

## Chemistry

### Chemistry, CHEM

**CHEM 1360. Context of Chemistry.** 3 hours. (3;2)

Fundamentals of chemistry for students who are not science majors. Applications of chemistry to its role in the world. Topics include historical and philosophical development of modern chemistry, the environment, energy, industrial and economic development, modern materials, popular perspectives of chemistry. Includes laboratory. May not be counted toward a major or minor in chemistry. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1410-CHEM 1420. General Chemistry for Science Majors.** 3 hours each. (3;0;1\*) *\*This hour is a problem-solving session.*

**CHEM 1410 (CHEM 1311).** Fundamental concepts, states of matter, periodic table, structure and bonding, stoichiometry, oxidation and reduction, solutions, and compounds of representative elements. Prerequisite(s): MATH 1100 or equivalent. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1420 (CHEM 1312).** Thermodynamics, reaction rates, equilibrium, electrochemistry, organic chemistry, polymers, radioactivity and nuclear reactions. Prerequisite(s): CHEM 1410 or CHEM 1413 or consent of department. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1412-CHEM 1422. General Chemistry for the Honors College.** 3 hours each. (3;0;1\*) *\*This hour is a discussion session.*

**CHEM 1412.** Nature of chemistry, states of matter, periodic table, structure and bonding, stoichiometry, oxidation and reduction, solutions, compounds of representative elements, historical context, practical consequences. Prerequisite(s): MATH 1100 or equivalent, admission to Honors College. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1422.** Thermodynamics, reaction rates, equilibrium, electrochemistry, organic chemistry, polymers, radioactivity and nuclear reactions, historical context, practical consequences. Prerequisite(s): CHEM 1412 (or CHEM 1410 or CHEM 1413 with grade B or better and permission of the department), MATH 1100 or equivalent, admission to Honors College. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1413-CHEM 1423. Honors General Chemistry.** 3 hours each. (3;0;1\*) *\*This hour is a problem-solving session.*

**CHEM 1413.** Fundamental concepts, states of matter, periodic table, structure, solutions and compounds of representative elements. Prerequisite(s): MATH 1100 or equivalent. High school chemistry or equivalent is strongly recommended. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1423.** Thermodynamics, reaction rates, equilibrium, electrochemistry and nuclear chemistry. This course is strongly advised and may be required for students planning to engage in undergraduate chemical

research. Prerequisite(s): CHEM 1413 or consent of department. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1415. General Chemistry for Engineering Majors.**

3 hours. (3;0;1\*) *\*This hour is a problem-solving session.* Fundamental concepts, atomic structure, periodic table, stoichiometry, states of matter, chemical bonding, new materials, solutions, thermodynamics, reaction rates, equilibrium, electrochemistry, polymers and nuclear reactions. Prerequisite(s): MATH 1650 or equivalent. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1430-CHEM 1440. Laboratory Sequence for General Chemistry.** 1 hour each. (1;3) Should be taken concurrently with CHEM 1410 or CHEM 1412 or CHEM 1413 and CHEM 1420 or CHEM 1422 or CHEM 1423.

**CHEM 1430 (CHEM 1111).** Laboratory techniques, weighing, errors and significant figures, identification and purification of substances, and elementary quantitative analysis. Corequisite(s): CHEM 1410 or CHEM 1412 or CHEM 1413. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1440 (CHEM 1112).** Quantitative, gravimetric and volumetric analyses; coordination compounds. Prerequisite(s): CHEM 1430. Corequisite(s): CHEM 1420 or CHEM 1422 or CHEM 1423. *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 1435. General Chemistry Laboratory for Engineering Majors.** 1 hour. (1;3) Laboratory techniques; application of statistical methods to laboratory data; chemical and physical property measurements; stoichiometric analysis; measurement of thermodynamic, electrochemical and kinetic data. Prerequisite(s): CHEM 1415 (may be taken concurrently). *May be used to satisfy a portion of the Natural Sciences requirement of the University Core Curriculum.*

**CHEM 2370-CHEM 2380. Organic Chemistry.** 3 hours each. (3;0;1\*) *\*This hour is a problem-solving session.*

**CHEM 2370 (CHEM 2323).** Structure, nomenclature, occurrence and uses of main classes of organic compounds; functional groups and their interconversion; character of chemical bonding; stereochemistry; structure and reactivity; acid/base reactions, resonance, inductive and steric effects; reaction mechanisms. Prerequisite(s): CHEM 1415, CHEM 1420, CHEM 1422 or CHEM 1423; CHEM 3210 (should be taken concurrently).

