

School of Natural Sciences and Mathematics

Department of Chemistry and Biochemistry

Objectives

The PhD program is designed to produce graduates with a focus on innovation and problem solving in interdisciplinary cutting edge research areas such as organic and inorganic materials, nanotechnology, biotechnology, and polymer chemistry. These graduates, with their broad course background, research skills, and practical attitudes should find ready employment in industry or academic positions. A spectrum of courses provides the student with a broad knowledge of chemistry.

The Master of Science program offers students the opportunity to prepare for positions in industry, for further training in related scientific fields, or for further training in chemistry.

Facilities

The department has the equipment and facilities necessary for routine use by its faculty and students in teaching and research. Larger items include: 270 MHz (2), 400 MHz, and 500 MHz multi-nuclear FT-NMR spectrometers; powder and single crystal x-ray diffractometer; MALDI mass spectrometer, several GC-MS and HPLC-MS; assorted spectrophotometers utilizing fluorescence, phosphorescence and absorption; peptide synthesizers; gel permeation chromatographs; workstations with molecular modeling software; and scanning tunneling and atomic force microscopes. Chemistry also participates in the Alan G. MacDiarmid NanoTech Institute, which houses instrumentation for modern materials science research. Facilities external to chemistry, but readily available to its use, include a library, the computer center, the cleanroom, and well-equipped machine and electronics shops.

Admission Requirements

The University's general admission requirements are discussed on the [Graduate Admission](https://catalog.utdallas.edu/2016/graduate/admission) page (catalog.utdallas.edu/2016/graduate/admission).

Undergraduate preparation equivalent to the degree of Bachelor of Science in Chemistry is required. The Chemistry program has no other requirements above the general admission requirements. However, admission is competitive and is decided case by case on the basis of the quality of previous relevant academic work, GRE combined score of 295 for the verbal and quantitative components, letters of reference, the student's statement of academic interests and,

for foreign students, evidence of fluency in English. Foreign students with TOEFL scores less than 600 (paper test), 250 (computer test), or 100 (internet test) are admitted only in special circumstances.

Degree Requirements

The University's general degree requirements are discussed on the [Graduate Policies and Procedures](https://catalog.utdallas.edu/2016/graduate/policies/policy) page (catalog.utdallas.edu/2016/graduate/policies/policy).

Master of Science in Chemistry

30 semester credit hours minimum

Department Faculty

FACG> nsm-chemistry-ms

Distinguished Chair in Natural Sciences and Mathematics; Dean of the School of Natural Sciences and Mathematics: Bruce M. Novak

Robert A. Welch Chair in Chemistry; Professor of Chemistry: Ray H. Baughman

Edith O'Donnell Distinguished Chair in Conservation Science: David McPhail

Cecil and Ida Green Distinguished Chair in Systems Biology; Professor of Chemistry: A. Dean Sherry

Professors: Kenneth J. Balkus Jr., Julia Chan, Rockford K. Draper, John P. Ferraris, Bruce E. Gnade, Inga H. Musselman

Professor Emeritus: Richard A. Caldwell

Associate Professors: Jung-Mo Ahn, Michael C. Biewer, Gregg R. Dieckmann, Warren J. Goux, Steven O. Nielsen, Paul Pantano, John W. Sibert IV, Mihaela C. Stefan, Jie Zheng

Assistant Professors: Sheena D'Arcy, Sheel Dodani, Jeremiah J. Gassensmith, Jiyong Lee, Gabriele Meloni, Ronald A. Smaldone

Visiting Professor: Jinming Gao

Research Professor: Duck Joo (D. J.) Yang

Senior Lecturers: Sergio Cortes, Sandhya R. Gavva, Nimanka Panapitiya, Yanping Qin, Amandeep Sra, Claudia Taenzler

UT Dallas Affiliated Faculty: Yves J. Chabal, Lev D. Gelb, Manuel Quevedo-Lopez, Walter E. Voit, Amy V. Walker, Anvar A. Zakhidov

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A minimum of 30 total graduate semester credit hours is required. The MS degree can be pursued on a full- or part-time basis.

Graduate students in chemistry are expected to demonstrate fundamental knowledge of lecture and laboratory skills by completing the following courses with a grade of B or better.

Core Courses:

[CHEM 5314](#) Advanced Physical Chemistry

[CHEM 5331](#) Advanced Organic Chemistry I

[CHEM 5341](#) Advanced Inorganic Chemistry I

[CHEM 5355](#) Analytical Techniques I

Doctor of Philosophy in Chemistry

75 semester credit hours minimum beyond the baccalaureate degree

Department Faculty

FACG> nsm-chemistry-phd

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Normally pursued by full-time students enrolled in a minimum of 9 semester credit hours of approved graduate level courses per semester.

Other Course Requirements

In addition to the 12-semester credit hour core course requirements listed above, students seeking the PhD degree must take two upper-level elective courses that are approved by the student's faculty research advisor and the Chemistry graduate advisor. PhD students are expected to complete these six required courses within the first two years of their enrollment. [CHEM 8399](#) is also required as part of the preparation of the dissertation. Additional courses may be required by the student's Supervisory Committee.

Well-prepared students may request substitution of portions of the course requirements from the Committee on Graduate Studies in Chemistry. At least three organized courses must be taken at The University of Texas at Dallas. The opportunity exists to take elective courses during their second and subsequent years.

Qualifying Examination: Original Research Proposal

All PhD students must take the qualifying examination. In the second year, students seeking the PhD degree are required to write, present, and defend an original research proposal. In addition to providing valuable experience to the student, this exam is used to assess the student's originality and skills in organizing an effective approach to solving a novel problem. The results of this examination will be one criterion upon which admission to doctoral candidacy will be judged.

Research

Students have the option of completing a thesis master's degree as part of their doctoral

candidacy preparation, unless this requirement has been satisfied at the time of admission. The doctoral research project may be conducted in the same laboratory as the master's degree research or, in order to gain a broader research experience, in another laboratory. A manuscript embodying a substantial portion of the PhD dissertation research accomplished by the student must be submitted to a suitable professional refereed journal prior to the public seminar and dissertation defense. A public seminar, successful defense of the dissertation, and its acceptance by the Supervising Committee and the Graduate Dean conclude the requirements for the PhD.

Representative Research Areas

Within the Chemistry program, opportunities exist for coursework and/or research in nanotechnology, biochemistry/biotechnology, organic, inorganic, materials, analytical, and physical chemistry. The opportunity to take coursework in several of the other University programs allows the student to prepare for interdisciplinary work. Specific topics within these broad research areas include nanoscience (carbon nanotubes, sensors, actuators, nanoscale devices, synthesis of nanoporous materials); organic solid-state and polymer chemistry (energy storage, electrochromism, light-emitting polymers, solar cells, membrane separations); inorganic solid-state (zeolites, membranes, laser ablation, sensors, fuel cells, electrospinning); biological NMR (structural biology, using NMR active tracers to follow metabolism in cells, isolated tissues and in vivo); supramolecular chemistry (design of novel host-guest systems; biologically responsive MRI agents, design, synthesis and study of macrocyclic receptors with applications in catalysis, materials science, and medicine); scanning probe microscopy (instrument development, image contrast, application to polymer microstructure); bioanalytical and bionano chemistry, synthetic chemistry (macrocycles, metalloprotein function); biochemistry/enzymology (study of oxidative stress; oxidative metabolism of signaling molecules; molecular modeling; and catalysis).

Updated: 2019-08-09 13:08:55 v3.a4603e