Bonus!!)

Academic Dishonesty:

Acts of dishonesty will be handled in accordance with SMSU's academic dishonesty policy. While you are encouraged to collaborate when working on homework assignments, you should not share your finished work with someone else nor ask someone else to share theirs with you.

Semester Schedule (Tentative)

This outline is only meant as a rough guide for the semester. Some topics listed may be abbreviated or eliminated. Additional topics may be introduced. The material covered for each topic, the exact nature of the assignments and the pace of the course will be dependent on how we progress as a class.

I. Topics in Graph Theory

- A. What is a Graph (Ref: Section 1.1)
- B. Graphs as Models (Ref: Section 1.1)
- C. Isomorphism (Ref: Section 1.2)
- D. A Combinatorial Principle (Ref: Section 1.3)
- E. Planarity (Ref: Section 1.4)

Quiz 1

- F. Euler Paths and Cycles (Ref: Section 2.1)
- G. Hamilton Paths and Circuits (Ref: Section 2.2)
- H. Graph Coloring (Ref: Section 2.3 – 2.4)
- I. Trees (Ref: Section 3.1)
- J. Algorithms Using Trees (Ref: Section 3.2 – 3.5)

Quiz 2

Exam 1

II. Basic Counting Principles

- A. Addition and Multiplication (Ref: Section 5.1)
- B. Arrangements and Selections (Ref: Section 5.2)
- C. Repetition (Ref: Section 5.3)
- D. Distributions (Ref: Section 5.4)
- E. The Binomial Theorem (Ref: Section 5.5)

Quiz 3

III. Generating Functions

- A. Ordinary Generating Functions (Ref: Section 6.1 – 6.3)
- B. Exponential Generating Functions (Ref: Section 6.4)

IV. Recurrence Relations

- A. Definitions and Applications (Ref: Section 7.1)
- B. Divide and Conquer (Ref: Section 7.2)
- C. The Master Theorem (Ref: Chapter 7.3)
- D. Linear Homogeneous Relations (Ref: Section 7.4)
- E. Linear Inhomogeneous Relations (Ref: Section 7.5)
- F. Using Generating Functions (Ref: Section 7.6)

Quiz 4

Final Exam: The final exam will be cumulative and given during the final exam period for this class. Make your travel plans accordingly. The final exam is scheduled for 10:00 AM on Tuesday Dec. 14.