**CHEM 2380 (CHEM 2325).** Nucleophilic and electrophilic reaction mechanisms; molecular rearrangements; radical reactions; organic synthesis; absorption spectra of organic compounds of biological interest. Prerequisite(s): CHEM 2370; CHEM 3220 (should be taken concurrently).

**CHEM 2900-CHEM 2910. Introduction to Chemical Research.** 1–3 hours each. Individualized laboratory instruction. Students may begin training on laboratory research techniques. Prerequisite(s): CHEM 1430 (should be taken concurrently) and consent of instructor. For elective credit only; may not be substituted for required chemistry courses.

**CHEM 3210-CHEM 3220. Organic Chemistry Laboratory.** 1 hour each. (1;3) Should be taken concurrently with CHEM 2370 and CHEM 2380.

**CHEM 3210. Separations and Synthesis.** Organic preparations; techniques of recrystallization, distillation, solvent extraction, separation of mixtures, chromatography and spectroscopic methods. Prerequisite(s): CHEM 1440; CHEM 2370 (should be taken concurrently).

**CHEM 3220. Synthesis and Analysis.** Organic syntheses and systematic identification of unknown organic compounds utilizing classical "wet" and spectroscopic analytical methods. Prerequisite(s): CHEM 2380 and CHEM 3210 (should be taken concurrently).

**CHEM 3230-CHEM 3240. Physical Chemistry Laboratory Sequence.** 1 hour each. (1;3) Should be taken concurrently with CHEM 3510 and CHEM 3520.

**CHEM 3230. Physical Measurements.** 1 hour. (1;3) Treatment of experimental data. Calorimetry, gases, vacuum line techniques, phase and chemical equilibria, polarimetry, and kinetics. Prerequisite(s): CHEM 3510 (may be taken concurrently).

**CHEM 3240. Advanced Physical Measurements.** 1 hour. (1;3) Spectrophotometry, lasers, atomic and molecular spectroscopy. Prerequisite(s): CHEM 3230.

**CHEM 3451. Quantitative Analysis.** 3 hours. Statistical treatment of data; theory and principles of sampling and transfer techniques, gravimetric, and volumetric methods; introductory instrumental analysis. Prerequisite(s): CHEM 1440; concurrent enrollment in CHEM 3452.

**CHEM 3452. Quantitative Analysis Laboratory.** 1 hour. (0;4) Statistical treatment of data; sampling and transfer techniques; selected gravimetric and volumetric methods; introductory instrumental analysis. Prerequisite(s): CHEM 1440; concurrent enrollment in CHEM 3451.

**CHEM 3510-CHEM 3520. Physical Chemistry.** 3 hours each. (3;0;1\*) *\*This hour is a problem-solving session.*

**CHEM 3510.** Thermodynamics, kinetic theory, solutions and phase equilibria, chemical equilibrium, photochemistry and chemical kinetics. Prerequisite(s): CHEM 1420, CHEM 1422 or CHEM 1423; MATH 1720; PHYS 1420 or PHYS 2220.

**CHEM 3520.** Quantum mechanics: atomic structure and molecular orbital theory. Spectroscopy: microwave, infrared, electronic, photoelectron, electron spin and NMR. Prerequisite(s): CHEM 3510.

**CHEM 3530. Physical Chemistry for Life Science.** 4 hours. Fundamental principles of physical chemistry applied to biological systems; thermodynamics, equilibrium and bioenergetics, ionic equilibria, pH, buffers, ionic strength, and electrical properties of amino acids and proteins; kinetics, enzyme catalysis and inhibition; physical properties of biological macromolecules and transport properties in living systems. Prerequisite(s): CHEM 1420 or CHEM 1423. For chemistry (BA) and life science majors, and preprofessional students.

