CHEMISTRY (CHEM)

CHEM 100-0 Introduction to Calculus and Chemistry (1 Unit) For participants in Bio&ChemEXCEL summer program. Introduction to calculus and general chemistry. Taken with BIOL_SCI 100-0.

CHEM 100-BR Introduction to Problem Solving in Chemistry (1 Unit) For participants in Bridge I summer program. Developing facility with quantitative tools to solve problems in chemistry. Prerequisites: MATH 100-BR and HUM 100-1-BR.

CHEM 105-6 First-Year Seminar (1 Unit) WCAS First-Year Seminar

CHEM 110-0 Quantitative Problem Solving in Chemistry (1.34 Units) Solution strategies for traditional word problems and their application to basic chemistry quantitative problems: dimensional analysis, chemical equations, stoichiometry, limiting reagents. Prerequisite: permission of department.

CHEM 110-SG Peer-Guided Study Group: Quantitative Problem Solving in Chemistry (0 Unit) Peer-guided study group for students enrolled in CHEM 110-0. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 131-0 General Chemistry 1 (1 Unit) Quantum mechanics, electronic structure, periodic properties of elements, chemical bonding, thermodynamics, intermolecular forces, properties of solids and liquids, special topics in modern chemistry. Prerequisite: CHEM 110-0 (C- or better). Natural Sciences Distro Area

CHEM 131-SG Peer-Guided Study Group: General Chemistry 1 (0 Unit) Peer-guided study group for students enrolled in CHEM 131-0. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 132-0 General Chemistry 2 (1 Unit) Solutions and colligative properties, chemical equilibrium, aqueous solution equilibria, chemical kinetics, metals in chemistry and biology, oxidation-reduction reactions and electrochemistry, special topics in modern chemistry. Prerequisites: CHEM 131-0, CHEM 141-0 (C- or better). Natural Sciences Distro Area

CHEM 132-SG Peer-Guided Study Group: General Chemistry 2 (0 Unit) Peer-guided study group for students enrolled in CHEM 132-0. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 141-0 General Chemistry Laboratory 1 (0.34 Unit) Chemical analysis of real samples using basic laboratory techniques including titration, colorimetric analysis, density measurements, and atomic spectroscopy. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with CHEM 131-0. Prerequisite: CHEM 110-0 (C- or better).

CHEM 142-0 General Chemistry Laboratory 2 (0.34 Unit) Chemistry laboratory techniques applied to materials science and nanotechnology, acid-base chemistry, and chemical kinetics. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with CHEM 132-0. Prerequisites: CHEM 131-0, CHEM 141-0 (C- or better).

CHEM 151-0 Accelerated General Chemistry 1 (1 Unit) Quantum mechanics, electronic structure, periodic properties of elements, chemical bonding, thermodynamics, gas laws, intermolecular forces, properties of solids and liquids, special topics in modern chemistry. Prerequisite: permission of department by placement exam. Natural Sciences Distro Area

CHEM 151-SG Peer-Guided Study Group: Accelerated General Chemistry 1 (0 Unit) Peer-guided study group for students enrolled in CHEM 151-0. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 152-0 Accelerated General Chemistry 2 (1 Unit) Solutions and colligative properties, chemical equilibrium, aqueous solution equilibria, chemical kinetics, metals in chemistry and biology, oxidation-reduction reactions and electrochemistry, special topics in modern chemistry. Prerequisites: CHEM 151-0, CHEM 161-0 (C- or better). Natural Sciences Distro Area

CHEM 152-SG Peer-Guided Study Group: Accelerated General Chemistry 2 (0 Unit) Peer-guided study group for students enrolled in CHEM 152-0. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 161-0 Accelerated General Chemistry Laboratory 1 (0.34 Unit) Chemical analysis of real samples using basic laboratory techniques including titration, colorimetric analysis, density measurements, and atomic spectroscopy. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with CHEM 151-0.

CHEM 162-0 Accelerated General Chemistry Laboratory 2 (0.34 Unit) Chemistry laboratory techniques applied to materials science and nanotechnology, acid-base chemistry, and chemical kinetics. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with CHEM 152-0. Prerequisites: CHEM 151-0, CHEM 161-0 (C- or better).

