OFFICIAL SYLLABUS

MATH 532-GEOMETRIC CONTENT, PEDAGOGY, AND CONNECTIONS

Effective Fall 2012

CATALOG DESCRIPTION: A focused look at geometric content, best practices in pedagogy, and connections to other areas.

Prerequisites: *MATH 250 or consent of instructor. Within the Department of Mathematics and Statistics, credit can only be earned for the Post-Secondary Mathematics option.*

Textbook: Mathematics for High School Teachers: An Advanced Perspective, by Usiskin, Peressini, Marchisotto, & Stanley

Chapter 1: What is Meant by "An Advanced Perspective"

Chapter 7: Congruence

- 7.1.1 Euclid's *Elements*
- 7.1.2 Deduction and proof
- 7.1.3 General properties and definitions
- 7.1.4 Definitions of congruence from Euclid to modern times
- 7.2.1 Translations
- 7.2.2 Rotations
- 7.2.3 Reflections
- 7.2.4 Glide reflections
- 7.2.5 Are there other congruence transformations?
- 7.2.6 Congruent graphs
- 7.3.1 Reflection symmetry
- 7.3.2 Other congruence transformation symmetries
- 7.4.1 Sufficient conditions for congruence
- 7.4.2 Concept analysis: analyzing a geometric figure
- 7.4.3 General theorems about congruence

Chapter 8: Distance and Similarity

- 8.1.1 What is distance?
- 8.1.2 Minimum distance problems
- 8.1.3 Extended analysis: locus problems
- 8.1.4 Distance on the surface of a sphere
- 8.2.1 When are two figures similar?
- 8.2.2 Similarity of graphs
- 8.2.3 Similar polygons
- 8.2.4 Similar arcs
- 8.2.5 When many theorems become one
- 8.2.6 Types of similarity transformations
- 8.3.1 Geometric means
- 8.3.2 Similarity and parallel lines

Chapter 9: Trigonometry

- 9.1.1 Angle measure and arc length
- 9.1.2 The trigonometric ratios
- 9.1.3 Extended analysis: indirect measurement problems
- 9.2.1 The trigonometric functions
- 9.2.2 Modeling with trigonometric functions

9.2.3 The historical and conceptual evolution of trigonometry
9.3.1 Algebraic properties of the trigonometric functions
9.3.2 Geometric properties of the sine and cosine functions
9.3.3 Analytical properties of the sine and cosine functions

Chapter 10: Area and Volume
10.1.1 What is area?
10.1.2 Area formulas for triangles
10.1.3 Extended analysis: the line through a given point minimizing area
10.1.4 From polygons to regions bounded by curves
10.1.5 The problem of quadrature
10.1.6 Area as representing probability
10.2.1 What is volume?
10.2.2 From cubes to polyhedra
10.2.3 From polyhedra to spheres
10.3.1 Surface area
10.3.2 The Isoperimetric Inequalities
10.3.3 The Fundamental Theorem of Similarity
10.3.4 Fractional dimension

Chapter 11 – Axiomatics and Euclidean Geometry
11.1.1 Axioms for incidence
11.1.2 Axioms for betweenness
11.1.3 Congruence and the basic figures
11.1.4 Geometry without the Parallel Postulate
11.1.5 Euclid's Fifth Postulate
11.2.1 The Cartesian Coordinate system
11.2.2 Verifying the definition of Euclidean geometry: the relationship between a mathematical theory and its models