

College of Science

UNDERGRADUATE:

Mission and Philosophy

The College of Science graduate programs are committed to excellence in graduate education and research and contribute, along with other institutions in this country and throughout the world, to the expansion of scientific knowledge. Graduates of our programs are highly trained and educated scientists who will be able to contribute to the economic and social well-being of our state and nation.

OVERVIEW

With outstanding departments of Biology, Chemistry and Biochemistry, Earth and Environmental Sciences, Mathematics, Physics and Psychology, the College of Science offers comprehensive graduate studies with our world class faculty and research programs. In addition to providing our students with strong core training in the physical and life sciences, we offer specialized Masters degrees for educators to expand their core science training. Interdisciplinary programs and Research Centers provide students with opportunities to span disciplines, and student research activities are complemented by excellent research facilities and state-of-the-art instrumentation. The College and Departments host a series of seminars to further expose our students to cutting edge science developments.

Master's degrees are offered in all of our departments, and we award Ph.D. degrees in Quantitative Biology, Applied Chemistry, Environmental and Earth Sciences, Mathematics, Applied Physics, and Experimental Psychology. For application and entrance requirements, or more on our graduate programs, please call us or visit our Web site at www.uta.edu/cos (<http://www.uta.edu/cos/>).

Overview

Pursuit of knowledge through scientific study has been the cornerstone of human accomplishment throughout history. The College of Science continues this tradition by providing undergraduate students with curricula that allow exploration and mastery of both the basic concepts and most recent advances of modern science and preparation for professional scientific careers. The College of Science consists of the departments of Biology, Chemistry and Biochemistry, Earth and Environmental Sciences, Mathematics, Physics, and Psychology. Bachelor of Science (B.S.) and Bachelor of Arts (B.A.) degrees offered by these departments prepare students to pursue a wide variety of rewarding, professional scientific careers or graduate study. Bachelor of Arts and Bachelor of Science degrees are offered in all departments. Bachelor of Arts degrees allow students to develop a broad liberal education with a concentration in science and are particularly appropriate for careers in science teaching. Bachelor of Science degrees provide students with a more intensive background in science, preparing them for advanced graduate study or entry into exciting technological careers in industry, medicine, government, business, or commerce. A wide range of degree options within departmental B.S. programs provide students with career-oriented course work required to pursue professional career paths in specific scientific fields. All departments within the college provide highly accessible student academic and career advising that support customization of degree plans to meet a student's specific career goals.

The College of Science fosters interaction between students and faculty. Faculty actively participate as advisors to student scientific societies and are readily available to assist or advise students both within and outside the classroom. Faculty members in all departments actively participate in research supported by world-class research facilities and modern scientific equipment. Undergraduate science majors are encouraged to engage in research under the supervision of a faculty member of their choice, many of whom have international reputations for their scholarly contributions. Students can receive course credit for supervised research.

Beyond the undergraduate degree, the College of Science offers programs leading to graduate degrees. All departments offer Master of Science degrees (M.S.) that allow students to pursue technologically intensive careers in public or private arenas. The departments of Biology, Chemistry and Biochemistry, Earth and Environmental Sciences, Mathematics, Physics and Psychology offer the Doctor of Philosophy degrees (Ph.D.) that allow students to carry out independent dissertation research within a chosen scientific specialty, leading to careers in research and/or university teaching. The M.S. and Ph.D. degrees offered by the Graduate Program in Environmental Science and Engineering prepare students for careers as environmental professionals. The Graduate Catalog provides details of the college's master's and doctoral degree programs.

Also available to undergraduate students in the College of Science are unique and innovative combined degree programs leading to both a B.S. degree and a graduate or professional degree within an accelerated time frame. These combined degree programs include the five-year Bachelor of Science (B.S.) in Biology/Master of Business Administration (M.B.A.) degree programs in Health Care and Biomedical Sciences Management and a five-year B.S. in Biology/Master of Biomedical Engineering (M.B.E.) degree program (see the Department of Biology section of this catalog for detailed descriptions of these programs).