CHEM 171-0 Advanced General Inorganic Chemistry (1 Unit) Review of mole problems and stoichiometry; descriptive chemistry, elements, compounds, and inorganic reactions; gas laws; phase equilibria and colligative properties; chemical equilibria; aqueous equilibria; topics in chemical bonding and molecular structure. Must be taken concurrently with CHEM 181-0. Prerequisite: department placement exam or appropriate AP credit. Natural Sciences Distro Area

CHEM 172-0 Advanced General Physical Chemistry (1 Unit) Thermodynamics and equilibria; chemical kinetics and mechanism; electrochemistry; electronic structure of the atom and quantum theory; advanced topics in chemical bonding; coordination compounds; solid-state chemistry; nuclear chemistry. Must be taken concurrently with CHEM 182-0. Prerequisites: CHEM 171-0, CHEM 181-0 (C- or better); MATH 220-1. Natural Sciences Distro Area

CHEM 181-0 Advanced General Inorganic Chemistry Laboratory (0.34 Unit) Laboratory techniques for studying chemical analysis and chemical reactions relevant to environmental or materials research. Planning, data collection, interpretation, and reporting on experiments. Must be taken concurrently with CHEM 171-0. Prerequisite: appropriate AP credit.

CHEM 182-0 Advanced General Physical Chemistry Laboratory (0.34 Unit) Study of the physical chemistry (acid base chemistry, kinetics, etc.) behind the operating principles of biosensors. Planning, data collection, interpretation, and reporting on these experiments. Must be taken concurrently with CHEM 172-0. Prerequisite: CHEM 171-0 (C- or better).

CHEM 199-BR Foundations of Organic Chemistry (1 Unit) For participants in Bridge II summer program. Exploring foundations and problem-solving skills in organic chemistry.
CHEM 201-0 Chemistry of Nature and Culture (1 Unit) Chemistry for the nonscientist. Chemicals commonly encountered in everyday life. With laboratory. Natural Sciences Distro Area

CHEM 210-1 Organic Chemistry (1 Unit) Basic concepts of structure, stereochemistry, and reactivity of organic compounds. The chemistry of hydrocarbons and alcohols. Prerequisites: CHEM 132-0 and CHEM 142-0, or CHEM 152-0 and CHEM 162-0, or CHEM 172-0 and CHEM 182-0 (C- or better). Natural Sciences Distro Area

CHEM 210-2 Organic Chemistry (1 Unit) The chemistry of aromatic, carbonyl, and nitrogen compounds; characterization of organic substances by chemical and spectral methods; reaction mechanisms. Must be taken concurrently with CHEM 230-2. Prerequisite: CHEM 210-1 (C- or better). Natural Sciences Distro Area

CHEM 210-3 Organic Chemistry (1 Unit) The chemistry of polyfunctional compounds of biological and medicinal interest. Modern organic synthesis, bioorganic chemistry, and recent developments in organic chemistry. Must be taken concurrently with CHEM 230-3. Prerequisites: CHEM 210-2 and CHEM 230-2 (C- or better). Natural Sciences Distro Area

CHEM 210-SG-1 Peer-Guided Study Group: Organic Chemistry 1 (0 Unit) Peer-guided study group for students enrolled in CHEM 210-1. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 210-SG-2 Peer-Guided Study Group: Organic Chemistry 2 (0 Unit) Peer-guided study group for students enrolled in CHEM 210-2. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 210-SG-3 Peer-Guided Study Group: Organic Chemistry 3 (0 Unit) Peer-guided study group for students enrolled in CHEM 210-3. Meets weekly in small groups, along with a peer facilitator, to collaboratively review material, work through practice problems, and clarify course concepts. Enrollment optional. Graded S/U.

