ELEMENTS OF MODERN MATH
MA 602

Course Description

This course includes an introduction to sets; elementary work with unordered fields, finite fields, and ordered fields; elements of number theory; systems of numeration; introduction to logic; nonmetric and informal geometry; and growth of the number system.

Goals of the Course

1. To deal with abstract symbols and comprehend their use.
2. To develop an understanding of logic.
3. To develop an understanding of algebraic structure.
4. To enhance the ability of the student to construct and to appreciate proofs.
5. To establish mathematical models for conceptual understanding.
6. To develop an awareness of the contributions of mathematics to other branches of learning.
7. To increase the mathematical maturity of the student and prepare students for Modern Algebra I.

Instructional Procedures

1. Lecture/Discussion
2. Problem Solving or group work on proofs.
3. Delivery of Research Paper prepared by the student.
4. Daily homework assignments and in-class discussion of solutions.

Course Content

I. Logic
   a. Sentences and Symbols
   b. Truth Value
   c. Tautology and Equivalence
   d. Conditional Forms
   e. Quantifiers

II. Mathematical Proof
   a. Direct Proof
   b. Conditional Proof
   c. Indirect Proof
   d. Proof by Cases
   e. Existence Proofs
   f. Mathematical Induction
   g. Overgeneralization and Counter Example

III. Set Theory
   a. Sets and Operations
   b. Counting and Cardinality
   c. Classification Problems
   d. Algebra of Sets
   e. Proofs of Set Theorems

IV. Relations
   a. Binary Relations
   b. Equivalence Relations
   c. Inequality Proofs
   d. Divisibility Groups

V. Introduction to Mathematical Systems

Evaluation Methods

1. Examinations
2. Problem Assignments
3. Class Participation
4. Research Paper

Bibliography

Required Text:

Lucas, John, Introduction to Abstract Mathematics, 2nd Ed., Ardsley House, 1990.

Supporting Bibliography

Avelsgaard, Carol, Survey of Modern Math, Scott, Foresman & Co., Glenview, Ill., 1990.

Barnier, William & Feldman, Norman, Introduction to Advanced Mathematics, Prentice Hall, Englewood Cliffs, N.J., 1990.

Cupillari, Antonella, The Nuts and Bolts of Proofs, Wadsworth Publ. Co., Belmont, Ca., 1989.

Fletcher, Peter & Patty, C. Wayne, Foundations of Higher Mathematics, ITP/PWS-Kent, Boston, Mass., 1988.

Galovich, Steven, Doing Mathematics, Saunders Publishing Co., Orlando, Fla., 1993.

Miller, Charles D. & Heeren, Vern E., Mathematical Ideas, Scott, Foresman & Co., Glenview, Ill., 1982.

Smith, Eggen, Andre, A Transition to Advanced Mathematics, ITP/Brooks/Cole Publ. Co., 4th Ed., 1997.

Solow, Daniel, The Keys to Advanced Mathematics, Books Unlimited, Cleveland, Ohio, 1995.