

Chemistry (CHE)

Chemistry (CHE) Courses

CHE 5263. Advanced Analytical Chemistry. (3-0) 3 Credit Hours.

Prerequisites: CHE 3214 and CHE 4213, or equivalents. The physical and chemical principles of modern analytical chemistry with emphasis on error analysis, signals and noise, electrochemical techniques, analytical separations, and selected spectroscopic methods based on absorption and emission.

CHE 5313. Advanced Biochemistry. (3-0) 3 Credit Hours.

Prerequisite: Undergraduate biochemistry. Advanced topics in modern biochemistry, including cell signaling, apoptosis, trafficking and processing of proteins, DNA array technology, and various aspects of bioinformatics. Ligand interactions and the thermodynamics and mechanisms underlying how these important macromolecules interact with each other. Spectroscopic determination of nucleic acid and protein structures, and reactions using techniques such as nuclear magnetic resonance spectroscopy, mass spectrometry and x-ray diffraction.

CHE 5453. Advanced Inorganic Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 4463 or equivalent. This course is intended to provide students with a firm foundation in modern inorganic chemistry and serve as a basis for advanced elective courses within the subdiscipline. Topics to be covered include symmetry and group theory, electronic structure and bonding in transition metal complexes, applications of group theory to vibrational and electronic spectroscopy, rudimentary topics in molecular magnetism, and inorganic reaction mechanisms.

CHE 5483. Inorganic Solid State Materials. (3-0) 3 Credit Hours.

Prerequisite: CHE 4463 or equivalent. This course is intended as an introductory course to inorganic materials and solid state chemistry for graduate students and advanced undergraduate students. The objective is to understand solid state materials from structural and chemistry perspectives and to introduce general solid state synthesis methodologies and characterization techniques.

CHE 5643. Advanced Organic Chemistry. (3-0) 3 Credit Hours.

Prerequisites: 8 semester credit hours each of undergraduate organic chemistry and physical chemistry or graduate standing in chemistry. An advanced study of topics in organic chemistry such as stereochemistry, conformational analysis, nonbenzenoid, aromaticity, molecular orbital theory, and organic reaction mechanisms. Applications of these concepts to the structure and reactivity of biomolecules such as peptides and proteins, nucleic acids, and carbohydrates.

CHE 5833. Computational Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 3824 or equivalent. The application of molecular mechanical, molecular orbital, and density functional methods to problems of molecular structure, property, reactivity, and spectroscopy. (Formerly CHE 7843. Credit cannot be earned for both CHE 5833 and CHE 7843).

CHE 5843. Advanced Physical Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 3824 or equivalent. An advanced study of valence and spectra as grounded in valence bond theory, molecular orbital theory and the extended Hückel method. Topics include group theory as applied to molecular structure and spectra, electronic, vibrational and rotational spectroscopies, and chemical reactivity including Woodward-Hoffmann theory.

CHE 5922. Research and Teaching Practice and Ethics. (0-0) 2 Credit Hours.

Prerequisites: Graduate standing in Chemistry and concurrent designation as a teaching assistant in the Chemistry program or consent of instructor. The course is designed to improve the instructional effectiveness of graduate students teaching at the college level. The course will cover, but is not limited to, board-work, clear speech, teacher-student interaction, professional responsibilities, course content and pace, grading policy, quiz writing, sensitivity training to student needs, information on technical support, and guest lecturers on special topics. Research ethics will be discussed based on case studies. The grade report for the course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance). (Formerly CHE 5923. Credit cannot be earned for both CHE 5922 and CHE 5923).

CHE 5981. Graduate Seminar in Chemistry. (0-3) 1 Credit Hour.

Prerequisite: Graduate standing in Chemistry or consent of the Graduate Advisor of Record. Current research and literature seminars presented by faculty, visiting lecturers, and doctoral candidates. Students in the Doctoral chemistry program must register every semester while in residence, but only 8 hours will apply toward the Doctoral degree. The grade report for the course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance).

CHE 6263. Recent Advances in Bioanalytical Chemistry. (3-0) 3 Credit Hours.

Prerequisites: Consent of instructor and Graduate Advisor of Record. A survey of modern analytical techniques used in studies of biological interest from both theoretical and practical perspectives. (Formerly CHE 7263. Credit cannot be earned for both CHE 6263 and CHE 7263).

CHE 6403. Bioinorganic Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 4303 or CHE 4463, or equivalent. Study of the functions, reaction sites, mechanisms, molecular architecture, and medicinal aspects of metal ions in biological systems including bio-organometallic compounds. A discussion of the experimental techniques will be included. (Formerly CHE 7403. Credit cannot be earned for both CHE 6403 and CHE 7403).

