CHEMISTRY (CHM)

CHM 1010 - Chemistry and Sustainability (Conceptions : VCNS - Natural Science) - 0,4 cr.
Introduces basic concepts of chemistry and their relationship or application to sustainability and social issues.

CHM 1011 - The Chemistry of Food (Conceptions : VCNS - Natural Science) - 4 cr.
Provides an opportunity to explore and understand the complex chemical components and reactions involved in growing, processing, consuming and digesting food. Students will read research articles involving food chemistry, watch current videos and presentations on food science and conduct their own research on food-related chemical reactions. Class discussions will involve student presentations, summaries and thoughtful interactions regarding course materials. The culminating project will involve crafting a research summary on a topic of choice and presenting it to the class.

CHM 1040 - General, Organic, and Biochemistry for Health Sciences (Conceptions : VCNS - Natural Science) - 0,4 cr.
Introduces concepts of general, organic, and biochemistry in an integrated rather than a sequential order. Topics include the structure and function of atoms, ions and compounds, the periodic table, organic functional groups, biological macromolecules, and an introduction to metabolism. This course is required for Nursing majors and can be applied to the Exercise Physiology major.

CHM 1110 - General Chemistry I (Conceptions : VCNS - Natural Science) - 0,4 cr.
Introduces atomic and molecular structure, bonding, stoichiometry, gas laws, chemical periodicity, and chemical reactions.
Prerequisite Courses: high school chemistry

CHM 1120 - General Chemistry II - 0,4 cr.
Studies solutions, equilibria, coordination chemistry, thermodynamics, electrochemistry, kinetics, nuclear chemistry, and qualitative analysis.
Prerequisite Courses: CHM 1110

CHM 2200 - Organic Chemistry I - 0,4 cr.
Introduces structure, properties, and reactions of alkanes, alkenes, alkynes, alcohols, alkyl halides, and ethers.
Prerequisite Courses: CHM 1110, C- or higher in CHM 1120.

CHM 2210 - Organic Chemistry II - 0,4 cr.
Introduces the structure, properties, and reactions of aldehydes and ketones, carboxylic acids and their derivatives, aromatic compounds, amines, phenols, carbohydrates, amino acids as well as infrared and nuclear magnetic resonance spectroscopy techniques.
Prerequisite Courses: CHM 2200, C- or higher in CHM 2200.

CHM 2777 - Topics in Chemistry - 0-4 cr.
Courses not part of the regular curriculum offered as need and interest arises.

CHM 2999 - Independent Study - 1-4 cr.
Topics in Chemistry.

CHM 3000 - Analytical Chemistry - 0,4 cr.
Analytical Chemistry is a branch of chemistry that aims to identify the components of a mixture (qualitative analysis) and/or determine the amount of one or more components (quantitative analysis). This course will explore the theory and practice of classical analytical methods and instrumentation with emphasis on solution equilibria, electrochemistry, spectroscopy, and chromatography and their relevance to modern chemical analysis. Application of computers and statistics to analytical problems will be a constant theme throughout the course.
Prerequisite Courses: CHM 1120

CHM 3220 - Intermediate Organic Chemistry - 0,4 cr.
Studies modern infrared, nuclear magnetic resonance, and mass spectroscopy; molecular orbital theory applied to bonding and pericyclic reactions; organic synthesis; and topic areas including medicinal, bio-organic, or polymer chemistry. (Offered fall semester in odd years: fall 2023, fall 2025, etc.)
Prerequisite Courses: C- or higher in CHM 2210 or equivalent.

CHM 3240 - Biochemistry I - 4 cr.
Studies the structure and role of proteins, lipids, carbohydrates, and nucleic acids in metabolism. Emphasizes protein structure and function, enzyme operation, metabolic pathways and their cellular role and regulation.
Prerequisite Courses: CHM 2210

CHM 3430 - Biochemistry II - 2 cr.
Reviews aspects of modern biochemistry as reflected in current research literature. Topics vary but aspects of protein structure, enzyme function and mechanism, signal transduction, metabolism concepts applied to nutrition and metabolic disorders, gene function and regulation are typically presented.
Prerequisite Courses: C - or higher in CHM 3240.

