Math 1 Sec ____ SPRING 2005

Title: Mathematical Reasoning (GE area B4)

Description Catalog: This course is recommended for students whose majors do not include a specific mathematics requirement. The course objectives are to show some of the essence and quality of mathematics, and to enhance precision in the evaluation and expression of mathematical ideas, thereby developing a student's quantitative reasoning skills. This course is designed to give students an understanding of some of the vocabulary, methods, and reasoning of mathematics with a focus on ideas.

Course: The primary purpose of the course is to give students an understanding of so me of the vocabulary, methods, and reasoning of mathematics. The focus is on the ideas of mathematics, and on giving students an understanding of why results hold - and not on learning specific results, techniques, or skills. Students will be given periodic writing assignments that encourage them to think through concepts of the course. The specific topics covered in this will be Numeration Systems, Logic, Probability, and Geometry. These topics can be applied to a wide variety of subject areas

Prerequisites: Math 9 or three years of high school mathematics that includes two years of algebra and one year of geometry and completion of the ELM requirement.

Learning Objectives:
Understand and appreciate the essence of mathematics
See and appreciate the quality, elegance, and beauty of mathematics, and overcome the fear of mathematics.
Enhance precision in the evaluation and expression of ideas, and thereby develop quantitative reasoning skills.
Introduce the vocabulary, methods and reasoning from several topic areas.

Text: Mathematical Ideas (10^{th} ed) by Miller, Heeren & Hornsby

Coverage: Chapters 1, 2, 3, 5, 6, 11, 12, 13 & 14. Handouts will be given outlining the material to be covered as the course progresses.

Writing Component: This is an area B4 GE course and has a writing component. To satisfy the writing requirement graded assignments involving writing and understanding of complex technical prose, interpretation of theoretical ideas, and the use of mathematical ideas will be part of the course.

Assignments: A variety of reading and problem solving assignments will be part of the course.

Examinations: There will be three midterm examinations and a comprehensive final examination for this course.

The examination schedule is given below.

Midterm I	Feb. 16
Midterm II	Mar. 16
Midterm III	Apr. 27
Final	May 18

Grading: Written work is scored on the following scale and your grade in this course is assigned according to the following percentages.

Homework	150 (10.0%)	88% - 100%	A
Midterms (150 pts each)	450 (45.0%)	76% - 87%	B
Final	400 (40.0%)	65% - 76%	C
		50% - 64%	D
Total	1000	below 50%	F

Drops: You may drop this course without penalty until and including March 4th. On or after March 10th you must be passing this course (have a grade of C or better) and must have a written medical excuse from a M.D. in order to drop this course without penalty.

Topics: (About 2.5 weeks for each topic)

I. Numeration Systems
   a. History of numbers and numerals
   b. Historical numeration systems (i.e., simple grouping, multiplicative, positional, etc.)
   c. Computations in bases other than 10

II. Logic
   a. Logical connectives and compound statements
   b. Truth tables
   c. Negation of statements (including De Morgan's Laws, negation of for all, there exists)
   d. Valid arguments
   e. Circuit theory

III. Sets
   a. Set relations and operations
   b. Venn diagrams
   c. Relationship between sets and logic
   d. Applications of sets
   e. Infinite sets

IV. Combinatorics
   a. Counting methods
   b. Permutations
   c. Combinations

V. Probability
   a. Sample spaces and composite events
   b. Properties of probability
   c. Conditional probability
   d. Independence
   e. Expectation

VI. Geometry
   a. Axioms of Euclidean Geometry
   b. Non-Euclidean Geometry
   c. Eulerian Circuits
   d. Hamiltonian Circuits
   e. Tilings

VII. Algebra and Number Theory
   a. Primes
   b. Congruence
   c. Integers mod n
   d. Introduction to Abstract Algebra