CHEM 212-1 Organic Chemistry (1 Unit) Primarily for chemistry majors and students in ISP. Similar to CHEM 210-1 except with required concurrent laboratory course CHEM 232-1. No P/N registration. Prerequisites: CHEM 132-0 and CHEM 142-0, or CHEM 152-0 and CHEM 162-0, or CHEM 172-0 and CHEM 182-0 (C- or better), and consent of department, enrollment in ISP, or department placement. Natural Sciences Distro Area

CHEM 212-2 Organic Chemistry (1 Unit) Primarily for chemistry majors and students in ISP. Similar to CHEM 210-2. No P/N registration. Must be taken concurrently with CHEM 232-2. Prerequisites: CHEM 212-1 and CHEM 232-1 (C- or better). Natural Sciences Distro Area

CHEM 212-3 Organic Chemistry (1 Unit) Primarily for chemistry majors and students in ISP. Similar to CHEM 210-3 except with no concurrent laboratory course. No P/N registration. Prerequisites: CHEM 212-2 and CHEM 232-2 (C- or better). Natural Sciences Distro Area

CHEM 220-0 Introductory Instrumental Analysis (1 Unit) Introduction to basic laboratory techniques in analytical chemistry and spectroscopy. Topics include infrared and UV-visible spectroscopy, gas and liquid chromatography, elemental and thermal analysis, simple X-ray diffraction, error analysis, and literature searching techniques. Prerequisites: CHEM 132-0 and CHEM 142-0, or CHEM 152-0 and CHEM 162-0, or CHEM 172-0 and CHEM 182-0 (C- or better), or equivalent.

CHEM 230-2 Organic Chemistry Lab I (0.34 Unit) Instruction in experimental techniques of modern organic chemistry emphasizing chemical separations, spectroscopic characterization, and reactions of alkanes, alkenes, alkyl halides, alcohols, carboxyls, esters, and aromatic compounds. Must be taken concurrently with CHEM 210-2. Prerequisite: CHEM 210-1 (C- or better).

CHEM 230-3 Organic Chemistry Lab II (0.34 Unit) Experimental techniques of modern organic chemistry emphasizing chemical separations, spectroscopic characterization, and reactions such as amide synthesis, Grignard reaction, aldol condensation, Robinson annulation, and DielsAlder reaction. Must be taken concurrently with CHEM 210-3. Prerequisites: CHEM 210-2 and CHEM 230-2 (C- or better).

CHEM 232-1 Organic Chemistry Laboratory I (0.34 Unit) For ISP students and chemistry majors. Molecular modeling, unknown identification by spectroscopic methods, and experimental techniques of modern chemistry emphasizing reactions of alkanes, alkenes, alkyl halides, alcohols, and carboxyls. Must be taken concurrently with CHEM 212-1. Prerequisites: CHEM 132-0 and CHEM 142-0, or CHEM 152-0 and CHEM 162-0, or CHEM 172-0 and CHEM 182-0 (C- or better), or equivalent.

CHEM 232-2 Organic Chemistry Laboratory II (0.34 Unit) For ISP students and chemistry majors. Techniques of modern organic chemistry including NMR spectroscopy and reactions such as electrophilic aromatic substitution, esterification, Grignard reaction, aldol condensation, Robinson annulation, and DielsAlder reaction. Must be taken concurrently with CHEM 212-2 (C- or better). Prerequisites: CHEM 212-1 and CHEM 232-1 (C- or better).

CHEM 301-0 Principles of Organic Chemistry (1 Unit) Introduction to the field of physical organic chemistry. Topics include bonding and structure, conformational analysis, stereochemistry, acids and bases, reactivity, and reaction mechanisms. CHEM 301-0 and CHEM 401-0 are taught together. Prerequisites: CHEM 212-3 or CHEM 210-3 and CHEM 230-3 (C- or better) and 1 quarter of physical chemistry, or consent of instructor.

CHEM 302-0 Principles of Inorganic Chemistry (1 Unit) Topics in advanced inorganic chemistry. CHEM 302-0 and CHEM 402-0 are taught together. Prerequisite: CHEM 333-0 or consent of instructor.

CHEM 303-0 Principles of Physical Chemistry (1 Unit) An overview of advanced topics in physical chemistry. CHEM 303-0 and CHEM 403-0 are taught together. Prerequisites: CHEM 342-1 and CHEM 342-2 and CHEM 342-3.