CHE 6433. Organometallic Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 4463 or equivalent. This course is intended to provide students with an introduction to the field of organometallic chemistry covering concepts in bonding, synthesis, and catalysis. Students will become familiar with common ligands and preparative methods in organometallic chemistry, theories of bonding and electronic structure, basic reaction mechanisms, and applications to catalysis in organic chemistry. (Formerly CHE 7433. Credit cannot be earned for both CHE 6433 and CHE 7433).

CHE 6443. Green Chemistry and Catalysis. (3-0) 3 Credit Hours.

Prerequisite: CHE 3464 or consent of instructor. Introduction to the 12 principles of green chemistry as well as the tools of green chemistry including the use of alternative feed stocks or starting materials, reagents, solvents, target molecules, and catalysts; demonstrates how to evaluate a reaction or process and determine "greener" alternatives; focuses on the application of innovative technology the development of "greener" routes to improve industrial processes and to produce important products.

CHE 6623. Advanced Organic Synthesis. (3-0) 3 Credit Hours.

Prerequisite: CHE 3643 or consent of instructor. A study of modern methods of organic functional group transformation, simple carbon skeleton construction, asymmetric synthesis, introduction to the synthon concept and to retrosynthetic analytical methodology for designing rational synthetic approaches to complex organic molecules of biological interest. (Formerly CHE 7623. Credit cannot be earned for both CHE 6623 and CHE 7623).

CHE 6633. Bioorganic Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 5643 or consent of instructor. Chemical transformations of biologically important organic compounds; examination of enzyme active sites. Discussion of theories of catalysis, stereochemistry, electron-transfer, and molecular structure in the context of biological systems. (Formerly CHE 7603. Credit cannot be earned for both CHE 6633 and CHE 7603).

CHE 6643. Chemistry of Heterocyclic Compounds. (3-0) 3 Credit Hours.

The course gives a broad introduction to cyclic organic compounds that include heteroatoms, especially nitrogen, oxygen and sulfur, in their ring structures. Emphasis is given to aromatic heterocyclic systems, such as pyridines, quinolines, isoquinolines, pyrroles, furanes, thiophenes, indoles, pyrimidines, purines, and imidazoles. For each group, ring synthesis, chemical properties and characteristic reactions will be discussed, as will be the biological effects of representative structures. Aromaticity applied to heterocyclic compounds, general methods for ring synthesis, and different systems for nomenclature will be presented. This course requires a firm understanding of the principles of organic chemistry.

CHE 6683. Topics in the Chemistry of Natural Products. (3-0) 3 Credit Hours.

Prerequisites: CHE 5643 and CHE 6623. Selected topics in the chemistry and biochemistry of natural products and related compounds of biological and medicinal interest. Course may be repeated for credit when topics vary, but not more than 6 hours may apply to the Doctoral degree. (Formerly CHE 7683. Credit cannot be earned for both CHE 6683 and CHE 7683 on the same topic).

CHE 6693. Pharmaceutical Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 3643 or equivalent or consent of instructor. This course aims to provide students with an understanding of the overall process of drug discovery and development with particular emphasis on the role of organic chemistry in these endeavors. It will cover the basic principles of how new drugs are discovered, how drugs interact with their biological targets, application of medicinal chemistry in lead optimization, and the role of process chemistry in large-scale drug synthesis and development. The second half of the course will provide actual case studies of both successful and unsuccessful drug candidates where students will learn about the entire drug discovery and development process from firsthand experience.

CHE 6813. Molecular Thermodynamics. (3-0) 3 Credit Hours.

Prerequisite: CHE 5843. A molecular approach to the study of the physicochemical properties of gases, liquids, and solids. (Formerly CHE 7813. Credit cannot be earned for both CHE 6813 and CHE 7813).

CHE 6823. Chemical Kinetics and Dynamics. (3-0) 3 Credit Hours.

Prerequisite: CHE 5843. An advanced study of topics in chemical kinetics and dynamics. (Formerly CHE 7823. Credit cannot be earned for both CHE 6823 and CHE 7823).

CHE 6833. Quantum Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 5843. The application of quantum mechanical methods to chemical systems. (Formerly CHE 7833. Credit cannot be earned for both CHE 6833 and CHE 7833).

CHE 6843. Statistical Mechanics. (3-0) 3 Credit Hours.

Prerequisite: CHE 5843. The application of statistical mechanical methods to chemical systems.

CHE 6853. Biophysical Chemistry. (3-0) 3 Credit Hours.

Prerequisite: CHE 5843. The study of the structure/function relations of proteins, nucleic acids, membranes, and other macromolecular biomolecules using spectroscopic methods. (Formerly CHE 7853. Credit cannot be earned for both CHE 6853 and CHE 7853).

CHE 6883. Mass Spectrometry. (3-0) 3 Credit Hours.

Prerequisite: Consent of instructor. The basic principles of interpreting mass spectra and how they are produced. The effect the method of ion production has on the observed mass spectra, and the theory and operation of various types of mass spectrometers will be covered. The basic theory of ion-molecule reactions and other advanced topics will be presented.

