

# MATHEMATICS EDUCATION (MTHED)

MTHED 501: Foundations of Mathematics Education I: Learning

3 Credits

This course focuses on understanding and application of theories of mathematical thinking and learning in research and practice. MTHED 501 Foundations of Mathematics Education I: Learning (3) An understanding of what it means to learn mathematics, knowledge of extant theories of learning mathematics, and knowledge of the nature of students' mathematical thinking at various grade levels are central to the work of mathematics educators. Research, curriculum development, classroom interactions with mathematics students, development of assessments, and many other activities in which mathematics educators engage all draw heavily on understanding and knowledge of mathematical thinking and learning. Students in this course will develop a deeper understanding of classical and contemporary theories of mathematical learning and thinking and comparisons among these theories. Assignments in the course support students' growth in applying these theories to frame research, to enhance instruction, to consider curriculum, to support teacher development, and to effect policy. A major project in the course builds students' skills in investigating mathematical thinking and learning. This course would be one of four required Mathematics Education courses for all doctoral students in the Mathematics Emphasis Area/Curriculum and Instruction Ph.D. program. [The other required courses are MTHED 502 Foundations of Mathematics Education II: Teaching; MTHED 503 Foundations of Mathematics Education III: Curriculum; and MTHED 504 Foundations of Mathematics Education IV: Teacher Development and Policy.] Students in this course would be expected to participate in class discussion, complete weekly assignments, conduct two major projects, and respond to a final examination. Course grades depend on students' performance on all of these measures.

**Prerequisite:** acceptance in Mathematics Education Emphasis Area/ Curriculum and Instruction Ph.D. program

MTHED 502: Foundations of Mathematics Education II: Teaching

3 Credits

Teaching is the object of study encountered through connections among classical and contemporary theories of teaching and research on teaching. MTHED 502 Foundations of Mathematics Education II: Teaching (3) Teaching mathematics and developing knowledge, skills, and dispositions of mathematics teachers are central tasks in the work of mathematics educators. Thus acquiring deeper theoretical knowledge and practical skills in teaching are fundamental objectives for doctoral students in mathematics education. The focus of this course is on teaching - and not the teacher - as an object of study. In this course, students explore and connect classic and contemporary research and theories of teaching, come to know the nature of mathematics teaching in tradition and vision, relate theories of teaching to theories of learning, develop ability and disposition to study and improve mathematics teaching and hone ability to evaluate and conduct research on teaching. This course would be one of four required Mathematics Education courses for all doctoral students in the Mathematics Emphasis Area/Curriculum and Instruction Ph.D. program. [The other required courses are MTHED 501 Foundations of Mathematics

Education I: Learning; MTHED 503 Foundations of Mathematics Education III: Curriculum; and MTHED 504 Mathematics Education IV: Teacher Development and Policy. This course would typically follow MTHED 501.] Students in this course would be expected to participate in weekly discussions, articulate their emerging philosophies of teaching, and analyze teaching episodes. Course grades depend on students' performance on all of these measures.

**Prerequisite:** acceptance in Mathematics Education Emphasis Area/ Curriculum and Instruction Ph.D.

MTHED 503: Foundations of Mathematics Education III: Curriculum

3 Credits

Study of mathematics curriculum blends historical trends and current issues with research literature and techniques to study effects of innovations. MTHED 503 Foundations of Mathematics Education III: Curriculum (3) Mathematics educators who are active in leadership of school systems, teacher education, research and development projects, and formulation of education policy are frequently called on for analytic or creative work related to the school and collegiate curriculum. They are asked for advice on the content, organization, presentation, and evaluation of mathematics curricula and to conduct research directly related to curricula and the effects of their implementation. Students in this course will develop a connected current and historical view of the nature of K-16 mathematics curriculum materials, movements, and guidelines. They will develop skills and dispositions to critique, conceptualize, design, conduct and report research on curriculum development and implementation efforts. This course would be one of four required Mathematics Education courses for all doctoral students in the Mathematics Emphasis Area/Curriculum and Instruction Ph.D. program. [The other required courses are MTHED 501 Foundations of Mathematics Education I: Learning; MTHED 502 Foundations of Mathematics Education II: Teaching; and MTHED 504 Foundations of Mathematics Education IV: Teacher Development and Policy.] In addition to participation in class discussions, students in this course would be expected to conduct a historical analysis of the treatment of a mathematical theme or topic in K-16 curricula, analyze and synthesize research related to an important issue, analyze instruments used in curriculum research, and propose a research study in some aspect of the mathematics curriculum. Course grades depend on students' performance on all of these measures.

