School of Natural Sciences and Mathematics

Department of Science and Mathematics Education

Preface

The department of Science and Mathematics Education offers two graduate degree programs: Science Education and Mathematics Education.

Degrees Offered

- Master of Arts in Teaching/Science Education
  - 36 semester credit hours minimum

- Master of Arts in Teaching/Mathematics Education
  - 36 semester credit hours minimum

Department Faculty

**Professors Emeritus:** Thomas Butts, Frederick Fifer, Cynthia Ledbetter, Lynn A. Melton

**Associate Professors:** Titu Andreescu, Homer Montgomery, Mary L. Urquhart

**Science Education Specialist and Senior Lecturer:** Barbara A. Curry

**Clinical Faculty:** Katherine (Katie) Donaldson, Floyd Dorsey, Billy Gammons, Amin Lalani, James (Jim) McConnell, James (Bill) Neal

**Affiliated Faculty:** John G. Burr, Gregg R. Dieckmann, Joseph (Joe) Ferrara, Matthew J. Goeckner, Pamela Gossin, John H. Hoffman, Joseph M. Izen, Susan E. Minkoff, Christine Salmon, Robert J. Stern, John Zweck

Objectives and Structure

The Master of Arts in Teaching (MAT) in Science Education Program and the MAT in Mathematics Program are designed to enhance the content knowledge and pedagogical content knowledge of science, technology, engineering, and mathematics (STEM) teachers. Both programs share a set of core courses that allow students to explore knowledge common to both disciplines. Students in Science Education or Mathematics Education can then collaborate to integrate science and
mathematics education and to provide a better education for their students. Because many graduates of these MAT programs will rise to leadership positions such as department head or science/mathematics coordinator, the core courses provide fundamental skills in cognition, education research, and assessment so that MAT graduates can evaluate educational strategies and thoughtfully advise their colleagues about them. The STEM Content courses provide additional depth in specific science and mathematics content areas. Students may elect to write and defend a research-based thesis.

Both programs are designed for individuals with significant ability in a science/mathematics discipline and a serious commitment to teaching. They provide forward-looking opportunities for professional development for both new and experienced teachers.

Departmental Activities and Facilities

The Science/Mathematics Education (SME) Department is a hub for many important activities. In addition to the graduate MAT in Science Education and MAT in Mathematics Education degree programs, faculty in the Science/Mathematics Education Department direct and carry out the UT Dallas implementation of UTeach, the nationally-acclaimed program for recruitment, preparation, and support of STEM teachers. The Science and Engineering Education Center (SEEC), directed by Nobel Laureate Russell A. Hulse, is housed in facilities adjoining the SME area, and collaborations with SEEC continue to grow. Joint meetings with faculty from the School of Brain and Behavioral Sciences and the Center for BrainHealth lead to discussions of ways in which neuroscience and STEM education can grow symbiotically. The Center for Science Education and Research and the UT Dallas T-STEM Center provide partnership and professional development support for T-STEM Academies in Texas.

In fall 2010, UT Dallas opened its new Science Learning Center. It contains not only undergraduate teaching areas for the science students, but also a specially designed classroom area for SME that can be configured for interactive classes. SME instructors can model the best of educational practices and develop research projects to evaluate such strategies.

Scientific equipment supporting the various programs at the university can be available to students in the MAT program. Facilities in biology, chemistry, computer science, geosciences, mathematics, and physics are briefly described in the respective sections of the catalog.

Admission Requirements

The university's general admission requirements are discussed on the Graduate Admission page (catalog.utdallas.edu/2014/graduate/admission).