CHE 6961. Comprehensive Examination. (0-0) 1 Credit Hour.

Prerequisite: Approval of the appropriate Graduate Program Committee. Independent study course for the purpose of taking the Comprehensive Examination. May be repeated as many times as approved by the Graduate Program Committee. Enrollment is required each term in which the Comprehensive Examination is taken if no other courses are being taken that term. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination).

CHE 6973. Special Problems. (3-0) 3 Credit Hours.

Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Problems courses may be repeated for credit when the topics vary, but not more than 6 hours, regardless of discipline, will apply to the Master's degree.

CHE 6983. Master's Thesis. (0-0) 3 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and thesis director. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress.

CHE 6991. Directed Research. (0-0) 1 Credit Hour.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 6992. Directed Research. (0-0) 2 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 6993. Directed Research. (0-0) 3 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 6994. Directed Research. (0-0) 4 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 6995. Directed Research. (0-0) 5 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 6996. Directed Research. (0-0) 6 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 6997. Directed Research. (0-0) 7 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. Normally a written report is required. May be repeated for credit, but not more than 9 hours or 19 hours, regardless of discipline, will apply to the Master's degree or Doctoral degree, respectively.

CHE 7633. Advanced Catalysis in Organic Synthesis. (3-0) 3 Credit Hours.

Prerequisite CHE 5642 or equivalent. This course will cover advanced topics in modern catalytic transformations useful in the synthesis of complex molecular structures. Topics will include an introduction to catalysis, organometallics overview, kinetics of catalysis, non-linear effects, kinetic resolutions, asymmetric hydrogenations, C-H activation, olefin metathesis, Pd-catalyzed allylic substitutions, transition metal mediated cross-couplings, biocatalysis and organocatalysis.

CHE 7911. Chemistry Research Colloquium. (0-0) 1 Credit Hour.

Prerequisite: Graduate standing in Chemistry. Discussions of current journal articles, reviews, and recent advances in specialized areas of chemistry (including current research progress of students). May be repeated for credit as topics vary. The grade report for this course is either "CR" (satisfactory participation in the colloquium) or "NC" (unsatisfactory participation in the colloquium).

CHE 7921. Doctoral Research. (0-0) 1 Credit Hour.

Prerequisite: Graduate standing in Chemistry. Doctoral research and preparation. May be repeated for credit, but not more than 26 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7922. Doctoral Research. (0-0) 2 Credit Hours.

Prerequisite: Graduate standing in Chemistry. Doctoral research and preparation. May be repeated for credit, but not more than 26 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7923. Doctoral Research. (0-0) 3 Credit Hours.

Prerequisite: Graduate standing in Chemistry. Doctoral research and preparation. May be repeated for credit, but not more than 26 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7926. Doctoral Research. (0-0) 6 Credit Hours.

Prerequisite: Graduate standing in Chemistry. Doctoral research and preparation. May be repeated for credit, but not more than 26 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7927. Doctoral Research. (0-0) 7 Credit Hours.

Prerequisite: Graduate standing in Chemistry. Doctoral research and preparation. May be repeated for credit, but not more than 26 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7928. Doctoral Research. (0-0) 8 Credit Hours.

Prerequisite: Graduate standing in Chemistry. Doctoral research and preparation. May be repeated for credit, but not more than 26 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7931. Doctoral Dissertation. (0-0) 1 Credit Hour.

Prerequisites: Permission of the Graduate Advisor of Record and dissertation director. Preparation and writing of the Doctoral dissertation. May be repeated for credit, but not more than 12 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7932. Doctoral Dissertation. (0-0) 2 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and dissertation director. Preparation and writing of the Doctoral dissertation. May be repeated for credit, but not more than 12 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7933. Doctoral Dissertation. (0-0) 3 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and dissertation director. Preparation and writing of the Doctoral dissertation. May be repeated for credit, but not more than 12 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7936. Doctoral Dissertation. (0-0) 6 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and dissertation director. Preparation and writing of the Doctoral dissertation. May be repeated for credit, but not more than 12 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7937. Doctoral Dissertation. (0-0) 7 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and dissertation director. Preparation and writing of the Doctoral dissertation. May be repeated for credit, but not more than 12 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7938. Doctoral Dissertation. (0-0) 8 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and dissertation director. Preparation and writing of the Doctoral dissertation. May be repeated for credit, but not more than 12 hours will apply to the Doctoral degree. Enrollment in either CHE 7921-8 or CHE 7931-8, depending on progress, is required each term in which the dissertation is in progress.

CHE 7973. Special Problems. (3-0) 3 Credit Hours.

Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Problems courses may be repeated for credit when the topics vary, but not more than 6 hours, regardless of discipline, will apply to the Doctoral degree.