

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

### 1. Catalog Description

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

**4 units**

Prerequisite: MATH 442 and MATH 481.

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.

### 2. Required Background or Experience

Math 442 and Math 481.

### 3. Learning Objectives

Students should 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, literature, and common core mathematics standards.
- b. Solving mathematics problems and modeling mathematics concepts using concrete manipulatives, such as algebra tiles and base blocks.
- c. Place value, 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. Equivalence and number theory topics related to K-12 school.
- f. Algebraic structures and equations.
- g. Data analysis topics related to K-12 standards.
- h. Learning mathematics knowledge for teaching algebraic thinking.
- 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 texts include:

- Boaler, Jo, What's Math Got to Do with It
- Stigler, James and Hiebert, James, The teaching Gap

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

Topic

- a. Number Systems
  - Place Value
  - Properties of numbers and operations
  - Prime Numbers and divisibility
  - Rational and irrational numbers
  - Complex Numbers
- b. Functions
  - Linear
  - Quadratic
  - Trigonometric
  - Others
- c. Data Analysis
  - Fitting functions to data
- d. Additional Topics from K-12 Curriculum

Method

Lecture, discussion, activity.

8. Methods of Assessment

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