CHEM 305-0 Chemistry of Life Processes (1 Unit) Topics in the chemistry and biochemistry of life processes. Taught with CHEM 405-0. Prerequisites: CHEM 210-3 and CHEM 230-2 or CHEM 212-3 and 1 biochemistry course; or consent of instructor.

CHEM 306-0 Environmental Chemistry (1 Unit) Topics in the physical chemistry of the environment. Taught with CHEM 406-0. Prerequisites: CHEM 210-3 and CHEM 230-3 or CHEM 212-3 (C- or better); MATH 230-2, MATH 250-0; PHYSICS 135-1 and PHYSICS 135-2; or consent of instructor.

CHEM 307-0 Materials and Nanochemistry (1 Unit) Introduction to frontier research at the interface of chemistry and materials science. CHEM 307-0 and CHEM 407-0 are taught together. Prerequisites: CHEM 212-3 or CHEM 210-3 and CHEM 230-3 (C- or better).

CHEM 308-0 Design, Synthesis, and Applications of Nanomaterials (1 Unit) Fabrication, chemical synthesis, assembly, and characterization of controlled-dimensionality materials, including metals, semiconductors, oxides, polymers, and mesoporous scaffolds. Interfacial phenomena and particle stability, nano forms of carbon, and material design. Taught with CHEM 408-0. Prerequisite: 1 quarter of physical chemistry or consent of instructor.
CHEM 309-0 Polymer Chemistry (1 Unit) This course will cover the design and synthesis of polymers, including reaction mechanisms, characterization, and structure-property relationships. CHEM 309-0 is taught with CHEM 409-0. Prerequisites (for undergraduates only): a full year of undergraduate organic chemistry (CHEM 210-1, CHEM 210-2, and CHEM 210-3 or CHEM 212-1, CHEM 212-2, and CHEM 212-3), and one of the following courses: CHEM 307-0, CHEM 313-0, CHEM 319-0, CHEM 412-0, or CHEM 415-0.

CHEM 313-0 Advanced Organic Chemistry 1. Advanced concepts of organic reactivity and selectivity in synthesis. (1 Unit) Strategies and tactics involved in complex target synthesis. Modern reaction classes as applied to chemical synthesis, coupled to in-depth discussion of the underlying key principles of synthesis design and execution, are covered in the class. Students will gain experience in problem solving, creative thinking, structural analysis and presentation skills.

CHEM 314-0 Bioorganic Chemistry (1 Unit) Introduction to using chemical principles in biology and medicine. Experimental techniques and experiments in chemical biology. Suitable for students in chemistry, engineering, and biology. Taught with CHEM 415-0. Prerequisites: CHEM 210-3 and CHEM 230-3 or CHEM 212-3 (C- or better) and 1 quarter of biology; or consent of instructor.

CHEM 316-0 Medicinal Chemistry: the Organic Chemistry of Drug Design and Action (1 Unit) Introduction to principles of drug design and mechanisms of drug action from a chemical viewpoint. Historical introduction, drug design and development, receptors, enzymes and enzyme inhibitors, DNA, drug metabolism, and prodrugs. Prerequisites: CHEM 210-3 and CHEM 230-3, or CHEM 212-3 (C- or better), or consent of instructor.

CHEM 319-0 Advanced Organic Synthesis - Concepts and Applications (1 Unit) Synthesis of natural products and other medicinally relevant organic compounds. Retrosynthetic analysis, substructure keying, and pattern recognition. Classic and modern organic reactions. Terpenes, alkaloids, polyketides, steroids, proteins, and pharmaceuticals. Prerequisites: CHEM 210-3 and CHEM 230-3 or CHEM 212-3 (C- or better).

CHEM 329-0 Analytical Chemistry (1 Unit) Principles and applications of analytical methods, with emphasis on advanced separation science, dynamic electrochemistry, and advanced mass spectrometry. No P/N registration. Prerequisite: CHEM 342-1 or CHEM 342-2 (C- or better).

