

PROFESSIONALIZED SUBJECT MATTER IN GEOMETRY

Ma 512

Course Description

This course provides a review of fundamental concepts of geometry and an investigation of their significance in the teaching of secondary school mathematics. Concepts to be analyzed include: logic, proof, and axiomatic systems, physical and geometric models; sets, relations and transformations; non-metric and metric concepts; duality and dimensionality; coordination of spaces. Attention is given to historical considerations bearing on the teaching of geometry, integration of geometry with algebra and science, and significant literature on the subject. This course requires evidence that the student is making effective use of these concepts in the student's own classroom.

Goals of the Course

1. To review and extend basic concepts of geometry.
2. To investigate the significance of fundamental concepts of geometry in the teaching of secondary school mathematics.
3. To provide materials designed to improve the teaching of secondary school geometry.
4. To investigate the role of axiomatics in secondary school geometry.
5. To explore the interaction of modern algebra and modern geometry in the new curricula for secondary school geometry.
6. To increase familiarity with past and present literature in the -field of professionalized subject matter in geometry.

Course Content

1. The nature and extent of professionalized subject matter in geometry.
2. Axiomatic systems, logic, and proof.
3. Models in geometry.
4. Integration of geometry with science, algebra, and trigonometry.
5. Sets, functions, and relations in geometry.
6. Transformations and geometry.
7. Duality in geometry.
8. Dimensionality and coordination of spaces in geometry.
9. Non-Euclidean geometries

Bibliography:

Brumbaugh, Douglas K., and David Rock, *Teaching Secondary Mathematics*, 2nd ed. Mahwah, New Jersey. Lawrence Erlbaum Associates, 2001.

Day, Roger, Paul Kelley, Libby Krussel, Johnny W. Lott, and James Hirstein, *Navigating through Geometry in Grades 9-12*, National Council of Teachers of Mathematics, 2001.

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

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

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

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

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

Nelson, Roger, *Proofs Without Words: Exercises in Visual Thinking*, Washington D.C.: Mathematical Association of America, 1993

O'Daffer, P. and Clemens, S., *Geometry: An Investigative Approach*, Reading, Mass, Addison-Wesley, 1992

Sved, Marta, *Journey into Geometries*, Washington, D.C.: M.A.A., 1991

Wallace, E. and West. S., *Roads to Geometry*, Englewood Cliffs, N.J.: Prentice-Hall. 1992