Admission Criteria

Prerequisites
Students should have completed undergraduate mathematics (15 credits or more) including a calculus sequence and linear algebra. An undergraduate major in mathematics or additional mathematics courses beyond linear algebra will be helpful but not necessary. Consult The Graduate School Web site (www.jmu.edu/grad) for application information. Contact those listed at the top of this page with questions about entrance requirements.

To Apply
Prospective students should visit the Web site of The Graduate School at JMU, where students will find links with information about the application process, as well as an online application. After completing and submitting an application, contact LouAnn Lovin, Judy Kidd or David Carothers.

Mission
The Master of Education in mathematics prepares high school teachers for positions of instructional leadership as master teachers of mathematics. The program extends the professional competence of high school mathematics teachers through an in-depth study of mathematics and mathematics teaching and learning. Program participants will demonstrate their knowledge through individual and collaborative projects and presentations, field-based curriculum implementation and evaluation, and the use of reflective classroom inquiry.

The program, which is a collaborative effort of the College of Education and the Department of Mathematics and Statistics, is designed to provide opportunities for mathematics teachers to deepen their understanding of mathematics by learning advanced mathematical topics in relation to the mathematics they actually teach. The program will also help prepare teachers to teach advanced secondary mathematics courses, such as Advanced Placement Calculus or Statistics. The proposed mathematics education courses will provide opportunities for teachers to learn math-specific technologies for learning, how to implement appropriate mathematics curriculum and how to continue to develop as professional educator. In addition, the program is designed to develop teachers’ understanding of and ability to apply education research within their own practice.

As a culminating project, teachers will conduct research in their own classrooms, where they analyze how aspects of their own practice impacted their own as well as their students’ learning. The program content is consistent with the recommendations of the Mathematical Education of Teachers’ report of the Conference Board of the Mathematical Sciences.

Plan of Study
The Master of Education in mathematics includes a minimum of 34 credit hours of course work organized as follows: educational inquiry, four hours; mathematics education, nine hours; mathematics, 21 hours. The student must also complete a comprehensive examination.

Master of Education in Mathematics

Degree Requirements

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<th>Course Requirements</th>
<th>Credit Hours</th>
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<tr>
<td>EDUC 631. Seminar in Educational Inquiry</td>
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<td>MAED 600. Seminar in Mathematics Education</td>
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<td>MAED 610. Curricular Trends in Mathematics Teaching and Learning</td>
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<td>MAED 620. Teaching Mathematics with Technology</td>
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<td>MATH 510. Analysis and Applications for Teachers</td>
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<td>MATH 512. Discrete Mathematics and Applications for Teachers</td>
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<td>MATH 514. Algebra for Teachers</td>
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<td>MATH 517. Probability and Statistics for Teachers I</td>
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<td>MATH 520. Geometry for Teachers</td>
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<tr>
<td>MATH 615. History of Mathematics</td>
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<td>MATH 618. Probability and Statistics for Teachers II</td>
<td>3</td>
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<td><strong>Total</strong></td>
<td><strong>34</strong></td>
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Course Offerings

Mathematics Education

MAED 501. Special Topics In Mathematics Education. 1-3 credits.
Designed to allow students to explore selected topics in mathematics education.

MAED 600. Seminar in Mathematics Education. 3 credits.
This survey course is designed to familiarize teachers with current research topics related to mathematics teaching and learning. Research topics include teacher professional development, mathematical reasoning (e.g., algebraic, geometric, multiplicative, proportional, arithmetical); implementation of standards-based curriculum, assessment of student learning, the role of representations, teaching for problem solving and theories that frame research.

MAED 610. Curricular Trends in Mathematics Teaching and Learning. 3 credits.
This course offers opportunities for teachers to explore curricular goals and implementations for various mathematical topics addressed in middle and secondary mathematics classrooms. Teachers will consider different curricula and how those curricula might be implemented to effectively support student learning. Mathematics topics addressed include algebra, proportional reasoning, geometry and advanced mathematics.

MAED 620. Teaching Mathematics with Technology. 3 credits.
This course offers opportunities for teachers to explore research-based applications of technology tools in secondary and middle school mathematics. Teachers will engage in advanced use of various technology tools for learning and teaching mathematics, including designing technology environments, appropriate investigation tasks, and professional developmental activities.

MAED 626. Advanced Mathematics Instruction For K-8. 3 credits.
This course will prepare teachers to engage in student-centered mathematics instruction in grades K-8. Instruction will focus on number and operations, algebra, geometry, measurement, data analysis, and probability. The Principles and Standards for School Mathematics will provide foundational ideas for the topics in the course, including the use of the five process standards and the use of technology in the teaching and learning of mathematics. Prerequisite: MATH 502.

MAED 627. Assessment of Learners (Leadership I). 3 credits.
This course is designed to help teachers create, implement, and evaluate both formal and informal assessment techniques. Teachers will construct instruments ranging from formative learning checks to summative tests and projects and the corresponding rubrics for evaluation purposes. Teachers will also learn to analyze assessment results in order to gauge student understanding and knowledge, and to use this information to modify instruction accordingly. Prerequisites: MATH 502 and MAED 626.

MAED 628. Diverse Learners in The Mathematics Classroom. 3 credits.
This course is designed to help teachers understand the learning characteristics of struggling and diverse learners in mathematics classrooms and to use the research-based instructional strategies which target these learning characteristics. The focus of the course will be learning to work effectively with students with learning disabilities in mathematics as well as English language learners. Prerequisites: MATH 502, MATH 503, MAED 626 and MAED 627.

