

# Department of Science Education and Mathematics Education

[http://www.utdallas.edu/dept/sci\\_ed/](http://www.utdallas.edu/dept/sci_ed/)

## Faculty

**Professors:** Thomas R. Butts (interim head), Frederick L. Fifer, Jr. , Russell Hulse

**Associate Professors:** Cynthia E. Ledbetter), Titu Andreescu

**Assistant Professors:** Homer Montgomery, Mary L. Urquhart

**Science Education Specialist:** Barbara A. Curry

**Affiliate Faculty:** John Burr, John Hoffman, Scherry Johnson, Lynn Melton, Robert Stern

Disciplinary science and mathematics courses are taught by faculty members in that discipline.

## Objectives

The Master of Arts in Teaching (M.A.T.) degree in Science Education stresses training in the art of teaching and advanced knowledge in the science selected for major specialization. Designed for individuals with significant ability in a discipline and a serious commitment to teaching, the program offers an opportunity for professional development of experienced teachers.

The M.A.T. degree in Mathematics Education is aimed at mathematics and computer science teachers in grades 8 - 12 and the community college level. [For mathematics teachers in grades 4 - 8, there is a comparable degree in the MAIS program.] It is a content-oriented program that strives to achieve a balance between increasing subject-matter knowledge and investigating relevant pedagogical and content issues of the mathematics curriculum with an emphasis on linking collegiate mathematics with secondary mathematics.

## Facilities

Scientific equipment which supports the various programs at the university is available to students in the M.A.T. program. Facilities in biology, chemistry, computer science, geoscience, mathematics and physics are briefly described in the respective disciplinary sections of the catalog.

## Admission Requirements

See the University's general admission requirements [here](#).

Special permission from the Department Head is required for admission.

## Science Education

Admission to the Graduate Program in Science Education requires, in addition to general University requirements, at least 24 hours in science. Students with strong backgrounds in an area of specialization are encouraged to discuss alternate plans with the Science Education Graduate Adviser. Students without the required science content backgrounds will be required to correct the deficiencies prior to admission.

## Mathematics Education

Admission to the Graduate Program in Mathematics Education requires, in addition to the general University requirements, includes at least one year of calculus, linear algebra and a junior-level course involving mathematical proof. Those teaching mathematics in grades 4 - 8 may wish to consider the option "The Teaching of Mathematics in Grades 4 - 8" in the Master of Arts in Interdisciplinary Studies [MAIS] program. Consult the Graduate Adviser for details.

## Degree Requirements

The University's general degree requirements are discussed [here](#). Additional requirements for each M.A.T. degree are described below.

### Science Education (Thesis Option; both online and traditional)

All students seeking the Master of Arts in Teaching (M.A.T.) Science Education degree (thesis option) must satisfactorily complete the following requirements (minimum of 36 graduate semester hours):

SCE 5301, SCE 5305, SCE 5308 and STAT 5353 (or acceptable equivalent as a prerequisite to enrolling in research hours),

A minimum of four courses (minimum of 12 semester hours) in a chosen specialization related to the student's major area of study. Specialty areas include biology, chemistry, geosciences and physics,

A minimum of three courses (minimum nine semester hours) in one specialty other than the chosen specialization.

A minimum of six semester hours in thesis research, SCE 6v03, and

Submission an acceptable thesis which warrants publication in peer reviewed journals, scholarly books, monographs or the equivalent.

In addition to the above requirements, students must submit, no later than the second semester of enrollment, an acceptable research proposal to the supervising committee. Upon completion of the thesis research, the candidate will publicly defend the thesis. The thesis is directed by a Supervising Professor and must be approved by the Head of the Science/Mathematics Education Department.

"Opportunities may arise for students to work directly in local schools. Be advised that public schools and many private schools within the state of Texas will require criminal background checks of all volunteers or individuals working within the schools regardless of the potential of direct contact with students."

### Science Education (Non-Thesis)

The M.A.T. degree in Science Education requires 36 semester hours, distributed as follows:

### **Science Education Courses (9 hours)**

SCE 5301 Critical Issues in Science Education  
SCE 5305 Evaluating Research in Science Education  
SCE 5308 Research Design and Methodology for Science Education

### **Science Content Courses (18-24 hours)**

Primary Area: 12-16 hours in biology, chemistry, geosciences, or physics.  
Secondary Area: 6-8 hours in biology, chemistry, geosciences, or physics.

### **Electives (3-12 hours)**

Three to twelve hours of electives are taken to complete the required minimum of 36 hours. These elective hours, chosen with the Graduate Advisor, may include additional science, mathematics, education and science education courses.

No more than two of the four courses required for a primary area may be taken during a summer field trip. No more than 15 hours will be accepted for transfer credit. Under appropriate circumstances, the Department Head may make substitutions for portions of these requirements.

## **Mathematics Education**

The M.A.T. degree in Mathematics Education requires 36 semester hours, distributed as follows:

### **Mathematics Education Core Courses (15 hours)**

Five approved courses chosen from:

Analysis: MATH 5301, 5302;

Algebra and Discrete Mathematics: CS 5333, MATH 6311;

Geometry: MATH 5305, 5306;

Probability and Statistics: STAT 5351, 5352

Other relevant courses approved by the Graduate Adviser

Students wishing to emphasize computer science may substitute appropriate courses for those in the Mathematics Education Core as approved by the Graduate Adviser.

### **Professional Course (3 hours)**

MATH 5310 (ED 5310) Seminar: The Teaching of Mathematics and Computer Science.

### **Guided Electives (18 hours)**

Six courses in mathematics, computer science or other area involving applications of mathematics or pedagogy (approval by Graduate Adviser required). MATH 5320 (which may be repeated up to six times) is highly recommended.

## **Science Education Course Descriptions**

**SCE 5301 Critical Issues in Science Education** (*3 semester hours*) Examination of classic issues in science and technology and the relationships developed between them. Topics include population and population growth, food and food sources, energy and energy sources, water needs/solutions, diseases and cures, housing – safe and

adequate, environmental issues – personal and political, and security – local and global. Also offered through the MAT-SE online strand. (3-0) Y

**SCE 5302 Photographic Field Collection Techniques** (3 semester hours) The use of a camera as a field collection instrument. Included topics are basic camera techniques, logging system for in-field use, coding system and cataloging procedure for access to stored slides. Field trip. (1-6) Y

**SCE 5305 Evaluating Research in Science Education** (3 semester hours) Examination of selected topics in the methodological and philosophical foundations of science education as applied to contemporary issues affecting today's students. Topics include current research on hands-on/inquiry teaching, concept mapping, student misconceptions, learning/teaching styles, alternative assessment, gender differences, learning environments, action research, and knowledge transfer to provide a context for the history of science literacy and educational literacy; quantitative and qualitative research methods; and professional writing techniques. Prerequisite: one semester teaching experience in science or consent of instructor. Also offered through the MAT-SE online strand. (3-0) Y

**SCE 5308 Research Design and Methodology** (3 semester hours) Application of the methodological and philosophical foundations of research in science education pertaining to an individual research question. Topics include educational research ethics and design, measuring instruments and data manipulation, methodological rigor, evidence-based conclusions, and publication genres to support the development of a professional presentation and formal research paper. Also offered through the MAT-SE online strand. Prerequisite: SCE 5305 (3-0) Y

**SCE 5309 Critical Thinking** (3 semester hours) Study of critical issues, problem-solving techniques and reasoning abilities as they relate to science/mathematics education in today's classrooms. (3-0) Y

**SCE5334 Instructional Strategies in Science** (3 hours credit) Designed for the master teacher/department leader, strategies for fostering an integrated science program based on national and Texas curriculum and assessment standards are presented through hands-on activities. (3-0) T

**SCE 8398 Thesis Research** (1 to 6 hours credit) May be repeated. (3-0) Y

**SCI 5320 Astrobiology** (3 hours credit) The ultimate integrated science, astrobiology brings together from the fields of astrophysics, planetary science, terrestrial geosciences, and of course, biology, an understanding how the history and diversity of life on our own planet relates to the possibilities for life on other worlds. (2-3) T

**SCI 5321 Science for Elementary School Teachers** (3 semester hours) Fundamental concepts in chemistry, physics, life and earth sciences, with particular emphasis on their applicability to the elementary science curriculum, including laboratory activities. (May be repeated to a maximum of 9 hours.) (2-3) Y

**SCI 5322 Basis of Evolution** (3 hours credit) Through discussions of the nature of science, Charles Darwin's travels, natural selection, the geologic record, and other topics, students will be acquainted with the scientific data that supports evolutionary theory. (2-3) T

**SCI 5324 Ecology** (3 semester hours) General ecological principles as related to productivity, population diversity, communities and ecosystem functions. Field data collection techniques included. (2-3) Y

**SCI 5325 Integrated Science for Teachers** (3 semester hours) Investigation of science standards using pedagogical models of best practice applicable to a variety of learners in diverse contexts. Inquiry-based investigations feature various topics in physical, earth and life sciences – with a hands-on emphasis on the latest scientific research and educational application. Courses are offered online only. (May be repeated to a maximum of 9 hours as topics cycle through earth, life and physical sciences.) (3-0) Y

