

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

Director: Raymond Lee

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 breadth of students' 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 has 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 programs.

### Requirements for a Master of Arts in Mathematics Education

Sem. Hrs.

#### Pedagogical Requirements

15

MATE 5000 Curriculum Development and Evaluation in Mathematics Education

MATE 5530 Teaching Critical Thinking and Problem Solving Techniques

MATE 5600 Advanced Classroom Instruction in Mathematics Education

MATE 5660 Advanced Educational Research in Mathematics Education

MATE 5990 Professional Development and Leadership Seminar

**Academic Specialization**

21

**Mathematics Content****1. Analysis (6 hrs)**

MATH 5210 Analysis I for Mathematics Teachers

MATH 5220 Analysis II for Mathematics Teachers

**2. Algebra and Discrete Mathematics (6 hrs)**

MATH 5410 Advanced Topics in Abstract Algebra

MATH 5420 Special Topics in Discrete Mathematics

**3. Geometry (3 hrs)**

MATH 5110 Advanced Topics in Geometry

**4. Statistics (3 hrs)**

MATH 5060 Statistics and Probability for Math Teachers

**5. Technology in Education (3 hrs)**

MATH 5080 Technology in Mathematics Education

**Total**  
**(minimum):**  
**36**

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

**COURSES****MATHEMATICS AND COMPUTER SCIENCE DEPT. (CSC/MAT/MATE/MATH)****CSC 5050. Current Topics in Computers in Education (MATH 5080)**

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 5080. 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 5090. 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 2020 or its equivalent is required background for this course.

**CSC 5100. 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 5090 or instructor permission.

**CSC 5110. 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 5120. Database Management for Teachers**

Goals of DBMS including data independence, relationships, logical organizations, schema and sub-

schema. Designing databases including lossless join, dependence preserving normal form decompositions. Using relational database management systems. Constructing applications which include databases. Data integrity and reliability. Credit, 3 semester hours. PREREQ: CSC 5100 or permission of instructor and program coordinator.

### **CSC 5130. 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. Credit, 3 semester hours. PREREQ: CSC 5100 or permission of instructor and program coordinator.

### **MAT 5020. 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 5050. 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 5070. 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 5100. Point Set Topology**

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

### **MAT 5120. 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 5150. 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 4150 classes.

### **MAT 5230. 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 5260. 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 5320. 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 5440. 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 5810. Internship in Secondary Mathematics**

Ten week, full-time internship experiences in an off-campus public school setting appropriate for 9-12 Mathematics licensure. Credit, 3 semester hours. PREREQ: Approval of the Mathematics Education Program Director.

**MAT 6000. 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 hours of electives. PREREQ: 21 hours of Graduate Work, MAT 5000, EDN 5660, permission of Math Dept. Chair, Graduate Program Coordinator, and Graduate Dean.

**MATE 5500. 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.

**MATE 5530. Teaching Critical Thinking and Problem-Solving Techniques**

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 master's candidates in mathematics education.

**MATE 5600. Advanced Classroom Instruction in Mathematics Education**

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.

**MATE 5660. Advanced Educational Research in Mathematics Education**

Emphasis is on understanding research designs and methods in mathematics education. Students will apply statistical methods to interpret and present data in a professional research method. Students will use experience gained here to develop a comprehensive research-based project as their capstone experience.

**MATE 5990. Professional Development and Leadership Seminar**

A capstone experience for mathematics teachers. Candidates will successfully complete a comprehensive research-based project in mathematics education by integrating knowledge gained throughout the program into a final conceptual framework. The project may take the form of a thesis or a comprehensive portfolio and will incorporate educational research. This project will include the candidate's plans for future professional development. Each candidate will give an oral presentation of his or her completed comprehensive project for review by the graduate faculty in the mathematics department.

**MATH 5060. 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.

**MATH 5080. Technology in Mathematics Education (CSC 5050)**

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.

**MATH 5110. 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 4110 classes.

**MATH 5210. Analysis I for Mathematics Teachers**

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.

**MATH 5220. Analysis II for Mathematics Teachers**

A continuation of MATH 5210. This course continues developing the principal ideas and techniques of Calculus. Advanced topics covered may include selected topics from the real number system involving open and closed sets, covering properties, Borel sets. Additional topics: measurable sets and measurable functions, Lebesgue measure and integration, and LP spaces.

**MATH 5410. Advanced Topics in Abstract Algebra**

Two- and three-dimensional linear algebra over the numbers; geometric interpretations; and topics from group, ring, and field theory that have implications to the secondary curriculum.

**MATH 5420. Special Topics in Discrete Mathematics**

This course will cover applications of Discrete Mathematics and such discrete techniques as are currently found at the secondary level. This course will also cover content chosen from classical Number Theory that extends beyond what students learned in undergraduate courses.