Chemistry

201A Physical Science Building
(915) 747-5701 (ph)
(915) 747-5748 (fax)
chemistry@utep.edu
www.chemistry.utep.edu

CHAIRPERSON: Jorge Gardea-Torresdey

Doctor of Philosophy in Chemistry

The Chemistry department administers the Doctor of Philosophy in Chemistry which consists of 72 credit hours beyond the bachelor’s level (or at least 42 hours beyond the master’s level). The program will provide opportunities for education and research in areas consistent with the strengths of department faculty and established research initiatives. The program is designed to prepare professional chemists for careers in teaching and research in academic, industrial and public sector settings. It will contribute to meeting an anticipated need for doctorally-trained chemists, particularly Hispanics, in industry and in academia. The border region location also places the UTEP program to collaborate with locally-based industry to exploit the opportunities for commercialization of research results.

Requirements for Admission to the Ph.D. Program

Admissions recommendations will be based upon review of an applicant’s academic record and other relevant performance indicators, set out in the following list, as to the potential for academic success.

1. Bachelor’s degree in chemistry or in a related science discipline from an accredited institution in the United States or proof of equivalent education in a foreign institution
2. Official transcripts of all previous academic work.
3. Official scores on the Graduate Record Examination (GRE).
4. Official TOEFL scores of 550 or higher for international applicants whose first language is not English or who have not completed a university degree in the U.S. or other English-speaking institutions.
5. Three letters of recommendation from individuals who are qualified to assess the applicant’s potential for doctoral work.
6. A personal statement setting out the applicant’s reasons for wishing to pursue a Ph.D. in Chemistry at UTEP and future career plans
7. Curriculum Vitae

Requirements for the Ph.D. Degree

A total of 72 semester credit hours beyond the Bachelor’s degree will be required for this degree. Students who previously earned a Master’s degree in Chemistry may, at the discretion of the admissions committee, be awarded up to 30 hours of credit toward the doctoral degree. Each student’s case will be individually evaluated to determine whether additional courses may be required. In order to qualify for Ph.D. candidacy students have to pass cumulative exams by the end of their second year in graduate school. In their third year of graduate studies Ph.D. students will take the comprehensive exam, which consists of two parts: Part A, presentation of the student’s research project; and Part B, presentation of an original research idea, which should be distinct from the student’s research project but may be in the same area of chemistry.
Credit Hour Requirements

Core Chemistry Graduate Courses 15 hours
Elective Graduate Courses in Chemistry or Allied Fields as
approved by the student's Dissertation committee 9 hours
Graduate Seminar 4 hours
Departmental Seminar 6 hours
Teaching Practicum 2 hours
Doctoral Research 30 hours
Dissertation 6 hours

Required Doctoral Courses

1. Core Chemistry Graduate Courses: (15 credit hours)
Each student must take five courses in the chemistry core distributed as follows. The courses will be selected in consultation with the student's advisor and the program director.

- At least 3 courses (9 hours) from the following:
  - CHEM 5318 (6318) Advanced Analytical Chemistry
  - CHEM 5321 (6321) Advanced Organic Chemistry I
  - CHEM 5331 (6331) Advanced Biochemistry
  - CHEM 5351 (6351) Advanced Physical Chemistry I
  - CHEM 5361 (6361) Advanced Inorganic Chemistry I

- Two courses (6 hours) from the following:
  a. The two remaining core courses listed above or
  b. CHEM 5322 (6322) Advanced Organic Chemistry II
     CHEM 5352 (6352) Advanced Physical Chemistry II
     CHEM 5319 (6319) Contemporary Topics in Analytical Chemistry
     CHEM 5329 (6329) Contemporary Topics in Organic Chemistry
     CHEM 5339 (6339) Contemporary Topics in Biochemistry
     CHEM 5341 (6341) Analysis and Modeling of Biological Structures
     CHEM 5369 (6369) Contemporary Topics in Inorganic Chemistry

2. Elective Graduate Courses in Chemistry or Allied Fields as approved by the student's dissertation committee: (9 credit hours)
Each student in accordance with the overall program requirements will develop a degree plan in consultation with her/his supervisor and the program director appropriate to her/his specific interests and academic needs. A minimum of nine hours must be in courses that are directly related to the student's research field, as approved by the student's research director.
The required nine hours of elective courses may be selected from the graduate offerings of the Chemistry department and other UTEP departments and programs. With the approval of the student's advisor and the program Director, a student may take undergraduate courses in science fields (that have been approved for graduate credit) to fulfill this requirement. Graduate students in such courses will be expected to do additional work appropriate to graduate-level training.

