

PROFESSIONALIZED SUBJECT MATTER IN ALGEBRA

Ma 510

Course Description

This course provides the students with a reappraisal of the fundamental concepts in algebra. Emphasis is placed on the manner in which these concepts can be used to teach algebra more effectively. This course demands evidence of effective use of these concepts in the student's own classroom. Topics include: number, set, relations, functions, operation structure, and problem solving.

Goals of the Course

1. To enhance the student's appreciation of the importance and scope of algebra.
2. To enhance the depth of the student's understanding of elementary and intermediate algebra.
3. To provide suggestions and materials for the teaching of algebra in the secondary schools.
4. To increase familiarity with technological tools which can enhance the teaching and learning of algebra.
5. To investigate the relationship between algebra and geometry, trigonometry, probability, and problem-solving.
6. To extend the student's familiarity with various forms of assessment.
7. To increase awareness of professional literature in algebra education.

Instructional Procedures

This course should provide a model for the teaching of algebra with emphasis of the use of technology to enhance learning. Students should take an active part in the presentation of topics.

Course Content

1. The nature and extent of professionalized subject matter in algebra.
2. Concepts of number, sets, relations, functions, and operations structure.
3. Algebraic models and their relation to numerical and graphical data.
4. Integration of algebra with geometry, trigonometry, probability, and problem-solving.
5. Introduction to the history of the development of algebra.
6. Exposure to applicable educational software and graphics calculators.
7. Algebraic models in problem-solving.

Methods of Evaluation

1. Class participation in group work.
2. Preparation of written analyses, special assignments, and projects.
3. Individual presentations of problems.
4. Written final examination or final project.

Bibliography

A. Required Text:

Burke, Maurice, and others (Eds.), Navigating through Algebra in Grades 9-12, National Council of Teachers of Mathematics, 2001.

Concepts in Algebra: A Technological Approach, University of Maryland and Pennsylvania State University, Janson Publications, Inc. Dedham, MA, 1996.

Heid, M. Kathleen, et al., Algebraic in a Technological World: Addenda Series, Grades 9-12, National Council of Teachers of Mathematics, 1995.

B. Additional Required Reading:

Coxford Arthur F., The Ideas of Algebra, K-12 (1988 Yearbook), National Council of Teachers of Mathematics, Reston, VA, 1988.

National Council of Teachers of Mathematics, Principles and Standards for School Mathematics, Reston, VA, 2000.

National Council of Teachers of Mathematics, Curriculum and Evaluation Standards for School Mathematics, Reston, VA, 1989.

C. Supporting Bibliography:

Coultas, June, James Swalm, and Frank Gelbwasser, Strategies for Success in Mathematics (HSPT 11 Level), Berrent Publications Inc., Roslyn, NY, 1993.

Masalski, William J., How to Use the Spreadsheet as a Tool in the Secondary School Mathematics Classroom, National Council of Teachers of Mathematics, Reston, VA, 1990.

National Council of Teachers of Mathematics, Assessment Standards for School Mathematics, Reston, VA, 1995.

National Council of Teachers of Mathematics, Historical Topics for the Mathematics Classroom, Reston, VA, 1989.

National Council of Teachers of Mathematics, Professional Standard for Teaching Mathematics, Reston, VA, 1991.

D. Relevant Periodical Sources:

“Algebraic Thinking,” focus issue of Mathematics Teacher, February 1997.

“Algebraic Thinking,” focus issue of Mathematics Teaching in the Middle School, February 1997.

“Algebraic Thinking,” focus issue of Teaching Children Mathematics, February 1997.

Mathematics Teacher, National Council of Teachers of Mathematics.

Mathematics in the Middle School, National Council of Teachers of Mathematics.

HIMAP (High School Mathematics Applications) Pull-Out Section of Consortium, COMAP (Consortium for Mathematics and Its Application).

E. Other Resources:

Videos:

The Theorem of Pythagorus by Tom M. Apostol, Project Mathematics, California Institute of Technology, 1988.*

Software:

Algebra Shop*