The College of Science takes pride in offering students outstanding degree programs in all of its departments. These programs are marked by excellent teaching, broad undergraduate research opportunities and superior academic and career advising. Graduates of these degree programs are highly competitive in the job market or when applying to nationally recognized graduate or health professions schools. Please visit the College of Science website to make an appointment with one of our advisors. www.uta.edu/cos (<https://www.uta.edu/science/>)

Opportunities in Science

The future marvels of the 21st century will spring from science just as did those of the 20th century. The human genome project, miracle drugs, efficient fuels, arrays of new synthetic materials, the transistor, the laser, nuclear power, solar energy, computers, the Worldwide Web, global information systems, the electron microscope, nanotechnology, bioinformatics and sophisticated techniques for locating mineral deposits are merely a few examples of the crowning scientific achievements of the past century. Discoveries of similar or greater magnitude lie ahead in this new century as scientists bring their talents to bear on modern society's pressing problems such as alternative energy sources, environmental protection, and improved health care. Students graduating from College of Science degree programs have the unique opportunity to participate in this century of new and unparalleled scientific discovery.

Requirements for Admission to the College of Science

The University of Texas at Arlington does not admit students to specific degree programs. Instead students wishing to pursue a major in one of the College of Science undergraduate degree programs must apply to the appropriate academic unit for acceptance into that program. Students should familiarize themselves with the general requirements for acceptance to the degree program of their choice as well as the specific requirements for granting of the degree.

ACADEMIC POLICIES FOR COLLEGE OF SCIENCE MAJORS

In the College of Science, students are required to maintain a minimum overall GPA of 2.25 in all their course work as well as a minimum GPA of 2.25 in their major course work in order to remain in good standing within their degree program. Students whose overall or major GPA falls below 2.25 will be dropped as a major in the College of Science and must select an alternative major.

The general College of Science policy on academic probation may be superseded by more rigorous policies within specific science degree programs.

ACADEMIC POLICIES FOR SCIENCE MINORS

A science minor consists of 18 credit hours or more in any one of the departments within the college. At least 6 of the 18 hours must be in advanced 3000 or 4000 level courses. All classes that are to be used toward a minor must also be applicable toward a major in the same discipline. Non majors courses may not be applied toward a minor.

A 2.0 grade average must be maintained in the minor in order to be approved by the minor department. All classes for a science minor must be approved by an academic advisor in the minor department. Transfer students must complete at least nine hours toward the minor at UT Arlington, and six of the nine must be 3000 or 4000 level.

Transfer Students

Field of Study

Students who complete an approved field of study curriculum in whole or in part will receive academic credit for the equivalent courses within their selected field of study at UT Arlington. To view the field of study curriculums approved by the Texas Higher Education Coordinating Board, visit the THECB website (<https://www.highered.texas.gov/our-work/supporting-our-institutions/institutional-resources/workforce-transfer-resources/programs-of-study/>).

Core Complete

Students who transfer from a Texas community college or university and are certified as core complete shall have satisfied the core requirements of UT Arlington. Academic departments may, in some instances, require specific courses outside the major as prerequisites for major course work.

Academic Standards

Students who wish to be admitted to a department within the College of Science must have a grade point average of 2.25 or higher in all college course work completed prior to application for admission to the UT Arlington College of Science.

COMPETENCE IN COMPUTER USE

Graduating students are expected to be proficient in the use of computers. Proficiency is considered to be the ability to utilize word-processing, database/spreadsheet, statistical, graphical and other representative software applications in a student's major discipline. Each student should be able to tap the communications, analytical, and information-retrieval potential of computers to solve scientific problems and evaluate research results. Students should consult with their individual department, school or college undergraduate advisors to determine the mechanisms by which they can demonstrate computer competency. A student may be required to pass a proficiency examination or complete a department- or college-designated computer proficiency course to meet this requirement.

COMPETENCE IN ORAL PRESENTATIONS

Graduating students are expected to have proficiency in oral communication skills including interaction in classroom settings to meet the needs of their course work and utilization of acceptable grammar and pronunciation in formal presentations. Students should consult their individual department, school or college undergraduate advisors to determine the mechanisms by which they can demonstrate oral communication skills competency. A student may be required to pass a proficiency examination or complete a department- or college-designated oral communication skills course to meet this requirement.

