

## **MATH 423 Advanced Mathematics for Teaching**

### 1. Catalog Description

#### **MATH 423 Advanced Mathematics for Teaching (4)**

Introduction to mathematics education research and advanced exploration of the mathematics taught in California's public high schools and middle schools through problem analysis, concept analysis, and problem connections. 4 lectures. Prerequisite: MATH 442 and MATH 481.

### 2. Required Background or Experience

Math 442 and Math 481.

### 3. Learning Objectives

Students will gain a deep and connected understanding of the mathematics content they may be responsible for teaching at the secondary level. Course content may include:

- a. Reading and critiquing of mathematics education research and literature.
- b. Solving mathematics problems and modeling mathematics concepts using concrete manipulatives.
- c. Properties of the rational, real, and complex numbers.
- d. Real functions, including limit behavior, multiple representations, monotonicity, compositions, inverses, and fitting functions to data.
- e. Equality, equivalence and isomorphism.
- f. Algebraic structures and equations.
- g. Optimization.
- h. Graphs, polygons, arcs, and similarity transformations.
- i. Angle measure and arc length and the trigonometric ratios.
- j. Historical and conceptual evolution of trigonometry and modeling with trigonometric functions.
- k. Algebraic, geometric, and analytical properties of sine and cosine.
- l. Area of polygons and regions bounded by curves, quadrature, and area as probability.
- m. Volume of cubes, polyhedra, and spheres.
- n. Relationships among distance, area, volume, and dimension.
- o. Cartesian coordinate system and its connections to Euclidean geometry.

### 4. Text and References

Suggested text:

Bremigan, Elizabeth, et al., Mathematics for Secondary School Teachers, MAA, 2011.

Boaler, Jo, What's Math Got to Do with It, Viking Adult, 2008.

Stigler, James and Hiebert, James, The teaching Gap, Free Press, 1999.

### 5. Minimum Student Materials

Required text, activity materials and readings provided by the instructor

### 6. Minimum University Facilities

Mathematics education classroom equipped with manipulative materials and technology.

7. Content and Method

<u>Topic</u>	<u>Lectures</u>
a. The rational numbers The real numbers The complex numbers	8
b. Definitions and development of functions Properties of real functions Fitting functions to data	6
c. The concept of equation Algebraic structures and solving equations	5
d. Distance Minimizing distance Distance within figures Similarity and similar figures	4
e. The trigonometric ratios and functions Modeling with trigonometric functions Properties of sine and cosine	5
f. Area and Volume Relationships between area and volume	5
g. The Cartesian model for Euclidean Geometry	<u>2</u>
	Total 35

Method

Lecture, discussion, activity.

8. Methods of Assessment

Class activities, homework and lab assignments, term projects, presentations, midterm test or quizzes, final examination.