Syllabus for
Introduction to Combinatorics, 2 (1995 Spring)

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Textbook. **Applied Combinatorics** by Fred Roberts.

Overview. We'll start with graph matching theorems; Hall's, König's and the Stable Marriage Lemma. We'll then move to network flows. We'll also cover the principle of inclusion-exclusion.

A good portion of most Fridays will be devoted to Combinatorial games. We'll start with a careful analysis of Nim and work our way to Grundy values for games. If time permits, we'll explore Smith's theory of Loopy Games.

A major topic for the second semester will be generating functions. Students should review, seriously, the section on Taylor Series in their calculus books. I also recommend looking at the Taylor Series section of Tom Apostol's book *Calculus*.

Notebook. Please obtain a looseleaf notebook in which to place all hand-outs, your exams, solution sheets, and other materials. I recommend that you bring your text to each class; certainly bring the the notebook.

Opportunities to show off (Otso). Currently, my intension is to have 3 take-home exams (with folks possibly working in teams), with the last Otso playing the role of a final.

Homework. I'll collect homework every Monday. I'll usually look at only one problem of the homework; sometimes we'll simply do the problems in class. Please write problem numbers as in "P28#12", which means problem 12 on page 28 of our text.

Other problems will be called "H problems". Whenever you hand in an H problem, ensure that your write-up *starts with a careful statement of the problem.*

The computer. Everyone has (or will be given) an account on the math dept computer system for exploring combinatorial ideas. Programs that you may use include *Maple* and *Mathematica*. Everyone will need to learn how to send and receive email; many of the homework assignments will be distributed by email. You can learn how to use email by reading the Sun Starter and other handouts which I will pass out.

Grades. I'll hand out a sheet later in the week with exam dates as well as the percentage each exam counts. Class participation and homework will count for about 10%–15%.

Books to inspire a delight in Mathematics.
Mathematical Plums, by Ross Honsberger; `QA7.M34447`.
   Mathematical Gems (I, II, III), by Ross Honsberger; `QA 241 .H63`
   Mathematical Circles Revisited and **Mathematical Circles Squared**, both by Howard Eves.

Conclusion. You are welcome –indeed, encouraged– to work on homework problems together. I may assign some communal homework projects. Combinatorics, when taught well, is a fascinating subject. When reading science articles in the newspaper or textbooks in scientific subjects, keep your eyes open for examples where combinatorial ideas were used to solve a real-world problem. Then bring this example to class —and teach me something!   *J. King*