CHEM 333-0 Inorganic Chemistry (1 Unit) Descriptive chemistry of some important elements. Current concepts and models of chemical bonding. Prerequisites: 2 200- or 300-level chemistry courses.

CHEM 342-1 Thermodynamics (1 Unit) Laws of applications of thermodynamics. Thermochemistry, chemical potentials, solution thermodynamics, nonideal gases. Prerequisites: CHEM 132-0 and CHEM 142-0, or CHEM 152-0 and CHEM 162-0, or CHEM 172-0 and CHEM 182-0 (C- or better); MATH 230-1; PHYSICS 135-1 and PHYSICS 136-1 and PHYSICS 135-2 and PHYSICS 136-2 (PHYSICS 135-2 and PHYSICS 136-2 may be taken concurrently).

CHEM 342-2 Quantum Mechanics and Spectroscopy (1 Unit) Quantum mechanics with emphasis on atomic and molecular electronic structure. Electronic, vibrational, rotational, and magnetic resonance spectroscopy. Prerequisites: MATH 230-1 (MATH 230-2 recommended also); PHYSICS 135-1 and PHYSICS 136-1 and PHYSICS 135-2 and PHYSICS 136-2.

CHEM 342-3 Kinetics and Statistical Thermodynamics (1 Unit) Chemical kinetics, including experimental techniques and theories of rate processes. Statistical mechanics, including Boltzmann distribution, partition functions, and applications to thermodynamics. Prerequisites: CHEM 342-1 and CHEM 342-2 (C- or better).

CHEM 348-0 Physical Chemistry for ISP (1 Unit) Gas laws and properties; kinetic theory; first, second, and third laws; phase equilibria; mixtures; phase diagrams, statistical thermodynamics, kinetics. Prerequisites: ISP enrollment; CHEM 172-0 and CHEM 182-0 (C- or better); MATH 281-1, MATH 281-2, MATH 281-3; or consent of department.

CHEM 350-1 Advanced Laboratory 1 (1 Unit) Advanced laboratory techniques in synthetic and analytical chemistry and spectroscopy: mass spectrometry, chromatography, NMR spectroscopy, and organic synthesis techniques. Prerequisites: CHEM 220-0 and CHEM 212-3 (C- or better) or equivalent.

CHEM 350-2 Advanced Laboratory 2 (1 Unit) Advanced laboratory techniques in synthetic and analytical chemistry and spectroscopy, polymer characterization methods, electrochemistry, x-ray crystallography, atomic spectroscopy, and inorganic synthesis techniques. Prerequisites: CHEM 333-0 and CHEM 350-1 (C- or better) or equivalent.

CHEM 350-3 Advanced Laboratory 3 (1 Unit) Advanced laboratory techniques in synthetic and analytical chemistry and spectroscopy: infrared and Raman spectroscopy, electronic spectroscopy, fast kinetics, organic and inorganic synthesis techniques in a self-guided project. Prerequisites: CHEM 342-2 or equivalent and CHEM 350-2 (C- or better).

CHEM 360-0 Nanopatterning: Top-down meets Bottom-up (1 Unit) Introduction to current problems in nanoscale science and technology; hands-on experience with nanoscale characterization tools and benchtop nanoscale experiments. With laboratory. Prerequisites: CHEM 132-0 and CHEM 142-0, or CHEM 152-0 and CHEM 162-0, or CHEM 172-0 and CHEM 182-0 (C- or better), or equivalent. Natural Sciences Distro Area

CHEM 393-0 Green Chemistry (1 Unit) Practices of environmentally benign chemistry as applied to the chemical industry. Introduction to the concept and discipline of green chemistry; growth and expansion of the discipline in historical context from its origins in the early 1990s to the present. Prerequisites: CHEM 210-3 and CHEM 230-3 or CHEM 212-3 (C- or better).

CHEM 398-0 Undergraduate Seminar (1 Unit) Advanced work for superior students through supervised reading, research, and discussion. Prerequisite: consent of department.

CHEM 399-0 Independent Study (1 Unit) Faculty-directed research. Must be taken P/N for first 2 quarters. Prerequisite: consent of department.