Science Education

Admission to the Graduate Program in Science Education requires, in addition to general university requirements, a significant background in science. A background of 24 semester credit hours in science at the undergraduate level or higher is preferred. An interview with an SME faculty member may also be required.
Mathematics Education

Admission to the Graduate Program in Mathematics Education requires, in addition to the general university requirements, an adequate background in mathematics. Applicants for the Upper Elementary/Middle School Mathematics and Applications track should have mastered pre-calculus and have experience with mathematical problem solving (e.g., MATH 3307 or equivalent). Applicants for the High School Mathematics track should have at least one year of calculus, a course in linear algebra, and a junior-level course involving mathematical proof. An interview with an SME faculty member may also be required.

Background Checks

For both Science Education and Mathematics Education programs, opportunities may arise for students to work directly in local schools. Public schools and many private schools in the state of Texas require criminal background checks of all volunteers or individuals working within the schools regardless of the potential for direct contact with students.

Degree Requirements

The university's general degree requirements are discussed on the Graduate Policies and Procedures page (catalog.utdallas.edu/2014/graduate/policies/policy).

The MAT in Science Education and the MAT in Mathematics Education have a common set of four core courses. Both degrees require satisfactory completion of a minimum of 36 semester credit hours, and both degrees allow a student to select a Practitioner Option (coursework only) or a Research Option (coursework plus thesis).

An overall grade point average of B (3.00) or better in the four core courses is required for graduation.

Requirements common to the MAT in Science Education and to the MAT in Mathematics Education

Four (4) Core Courses:

- SMED 5301 Science, Mathematics, and Society
- SMED 5302 Teaching and Learning of Science and Mathematics
- SMED 5303 Introduction to Research and Evaluation in Science and Mathematics Education
- SMED 5304 Research Methods in Science and Mathematics Education

Six (6) STEM Content Courses (Practitioner Option) or four (4) STEM content courses plus at least six semester credit hours of SMED 6V98 (Research Option). In both cases, four STEM content courses must be taken within a single STEM content area subject to the specific requirements for each program given below.
Elective Courses sufficient to bring the total semester credit hours to a minimum of 36 semester credit hours. Electives must be approved by the SME Graduate Studies Committee. Research Option students must use one of their electives to take SCI 5340 Statistics for Science/Mathematics Education, which must be taken prior to enrolling in thesis semester credit hours.

Students may petition the Graduate Studies Committee for waiver of requirements or substitution of alternate means of meeting requirements. Students who have particularly strong STEM content backgrounds are encouraged to meet with the graduate advisor and develop an appropriate degree plan.

Thesis Option

Students who wish to pursue the thesis option must consult with potential faculty advisors and present to the Graduate Studies Committee the name of the proposed thesis advisor, the proposed thesis topic, and potential committee members. The Graduate Studies Committee, after consultation with the student and appropriate faculty members, may approve the project and committee or require changes. In order to fulfill the thesis requirement, the student must pass a minimum of six semester credit hours in thesis research, SMED 6V98, and submit an acceptable thesis. The thesis is directed by a supervising professor and must be approved by the student's thesis supervisory committee. In addition, the student must comply with the rules set by the Graduate Dean and successfully defend the thesis.

Requirements Specific to the MAT in Science Education

Students in the MAT in Science Education must pass four courses in one of the following Science Content areas: (1) Earth and Space Sciences, (2) Life Sciences, or (3) Physical Sciences. For Practitioner Option students, the other two courses must be taken in a different STEM content area, which may include both Mathematics content areas described below.

Requirements Specific to the MAT in Mathematics Education

(1) Upper Elementary/Middle School Mathematics and Applications

Students must pass MTHE 5327 Functions and Modeling and five of the six courses in the Mathematics B content area.

(2) High School Mathematics

Students must pass four courses in the Mathematics A content area and at least two courses in the Mathematics B content area. It is recommended that those in the Practitioner Option use their elective courses to take two additional courses in the Mathematics B content area.

Requirements Associated with Community College Teaching

Many community colleges require that instructors have 18 hours of graduate coursework in the discipline to be taught. Students with an interest in teaching in community colleges should consult
with the Graduate Studies Committee as soon as possible to identify the courses taken as part of the MAT in Science Education or the MAT in Mathematics Education that meet the expected requirements.