3. Graduate Seminar (4 credit hours)
Doctoral student are expected to participate in the 1 hour Graduate Seminar Course. They must enroll in the course at least four times. This course will be designed to promote professional development. It will include a wide variety of topics in the areas of scientific information retrieval, laboratory safety, research ethics, oral and written presentation of research results and writing grant proposals. Attention will also be given to providing the students with current information and advice on career opportunities, writing job applications and how to conduct themselves at interviews.
4. **Department Seminar (6 credit hours)**
   All graduate students, in residence, are required to enroll in and attend the weekly seminars that feature accounts of current research by outstanding investigators in chemistry and related scientific areas.

5. **Teaching Practicum (2 credit hours)**
   All doctoral candidates will be required to earn two hours of credit, team-teaching undergraduate (or graduate) courses with an experienced faculty member. Students will also be encouraged to participate in the professional development programs focusing on preparing future faculty and professionals offered through the Graduate School and the Center for Effective Teaching and Learning.

6. **Doctoral Research (30 credit hours)**
   Candidates for a Ph.D., must earn credit for at least 30 semester credit hour of original research in some recognized branch of chemistry. The candidate must work under the guidance of a faculty supervisor. The purpose of the program is to enable the candidates to develop the skills and knowledge to enable them to carry out an independent program of research.
   **Career Practicum:** Credit may, with concurrence of their research director, be given for students to spend a semester in another academic, an industrial or governmental environment to permit them to explore possible career options.

7. **Doctoral Dissertation (6 credit hours)**
   All graduates must complete a dissertation that is a substantial work of original scholarship. The dissertation shall contain an introduction that describes the general area of chemical scholarship and clearly identifies the purpose of the investigation. The research shall have led to new knowledge of a standard worthy of publication in a major refereed journal. If previously published articles are to be included in the dissertation, it must be made clear how much the candidate has contributed. Sufficient detail of the nature of the work performed should be provided such that it should be possible for a qualified reader to repeat each step. In cases involving potential patents, all or part of the dissertation may be embargoed for specified periods of time, following accepted university policies. Candidates must defend their dissertations successfully. Part of the defense proceeding will be open to the public.

   CHEM 6398  Dissertation
   CHEM 6399  Dissertation

   A copy of the dissertation in PDF or Word electronic format must be submitted to the Graduate School for format check prior to the scheduled defense date. The dissertation, including an abstract not to exceed 350 words, must be prepared according to the Graduate School’s thesis and dissertation guidelines available at the Graduate School website. The student will receive email confirmation from the Graduate School after the format has been approved. The final Graduate School approved dissertation must be submitted to the Graduate School in PDF electronic format on a CD in a case by the deadline as published in the Class Schedule along with a hard copy of the signature page with original signatures of the dissertation committee members. The signature page must be included in the PDF file but it should not be signed.

   Doctoral candidates are also required to submit the Graduate School approved dissertation at the University Microfilms International website for on-line publication, http://dissertations.umi.com/utep. Dissertations are regarded as publications and will be made public once they are approved and submitted. On-line publication does not preclude subsequent publication of the dissertation, in whole or in part, as a monograph or in a journal. Copyright at the author’s expense may be arranged through University Microfilms International. In order to protect patent or any other rights, the Graduate School may be requested to delay publication for a period of one year. This request must be supported by a written recommendation of the supervising professor.
For Doctoral Students Only

Chemistry (CHEM)

6195  Graduate Seminar (1-0)
Ph.D. in Chemistry seminar.

6196  Graduate Research in Chemistry (1-0)
Prerequisite: Department approval.

6318  Advanced Analytical Chemistry (3-0)
Chemical equilibrium and its applications to separation and analysis. Prerequisite: Department approval.

6319  Contemporary Topics in Analytical Chemistry (3-0)
Selected topics of current interest in modern analytical chemistry. May be repeated for credit when topics vary. Prerequisite: Department approval.