**Prerequisite:** acceptance in Mathematics Education Emphasis Area/ Curriculum and Instruction Ph.D.

MTHED 504: Foundations of Mathematics IV: Teacher Development and Policy

3 Credits

Nature and study of teacher education and professional development programs and projects coupled with policy and impact in mathematics education. MTHED 504 Foundations of Mathematics IV: Teacher Development and Policy (3) One of the principal day-to-day responsibilities of mathematics educators is teaching of content and pedagogy courses for prospective teachers. This work often leads to opportunities for leadership through professional development courses and projects with in-service teachers and to consulting work with local, state, and national school, governmental, and professional organizations concerned about educational policy. Effective work in these arenas requires knowledge and practical skills about professional development and institutional change as well as awareness of policies and the role

of policy in influencing practice. Students study research and practice in teacher education and professional development of mathematics teachers. They come to know the research and the issues that confront those who prepare teachers and support teachers' continued professional development. Students become familiar with governmental and professional organizations and the critical issues that impact the direction of mathematics education. They also learn how to study local, state, and national policies and publications. This course would be one of four required Mathematics Education courses for all doctoral students in the Mathematics Emphasis Area/Curriculum and Instruction Ph.D. program. [The other required courses are MTHED 501 Foundations of Mathematics Education I: Learning; MTHED 502 Foundations of Mathematics Education II: Teaching; and MTHED 503 Foundations of Mathematics Education III: Curriculum.] In addition to participation in class discussions, students in this course would be expected to articulate a policy regarding a critical issue in mathematics education, evaluate a teacher education or professional development program, propose a professional development or teacher education project, and complete a final examination. Course grades depend on students' performance on all of these measures.

**Prerequisite:** acceptance in Mathematics Education Emphasis Area/Curriculum and Instruction Ph.D.

MTHED 511: Connections Between Mathematics and Mathematics Education

3 Credits

Course connects college-level mathematics with secondary school mathematics in terms of curriculum content and research on teaching and learning. MTHED 511 Connections Between Mathematics and Mathematics Education (3) The course is organized around key areas of college-level mathematics. In each area, the college-level mathematics focus is on critical ideas, such as fundamental concepts, powerful techniques, and important theorems. These ideas are then explored as abstractions of secondary school mathematics content and as justifications for procedures taught in secondary schools. Resulting new mathematics understandings will be used to understand research on learning and teaching mathematics and to apply research to secondary school mathematics instruction. Mathematics curriculum expectations will include both mathematics content topics and mathematical practices and processes.

**Prerequisite:** MATH 435, MATH 471, MTHED411, and MTHED427

MTHED 520: Analysis of Research in Mathematics Education

3 Credits

Survey of the status of knowledge about mathematics learning and instruction, K-12; analysis of research procedures; instruments for evaluating research.

**Prerequisite:** MTHED412W or MTHED420; 3 credits in statistics; teaching experience

MTHED 523: Projects in Mathematics Education Research, Curriculum Development, and Evaluation

1-3 Credits/Maximum of 24

Conceptualizing, designing, conducting, and reporting mathematics education research, curriculum development and/or evaluation projects.

**Prerequisite:** enrollment in Curriculum and Instruction graduate program and by permission of the Mathematics Education emphasis area; course in psychological foundations and course in qualitative or quantitative research foundation

MTHED 527: Research on the Use of Technology in Mathematics Education

3 Credits

Reviewing, critiquing, designing, and conducting research on mathematics learning and teaching in technology intensive environments.

**Prerequisite:** MTHED427

MTHED 530: Mathematical Thinking at the Secondary and Early College Levels

3 Credits

Exploring and applying theories of advanced mathematical thinking; reviewing, conducting research on mathematical thinking at secondary and early college levels.

**Prerequisite:** enrollment in Curriculum and Instruction doctoral program with Mathematics Education emphasis; mathematics background equivalent to a Bachelors' degree in mathematics

MTHED 590: Colloquium

1-3 Credits/Maximum of 3

Continuing seminars that consist of a series of individual lectures by faculty, students, or outside speakers.

MTHED 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.

MTHED 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently.