Department of Chemistry

Earl Pearson, Chair
Davis Science Building 239

The Department of Chemistry offers a Master of Science degree with a major in Chemistry and the Doctor of Arts in Chemistry; also offered is a minor in Chemistry at the graduate level.

The required test score for admission to the M.S. program is a satisfactory Graduate Record Examination score. For admission to the D.A. program, a score of 900 on the GRE is expected.

Requirements for the Master of Science (5000 and 6000 level)

Chemistry
Candidate must

1. have an undergraduate minor in chemistry or its equivalent at time of admission;
2. complete a minimum of 30 semester hours including a thesis of 3 semester hours with no more than 30 percent of the total degree hours dually listed as undergraduate/ graduate hours;
3. complete CHEM 6640, 6800, 6870, plus one course from five of the following six areas:
   Inorganic Chemistry - CHEM 6410, 6420
   Analytical Chemistry - CHEM 5230, 6200
   Organic Chemistry - CHEM 5100, 6110
   Physical Chemistry - CHEM 5730, 6720
   Biochemistry - CHEM 5500, 6510, 6520
   Applied Chemistry - CHEM 5600, 5700, 6610
   The remaining courses may come from courses in chemistry or approved cognate courses in biology, mathematics, computer science, and physics. Up to 8 hours of Thesis Research (CHEM 6640) may be applied to the degree program.
4. file a Candidacy Form with the Graduate Office prior to the completion of 24 credit hours;
5. successfully complete a written comprehensive examination (may be taken no more than twice).

Requirements for the Doctor of Arts (6000 and 7000 level)

1. Candidate must have completed undergraduate prerequisites of at least 18 semester hours of chemistry at the undergraduate level and at least 20 semester hours at the master's level.
2. There are two alternatives:
   Alternative #1
   48 semester hours above the master's level with at least two-thirds of the program on the 7000 level.
   Work in the major teaching field will consist of at least 24 semester hours of classwork, plus 6 semester hours of internship/externship, plus 6 semester hours for the dissertation.
   Alternative #2:
   60 semester hours above the master's level with at least two-thirds of the program on the 7000 level. 5000-level courses may not be applied.
   Work in the first teaching field will consist of at least 18 semester hours of classwork in chemistry, with that in the second teaching field consisting of at least 18 semester hours of classwork in anything which is offered as a major at the master's level (see exceptions, page 42), plus 6 semester hours of internship/ externship, plus 6 semester hours for the dissertation.
3. The core of professional education, 12 semester hours, consists of FOED 7520 and 7560 and SPSE 7540 and 7550.
4. A doctoral advisory committee will be appointed.
5. Candidacy Form must be filed with the Graduate Office prior to the completion of 24 credit hours.
6. Qualifying examinations as described on page 43 must be completed.
7. Defense of the proposed dissertation and preparation of the dissertation:
   a. The Dissertation Prospectus
      The dissertation prospectus should conform to the specifications given on page 43.
   b. Type of Dissertation
      Guidelines for selecting the research and dissertation topic are given on page 44.
   c. The Defense of Dissertation Seminar
      Guidelines are given under the discussion of the D.A. degree on page 44. After the candidate has successfully defended the proposed problem, it is assumed that he/she will develop, with the supervision of the advisory committee, this proposed problem into a complete dissertation. The candidate will be notified in writing of the committee's approval.

Courses in Chemistry [CHEM]

Graduate standing and consent of instructor are prerequisites for graduate courses in chemistry. The 5000-level courses also have the same prerequisites as listed for the corresponding 4000-level courses in the undergraduate catalog.

5100 (524) Organic Spectroscopy. Three credits. Prerequisite: CHEM 3220. Theory of and practice in the interpretation of mass, infrared, Raman, ultraviolet-visible, and nuclear magnetic resonance spectra. Three hours lecture.

5230 (523) Instrumental Analysis. Four credits. Prerequisite: CHEM 2230. Potentiometric titration polarographic, coulometric, gas chromatographic, ultraviolet, visible, and infrared absorption, and atomic absorption techniques of analysis. Requirements and limitations of each technique and the applications to various chemical systems emphasized from both a theoretical and an experimental standpoint. Three lectures and one three-hour laboratory period.

5330/ 5340 (501/502) Physical Chemistry Fundamentals. Four credits each. Modern physical chemistry including current theories of atomic and molecular structures, chemical thermodynamics, electrochemistry, chemical kinetics, and related theoretical topics. Three lectures and one three-hour laboratory period.

5350/ 5360 (521/522) Physical Chemistry. Four credits each. Quantitative principles of chemistry involving extensive use of calculus. Major topics include thermodynamics, phase changes, chemical equilibria, electrochemistry, reaction kinetics, quantum chemistry, molecular structure, and statistical mechanics. Three lectures and one three-hour laboratory period.

5400 (516) Inorganic Chemistry. Three credits. Basic concepts and theories of inorganic chemistry and how these are used to predict and understand the physical and chemical properties of compounds of the elements other than carbon. Inorganic compounds in the air, water, earth, and in the laboratory, and in biochemistry, geochemistry, and industrial materials and processes.

5500 (525) Biochemistry I. Three credits. Prerequisite: CHEM 3220 or consent of instructor. The chemical properties of biological molecules such as amino acids, proteins, enzymes, and carbohydrates. Chemical basis of enzyme catalysis and reactions of carbohydrate metabolism.

5580 (535) Clinical Biochemistry. Five credits. Prerequisite: Admission to an affiliated medical technology program. An intensive classroom/laboratory treatment of principles and procedures of clinical biochemistry.

5600 (570) Introduction to Environmental Chemistry. Three credits. Quality of the environment and of chemical changes in the environment through contamination or modification of the air, water, and soils as affected by human, agricultural, industrial, and social activities.

5630 (571) Detection of Chemical Pollutants. Four credits. Theory and practice of analytical chemistry methods used in pollution measurement. Three lectures and one three-hour laboratory period.

5700 (528) Polymers, an Introduction. Three credits. Their structure, properties, and applications.

5730 (529) Advanced Physical Chemistry. Four credits. Modern chemical concepts and computations applied to quantum chemistry molecular spectroscopy, and statistical thermodynamics. Three lectures and one three-hour calculation laboratory period.

6110 (624) Topics in Organic Chemistry. Three to six credits. A selection of modern topics.

6200 (623) Topics in Analytical Chemistry. Three to six credits. Prerequisite: CHEM 4230/5230. Selected topics of major interest in chemical analysis.

6410 (606) Transition Metal and Theoretical Inorganic Chemistry. Three credits. Prerequisite: CHEM 5400 or consent of instructor. The chemistry of transition metal complexes, organometallic compounds, and of related compounds, their practical applications, and modern theoretical treatments of this chemistry. Three hours of lecture.

6420 (622) Topics in Inorganic Chemistry. Three to six credits. Selected topics of current interest in inorganic chemistry such as organo-metallic chemistry, symmetry and group theory, physical methods of characterizing inorganic compounds, inorganic materials science, and kinetics and mechanisms of inorganic reactions.

6480/ 6490 (616 A,B) Laboratory in Inorganic Chemistry. One credit each. Prerequisite or corequisite: CHEM 6410 (for 6480), CHEM 6420 or CHEM 5700 (for 6490), or consent of instructor.
6480 Inorganic synthetic methods
6490 Physical methods in inorganic chemistry

6510 (635) Biochemistry II. Three credits. Prerequisite: CHEM 5500. The structure of lipids, amino acids, nucleotides, and nucleic acids and their metabolism at a molecular level. Emphasis on understanding the chemical basis of biological phenomena.

6520 (625) Topics in Biochemistry. Three to six credits. Prerequisite: CHEM 6510 or consent of instructor. Selected topics of particular interest in biochemistry.

6530 (645) Biochemical Techniques. Two credits. Prerequisite/corequisite: CHEM 6510 or consent of instructor. Laboratory in biochemical techniques with emphasis on protein purification, enzyme kinetics, carbohydrate and lipid analysis, and manipulation of DNA.

6610 (670) Environmental Soil Chemistry. Three credits. Prerequisite: Working knowledge of physical and organic chemistry. Fundamental chemical principles applied to the fate and behavior of organic and inorganic contaminants in the soil-water environment. Topics include sorption and redox reactions of contaminants.

6640 (664) Thesis Research. One to six credits per semester. Selection of a research problem, review of pertinent literature, collection and analysis of data, and composition of thesis. Once enrolled, student should register for at least one credit hour of master's research each semester until completion. S/U grading.

6720 (629) Topics in Physical Chemistry. Three to six credits. Advanced theories of, latest literature in, and unsolved problems of a particular research area in physical chemistry selected by the professor.

6800 (663) Chemistry Seminar. One credit. Required of graduate students specializing in chemistry. Scientific articles reviewed and reports on individual research projects presented.

6870 (662) Chemistry Research. Three credits. Original laboratory problem that will furnish material for a thesis.

6890 (665) Individual Research. Three credits. Limited to and required of all graduate students in chemistry who expect to do research using university facilities in any semester or term when the student is not registered for any other course. This course may be repeated as many times as is necessary for the research to be completed. Pass/fail grading.

7210 (713) Problems in Modern Chemical Laboratory Procedures. Three credits. Newly developed laboratory techniques and procedures which the student had not previously had the opportunity to learn.

7220 (714) Independent Study of Instrumental Analysis. Three credits. Developing skill in using selected sophisticated instruments.

7640 (764) Dissertation Research. One to six credits. Selection of a research problem, review of pertinent literature, collection and analysis of data, and composition of dissertation. Once enrolled, student should register for at least one credit hour of doctoral research each semester until completion. S/U grading.

7700 (711) Topics in Theoretical Chemistry. Three to six credits. Bonding, stereochemistry, empirical and semi-empirical parameters, state functions, spectroscopic interpretation, and reaction mechanisms.

7710 (712) Topics in Applied Chemistry. Three to six credits. Some important and current practical applications.

7800/ 7810 (760/761) Chemistry Internship. Three credits each.

Courses in Physical Science [PSCI]

Graduate standing and consent of instructor are prerequisites for graduate courses in physical science.

5030 (542) Experimental Physical Science. Four credits. Basic concepts, laws, and principles of astronomy, chemistry, geology, and physics with particular emphasis on the utilization of equipment available or easily improvised in actual school situations to illustrate these concepts, laws, and principles.

5080 (500) Problems in Physical Science. Four credits. A problem from chemistry, physics, or other physical science appropriate to the student's background and interest.

6020 (666) Investigations in Physical Science. One, two, or three credits. Prerequisite: Graduate standing or consent of instruct. Topics from astronomy to chemistry and physics, with special emphasis on the development of hands-on activities, determination of content cognitive demand, development of appropriate assessment instruments/implementation plans, and implementation of these across the pre-college curriculum. For practicing pre-college science teachers and school administrators. Consult the listed instructor for costs and specific credits. This course will not apply towards chemistry graduate degrees.