6321  Advanced Organic Chemistry I (3-0)
A survey of the more important types of reactions in organic chemistry; reaction mechanisms, stereochemistry of intermediates and products; current structural theory. Prerequisites: CHEM 3322 and department approval.

6322  Advanced Organic Chemistry II (3-0)
Theoretical physical organic chemistry, bioorganic chemistry. Prerequisites: CHEM 6321 with a grade of "C" or better and department approval.

6329  Contemporary Topics in Organic Chemistry (3-0)
Selected topic of current interest in descriptive and theoretical organic chemistry. May be repeated for credit when topics vary. Prerequisite: Department approval.

6331  Advanced Biochemistry (3-0)
A survey of the organic and physical aspects of biological chemistry. Prerequisite: Department approval.

6339  Contemporary Topics in Biochemistry (3-0)
Selected topics of current interest in organic or physical aspects of biological chemistry. May be repeated for credit when topics vary. Prerequisite: Department approval.

6351  Advanced Physical Chemistry I (3-0)
Schroediner wave mechanics: atomic and molecular quantum states; applications to the treatment of wave functions for atoms and molecules. Prerequisite: Department approval.

6352  Advanced Physical Chemistry II (3-0)
Classical and statistical thermodynamics; applications to physical and chemical systems. Prerequisite: Department approval.

6359  Contemporary Topics in Physical Chemistry (3-0)
Selected topics of current interest in experimental and theoretical fields of physical chemistry. May be repeated for credit when topics vary. Prerequisite: Department approval. Prerequisite: Department approval.

6361  Advanced Inorganic Chemistry (3-0)
Ionic, metallic, and covalent bonding; valence bond, molecular orbital, and ligand field theories; structure and properties of coordination compounds, metal carbonyls, and complexes. Prerequisite: Department approval.

6369  Contemporary Topics in Inorganic Chemistry (3-0)
Selected topics of current interest in descriptive and theoretical organic chemistry. May be repeated for credit when topics vary. Prerequisite: Department approval.

6396 Graduate Research in Chemistry (0-0-3)
Prerequisite: Department approval.

6398 Dissertation (0-0-3)
Prerequisite: Department approval.

6399 Dissertation (0-0-3)
Prerequisite: Department approval.

Master of Science in Chemistry
The Department of Chemistry offers studies leading to the degree of Master of Science in Chemistry with experimental and/or theoretical research in the following fields of specialization: analytical, biochemistry, environmental, inorganic, organic, organometallic, physical, chemical physics, and materials science.

Requirements for Admission to the Master’s Program
1. Bachelor’s degree in chemistry or in a related science discipline from an accredited institution in the United States or proof of equivalent education in a foreign institution
2. Official transcripts of all previous academic work.
3. Official scores on the Graduate Record Examination (GRE).
4. Official TOEFL scores of 550 or higher for international applicants whose first language is not English or who have not completed a university degree in the U.S. or other English-speaking institutions.
5. Three letters of recommendation from individuals who are qualified to assess the applicant’s potential for doctoral work.
6. A personal statement setting out the applicant’s reasons for wishing to pursue a Ph.D. in Chemistry at UTEP and future career plans
7. Curriculum Vitae

Requirements for Master’s Degree in Chemistry
In addition to the institutional requirements for a Master of Science degree, the candidate must also meet the following stipulations: a minimum of 21 of the required 30 hours of credits must be in courses at the graduate level. Credits must include at least one graduate-level course in three of the five areas of organic chemistry, physical chemistry, inorganic chemistry, analytical chemistry, or biochemistry. The candidate must also enroll in CHEM 5195 during each semester of residence. Not more than one hour of CHEM 5195 may be counted toward the 30 credit hour requirement. The normal program for the MS degree in Chemistry may include 6 hours of supporting work from approved fields. A program of specialization in chemical physics may be elected with the permission of the graduate advisor. Such a program may include, within the required 30 hours of credits, up to 12 hours in the related fields (e.g., Physics, Mathematics). Courses of study are designed for each student in consultation with the advisor. Each student must confer with the graduate advisor prior to each registration. The thesis presented for this degree must describe original work related to a research problem of some importance. The thesis must be defended orally.