Pre-Health Programs

Students interested in graduate health professional fields such as medicine, dentistry, physician assistant, pharmacy, optometry and veterinary medicine may complete required courses with most majors. The Health Professions Office offers pre-health advising on graduate health school requirements and expectations, access to resources, mock interviews, opportunity for a committee letter of recommendation, and feedback/assistance in applying to professional health schools.

In general, health professional admission committees do not state a preference regarding an applicant's undergraduate major, leaving students to choose a degree program best suited to their special abilities and interests. Therefore, a student may choose any major, as long as the minimum requirements for admission to the specific program(s) are met. Science courses for non-science majors do not satisfy the requirements for most graduate health professional schools. The B.S. in Biology meets the requirements for most programs. Additional information can be found on the Health Professions Website: <https://www.uta.edu/pre-health> (<https://www.uta.edu/pre-health/>).

Post Baccalaureate Non-Degree Seeking Program

The post baccalaureate program is intended for students who have previously completed a bachelor's degree and wish to pursue admission to a graduate health professional school, usually medical, dental, or PA school. Since student backgrounds vary, courses for the post baccalaureate program are custom designed for the individual student. This informal program does not have special admission requirements. Students in this program may complete prerequisite requirements in one to two years depending upon their undergraduate major and GPA, intended course load, time of entry to the program, and additional criteria that should be discussed with the Health Professions Advisor. Additional information can be found on the Post Bacc Program Page (<https://www.uta.edu/science/programs/health-professions/non-traditional-and-post-bacc-applicants.php>) on the Health Professions Website: <https://www.uta.edu/pre-health> (<https://www.uta.edu/pre-health/>).

Teacher Certification in the Sciences

Programs leading to teacher certification at secondary levels are available in departments of the College of Science in coordination with UTeach Arlington and the College of Education. Included among these are secondary certification in Composite Science or Life Science offered in the Departments of Biology and Earth & Environmental Sciences; in Physical Science offered in the Departments of Physics and Chemistry & Biochemistry; in Chemistry offered in the Department of Chemistry and Biochemistry; in Physics/Mathematics offered in the Department of Physics; and in Mathematics offered in the Department of Mathematics. Descriptions of these programs are provided in each department's section of this catalog.

Transfer Students

Students transferring from other institutions are invited to explore opportunities in the College of Science. Inquiries about the equivalency of their transferred courses and other questions related to transferring are welcome to make an appointment with the Transfer Advisor, 107B Life Science Building.

Science Constituency Council

The Science Constituency Council is the official representative student organization for the College of Science with Student Government. Meeting twice monthly, the SCC serves both the College and its students. The SCC strives to involve a greater number of students in all aspects of the College of Science. SCC members are majors in the departments of the College. For more information, visit <https://mavorgs.campuslabs.com/engage/organization/scienceconstituencycouncil> (<https://mavorgs.campuslabs.com/engage/organization/scienceconstituencycouncil/>).

Science Learning Center

501 S. Nedderman Dr. · 106 Life Science Bldg.

The Science Learning Center is an on-site resource facility designed to support student learning and course work in science and mathematics through self-study modules and a variety of study aids. In cooperation with College of Science faculty, the center offers a full spectrum of multimedia resource materials and study aids for students in biology, chemistry, geology, mathematics, physics and psychology classes. The center also provides students with study areas and a study lounge.

Materials currently available include:

- Study guides and sample exams
- Lab notes and solutions manuals
- Hands-on models (Anatomical and Molecular)
- MCAT Prep Resources
- Networked computers

Chemistry Clinic

The Chemistry Clinic is available to answer questions related to your chemistry courses. This service is free for all UT Arlington students enrolled in the following courses:

CHEM 1400	INTRODUCTORY CHEMICAL PRINCIPLES	4
CHEM 1341	GENERAL CHEMISTRY I	3
CHEM 1342	GENERAL CHEMISTRY II	3
CHEM 1441	GENERAL CHEMISTRY I	4
CHEM 1442	GENERAL CHEMISTRY II	4
CHEM 1451	CHEMISTRY FOR HEALTH SCIENCES	4
CHEM 1465	CHEMISTRY FOR ENGINEERS	4
CHEM 2321	ORGANIC CHEMISTRY I	3
CHEM 2322	ORGANIC CHEMISTRY II	3

The tutors are outstanding undergraduates in the Department of Chemistry & Biochemistry. The clinic's location is Room 318, Science Hall, where you can find the operation hours posted. No appointment is necessary.

