College of San Mateo
Course Outline

___ New Course
X Course Revision

(Revised by memo 10/08/09)
Date: October 22, 2007

Department: Mathematics **Number:** 268

Course Title: Discrete Mathematics **Units:** 4

Hours/Week: **Lecture:** 4 **Scheduled Lab:** 0 **By Arrangement**: 1

Length of Course

X Semester-long
___ Short course (Number of weeks___)
___ Open entry/Open exit

Grading

___Letter
___ Credit/No Credit
X Grade Option (letter or Credit/No Credit)

1. Prerequisite (Attach Enrollment Limitation Validation Form.)

Math 251 or other measures as appropriate.

2. Corequisite (Attach Enrollment Limitation Validation Form.)

None

3. Recommended Preparation (Attach Enrollment Validation Form.)

Read 400 or 405.

4. Catalog Description (Include prerequisites/corequisites/recommended preparation.)

268 Discrete Mathematics (4) *Minimum of sixty-four lecture hours; plus 16 hours by arrangement per term.* ***Prerequisite:*** *MATH 251 OR other measures as appropriate.* ***Recommended Preparation:*** *READ 400 or 405.* Covers topics in discrete mathematics with particular emphasis on applications to computer science. Includes logic, sets, functions and relations, mathematical induction, recursion, Boolean algebra, elementary number theory, probability, algebraic structures, statistics, graphs, counting, and combinatorics. Extra supplies may be required. (AA, CSU: Area B4, UC: Area 2A)

5. Class Schedule Description (Include prerequisites/corequisites/recommended preparation.)

Math 268 DICRETE MATHEMATIC Covers topics in discrete mathematics with particular emphasis on applications to computer science. Includes logic, sets, functions and relations, mathematical induction, recursion, Boolean algebra, elementary number theory, probability, algebraic structures, statistics, graphs, counting, and combinatorics. Plus one hour by arrangement per week. Extra supplies may be needed. Prerequisite: MATH 251 or other measures as appropriate. *Recommended Preparation: READ 400 or 405.* (CSU/UC)(CSCI MATH 26)

6. Student learning Outcomes (identify 1-6 student learning outcomes using active verbs).)

The student will:

A. Develop analytical thinking
- Answer the question, "What is the problem really asking?" and identify the pertinent given information.
- Break complex problems into manageable smaller problems.
- See relationships between concepts, notational representation, and problem situations.
- Solve problems that cannot be reduced to algorithms

B. Demonstrate resourcefulness in problem solving
- Choose appropriate methods
- Synthesize appropriate strategies, techniques or information from prerequisite courses
- Use geometric context as a guide.
- Recognize and analyze erroneous or impossible solutions

C. Verify assertions expressed in mathematical language
- Write, read, and understand mathematics as written in mathematical symbolism and wording.
- Form and assess mathematical conjectures
- Verify identities
- Apply counter examples

D. Synthesize ideas expressed in mathematical language
- Read mathematical writing with understanding.
- Demonstrate a basic understanding of proof
- Communicate arguments clearly

E. Develop confidence in ability to employ mathematical strategies.

7. Course Objectives (Identify 5-8 expected learner outcomes using active verbs.)

Students can:

- Build and interpret logical statements with proper quantification.
- Recognize valid and invalid logical arguments.
- Use basic argument forms singly and in complex combinations.
- Use quantifiers and predicates.
- Build correct logical arguments to prove or disprove logical statements.
- Prove or disprove statements in elementary number theory using direct and indirect proof methods.
- Use unique factorization, the quotient remainder theorem and the Euclidean algorithm.
- Prove statements using mathematical induction.
- Perform basic operations with sets.
- Prove and disprove statements about sets.
- Solve counting problems using elementary laws for counting, permutations, combinations
- Find probabilities using counting ideas.
- Solve problems using the Binomial theorem and binomial coefficients.
- Work with functions, and inverse functions, composition of functions, recognizing domain, co-domain, and range, and recognizing one to one and onto.
- Use one-to-one correspondence to prove sets countably infinite.
- Solve recurrence relations.
- Classify functions using Big-oh notation.
- Show relations are or are not equivalence relations, and identify equivalence classes.