**CHEM 3601. Organic Chemistry.** 3 hours. (3;0;1\*) Survey of organic chemistry; types of chemical bonding, functional groups, synthesis and reactions; aliphatic, aromatic and heterocyclic compounds; carbohydrates, lipids and proteins. Prerequisite(s): CHEM 1420 or CHEM 1423. For medical technology, merchandising and hospitality management, and secondary education students. *\*This hour is a problem-solving session.*

**CHEM 3602. Laboratory for Organic Chemistry.** 1 hour. (0;3) Prerequisite(s): CHEM 3601 (may be taken concurrently).

**CHEM 3610. Quantitative Techniques.** 4 hours. (3;3) Survey of modern methods used in analytical chemistry; statistical treatment of data; gravimetric and titrimetric methods; spectrophotometric, chromatographic, potentiometric and radioisotope techniques. Prerequisite(s): CHEM 1420 or CHEM 1423. For medical technology, merchandising and hospitality management and secondary education students.

**CHEM 4351. Forensic Chemistry.** 3 hours. (2;6) Analytical chemistry applied to forensic science. Statistics and error analysis of drugs and physical evidence. Identification and analysis of forensic evidence through absorption and transmission spectroscopy, chromatography (TLC, HPLC, GC), electrophoresis, mass spectrometry, and atomic emission and analysis. Prerequisite(s): CHEM 2380, CHEM 3451 and CHEM 3452.

**CHEM 4530. Materials Chemistry.** 3 hours. Application of chemical principles to understanding the general behavior of materials. Course includes semiconductors, metals, catalysts and "nano-designed" materials (e.g. quantum wells). Prerequisite(s): concurrent enrollment in CHEM 3520 or equivalent, or consent of department. May not be repeated at the graduate level as CHEM 5530.

**CHEM 4610. Advanced Inorganic Chemistry.** 3 hours. Electronic structure of atoms and molecules; structure and thermodynamic properties of binary compounds; inorganic nomenclature; introductory survey of bonding, stereochemistry and reactivity of inorganic and organometallic complexes. Prerequisite(s): CHEM 3520.

**CHEM 4620. Advanced Inorganic Chemistry Laboratory.** 1 hour. (1;3) Inorganic and organometallic preparations; spectroscopic identification of diamagnetic and paramagnetic compounds; basic glassblowing; introduction to library resources. Prerequisite(s): CHEM 4610.

**CHEM 4631. Instrumental Analysis.** 3 hours. Principles and theory of chemical analysis utilizing absorption spectroscopy in ultraviolet, visible and infrared regions, nuclear and electron spin resonance, mass spectrometry, chromatography, polarography and other advanced instrumental techniques. Prerequisite(s): CHEM 3451, CHEM 3452.

**CHEM 4632. Instrumental Analysis Laboratory.** 1 hour. (0;4) Identification and analysis of compounds through absorption spectroscopy in ultraviolet, visible and infrared regions, nuclear and electron spin resonance, mass spectrometry, chromatography, polarography and other advanced instrumental techniques. Corequisite(s): CHEM 4631.

**CHEM 4660. Introduction to Computational Chemistry.** 3 hours. (2;3) Introduction to the use of modern computational methodologies for the study of physical properties and chemical reactions of importance in chemistry, biochemistry, molecular biology and environmental sciences. Prerequisite(s): CHEM 3520 (should be taken concurrently) or consent of department.

**CHEM 4670. Introduction to Medicinal Chemistry.** 3 hours. Fundamentals of medicinal chemistry. General aspects of drug action and rational drug design. Drug development, antibacterial agents, analgesics, antidepressants and anticancer agents. Prerequisite(s): CHEM 2380 or CHEM 3601 with consent of department.

**CHEM 4700. Research Methods for Secondary Science Instruction.** 3 hours. (2;4) Techniques used to solve and address scientific inquiry. Design of experiments. Use of statistics to interpret experimental results and measure sampling errors. Ethical treatment of human subjects. Laboratory safety. Mathematical modeling of scientific phenomena. Oral and written presentation of scientific work. Prerequisite(s): 16 hours of chemistry, completion of freshman and sophomore science courses required for certification and consent of department. EDSE 3500 and EDSE 4000 are highly recommended. Students seeking secondary certification in mathematics or computer science who have completed the other science requirements of their majors also may enroll. Does not count as an elective toward a major or minor in chemistry, except for students seeking teacher certification.

