
Mathematics Education

Gerald M. Armstrong, Chair
260 TMCB, (801) 422-1735

College of Physical and Mathematical Sciences Advisement
Center
N-179 ESC, (801) 422-6270

Admission to Degree Program

Candidates for all teacher preparation programs are required to complete an application that includes core criteria for each program. Applications are available from the Mathematics Education Department.

The Discipline

Mathematics is the discipline through which we make sense of the order, patterns, and quantitative situations we perceive in the world around us. The foundational skills of this discipline—the abilities to formulate, focus, and solve problems; to articulate, test, and justify conjectures; to communicate one's reasoning about quantities and the relationships between them; and to see connections between different mathematical ideas and real-world contexts—are highly valued in society and are characteristics of any educated person. Mathematics is not only a body of knowledge but also a process of analysis, reasoning, comparison, deduction, generalization, and problem solving.

Mathematics educators depend heavily upon their own understanding of mathematics in order to identify and articulate the mathematical ideas they want students to learn, to assess which concepts their students already possess that might serve as a foundation for learning, and to develop activities that help students develop rich understandings. They also use their understanding of the nature of the discipline to structure a culture of inquiry, reasoning, and problem solving in their classrooms.

Courses in the undergraduate program are designed to help prospective teachers plan, manage, and implement classroom activities that facilitate students' learning of mathematics. Specific program goals include (1) mastery of the foundational skills of mathematics, (2) deep reflection on mathematics learning at all levels, through observation of and participation in high-quality classroom practice, (3) increased autonomy and confidence as an investigator, active learner, and productive thinker, and (4) extended field experience, informed by the best current understanding.

Program faculty include educational and mathematical researchers, specialists in both preservice and inservice teacher education, and school practitioners, spanning a broad range of interest and experience.

Career Opportunities

Majors in mathematics education prepare for careers in teaching at the middle school and junior and high school levels or graduate studies in the field.

Graduation Requirements

To receive a BYU bachelor's degree a student must complete, in addition to all requirements for a specific major, the following university requirements:

- The university core, consisting of requirements in general and religious education (See the University Core section of this catalog for details. For a complete listing of courses that meet university core requirements, see the current class schedule.)
- A minimum of 30 credit hours in residence
- A minimum of 120 credit hours
- A cumulative GPA of at least 2.0

Undergraduate Programs and Degrees

BS Mathematics Education
Minor Mathematics Education

Students should see their college advisement center and department advisors for information concerning the undergraduate programs.

Graduate Programs and Degrees

MA Mathematics Education

For more information see the BYU 2007–2008 Graduate Catalog.

Advisement

Upon completion of five core courses (Math 112 [honors section], 113 [honors section], 190, MthEd 117, Sc Ed 276R), undergraduate majors are required to meet with the undergraduate advisor to begin the program admissions process. Students whose grade point averages are less than a B in the first five core courses need to realize that advanced courses require much more depth of understanding and may be difficult for them.

Students who are considering graduate work in mathematics education may receive advice from the graduate coordinator.

General Information

It is recommended that a student complete the following courses in high school:

- 4 units of English.
- 1 unit of physics or chemistry.
- 4 units of mathematics, including 2.5 units of algebra, 1 unit of geometry, and .5 unit of trigonometry. This qualifies a student to begin college mathematics with Math 112 (honors section). If calculus is available in high school, a student planning to major in mathematics education is strongly encouraged to take it; doing so requires completing one of the preceding algebra units before high school.

Advanced Placement (AP) credit is available in mathematics as follows:

- A score of 3 on the calculus AB exam gives credit in Math 110 and 111; a score of 4 or 5 on the calculus AB exam gives credit in Math 110 and 112.
- A score of 3, 4, or 5 on the calculus BC exam gives credit in Math 112 and 113.
- An AP student without credit in Math 112 must begin with Math 112 (honors section); an AP student without credit in Math 113 must begin with Math 112 or 113 (honors sections).
- AP students with credit in Math 113 are urged to begin with Math 113 (honors section) anyway, unless they scored 5 on the calculus BC exam.
- AP students should direct Educational Testing Service (ETS) to report scores to BYU to have credit posted.

Questions regarding placement should be directed to the Mathematics Education Department, 260 TMCB.

BS Mathematics Education (74 hours*, including licensure hours)

Major Requirements

1. Grades below C– will not be acceptable in major courses.
2. Complete the following core requirements:
MthEd 117, 218, 308, 377, 378.

Note: Prerequisites for all mathematics education courses will be strictly adhered to.

Note: Fingerprinting and FBI clearance must be completed prior to enrollment in MthEd 377.

