MATHEMATICS 30 – Special Topics in Mathematics – Syllabus (Spring, 1987)

Topic: Combinatorial and Discrete Mathematics

Text: Discrete and Combinatorial Mathematics, an Applied Approach, by Ralph P. Grimaldi, Addison-Wesley, 1985.

Course Outline (based on text above)

1. **Basic counting techniques – 2 weeks – chap. 1**
   - Rules of sum and product, permutations
   - Combinations
   - Combinations with repetition

2. **The language of logic and set theory , 1- ½ weeks – Chap. 2 Sect. 1-4**
   - Propositional calculus and truth tables – lightly
   - Sets, set operations, set theoretic identities

3. **Relations and functions and their uses in counting – 3 weeks – Chap.3, Chap. 5, Sect. 1-3**
   - Functions
     - Injections, surjections, counting these, Stirling numbers of 2^{nd} kind Pigeonhole principle
     - Composition, bijection, inverses
   - Relations
     - Properties, examples
     - Partial orders
     - Directed graphs – introduction

4. **Inclusion and Exclusion – 1 week – Chap. 7 Sect. 1-3**
   - Basic principles and examples (Omit Euler ø-function), Stirling numbers again
   - Derangements

5. **Generating functions – 2 weeks – Chap. 10 Sect. 1-4**
   - Definitions and examples
   - General binomial coefficient, nCr for n e R
   - Partitions and Ferrers diagrams
   - Exponential generating functions

6. **Graphs – 3 weeks – Sect. 5.2 again, Chap. 14 Sect. 1-4, optional 14.5, 14.6**

Introduction and examples

Subgraphs, complements, isomorphism

Vertex degree and Euler paths and cycles

Planar graphs: statement of Kuratowski's theorem

Optional: Hamilton paths and cycles

Graph coloring, chromatic polynomials

Total 12-1/2 weeks

1-1/2 weeks – exams and review