Five-Year BS-MS Program
The curriculum for the BS degree in Chemistry can be completed in three and one-half years. After admission to the Graduate School of the University, it is possible to obtain the MS degree at the end of the fifth year of study in Chemistry. Qualified students should consult their academic advisor about the course of study and about the various forms of financial assistance obtainable through this program.

Chemistry (CHEM)
For Undergraduate and Graduate Students
3110 Laboratory for Chemistry 3310
3124 Laboratory for Chemistry 3324
3125 Laboratory for Chemistry 3325
3151 Laboratory for Chemistry 3351
3152 Laboratory for Chemistry 3352
3221 Laboratory for Chemistry 3321
3222 Laboratory for Chemistry 3322
3310 Analytical Chemistry
3321 Organic Chemistry
3322 Organic Chemistry
3324 Organic Chemistry
3325 Organic Chemistry
3351 Physical Chemistry
3352 Physical Chemistry
4165 Laboratory for Inorganic Chemistry
4176 Introduction to Research
4211 Instrumental Methods of Analytical Chemistry
4212 Laboratory for Chemistry 2411
4328 Advanced Topics in Organic Chemistry
4330 Topics in Biochemistry
4332 Biochemistry
4362 Structure of Matter
4365 Inorganic Chemistry
4376 Introduction to Research
4380 Polymer Chemistry

For Graduate Students Only

5195 Graduate Seminar (1-0)
5196 Graduate Research in Chemistry (0-0-1)
5396 Graduate Research in Chemistry (0-0-3)
Prerequisites: Graduate standing and instructor approval.

5301 Modern General Chemistry (3-0)
An intensive course intended for schoolteachers, which presents a thorough grounding in the basic principles of chemistry. May not be counted toward the MS Degree in Chemistry. Prerequisite: 18 semester hours of undergraduate Chemistry.

5318 Advanced Analytical Chemistry (3-0)
Chemical equilibrium and its applications to separation and analysis.

5319 Contemporary Topics in Analytical Chemistry (3-0)
Selected topics of current interest in modern analytical chemistry. May be repeated for credit when topics vary.

5321 Advanced Organic Chemistry I (3-0)
A survey of the more important types of reactions in organic chemistry; reaction mechanisms, stereochemistry of intermediates and products; current structural theory. Prerequisite: CHEM 3322.

5322 Advanced Organic Chemistry II (3-0)
A continuation of CHEM 5321. Prerequisite: CHEM 5321.

5329 Contemporary Topics in Organic Chemistry (3-0)
Selected topics of current interest in descriptive and theoretical organic chemistry. May be repeated for credit when topics vary.

5339 **Contemporary Topics in Biochemistry (3-0)**
Selected topics of current interest in organic or physical aspects of biological chemistry. May be repeated for credit when topics vary.

5341 **Analysis and Modeling of Biological Structures (2-3)**
Introduction to the principles and methods used for the three-dimensional structural determination and simulation of macromolecules of biological interest. Molecular recognition, conformational analysis, and molecular dynamics; ligand design and docking; and modern methods for protein structure determination. Laboratory fee required.

5351 **Advanced Physical Chemistry I (3-0)**
Schroedinger wave mechanics; atomic and molecular quantum states; applications to the treatment of wave functions for atoms and molecules.

5352 **Advanced Physical Chemistry II (3-0)**
Classical and statistical thermodynamics; applications to physical and chemical systems.

5359 **Contemporary Topics in Physical Chemistry (3-0)**
Selected topics of current interest in experimental and theoretical fields of physical chemistry. May be repeated for credit when topics vary.

5361 **Advanced Inorganic Chemistry (3-0)**
Ionic, metallic, and covalent bonding; valence bond, molecular orbital, and ligand field theories; structure and properties of coordination compounds, metal carbonyls, and complexes.

5369 **Contemporary Topics in Inorganic Chemistry (3-0)**
Selected topics in Inorganic Chemistry. May be repeated for credit when topics vary.

5398 **Thesis (0-0-3)**
Initial work on the thesis.

5399 **Thesis (0-0-3)**
Continuous enrollment required while work on thesis continues. **Prerequisite:** CHEM 5398.