

MASTER OF ARTS IN MATHEMATICS EDUCATION (M.A.)

Coordinator: William Truman

Sir Isaac Newton made the statement, "If I have seen further than others, it is because I have stood on the shoulder of giants." In this statement, Sir Isaac Newton gave the essence of mathematics; it is a body of knowledge accumulated through cultural and historical development, and it is a shared experience.

Program Description

The Master's of Arts in Mathematics Education Program seeks to build upon the undergraduate degree through the extension of the width and breath of their mathematics background and through the enhancement of those skills and attributes which assist in the improvement of learning and teaching. The program's conceptual framework is based upon the premise of extending the experienced teacher's instructional background in those subject areas that are pertinent to the secondary curriculum: function, algebra, and geometry. The extension of the instructional background is contained within the casing of problem solving and research. Problem solving and research should promote data collection, analysis, reflective thought, conjecture, and assessment which provide collaborative leadership to other experienced practitioners. The growth will be demonstrated through the capstone project of the Portfolio and the comprehensive exams.

Program Goals

The educational objectives of the program are

1. to provide students with a solid foundation and understanding of mathematics;
2. to enable students through study to appreciate both the aesthetic and practical aspects of mathematics.
3. to provide experiences that will help students see that they will need to have a variety of teaching and learning strategies available at all times;
4. to provide students with current theories regarding the psychological development of the learner, and an understanding of human dynamics found in the home, the school, and the community;
5. to demonstrate methods of evaluating student learning, textbooks, curriculum educational techniques, and the educational process as a whole;
6. to prepare students to deal with a diverse population that have a broad spectrum of needs, aspirations, and expectations for themselves and others;
7. to provide a consideration of societal needs that are satisfied by applications of and careers based on mathematics and technology; and
8. to stress the importance to a teaching professional of keeping abreast of current trends in mathematics education through the reading of professional journals and participation in mathematics workshops, institutes, conferences, professional meetings, and inservice program.

| Requirements for a Master of Arts in Mathematics Education | Sem. Hrs. |
|--|------------------|
| Required Professional Studies Core | 9 |
| EDN 550 Applied Educational Psychology | |
| EDN 565 Applied Philosophy of Education | |
| EDN 566 Applied Educational Research | |
| Specialty Area Requirements | |
| Mathematics Education | 6 |
| MAT 500 Curriculum Development and Evaluation in Mathematics Education | |
| MAT 501 Theoretical Bases of Math Instruction | |
| Mathematics | 21 |
| 1. Analysis (6 hrs) | |
| Choose 2 of the 3 below; others may be used as electives | |
| MAT 523 Real Analysis | |
| MAT 532 Advanced Calculus for the Math Teacher | |
| MAT 544 Complex Analysis for the Math Teacher | |

2. Algebra and Number Theory (3 hrs)

Choose one of the 3 below; others may be used as electives

MAT 512 Advanced Topics in Linear Algebra

MAT 515 Topics in Number Theory

MAT 526 Special Topics in Abstract Algebra

3. Geometry and Topology (3 hrs)

Choose 1 of the 2 below; the other may be used as an electives

MAT 510 Point Set Topology (offered on alternate years.)

MAT 511 Advanced Topics in Geometry (offered on alternate years.)

4. Applied Mathematics (3 hrs)

MAT 503 Elements of Problem Solving (required)

5. Mathematics Electives (3-6 hrs)

May be chosen from math courses in above 4 sections or those listed below

MAT 502 History of Mathematics (if not taken as an undergraduate)

MAT 506 Statistics and Probability for Math Teachers

MAT 507 Discrete Mathematics for Math Teachers

CSC 505 Current Topics in Computers in Education

6. Thesis (0-3 hrs) option may replace 3 semester hours of the math electives.

MAT 600 Thesis in Mathematics Education

Total (minimum): 36

NOTE: For EDN course descriptions, see listings in the M.A.Ed. program.

COURSES**MATHEMATICS AND COMPUTER SCIENCE DEPARTMENT (CSC/MAT)****CSC 505. Current Topics in Computers in Education**

An inservice course in the comparison and evaluation of computer hardware configurations and computer software packages for the classroom. The mechanics of setting up a computer network. A consideration of the effect that computers in the classroom have on curriculum development. A laboratory experience will be an integral part of the course.

CSC 508. Computer Graphics for the Mathematics Teacher

This course introduces graphics appropriate to classroom settings at the pre-college level. Graphics that will be dealt with include various algebraic, geometric, and trigonometric relations. Methods that will be used include direct programming as well as the introduction of commercially available software designed for this purpose.

CSC 509. Programming and Algorithms for the Mathematics Teacher I

Techniques for problem solving in a mathematical setting through programming in a high level language. The efficiency of algorithms and the design of programs are considered. CSC 202 or its equivalent is required background for this course.

CSC 510. Programming and Algorithms for the Mathematics Teacher II

Advanced techniques for problem solving in a mathematics setting through programming in a high level language. Emphasis is given to data structures and object-oriented design. An individual in-depth programming project including design, implementation, testing, and documentation of each phase is required. PREREQ: CSC 509 or instructor permission.

CSC 511. Computer Hardware in an Educational Setting

A study of the various components that make up computer configurations in public school settings. Comparison of the various types of computer hardware available for use in the school. Particular attention will be given to evaluation of hardware for laboratory situations with both individual and networking of computers and computer terminals.