### STEM Content Area Courses

#### Earth and Space Sciences
- **SCI 5322** Basis of Evolution
- **SCI 5337** Rockin Around Texas
- **SCI 5326** Astronomy: Our Place in Space
- **SCI 5327** Comparative Planetology

#### Life Sciences
- **SCI 5322** Basis of Evolution
- **SCI 5324** Ecology
- **SCI 5329** Bioethics
- **SCI 5330** Emerging Topics in Biology

#### Physical Sciences
- **SCI 5323** Laboratories and Demonstrations for Middle School Science Teachers
- **SCI 5331** Conceptual Physics I: Force and Motion
- **SCI 5332** Conceptual Physics II: Particles and Systems
- **SCI 5333** Conceptual Physics III: Atoms, Charges, and Interactions

#### Mathematics A
- **MATH 5301** Elementary Analysis I
- **MATH 5302** Elementary Analysis II
- **MATH 5305** Higher Geometry for Teachers
- **MATH 5306** Non-Euclidean Geometry for Teachers
- **MATH 6311** Abstract Algebra I
- **STAT 5351** Probability and Statistics I
- **STAT 5352** Probability and Statistics II
CS 5333 Discrete Structures

Mathematics B

MTHE 5321 Problems Using Algebra
MTHE 5322 Problems Using Geometry
MTHE 5323 Problems Using Pre-calculus
MTHE 5324 Problems Using Discrete Mathematics
MTHE 5325 Problems Using Mathematical Modeling
MTHE 5326 Problems Using Statistics and Probability

Mathematics C

MTHE 5327 Functions and Modeling

The courses available to students to meet the STEM Content requirements include, but are not limited to, the courses listed in the STEM Content areas above. Use of courses outside these sets must be approved by the Graduate Studies Committee.

Online Course Work and Degree Options

Courses applicable to the MAT in Science Education and MAT in Mathematics Education may be offered online. However, the Science/Mathematics Education Department cannot guarantee that a student can carry out the entire degree program online. Students interested in online work should consult course schedules and contact the Graduate Studies Committee for current advice.

Undergraduate UTeach Dallas Students May Begin an MAT Program

Undergraduate students at UT Dallas who anticipate entering one of the Master of Arts in Teaching programs after obtaining a bachelor's degree are encouraged to begin taking MAT courses under UT Dallas' fast-track program for graduate credit option. The most appropriate courses for such students to take are

- SMED 5301 Science, Mathematics, and Society
- SMED 5302 Teaching and Learning of Science and Mathematics
- SMED 5303 Introduction to Research and Evaluation in Science and Mathematics Education

UTeach students are encouraged (1) to explore with their advisors the possibility that some graduate courses, such as SMED 5302 Teaching and Learning of Science and Mathematics and SCI 5342 Research Methods in STEM may satisfy a portion of the UTeach requirements and (2) to contact the graduate advisor to discuss a smooth transition to the Master of Arts in Teaching
MAT and Other Post Baccalaureate Students May Pursue Secondary Mathematics or Science Certification Through UTeach Dallas

UTeach Dallas is an innovative teacher preparation program that allows students to pursue middle school and high school teacher certification within a science-technology-engineering-mathematics (STEM) degree program. While learning STEM subject matter, students also learn, through courses taught by some of Texas's most respected secondary school math and science teachers, how to teach. Upon completing the UTeach program, students are recommended for a middle school or high school teaching certificate. Both degree seeking and non-degree seeking students may apply. Interested students should contact the graduate advisor or the UTeach Dallas Advisor.

Teacher certification requirements are described in the following section of the undergraduate catalog: [catalog.utdallas.edu/2014/undergraduate/programs/teacher-education-certification](catalog.utdallas.edu/2014/undergraduate/programs/teacher-education-certification).