

## Syllabus for Math 528

Summer 2009

Instructor: Professor Richard Grassl

TEXT: Discrete and Combinatorial Mathematics, Grassl/Mingus – Wiley Custom Services  
Notes on Bell, Catalan, Fibonacci and Stirling numbers

Course Prerequisite: Undergraduate degree in mathematics and/or instructor advisement along with willingness to put forth a strong, consistent effort from beginning to end.

### Course Goals:

- a) Deepen understanding of discrete mathematics
- b) Pay explicit attention to problem solving methods and proof techniques.
- c) Increase students' understanding of the mathematical process by encouraging them to formulate and test conjectures, and by introducing open questions.
- d) Increase student appreciation and facility with algorithmic reasoning.

### Core Ideas – Questions

- a) Why is the idea of proof important?
- b) How can we make **CONCRETE** the connections that exist between discrete and continuous mathematics?
- c) Why do we care about patterns so much?
- d) What is the value in doing things over and over again? Recursive thinking is a core idea in discrete mathematics.
- e) How useful is the idea of a one-to-one correspondence?

Course Content: Data collection and conjecturing, sequences, finite differences, binomial coefficients, binomial theorem, principle of inclusion – exclusion, derangements, induction, telescoping sums, generating functions, recursions, logic, methods of proof, graph theory, and special sequences

Course Objectives: Consistent with the NCTM Curriculum and Evaluation Standards for School Mathematics the following objectives are targeted:

- Represent problem situations using discrete structures such as finite graphs, matrices, sequences and recurrence relations.
- Develop and solve recursive algorithms.
- Develop and use counting techniques to solve combinatorial problems.

Approaches to learning these topics include using technology, projects, cooperative learning, and considerable classroom discussion.

**Course Activities:** You will be required to read the majority of the text material, work and submit selected problems, work in groups on small projects, and complete several take home assignments. Choices of the projects include:

- Bell numbers
- Catalan numbers
- Fibonacci numbers
- Stirling numbers
- Linear partitions
- Leibnitz Harmonic triangle
- Generalized Pascal triangle
- Twelve days of Christmas triangle
- Triangular numbers

**Evaluation:** Your course grade will be based on your increasing success on the evaluation instruments. There is no curve, so you should work closely with one another.

Evaluation instruments:

1. Class participation and presentations
2. Two take home exams
3. Projects

**Accommodations:** Students who believe that they may need accommodations in this class are encouraged to contact Disability Support Services at (970)351-2289 as soon as possible to ensure that accommodations are implemented in a timely fashion.