Mathematics Education

3. Complete the following:
Math 112, 113, 190, 214, 315, 334, 343, 371.
MthEd 300, 362.
Stat 301.
Note: Math 112 and 113 must be honors sections.
4. Complete one course from the following:
Math 350, 355, 387.
5. A teaching minor is not needed for licensure. However, it is strongly recommended.
6. Complete the Professional Education Component:
 - a. Complete the following:
CPSE 402.
Sc Ed 276R (4 hours required), 350, 353, 379.
 - b. Complete 12 hours from one of the following:
Sc Ed 476R, 496R.

*Hours include courses that may fulfill university core requirements.

Minor Mathematics Education (33 hours*)

Minor Requirements

1. Grades below C– will not be accepted.
2. Complete the following:
Math 112, 113, 190, 343, 362.
MthEd 117, 218, 308, 377, 378.
Stat 301.

*Hours include courses that may fulfill university core requirements.

Mathematics Education (MthEd)

Undergraduate Courses

- 117. Critical Review of School Mathematics.** (3:3:0) F, W, Sp
Prerequisite: Math 113.
Strengthening understanding of high-school mathematics; gaining awareness as mathematics learners in learning communities; learning how to support collaborative communities as teachers.
- 218. Task Design and Assessment of Student Understanding.** (3:3:0) F, W, Sp Prerequisite: Math 113, 190, 343, MthEd 117, Sc Ed 276R.
Building tasks that elicit important mathematical ideas. Reflecting on and assessing the success of tasks through questioning and other methods of formative assessment.
- 300. (MthEd-Math) History and Philosophy of Mathematics.** (3:3:0) F, W, Sp Prerequisite: Math 113.
Historical development of important mathematical ideas and philosophies; implications for the mathematical curriculum.
- 305. Basic Concepts of Mathematics.** (3:3:1) F, W Prerequisite: Math 110 or equivalent; permission from Teacher Education Department.
Concept-oriented exploration of number, measurement, and informal geometry in relation to children's learning. Required of prospective elementary school teachers.
- 306. Concepts of Mathematics.** (3:3:1) F, W Prerequisite: MthEd 305; permission from Teacher Education Department.
Concept-oriented exploration of rational numbers and proportional reasoning, probability, and early algebraic reasoning in relation to children's learning. Required of prospective elementary school teachers.

308. Mathematics Teaching with Technology. (3:3:0) F, W, Sp
Prerequisite: Math 214, 343, 362; basic computer literacy.
Using technology to teach and understand mathematics. Math-specific software and calculators used to investigate Euclidean geometry, non-Euclidean geometry, algorithms, probabilities, etc., research regarding effectiveness.

362. (MthEd-Math) Survey of Geometry. (3:3:0) F, W, Sp
Prerequisite: Math 112, 190.
Logical and historical development of Euclidean and non-Euclidean geometry, transformations and symmetry; relationships among axiomatic systems; use of software and other geometric models; proofs and Van Hiele levels.

377. Mathematics Teaching in the Public Schools. (3:3:0) F, W
Prerequisite: Math 113, 190, 343, MthEd 117, 218, Sc Ed 276R, departmental consent.
Mathematics teaching practice in grades 7–12, including lesson/task design, curriculum evaluation, and classroom management in context of practice teaching.

378. Practicum in Mathematics Education. (1:0:3) F, W
Prerequisite: MthEd 117, 218, Sc Ed 276R; concurrent enrollment in MthEd 377.

Implementing meaningful and engaging instruction for secondary students; developing critical thinking, problem solving, literacy, and democratic character; assessing learner performance.

495R. Readings in Mathematics Education. (1–2:0:3 ea.) F, W, Sp, Su Prerequisite: instructor's consent.
Directed readings beyond scope of usual undergraduate courses.

499R. Senior Thesis. (1–3:0:Arr. ea.) F, W, Sp, Su Prerequisite: instructor's consent.

500-Level Graduate Courses (available to advanced undergraduates)

550. Problem Solving. (3:3:0) On dem. Prerequisite: strong background in undergraduate mathematics; instructor's consent.

Solving and building explanations and presenting solutions to conceptually important problems. Connections between problem solving and understanding, and implications for teaching and learning.

562. Euclidean Geometry: Content, Learning, and Teaching. (3:3:0) Alt. yr. on dem. Prerequisite: Math 362 or equivalent.

Euclidean geometry, including classical problems, polyhedra, transformations, congruence, similarity, integer geometry, minimization; technology in geometry, Van Hiele levels, role of proof, and high school curriculum.

