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

Associate Professors: Titu Andreescu, Mary L. Urquhart

Senior Lecturers: Vinita Hajeri, Emily Hennessy, Stephanie Taylor

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

UT Dallas Affiliated Faculty: John G. Burr, Gregg R. Dieckmann, Matthew J. Goeckner, Pamela Gossin, John H. Hoffman, Joseph M. Izen, Susan E. Minkoff, 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. STEM content MAT coursework delivered in SME, and by SME faculty, can be expected to include a blend of rich exploration of the content area with practical classroom applications. SME coursework can also be expected to provide opportunities for growth of pedagogical content knowledge including through the explicit modeling of research-based classroom practices.

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. SME faculty regularly collaborate with UT Dallas faculty in other STEM and related disciplines. Facilities include two specially designed classrooms 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.

Science Education

Admission to the Graduate Program in Science Education requires, in addition to general University requirements, a significant background or interest in science. A background of 24 semester credit hours in science at the undergraduate level or higher is preferred. However, elementary educators and others applying without a significant science background may be admitted on a probationary basis. 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 some experience with mathematical problem solving (e.g., MATH 3307 e.g., \textit{MA TH 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 rigorous 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 \textit{Graduate Policies and Procedures} page.

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.

\textbf{Four (4) Core Courses:}

- \textit{S M E D \, 5 3 0 1} Science, Mathematics, and Society
- \textit{S M E D \, 5 3 0 2} Teaching and Learning of Science and Mathematics
- \textit{S M E D \, 5 3 0 3} Introduction to Research and Evaluation in Science and Mathematics Education
- \textit{S M E D \, 5 3 0 4} 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 \textit{S M E D \, 6 V 9 8} (Research Option). In both cases, at least four content courses must be taken in the area represented by the degree (i.e, Mathematics or Science.)

Elective Courses, with additional flexibility, must be sufficient to bring the total semester credit hours to a minimum of 36 semester credit hours. Electives taken from outside the department or the Mathematics C option must be approved by the SME Graduate Studies Committee. Research Option students must use one of their electives to take \textit{S C I \, 5 3 4 0} 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. All students with the graduate advisor and develop an individualized, appropriate degree plan.
Thesis Option

Students who wish to pursue the thesis option must complete a thesis proposal and 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. It is the student's responsibility to find a faculty advisor agreeing to supervise the work and receive approval to proceed with the project. Such agreement and approval is not guaranteed by admission to one of the MAT programs. 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.

Course Requirements

Students in the MAT in Science Education and MAT in Mathematics Education must generally pass four courses in either a science or mathematics content area, respectively. SME values flexibility to meet individual student needs, and therefore courses taken may also include those offered through another STEM discipline department. However, no less than two of the four courses in science/mathematics must be offered through SME. Individual degree plans must be approved by the graduate studies committee.

In Science there are three areas of focus within the department from which students may select: (1) Earth and Space Sciences, (2) Life Sciences, or (3) Physical Sciences. In Mathematics, courses are offered at levels A, B, and C. Courses at the C level include those taught outside of SME. For Practitioner Option students, the other two courses may be taken in a different STEM content area, which may include the Science, Mathematics, or Computer Science content areas described below.

Computer Science courses offered within SME are currently for elective credit only. Each of these courses were developed in partnership with faculty in Computer Sciences and UTeach Dallas along with local industry and the UT Austin WeTeach_CS initiative. Each of these courses is designed to either (1) help science and mathematics teachers incorporate CS skills and processes into their instruction and/or (2) assist in preparing in-service or pre-service teachers for the 8-12 Computer Science certification exam.

Requirements Associated with Community College Teaching

Many community colleges require that instructors have 18 semester credit hours of graduate coursework in the discipline to be taught. Students with an interest in teaching in community colleges (including teaching of dual enrollment courses) should consult with the graduate advisor 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. For example, in Mathematics students must generally pass 18 credit hours (6 courses) of graduate MATH courses.
(Mathematics content area C). However, specific transcript requirements vary by community college. It is the responsibility of the student to contact a specific community college to determine if proposed coursework will be acceptable. Students should be aware that acceptable offerings in evenings and summers vary by STEM department and are typically beyond the control of SME.

**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
- **SCI 5341** Astrobiology

**Life Sciences**

- **SCI 5322** Basis of Evolution
- **SCI 5324** Ecology
- **SCI 5330** Emerging Topics in Biology
- **SCI 5339** Practical Applications in Genetics
- **SCI 5341** Astrobiology

**Physical Sciences**

- **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
- **SCI 5338** Conceptual Chemistry: The Atom and the Bridge from Physics to Biology

**Mathematics A**

- **MTHE 5300** Foundations in Algebra
- **MTHE 5301** Foundations in Geometry
- **MTHE 5302** Foundations in Probability and Statistics

**Mathematics B**
MTHE 5321 Concepts and Techniques in Algebra
MTHE 5322 Concepts and Techniques in Geometry
MTHE 5323 Concepts and Techniques in Pre-calculus
MTHE 5324 Concepts and Techniques in Discrete Mathematics
MTHE 5325 Concepts and Techniques in Mathematical Modeling
MTHE 5326 Concepts and Techniques in Statistics and Probability
MATH 5305 Higher Geometry for Teachers
MATH 5306 Non-Euclidean Geometry for Teachers
MTHE 5327 Functions and Modeling

Mathematics C
MATH 5301 Elementary Analysis I
MATH 5302 Elementary Analysis II
MATH 6311 Abstract Algebra I
STAT 5351 Probability and Statistics I
STAT 5352 Probability and Statistics II
STAT 5353 Probability and Statistics for Data Science and Bioinformatics
CS 5333 Discrete Structures

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, a student cannot 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. This option is particularly appropriate for elementary pre-service teachers or students seeking teacher certification in STEM areas through
our UTeach Dallas program. 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

Specific STEM content courses in science, mathematics, or computer science that may help students prepare for the certification exam are also recommended. The MAT advisor, in coordination with the undergraduate advisor, can provide individualized advice. (Computer science majors seeking Computer Science certification with are recommended to take MTHE 5309 or SCI 5309, regardless of interest in a Fast Track MAT.) UTeach Dallas 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 Dallas requirements, (2) determine which STEM content courses may be most beneficial while taken as an undergraduate and (3) to contact the graduate advisor to discuss a smooth transition to the Master of Arts in Teaching programs.

For requirements on transfer of credit to the MAT, or to any other Masters program at the university, please refer to the undergraduate catalog.

**MAT and Other Post Baccalaureate Students May Pursue Secondary Mathematics, Science, or Computer Science Certification Preparation 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.