**SCI 5326 Astronomy: Our Place in Space** (3 hours credit) This course focuses on developing student understanding of our planet fits within a larger astronomical context. Topics will include common misconceptions in astronomy, scale in the solar system and beyond, phases of the moon, seasons, navigating the night sky, our sun as a star, properties and lifecycles of stars, galaxies, and cosmology. (2-3) T

**SCI 5327 Comparative Planetology** (3 hours credit) Every world in our solar system is unique, but none more so than our own planet Earth. In this course we will explore the astrophysical, chemical, and geological processes that

have shaped each planet, moons and the myriad of rocky and icy bodies in our solar system. We will also investigate what discoveries of worlds orbiting other stars may tell us about our own solar system and home world. (2-3) T

**SCI 5328 Marine Science** (3 hours credit) The purpose of this class is to acquaint students with issues surrounding our use of the oceans and their resources. Students will also gain skills in writing an on-line lesson plan and in preparing a research report. (2-3) Y

**SCI 5331 Conceptual Physics I: Force and Motion** (3 hours credit) The primary focus of the class will be deepening the participants' conceptual understanding of physics, always with the added component of applicability to the pre-college classroom. We will use a hands-on approach, and will utilize FOSS, Cambridge Physics (CPO), and examples of physics in the everyday world. (3-0) T

**SCI 5332 Conceptual Physics II: Energy in Motion** (3 hours credit) The physics content topics will be covered in workshop style, with hands-on materials available in local districts or demonstrations and experiments that can be done with inexpensive or common materials. Students will also be expected to think critically about how topics discussed in the course can relate to their own classrooms. (3-0) T

**SCI 5333 Conceptual Physics III: Physics in the Modern World** (3 hours credit) The physics content topics covered in this course will deepen the participants' conceptual understanding of physics, using hands-on materials available in local districts or demonstrations and experiments that can be done with inexpensive or common materials. (3-0) T

**SCI 5335 Environmental Field Methods** (3 hours credit) Hands-on activities explore the properties and qualities of water through traditional and digital sampling methods. Designed for teachers, this inquiry-based course addresses information technology and environmental science standards in the context of real-world constructivist practice. May be repeated for credit as topics change. (2-3) T

**SCI5336 Astronomy** (3 hours credit) Develop an understanding of motions in the sky including phases of the moon, seasons, and the celestial sphere, properties and life cycles of stars (including the sun), nebulae, galaxies, and the history and fate of the universe. All topics are explored with an emphasis in developing a conceptual sense of our place in space and time, and how each topic fits within a greater conceptual context. This course address applications to pre-college classrooms both in course design and resources utilized. (3-0)T

**SCI 5330 Special Topics** (3 semester hours) May repeat for credit to a maximum of 9 hours. (3-0) Y

**SCE 5V06 Special Topics in Science Education** (1-3 semester hours) (May be repeated for credit to a maximum of 9 hours.) ([1-3]-0) S

**SCI 5V06 Special Topics in Science** (1-3 semester hours) (May be repeated for credit to a maximum of 9 hours) ([1-3]-0) S

## Mathematics Education Course Descriptions

### **MATH 5310 (ED 5310) Seminar: The Teaching of Mathematics and Computer Science**

(3 semester hours) A forum for sharing ideas on current issues in the teaching of mathematics and computer science, grades 8-14, through participant presentations and discussions. Some work on mathematics history is included.

Prerequisite: One year of teaching experience in mathematics or computer science. (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) (3-0) Y

### **MATH 5320 Usual and Unusual Problems Using Secondary Mathematics** (3 semester hours) For teachers only.

Emphasis on (1) problem solving, (2) linking 'college mathematics' and 'secondary mathematics', and (3) using technology. Content varies from term to term with courses in algebra, geometry, precalculus, calculus, probability/statistics, discrete mathematics, mathematical modeling. (May be repeated to a maximum of 18 semester hours.) (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) (3-0) Y

**MATH 5330 Topics in Mathematics** (*3 semester hours*) Special topics for mathematics teachers. (May be repeated for credit to a maximum of 9 hours.) (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) (3-0) Y

**MATH 5V06 Special Topics in Mathematics** (1-3 semester hours) (May be repeated for credit to a maximum of 9 hours) (May not be counted as credits toward the M.S. or Ph.D. degrees in Mathematical Sciences.) ([1-3]-0)S