**CHEM 4900-CHEM 4910. Special Problems.** 1–3 hours each. Prerequisite(s): CHEM 3220 or equivalent, and consent of directing professor. A written report is required each term/semester. May be repeated for credit, not to exceed 3 hours each.

**CHEM 4920. Cooperative Education in Chemistry.** 1–3 hours. Supervised work in a job directly related to the student's major, professional field of study or career objective. Prerequisite(s): 12 semester hours of credit in chemistry; student must meet employer's requirements and have consent of the department chair. May be repeated for credit.

**CHEM 4930. Selected Topics in Chemistry.** 3 hours. Topics of current interest, which vary from year to year. Prerequisite(s): consent of department. May be repeated for credit as topics vary.

**CHEM 4940. Chemistry Seminar.** 1 hour. Colloquia covering current topics in chemistry. Prerequisite(s): chemistry major with senior standing. May be repeated for credit. May not be used to meet degree requirements for chemistry major or minor. Pass/no pass only.

**CHEM 4951. Honors College Capstone Thesis.** 3 hours. Major research project prepared by the student under the supervision of a faculty member and presented in standard thesis format. An oral defense is required of each student for successful completion of the thesis. Prerequisite(s): completion of at least 6 hours in honors courses; completion of at least 12 hours in the major department in which the thesis is prepared; approval of the department chair and the dean of the school or college in which the thesis is prepared; approval of the dean of the Honors College. May be substituted for HNRS 4000.

**CHEM 4960-CHEM 4970. Science Institute (Chemistry).** 1–6 hours each. For students accepted by the university in special institute courses. May be repeated for credit, not to exceed 6 hours in each course.

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## Chinese

see Foreign Languages and Literatures

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## Communication Studies

Students interested in majoring in communication studies must complete all pre-major requirements. COMM 3010 may be taken concurrently with **one** other communication course; students may either take COMM 3010 concurrently with their final 2000-level pre-major course or their first enrollment in an upper-division course. Students who do not complete COMM 3010 with a grade of C or better are prohibited from enrolling in other upper-division communication courses until they have completed COMM 3010 successfully.

### Communication Studies, COMM

**COMM 1010 (SPCH 1311). Introduction to Communication.** 3 hours. (1;0;2) Examination of how communication principles and skills influence our understanding of current social problems such as global climate crisis, health care, and poverty. Focus on communication and community engagement includes experimental learning with community partners. Oral communication skills and collaborative group building skills are emphasized. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.*

**COMM 1440. Honors Classical Argument.** 3 hours. Uses of argument in rational decision making based on classical theories of reason. Elements of argument, classical foundations of argument and contemporary application of argument principles. Prerequisite(s): acceptance to Honors College. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.*

**COMM 2020 (SPCH 1318). Interpersonal Communication.** 3 hours. An introduction to interpersonal communication research results and theories with application in two-person and small group relationships in a variety of human communication contexts. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.*

**COMM 2040 (SPCH 1315). Public Speaking.** 3 hours. (1;0;2) Introduction to principles of and practice in preparing public speaking speeches. Stresses the role of public speaking in democratic decision making. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.*

**COMM 2060 (SPCH 2341). Performance of Literature.** 3 hours. (1;0;2) Performance as a method of textual study. An introduction to the theory and practice of analyzing, rehearsing and performing non-dramatic texts. Recommended for elementary education majors. *Satisfies a portion of the Understanding the Human Community requirement of the University Core Curriculum.*

**COMM 2140. Rhetoric and Argument.** 3 hours. (1;0;2) Introduction to the critical dimensions of rhetoric and argument through presentation and evaluation of public discourse. Balanced attention to the theory and practice enabling students to analyze the persuasive function of public discourse; to discuss the role of audience in the construction of public discourse; and to develop skills for constructing, supporting, and evaluating public discourse.

**COMM 2900. Special Problems.** 1–3 hours.