- Perform tasks with basic graphs, Euler graphs, Hamiltonian graphs, trees.
- Perform tasks with regular expressions and finite state automata.

8. **Course Content** (Brief but complete topical outline of the course that includes major subject areas [1-2 pages]. Should reflect all course objectives listed above. In addition, you may attach a sample course syllabus with a timeline.)

- Logical statements, truth tables, arguments.
- Conditionals, contrapositive.
- Argument forms.
- Quantifiers and predicates.
- Direct and indirect proof, proof by cases.
- Proof in elementary number theory.
- Unique factorization, quotient-remainder theorem, Euclidian algorithm.
- Build and interpret logical statements with proper quantification.
- Set, basic set operations, proof propositions involving sets.
- Counting theory, permutations, combinations, basic probability.
- The Binomial theorem.
- The Pigeon Hole principle.
- Functions, inverse functions, composition of functions.
- One to one and onto.
- Countable infinity.
- Recurrence relations.
- Big Oh notation.
- Equivalence relations.
- Graphs, Euler graphs, Hamiltonian graphs, and trees.
- Regular expressions and finite state automata.

9. **Representative Instructional Methods** (Describe instructor-initiated teaching strategies that will assist students in meeting course objectives. Include examples of out-of-class assignments, required reading and writing assignments, and methods for teaching critical thinking skills.)

A. Out-of-class assignments: problem sets requiring students to compute, solve, construct, prove, and assess.

   - Example: A group of 8 people are attending the movies together. Two of them insist on sitting together. In how many ways may the 8 be seated in a row?
   - Example: Prove: The product of any four consecutive integers is divisible by 8.

B. Required reading assignments: assignments requiring the student to read sections of the (discrete mathematics) textbook and/or selected materials supplied by the teacher.

   - Example: Read the section in the textbook on Division into Cases and the Quotient-Remainder Theorem.

   - Example: Read the instructor's handout on RSA Cryptography.

C. Required writing assignments:

D. Students will be required to explain concepts and compose logical arguments in writing assignments.

- Example: Prove or disprove: If an integer is a perfect square then its cube root is irrational.

E. Methods for teaching critical thinking: Assignments (see 1 and 3 above) that require students to calculate, judge, assess, construct, and solve. Also students will be encouraged to discuss and debate conceptual questions in classroom discussion. And of course students are always encouraged to question whatever the teacher or other students do.

- Example: f(n) = 2n is a mapping from the integers into the integers. Is f one to one? Prove or give a counter-example. Is f onto? Prove or give a counter-example

- Example: Do the set of real numbers more than 0 and less than one and the set of real numbers more than 0 and less than 2 have the same cardinality? Why or why not?

F. Other methods: Collaborative work in or out of class. Work using computer software.

10. Representative Methods of Evaluation (Describe measurement of student progress toward course objectives. Courses with required writing component and/or problem-solving emphasis must reflect critical thinking component. If skills class, then applied skills.)

A. Problem sets – These consist of sets of exercises assigned frequently. Questions may require proof, calculation (calculate the number of arrangements), proof, construction of discrete mathematical objects (construct a quotient finite state automaton), judgements about discrete mathematica objects (are these two sets equal), and explanation of why.

B. Quizes – These are short examinations on the areas covered in the problem set.

C. Exams – Longer examinations. May be cumulative.

D. Writing assignments – Require extended logical argument and explanation of mathematical assertions, concepts, and processes.

12. Representative Text Materials (With few exceptions, texts need to be current. Include publication dates.)

Discrete Mathematics with Applications, 3rd Ed., Susanna Epp, 2003, Brooks-Cole.

Prepared by: _____
(Signature)

Submission Date: _____