CHM 3431 - Biochemistry II Lab - 2 cr.
Applies techniques including UV-Vis and fluorescence spectroscopy, protein purification, chromatographic separations, electrophoresis, enzyme kinetics, immunoassays, and antioxidant assays.
Prerequisite Courses: CHM 3430

CHM 3460 - Physical Chemistry I - 4 cr.
Introduces thermodynamics, statistical mechanics, kinetics, and phase equilibria.
Prerequisite Courses: PSC 2011 and MTH 2222

CHM 3470 - Physical Chemistry II - 0,4 cr.
Covers postulates of quantum mechanics, particle in a box, harmonic oscillator, rigid rotor, and hydrogen atom with application to electronic structure of atoms and molecules and to atomic and molecular spectroscopy. (Offered spring semester in even years: spring 2024, spring 2026, etc.).
Prerequisite Courses: CHM 3460, A grade of C- or higher in CHM 3460.

CHM 3510 - Polymer Chemistry - 2 cr.
A study of the major aspects of polymer chemistry including the history, synthesis, structure, characterization, and properties of synthetic polymers and other macromolecules.
Prerequisite Courses: CHM 2210

CHM 3777 - Topics in Chemistry - 0-4 cr.
Courses not part of the regular curriculum offered as need and interest arises.

CHM 3999 - Independent Study - 0-4 cr.
Independent Study.

CHM 4000 - Senior Assessment - 0 cr.
Assesses Chemistry and Biochemistry majors' knowledge and understanding of major-related topics in a standardized exam during their senior year as part of the Department's assessment program.

CHM 4010 - Teaching Assistant Training - 0,1 cr.
Prepares teaching assistants in areas of classroom management, departmental policies, safety procedures, handling of hazardous materials and waste disposal. One day-long workshop and several follow up sessions for a total of 12-13 hours.
Prerequisite Courses: junior standing and permission of instructor, and employed status as chemistry TA.

CHM 4020 - Inorganic Chemistry - 0,4 cr.
Considers acid-base concepts, bonding, ligand field theory, molecular orbital and symmetry principles, reactions, energetics, coordination compounds, organometallic and bioinorganic chemistry. Laboratory focuses on synthesis and reactions of a broad range of inorganic and organometallic compounds. (Offered fall semester in even years: fall 2022, fall 2024, etc.).
Prerequisite Courses: CHM 1120 and CHM 2200 and CHM 3000, C- or higher in CHM 1120.

CHM 4060 - Undergraduate Research - 1-4 cr.
Introduces students to original laboratory research in collaboration with a faculty member; requires literature searching, experimental planning, a minimum of 8 hours laboratory work a week, a final written report and an oral presentation of the work.
Prerequisite Courses: junior standing, application according to departmental policy and permission of the instructor.

CHM 4120 - Instrumental Analysis - 0,4 cr.
Studies instrumentation for chemical analysis and method selection. Topics covered include ultraviolet- visible spectroscopy, atomic absorption and emission, polarography and voltammetry, thermal analysis, and chromatography. (Offered spring semester in odd years: spring 2023, spring 2025, etc.).
Prerequisite Courses: C- or higher in CHM 3000.

CHM 4330 - Environmental Chemistry - 2 cr.
Introduces the chemical interactions among earth, air, water, and living environments, with some emphasis on ecological damage, toxicology, ecosystem interdependence and repair of environmental damage.
Prerequisite Courses: C- or higher in CHM 1120; CHM 2210 and 3000 suggested.

CHM 4777 - Topics in Chemistry - 0-4 cr.
Topics.

CHM 4999 - Independent Study - 0-4 cr.
Specialized or personalized instruction under the guidance of a faculty member. Requires a written plan of the work to be undertaken and consent of instructor and department chair.

CHM 6001 - Bonding and Materials - 3 cr.
An in-depth survey of different bonding models, including molecular orbital theory, band theory, and non-covalent interactions. The course will then focus on how those theories apply to advanced materials such as porous solids, photovoltaics, and nanoparticles.

CHM 6002 - Topics in Thermodynamics - 3 cr.
An array of thermodynamic concepts will be implemented to solve current challenges in research, environmental chemistry, and industry. Examine the mathematical framework, theory and applications. Construct solutions of relevant thermodynamic questions such as energy efficiency and environmental stewardship.

CHM 6003 - Advanced Spectroscopy - 3 cr.
Survey of analytical spectroscopy including fundamental physical principles, signal generation, data acquisition, and interpretation. The course will progress through the measurement of electronic transitions (atomic and molecular), vibrational molecular transitions, molecular scattering, mass (atomic and molecular), and molecular nuclear magnetic resonance.