Math Clinic

The Math Clinic is a service provided on a walk-in basis for all math students enrolled in:

MATH 0302	FUNDAMENTALS OF ALGEBRA	3
MATH 1301	CONTEMPORARY MATHEMATICS	3
MATH 1302	COLLEGE ALGEBRA	3
MATH 1303	TRIGONOMETRY	3
MATH 1308	ELEMENTARY STATISTICAL ANALYSIS	3
MATH 1315	COLLEGE ALGEBRA FOR ECONOMICS & BUSINESS ANALYSIS	3
MATH 1316	MATHEMATICS FOR ECONOMICS AND BUSINESS ANALYSIS	3
MATH 1324	ALGEBRA AND TRIGONOMETRY	3
MATH 1325	ANALYTIC GEOMETRY	3
MATH 1421	PREPARATION FOR CALCULUS	4
MATH 1426	CALCULUS I	4
MATH 2326	CALCULUS III	3
MATH 2425	CALCULUS II	4
MATH 3319	DIFFERENTIAL EQUATIONS & LINEAR ALGEBRA	3

It is located in Room 325, Pickard Hall, and is open seven days a week during the Fall and Spring semesters and with limited hours during the Summer semesters. The tutors are outstanding undergraduate students with demonstrated abilities for helping students.

Physics Clinic

The Physics Clinic is a tutoring service provided on a walk-in basis for students enrolled in:

PHYS 1441	GENERAL COLLEGE PHYSICS I	4
PHYS 1442	GENERAL COLLEGE PHYSICS II	4
PHYS 1443	GENERAL TECHNICAL PHYSICS I	4
PHYS 1444	GENERAL TECHNICAL PHYSICS II	4

The tutors include graduate students, faculty and outstanding undergraduates. The location and times are posted in the Physics Department Office, 108 Science Hall.

Science and Mathematics for the Non-Science Major

The College of Science provides a wide variety of science courses for non-science majors. These courses, including those listed below, have been specifically designed to be applicable to science and mathematics requirements for non-science majors. Non-major students should examine the requirements for their degrees before selecting science courses to meet those requirements. The listed courses are also intended to stimulate interest in science and mathematics beyond the specific degree requirements for non-science majors. The figures in parenthesis indicate the number of hours

of instruction per week in the Fall and Spring Semesters. The first figure indicates the amount of time devoted to theory, and the second indicates the amount of time devoted to laboratory work.

BIOLOGY

BIOL 1301	NUTRITION	3
BIOL 1333	BIOLOGY FOR NON-SCIENCE MAJORS: CELLS AND DISEASE	3
BIOL 1334	BIOLOGY FOR NON-SCIENCE MAJORS: LIFE ON EARTH	3
BIOL 3303	DRUGS AND BEHAVIOR	3

CHEMISTRY

CHEM 1445	CHEMISTRY FOR NON-SCIENCE MAJORS	4
CHEM 1446	CHEMISTRY II FOR NON-SCIENCE MAJORS	4
CHEM 1451	CHEMISTRY FOR HEALTH SCIENCES	4

GEOLOGY

GEOL 1360	GEOLOGIC HAZARDS	3
GEOL 1301	EARTH SYSTEMS	3
GEOL 1302	EARTH HISTORY	3
GEOL 1330	GLOBAL WARMING	3
GEOL 1350	INTRODUCTION TO OCEANOGRAPHY	3
GEOL 1350	INTRODUCTION TO OCEANOGRAPHY	3

