Department of Chemistry

http://www.utdallas.edu/dept/chemistry/

Faculty

Robert A. Welch Chair in Chemistry; Professor of Chemistry: Ray H. Baughman
Cecil and Ida Green Distinguished Chair in Systems Biology; Professor of Chemistry: A. Dean Sherry
Cecil and Ida Green Chair in Systems Biology; Professor of Chemistry: John P. Ferraris
Professors: Kenneth J. Balkus, Jr., Rockford K. Draper (Biology), Bruce E. Gnade (Electrical Engineering), Lynn A. Melton
Associate Professors: Michael C. Biewer, Gregg R. Dieckmann, Warren J. Goux, Inga H. Musselman, Paul Pantano, John W. Sibert
Assistant Professors: Jung-Mo Ahn, Donovan C. Haines, Steven O. Nielsen
Affiliated Professors: Lee A. Bulla (Biology), Anvar A. Zakhidov (Physics)
Research Professors: Duck Joo Yang, Gary E. Kiefer
Emeritus Professors: Richard A. Caldwell
Senior Lecturers: Sergio Cortes, Sandhya R. Gavva

Objectives

The Ph.D. program is designed to produce graduates with a focus on innovation and problem solving in current materials, biotechnology, and industrial process research and development. 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. A student may apply for either of two research tracks: an intramural research track or an extramural/intramural research track, which includes a one-year internship in an industrial or governmental R&D facility.

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 a laser spectroscopy facility; 270 MHz (2), and 500 MHz multi-nuclear FT-NMR spectrometers; a powder x-ray diffractometer; assorted spectrophotometers utilizing fluorescence, phosphorescence and absorption; a protein synthesizer; gel permeation chromatographs; workstations with molecular modeling software; and scanning tunneling and atomic force microscopes.

Chemistry also participates in the UTD 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 here.

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 beginning on page 24. However, admission is competitive and is decided case by case on the basis of the quality of previous relevant academic work, GRE scores (highly recommended), 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) or 250 (computer test) are admitted only in special circumstances.

Degree Requirements

The University's general degree requirements are discussed here.

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 (15 hours)

CHEM 5314 Advanced Physical Chemistry
CHEM 5331 Advanced Organic Chemistry I
CHEM 5341 Advanced Inorganic Chemistry I
CHEM 5355 Analytical Techniques I
CHEM 6389 Scientific Literature and Communication Skills

Master of Science

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

Other Course Requirements

The remaining requirements beyond the 15-hour core listed above may be satisfied in one of the two ways listed below.

- Presentation and defense of a written master's thesis. The student must complete, as a minimum, 12 credit hours of research or other graduate electives plus CHEM 8398. A Supervising Committee will be appointed to guide the student's thesis work and to assess the completed thesis.
- Completion of an approved internship in an industrial or governmental laboratory. The student must complete, as a minimum, 15 credit hours of research, chemistry internship or other graduate electives.

A Supervising Committee must approve an internship in advance. The final written report must be defended before this committee and filed in the Chemistry department office.

Doctor of Philosophy

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

Other Course Requirements

In addition to the 15-semester hour core course requirements listed above, students seeking the Ph.D. degree must take two upper level chemistry courses, as specified by the Chemistry Graduate Committee. Ph.D. students are expected to complete these seven required courses within the first two years of their enrollment. CHEM 8399 is 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

In the second year, students seeking the Ph.D. 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 Practica

All students must complete a thesis Master's degree as part of their doctoral candidacy preparation, unless this requirement has been satisfied at the time of admission. A student may apply for either of the two subsequent research tracks, the intramural research track or the extramural/intramural research track, and on achievement of doctoral candidacy, may pursue a track for which they have been accepted. Students in the intramural research track begin their intramural research immediately after achieving doctoral

candidacy. Students in the extramural/intramural track begin their 9-12 month Industrial Practicum immediately after achieving doctoral candidacy, and after successful defense of their Industrial Practicum report, complete their doctoral research after returning to campus. In either case, the standard for the doctoral defense is the same: the student must present and defend a dissertation which describes new knowledge and the substance of which is ready for submission to a quality scientific journal. The Industrial Practicum provides a student research experience in innovation and/or problem solving in an industrial or governmental R&D facility. Students who apply for an Industrial Practicum but who do not achieve placement will proceed to the intramural track.

The doctoral research, either intramural or extramural/intramural, may be taken in the same laboratory as the Master's degree research or, in order to gain a broader research experience, in another laboratory.

Research

Within the Chemistry program, opportunities exist for course work and/or research in nanotechnology, biochemistry/biotechnology, organic, inorganic, materials, analytical, and physical chemistry. The opportunity to take course work 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, 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 chemistry (fiber-optic microarrays for probing cells and tissue), synthetic chemistry (macrocycles, small protein domains to study membrane fusion; DNA recognition and modification; metalloprotein function); biochemistry/enzymology (study of oxidative stress; oxidative metabolism of signaling molecules; enzymology of monooxygenation, molecular modeling; and catalysis) and laser diagnostics for industrial mixing.

Special topics within the Industrial Practicum research areas have included silicon wafer inspection instrumentation development, laser engraving instrumentation development, process development and improvement in pharmaceutical manufacturing, and natural product identification.

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