CHM 6004 - Chemical Information and Communication - 3 cr.
Designed to prepare graduate chemistry students to communicate proficiently. The focus is on strategies for reading critically, organizing and summarizing scientific ideas, drawing chemical structures, and communicating to diverse audiences about the field of chemistry. Ethics related to scientific communication will be discussed. Projects may include writing abstracts, literature reviews, grant proposal outlines, eposters, and oral presentations.

CHM 6005 - Topics in Kinetics - 3 cr.
Acquire a molecular understanding of the fundamental theories underlying chemical reaction as well its implementation. The fundamentals of reaction rates, collision theory, activated complex and transport properties will be applied to a current kinetic problem. In addition, the kinetics framework will be compared to several practical cases and discussed.

CHM 6101 - Medical Biochemistry - 3 cr.
Biochemically distinguish protein structure and function in relation to selected human diseases. Describe the biochemical consequences underlying disease such as sickle cell anemia, diabetes, Alzheimer's and cancer. Recognize that biochemistry integrates knowledge of the chemical processes in living cells with strategies to understand disease and identify potential therapies.

CHM 6102 - Bioanalytical Chemistry - 3 cr.
The goal of the course is to deepen student knowledge in the field of bioanalytical chemistry through the identification of complex bioanalytical challenges facing modern scientists and proposal of novel methodologies to solve them. To accomplish this goal, the course will explore the history of bioanalytical measurements, current bioanalytical assays, and emerging bioanalytical techniques and methodologies. Students will develop the skills to: i) critically evaluate the primary literature to identify current bioanalytical challenges, ii) think creatively to propose novel methods or techniques to overcome a challenge in their chosen sub-field (e.g. genomics, proteomics, metabolomics, lipidomics, bioinformatics, or single-cell analysis), and iii) clearly and persuasively communicate their ideas to the scientific community in written and oral formats.

CHM 6103 - Chemical Education - 3 cr.
Provides students with the background and knowledge to apply the most current teaching theories and tactics in the chemistry classroom. Students will gain experience and confidence in utilizing multiple educational approaches to teach chemistry. Best practices for teaching will be explored and discussed, including an emphasis on inclusive and adaptive strategies for every classroom. Students will leave with practical and applicable resources, instructional methods, and hands-on approaches to sharing their knowledge of chemistry with others.

CHM 6104 - Energy and Environment - 3 cr.
Tackle global and societal challenges of providing the world's energy needs while minimizing environmental damage. The scope is intentionally broad and recognizes the complexity of issues and competing challenges relating to renewable energy production and storage, emerging technologies, and land use.

CHM 6105 - Introduction to Computational Chemistry - 3 cr.
Several of the essential computational chemistry techniques will be discussed. The theoretical basis of Molecular Dynamics and Monte Carlo simulations will be analyzed and applied to real-world applications such as pharmaceuticals, materials science, phase equilibria and nano-technology. Connections between theory, computer simulations, experiments will be highlighted with hands-on activities.

CHM 6107 - Advanced Instrumental - 3 cr.
A survey of the theory, scope, and limitations of the most commonly applied instrumental techniques of chemical analysis. Topics may include spectroscopy, chromatography, mass spectrometry, and electrochemistry, viewed through a lens of practical instrument use. Emphasis between these methods and factors such as noise, resolution, sensitivity, error and economic considerations will be a common theme.

CHM 6110 - Pharmaceutical Chemistry - 3 cr.
Discover the important role that chemists contribute to the research and development of pharmaceuticals. Students will investigate drug discovery by integrating knowledge from organic, analytical and medicinal chemistry.

CHM 6111 - Chemistry of the Elements - 3 cr.
An in-depth look at the elements that make up our universe, including their nucleosynthesis, classification, periodic trends, isolation, and chemical reactivity.

CHM 6112 - Advanced Organic Chemistry - 3 cr.
A survey of common flavorant organic compounds: natural and/or synthetic, from an advanced organic chemistry perspective. An exploration of the nature of functional group(s) present, structure-activity relationship, biosynthesis, total synthesis and spectroscopic characterization for each of the flavorant molecules. Discussion of a brief history of the flavorant and current or potential uses. Overall, the goal is to integrate elements of advanced synthetic organic chemistry along with a general understanding of the flavorant compounds discussed in historical and contemporary societal contexts.

CHM 6113 - Organometallic Reactions and Structures - 3 cr.
An overview of organometallic structure and mechanisms with an emphasis on organo-transition metal chemistry. The course will address structure and bonding of different ligand types and in different geometries. Elementary reactions will be used to build models of catalytic cycles for new reactions based on precedent.

CHM 6777 - Topics in Chemistry - 0-3 cr.
Topics in Chemistry.