MATHEMATICS

MATH 0302	FUNDAMENTALS OF ALGEBRA	3
MATH 1301	CONTEMPORARY MATHEMATICS	3
MATH 1302	COLLEGE ALGEBRA	3
MATH 1308	ELEMENTARY STATISTICAL ANALYSIS	3
MATH 1315	COLLEGE ALGEBRA FOR ECONOMICS & BUSINESS ANALYSIS	3

PHYSICS

PHYS 1300	INTRODUCTION TO MUSICAL ACOUSTICS	3
PHYS 1301	PHYSICS FOR NON SPECIALISTS I	3
PHYS 1302	PHYSICS FOR NON SPECIALISTS II	3

PSYCHOLOGY

The psychology courses listed below are of general interest. Such courses contribute significantly to a well-balanced education even though they do not apply to any science requirement.

PSYC 1315	INTRODUCTION TO PSYCHOLOGY	3
PSYC 2300	STATISTICS IN PSYCHOLOGY	3
PSYC 2317	BASIC CONCEPTS IN HUMAN SEXUALITY ¹	3
PSYC 3301	PSYCHOLOGY OF HUMAN RELATIONS	3
PSYC 3304	ANALYSIS & MANAGEMENT OF BEHAVIOR	3
PSYC 3303	DRUGS AND BEHAVIOR ¹	3
PSYC 3306	PSYCHOLOGY OF CREATIVITY AND CREATIVE THINKING	3
PSYC 3310	DEVELOPMENTAL PSYCHOLOGY	3
PSYC 3312	SOCIAL & PERSONALITY DEVELOPMENT	3
PSYC 3314	PSYCHOLOGY OF PERSONALITY	3
PSYC 3315	SOCIAL PSYCHOLOGY	3
PSYC 3317	INTRODUCTION TO CLINICAL AND COUNSELING PSYCHOLOGY	3
PSYC 3318	ABNORMAL PSYCHOLOGY	3
PSYC 3326	ANIMAL BEHAVIOR ¹	3

¹ Course can be taken as biology.

GRADUATE:

Scholastic Activity and Research Interests of the Faculty

BIOLOGY

The Department of Biology has a wide array of research programs ranging from molecular through ecosystem levels of integration. The program boasts strengths in ecology and systematics, evolution, microbiology, genomics, and molecular biology, and has active funding from a variety of private and public agencies. The department also hosts centers for genomics, biological macrofouling, electron microscopy and a collection of vertebrates. The research program emphasizes quantitative aspects of biology and provides students with strong training in statistics and experimental design.

CHEMISTRY AND BIOCHEMISTRY

Research programs include synthetic work on natural products, medically active agents, novel ligands, new catalysts, luminescent materials, photocatalysts, supramolecular and metallosupramolecular compounds, molecular magnetism, molecular recognition, stabilization of reactive intermediates, solar energy conversion and electrically conducting polymers. Biochemical research includes studies of enzymology and molecular biology of bacterial metabolism, and studies on problems involved in anticancer therapy. Physical, analytical and electrochemical research includes studies of colloids and surfaces, electrode modification through thin film surface deposition, MALDI mass spectrometry and characterization of the electrical properties of polymers and other materials. Theoretical studies involve both a major computational program applying molecular orbital theory to a variety of problems.

EARTH AND ENVIRONMENTAL SCIENCES

Department research has a strong orientation toward the application of geochemistry, oceanography, geophysics and paleobiology to earth resources and the environment. Current research interests include analysis and modeling of geologic deformational structures, biostratigraphy of accreted terranes of the Pacific Northwest and the middle Permian of West Texas, sedimentology, paleoclimatology, hydrology, fluvial geomorphology, environmental health, and plate tectonics.

MATHEMATICS

The Department of Mathematics at the University of Texas at Arlington is fast evolving into one of the premier centers in the Dallas/Fort Worth metroplex for mathematics research and education. Our active research faculty have strengths that lie in pure, applied mathematics, statistics, and mathematics education. Many of their research projects are supported by external grants. Recent faculty scholarly accomplishments attest to the high quality of research. The research interests of the faculty in the Mathematics Department include the following areas:

Algebra: homological theory of commutative Noetherian rings; non-commutative algebra using geometric methods; symbolic computations; representations of Lie Algebras and superalgebras.