585R. Research Practicum. (3:3:0 ea.) Sp Prerequisite: graduate student status or instructor's consent.

Hands-on introduction to department research projects. Data analysis, discussion of theoretical frameworks, and reflection on possible implications.

590. Foundational Issues in Learning Mathematics. (3:2:2) Prerequisite: teaching certificate or completion of student teaching.

Introduction to research in mathematics learning; mathematical thinking; cognitive, social, and philosophical approaches to describing mathematics learning. Lab experience in classrooms.

591. Scholarly Inquiry in Mathematics Education. (3:2:2) Prerequisite: MthEd 590.

Introduction to scholarly inquiry in mathematics education; issues in research methodology. Lab experience in classrooms.

598R. Topics in Mathematics Education. (1–3:Arr.:Arr. ea.) Prerequisite: instructor's consent.

Includes specific research areas and curriculum studies of school mathematics topics (i.e., geometry, algebra, and calculus).

Graduate Courses

For 600- and 700-level courses, see the BYU 2007–2008 Graduate Catalog.

Mathematics Education Faculty

Professors

Speiser, Robert David (1984) AB, Columbia Coll., 1965; PhD, Cornell U., 1970.
Williams, Steven R. (1993) BS, MS, Brigham Young U., 1980, 1983; PhD, U. of Wisconsin, Madison, 1989.

Teaching Professor

Voyles, Jacqueline Taylor (1978) BS, Idaho State U., 1966; MA, EdD, Brigham Young U., 1976, 1987.

Associate Professors

Armstrong, Gerald M. (1970) BS, MS, Brigham Young U., 1963, 1965; PhD, U. of Wisconsin, Madison, 1971.
Lawlor, Gary R. (1991) BS, Brigham Young U., 1984; PhD, Stanford U., 1988.
Peterson, Blake (1996) BA, Utah State U., 1986; MS, PhD, Washington State U., 1990, 1993.
Siebert, Daniel (2000) BS, MS, Brigham Young U., 1989, 1993; PhD, U. of California, San Diego, 2000.
Walter, Charles N. (1969) BA, MA, PhD, U. of New Mexico, 1963, 1965, 1970.

Assistant Professors

Belnap, Jason (2004) BS, Utah State U., 1996; MS, PhD, U. of Arizona, 1998, 2005.
Gerson, Hope (2005) BA, Whittier Coll., 1990; MS, U. of Iowa, 1992; PhD, U. of New Hampshire, 2000.
Leatham, Keith (2003) BS, MS, Utah State U., 1992, 1998; PhD, U. of Georgia, 2002.
Walter, Janet (2002) BA, MA, Brigham Young U., 1988, 1992; EdD, Rutgers U., 2004.

Assistant Teaching Professor

Hendrickson, Scott (2005) BA, MA, Brigham Young U., 1979, 1984.

Instructor

Corey, Douglas (2006) BA, MA, Brigham Young U., 1999, 2001; MA, U. of Michigan, 2004.

Mechanical Engineering

Larry L. Howell, Chair
435-A CTB, (801) 422-2625

Ira A. Fulton College of Engineering and Technology Advisement Center
264 CB, (801) 422-4325

Admission to Degree Program

The degree program in the Department of Mechanical Engineering carries special enrollment limitations at the junior level. Please see Professional Program Acceptance below and the college advisement center for specific details.

Graduation Requirements

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Undergraduate Programs and Degrees

BS Mechanical Engineering

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Graduate Programs and Degrees

MS Mechanical Engineering

PhD Mechanical Engineering

For more information see the BYU 2007–2008 Graduate Catalog.

The Discipline

Mechanical engineers work with concepts, ideas, and products that are primarily mechanical or energy related. Mechanical engineering is a broad discipline that prepares a person to contribute in a wide range of fields such as aerospace, computer graphics, power generation, machine tools, petroleum, agricultural and construction equipment, medicine, government, and all types of transportation. A mechanical engineer may work in research, design, analysis, manufacturing, testing, operations, sales, or management. Engineers use critical problem-solving methods and basic principles of mathematics and science to creatively solve problems.

Educational Objectives

The Brigham Young University Department of Mechanical Engineering undergraduate bachelor of science program pursues the following objectives:

1. Teach the fundamental concepts of math, science, and mechanical engineering to produce graduates who demonstrate technical excellence and provide service to their profession, community, family, and church.
2. Instill a desire and ability to learn continuously, both through study and faith, to enable graduates to meet the changing demands of their profession and personal life.
3. Provide practical and open-ended engineering experiences to develop graduates who think independently and demonstrate leadership and creativity.