Math 193 : Capstone Course for the Teaching Credential Candidate

California State University, Sacramento · Department of Mathematics & Statistics

A one semester course, reviewing the major themes presented in the upper division subject matter program in mathematics, and relating these themes to the junior high school and high school curriculum. Required for all subject matter students and offered Spring semester only. Not allowable for credit for non-teaching credential.

Catalog Description

Reviews the major themes presented in the upper division program in Mathematics, and relates the themes to junior high school and high school curriculum. Required for all subject matter students. Note: Not accepted for credit for non-Teaching Credential students. **Graded**: Graded Student. **Units**: 3.0.

Prerequisites

Successful completion of at least five of the following: Math 102, Math 110A, Math 110B, Math 121, Math 130A, Math 130B or Math 190; Math 110A or Math 130A may be taken concurrently. .

Course Outline

Considerable flexibility will be allowed the instructor in selecting the topics for the course. The purpose of the course is not to cover topics that are not included in the upper division major, but to show how the major topics of the major apply to the secondary curriculum. The major topics of the upper division program are important theorems (e.g., the Fundamental Theorem of Algebra) or areas of study (e.g., power series representations).

The course will typically consist of at least four topics, and will incorporate areas of algebra, analysis, number theory, and geometry. The following ten examples are meant to be illustrative of appropriate topics:

I. Infinite Series

    A. Geometric series and arithmetic series

        1. Decimal representations

            a. repeating patterns

            b. two representations of a single number

    B. Binomial theorem

    C. Convergence

    D. Formal manipulation

        1. Partial fractions

II. Fundamental Theorem of Arithmetic

    A. GCD, LCM, and rational numbers

    B. GCD as a linear combination

    C. Euclidean algorithm

    D. Fractions as a sum of fractions with prime power denominator

E. Applications to polynomials and partial fraction decomposition

F. Prime factorization of denominator and decimal expansion

G. Irrational numbers

III. Tangent Lines without Calculus

A. Slope of a straight line

B. Tangent lines of circles

C. Tangent lines to conic sections

D. Graphs of derivatives and antiderivatives

IV. Analytic Geometry via Vectors

A. Lines and planes

1. Duality

B. Sections of cones

C. Properties of conic sections derived from vectors in $\mathbb{R}^3$

V. Power Series Representations of Functions

A. Trigonometric functions

B. Even and odd functions

C. Euler's formula

D. Polynomial approximation

E. Calculators

VI. Number Systems (Algebraic Numbers and Transcendental Numbers)

A. Whole numbers, integers, rational numbers, real numbers

B. Complex numbers

C. Algebraic closure of complex numbers

D. Fundamental Theorem of Algebra

E. Insolvability of quintics

F. Limits of describing numbers using standard notation

G. Decimal representations

H. Least upper bound and greatest lower bound

VII. Discrete Mathematics

A. Combinatorics

B. Probability

C. Statistics

VIII. Mensuration

A. Fundamental concepts of area

1. Squares, rectangles, triangles, trapezoids

2. Conic sections

B. Volume

C. Area and the antiderivative

D. Dimension

IX. Relating Geometry to Algebra

    A. Irrationality of $\sqrt{2}$

    B. Geometric proofs in number theory

    C. Complex numbers

        1. Inversion

X. Indeterminate Forms

    A. Applications

    B. Error analysis

    C. Calculators