CSC 512. Database Management for Teachers

Goals of DBMS including data independence, relationships, logical organizations, schema and subschema. Designing databases including lossless join, dependence preserving normal form decompositions. Using relational database management systems. Constructing applications which include databases. Data integrity and reliability. As announced. Credit, 3 semester hours. PREREQ: CSC 510 or permission of instructor and program coordinator.

CSC 513. Computer Systems for Teachers

Basic logic design; sequential circuits; digital storage and access. Computer structure, machine and assembly language, and addressing modes. I/O and interrupt structure. Operating system concepts. Examples from microcomputer operating systems. As announced. Credit, 3 semester hours. PREREQ: CSC 510 or permission of instructor and program coordinator.

MAT 500. Curriculum Development and Evaluation in Mathematics Education

A critical study of current issues, trends, and the design and evaluation of curriculum in mathematics education. Students will develop, use, and evaluate a teaching unit as a major part of the work in this course. Required of all master's candidates in mathematics education.

MAT 501. Theoretical Bases of Mathematics Instruction

An advanced study of the theoretical bases of mathematical instruction, including philosophical and psychological concerns. Instructional theories from the field of mathematics education will be examined, together with the research that supports these theories.

MAT 502. History of Mathematics

A historical development of selected topics in mathematics from ancient to modern times. Systems of numeration, geometrical notions, and the development of algebra and analysis with motivational and pedagogical relevance will be given emphasis. Credit will not be allowed for MAT 502 if student has credit for an undergraduate course in the History of Mathematics.

MAT 503. Elements of Problem Solving

This course strengthens the student's mathematical problem-solving ability by extensive work with non-routine problems that can be solved by elementary methods. General strategies for creative problem-solving will be emphasized. Meaningful ways of dealing with such problems in the secondary school classroom will constitute a significant part of the course. Required of all masters candidates in mathematics education.

MAT 505. Elements of Mathematics for the Middle Grades Teacher

The content of this course provides teachers at the middle school level with the mathematics they need in order to be effective in the classroom. Topics include sets, metric geometry, and introductory algebra. These topics will be handled from a problem-solving point of view.

MAT 506. Statistics and Probability for the Secondary Mathematics Teacher

The emphasis of this course will be on understanding various statistical concepts and techniques including measures of central tendency, correlation coefficients, hypothesis testing, analysis of variance, and inferential statistics. The fundamentals of probability that will be discussed include univariate and multivariate distributions, expectation, conditional distributions, and the law of large numbers.

MAT 507. Discrete Mathematics for the Math Teacher

This course will stress applications of Discrete Mathematics and such discrete techniques as are now, or should be, found at the secondary level. Mathematical modeling will be an underlying concept of the course.

MAT 510. Point Set Topology

Elements of point set topology, separation properties, compactness, connectedness, functions, Tietze extension theorem, fundamental group, and covering spaces.

MAT 511. Advanced Topics in Geometry

Topics chosen to improve the secondary mathematics teacher's mastery, breadth of knowledge, and appreciation of classical geometry. Content variable, but chosen to minimize duplication with recent and current MAT 411 classes.

MAT 512. Advanced Topics in Linear Algebra

2- and 3-dimensional linear algebra over the numbers; geometric interpretations; and topics chosen to improve secondary teachers' breadth in and knowledge of Linear Algebra.

MAT 515. Topics in Number Theory

Topics chosen to improve the secondary mathematics teacher's mastery, breadth of knowledge, and appreciation of classical number theory. Content variable, but chosen to minimize duplication with recent and current MAT 415 classes.

MAT 521. Basic Ideas of Analysis I

A brief survey of the principal ideas and techniques of Calculus. Intended as a refresher course for high school teachers who feel the need for an understanding of Calculus in order to prepare their students for college work.

MAT 522. Basic Ideas of Analysis II

A continuation of MAT 521. This course continues developing the principal ideas and techniques of Calculus. Topics considered in 521 and 522 will generally coincide with topics covered in a three-semester Calculus sequence. (Any student taking MAT 521, and MAT 522, will be required to take three additional semester hours of Analysis.)

MAT 523. Real Analysis

Real number system; open and closed sets, covering properties, Borel sets. Measurable sets and measurable functions. Lebesgue measure and integration, LP spaces.

MAT 526. Special Topics in Abstract Algebra

Selected topics from group, ring, and field theory that have implications to the secondary curriculum will be chosen for study.

MAT 532. Advanced Calculus for the Mathematics Teacher

Topics chosen to improve the secondary mathematics teacher's mastery, breadth of knowledge, and appreciation of advanced calculus. Content variable, but chosen to minimize duplication with recent undergraduate courses in advanced calculus.

MAT 544. Complex Analysis for the Mathematics Teacher

Topics chosen to improve the secondary mathematics teacher's mastery, breadth of knowledge, and appreciation of complex analysis. Content variable, but chosen to minimize duplication with recent undergraduate courses in complex analysis.

MAT 600. Thesis in Mathematics Education

The student prepares a masters degree thesis in Mathematics Education under the direction of a thesis advisor from the Dept. of Math/CSC and the student's thesis committee. Students electing to complete a thesis are still required to take the written comprehensive examinations. May be used to satisfy 3 hrs of electives. PREREQ: 21 hrs of Graduate Work, MAT 500, EDN 566, permission of Math Dept. Chair, Graduate Program Coordinator, and Graduate Dean.