Differential Equations, Integral Equations and Dynamical Systems: geometric study of integrable Hamiltonian systems; stability and instability of solitary waves; nonlinear dispersive waves; free boundary problems related to phase transition and multi-fluid flow; stochastic differential equations; control theory; inverse problems; computerized tomography.

Geometry: birational algebraic geometry and Mori theory; differential geometry and inverse spectral geometry; finite geometry related to non-associative division algebras.

Mathematical Biology: mathematical modeling of microbial populations, biofilms and competition dynamics; population biology and epidemiology; neuronal dynamics.

Mathematical Statistics, Probability Theory and Stochastic Process: multivariate analysis, statistical inference, sample survey and statistical process control; stochastic processes and applications to stochastic differential equations, random graphs, path integrals, quantum mechanics.

Mathematical Education: mathematics program development, impact of reform mathematics learning strategies on mathematics teaching, mathematics problem solving for teaching.

Numerical Analysis: numerical solutions to ordinary and partial differential equations; moving grid, multi-grid and multilevel adaptive methods; fluid dynamics (mechanics); numerical simulation and scientific computation; numerical combustion; software development.

PHYSICS

Current research in the department is primarily in the areas of condensed matter physics, materials science and high energy physics. The theoretical condensed matter group is engaged in cluster, electron transport, electronic structure, molecular dynamics and path integral computations having relevance to the chemical, electrical and magnetic properties of surfaces, metals and semiconductors. The experimental condensed matter group is engaged in studies of diamond coatings, magnetic multi-layers, metals, semiconductors and surfaces using electron, positron, optical and magnetic resonance spectroscopies. The experimental high energy group is involved in collider experiments at Fermi-lab, Brookhaven Laboratory and CERN to

study QCD and to search for super-symmetry and other physics beyond the standard model. Other active research areas include high energy theory, optics, parallel computing and statistical physics.

PSYCHOLOGY

Expertise and research activity include animal behavior, animal and human learning, cognitive processes, social psychology, psycho-biology and developmental psychology. Current research interests include group brainstorming, verbal memory and neuro-psychology, applied psychological measurement, pain systems, decision processes, naturalistic social cognition, stress, genetic and hormonal determinants of aggressive and defensive behaviors and parent-offspring interactions, sea turtle behavior, and infant mental representation of objects.

SCIENCE EDUCATION

The Master of Arts in Interdisciplinary Science (MAIS), a 36 credit hour degree program without a thesis requirement, was designed and developed by science teachers for science teachers. The program will help science educators strengthen and update their knowledge of content in two or more of the following cognate areas: biology, chemistry, earth & environmental sciences, mathematics, and physics. In addition to enhancing content knowledge, the courses will help educators develop teaching strategies that lead to improved student learning, implement high quality instructional materials, and develop skills in using various strategies for assessing student learning. The MAIS degree will serve the needs of classroom teachers, content-area and staff development specialists, curriculum developers, program directors, school administrators, college/university faculty, and educators from informal science institutions who have responsibility for designing, delivering, evaluating, and/or continuously improving standards-based science, mathematics, and technology instruction for students, prekindergarten through the undergraduate degree.

While engaging in the coursework, educators will become learners themselves to deepen their own mastery of scientific and/or mathematical content. The laboratory-based learning activities in the program will help science educators see teaching as less a matter of knowledge transfer and more as an activity of facilitation in which knowledge is generated, content is investigated in depth, and meaning is developed from experience. Graduates of the program will take their place as master science educators who are recognized as proven practitioners in delivering rigorous and relevant instruction and are valued as effective coaches, mentors, and teacher trainers.

Programs

MASTER OF SCIENCE DEGREES

Biology
 Chemistry
 Earth & Environmental Sciences (Both Thesis and Non-thesis)
 Mathematics
 Physics
 Psychology

MASTER OF ARTS DEGREE

Interdisciplinary Science (Non-thesis)
 Mathematics

DOCTORAL DEGREES

Chemistry
 Experimental Psychology
 Physics and Applied Physics
 Quantitative Biology
 Mathematics
 Earth and Environmental Sciences