MAED 629. Professional Development of Adult Learners (Leadership II). 3 credits.
This course is designed to help teachers build those skills, understandings and dispositions required to play optimal, mathematics education leadership roles in elementary/middle schools. In particular, this course will help mathematics specialists create, implement, and evaluate a variety of professional development experiences for classroom teachers. Prerequisites: MATH 502, MATH 503, MAED 626, MAED 627 and MAED 628.

MAED 630. Research in Mathematics Education (Leadership III). 3 credits.
This course is designed to familiarize teachers with the body of research related to selected topics in mathematics education and will help teachers further their understanding of the relationships between research and practice. Teachers will use this course to begin to develop ideas for a final project for the program. Prerequisites: MATH 502, MATH 503, MATH 504, MATH 505, MATH 627, MATH 628, MATH 629 and MAED 626.

MAED 631. Externship in Education I. 3 credits.
This course is designed to support teachers in developing a final project for the mathematics specialists program. Projects should be developed in conjunction with the teacher’s school or school division and should help prepare teachers for the role of a mathematics specialist in an elementary/middle school setting. Prerequisites: MATH 502, MATH 503, MATH 504, MATH 505, MAED 626, MAED 627, MAED 628, MAED 629 and MAED 630.

Mathematics

MATH 502. Numbers and Operations for K-8. 3 credits.
This course will explore topics important to the mathematical experiences of students in K-8 classrooms including addition, subtraction, multiplication, division, place value, and properties of whole numbers. Relevant connections to the history of mathematics will also be included.

MATH 503. Algebra and Functions for K-8. 3 credits.
The course is designed to develop an understanding of topics from algebra: variables, patterns, and functions; modeling and interpreting graphs; linear and non-linear functions, connecting these ideas to underlying concepts in primary and middle grades mathematics. Attention will be given to interpreting and assessing students’ work and learning. Relevant connections to the history of mathematics will also be included.
MATH 504. Rational Numbers for K-8. 3 credits.
This course is designed to help participants develop understanding in: theoretical development of math and students’ learning of math within content strands of rational numbers and proportional reasoning; development of pedagogical knowledge of rational numbers and proportional reasoning appropriate for K-8 Mathematics Teacher Specialists; and assessment of K-8 students’ mathematical conceptions through interviews. Relevant connections to the history of mathematics will also be included. Prerequisites: MATH 502, MATH 503, MAED 626, MAED 627, MAED 628 and MAED 629.

MATH 505. Probability and Statistics for K-8. 3 credits.
The course will develop students’ understanding of probabilistic structures, reasoning, data analysis and exploration. These structures will be related to real world problem solving. Attention will also be given to children’s thinking, how they learn this basic mathematics, their problem solving strategies, and how they construct their understanding of our number system and arithmetic. Relevant connections to the history of mathematics will also be included. Prerequisites: MATH 502, MATH 503, MATH 504, MAED 626, MAED 627, MAED 628 and MAED 629.

MATH 506. Geometry for K-8. 3 credits.
Explorations of foundations of informal measurement and geometry in one, two, and three dimensions. The van Hiele model for geometric learning is used as a framework for how children understand measurement and geometric relationships. Visualization, spatial reasoning, and geometric modeling are stressed. Transformational geometry, congruence, similarity, and geometric constructions will be discussed and relevant connections to history of mathematics will be included. Prerequisites: MATH 502, MATH 503, MATH 504, MAED 626, MAED 627, MAED 628 and MAED 629.

MATH 510. Analysis for Teachers. 3 credits.
A course to update and broaden secondary teachers’ capability and point-of-view with respect to topics in analysis. Applications of concepts such as limits, continuity, differentiation and integration. May be taken for graduate credit and for certificate renewal by secondary school teachers. Prerequisite: Undergraduate analysis or permission of instructor.

MATH 512. Discrete Mathematics for Teachers. 3 credits.
A course to update and broaden secondary teachers’ capability and point-of-view with respect to topics in discrete mathematics. May be taken for graduate credit for certificate renewal by secondary school teachers. Prerequisite: Undergraduate mathematics through linear algebra.

MATH 514. Algebra for Teachers. 3 credits.
From an advanced viewpoint, an investigation of topics in algebra from high school curriculum. Theory of equations, polynomial rings, rational functions and elementary number theory. Course may be taken for graduate credit and for certificate renewal by secondary school teachers. Prerequisite: Undergraduate algebra or permission of instructor.

MATH 520. Geometry for Teachers. 3 credits.
Topics in geometry of concern to secondary teachers in their work and provision for background and enrichment. Various approaches to study of geometry, including vector geometry, transformational geometry and axiomatics. Course may be taken for graduate credit and for certificate renewal by secondary teachers. Prerequisite: Undergraduate mathematics through linear algebra or undergraduate geometry.

MATH 515. History of Mathematics. 3 credits.
Topics in the history of mathematics of particular concern to secondary teachers in their work and provision for background and enrichment. Selected topics spanning ancient times to the present. Course may be taken for graduate credit and for certificate renewal by secondary teachers.

MATH 518. Probability and Statistics for Teachers II. 3 credits.
A course to update and broaden secondary teacher’s capability and point-of-view with respect to selected topics in statistics and to prepare teachers to teach AP statistics. Course may be taken for graduate credit and for certificate renewal by secondary school teachers. Prerequisite: MATH 517.

MATH 685. Selected Topics II. 3 credits.
An in-depth study of selected topics not otherwise covered in the regular offerings of the department. May be repeated for credit when course content changes.