CHEMISTRY (CHEM)

CHEM F100X Chemistry in Complex Systems (n) 4 Credits
Fundamentals of chemistry with an emphasis on the role of chemistry in environmental and life systems. The role of feedback systems on chemical behavior is illustrated in atmospheric, aquatic, nuclear and nutritional systems. For non-science majors.
Prerequisites: Placement in WRTG F111X or higher; placement in DEV M 105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

CHEM F103X Basic General Chemistry (n) 4 Credits
Offered Fall
Fundamentals of chemistry including historical and descriptive aspects as well as basic mathematical concepts. Fulfills the laboratory part of the natural science requirement and prepares the student for CHEM F105X.
Note: This course satisfies elective credit only.
Prerequisites: Placement in WRTG F111X or higher; placement in DEV M 105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

CHEM F104X Survey of Organic Chemistry and Biochemistry (n) 4 Credits
Offered Spring
Fundamentals of chemistry as applied to biological systems. Bridges the gap between a general chemistry course and biochemical concepts of other health-related sciences. Recommended for health-science degree candidates and non-science majors interested in the central role of chemistry in life. May be used to meet the general laboratory science requirement or for preparation for CHEM F105X.
Prerequisites: CHEM F103X; placement in WRTG F111X or higher; placement in DEV M 105 or higher; or permission of instructor.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

CHEM F105X General Chemistry I (n) 4 Credits
CHEM F105X-F106X, together constitute the standard one-year engineering and science-major general chemistry course with laboratory. Major subjects include measurements, calculations, atomic and molecular structure, gas laws, stoichiometry, an introduction to organic chemistry, chemical reactions and related energy changes. Co-requisite: CHEM F105L. Students must be enrolled in both CHEM F105X and CHEM F105L to receive full credit.
Prerequisites: Placement in WRTG F111X or higher; placement in MATH F151X or higher; or a B- or better in CHEM F103X; or permission of instructor and department.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

CHEM F106L Chemistry F106X Lab 0 Credit

CHEM F106X General Chemistry II (n) 4 Credits
Major subjects include reaction kinetics, equilibrium (including acids and bases, solubility and complex ion formation), nuclear chemistry, electrochemistry, and descriptive chemistry of the elements. Students must be enrolled in both CHEM F106X and CHEM F106L to receive full credit. Co-requisite: CHEM F106L.
Prerequisites: Grade of C- or better in CHEM F105X; placement in WRTG F111X or higher; placement in MATH F151X or higher; or permission of instructor and department chair.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

CHEM F111X Introduction to Environmental Chemistry of the Arctic (a) 4 Credits
This course introduces students to environmental chemistry through investigating the air, water and soil quality of the Arctic environment as affected by natural and anthropogenic cycling of nutrients and contaminants. The lab component will focus on characterization of natural waters collected around the state. This course is offered on-campus and by distance.
Prerequisites: DEV M 105 or higher.
Attributes: UAF GER Natural Science Req
Lecture + Lab + Other: 3 + 3 + 0

CHEM F190 Alaska Statewide High School Science Symposium 2 Credits
Offered Spring
Students employ the scientific method to approach a problem of personal interest. Student work is molded into a research paper delivered orally in a formal scientific presentation for judges with wide-ranging experiences.
Prerequisites: High School student grades 9-12.
Recommended: Research completion, abstract and paper writing/submission, ASHSSS presentation.
Lecture + Lab + Other: 0 + 10 + 0

CHEM F202 Basic Inorganic Chemistry (n) 3 Credits
Offered Spring
Introduction to coordination theory, crystal field theory, kinetics and mechanisms of substitutions and redox reactions, unit cells and ionic bonding, periodic law, and descriptive chemistry of selected main group elements.
Prerequisites: CHEM F106X.
Lecture + Lab + Other: 2 + 3 + 0

CHEM F212 Chemical Equilibrium and Analysis (n) 4 Credits
Offered Fall
Aqueous chemical equilibrium as applied to chemical analysis, separations, spectrophotometry, potentiometry and factors considered in the analytical approach. Lab portion will include introductory experiments in analytical and instrumental techniques.
Prerequisites: Grade of C or better in CHEM F106X; MATH F151X or equivalent.
Lecture + Lab + Other: 3 + 3 + 0
CHEM F288  Introduction to Chemical Research
2 Credits
Offered Spring
Scientific research is creative and engaging when properly planned and executed. This course introduces students to the process of planning and executing a research project. We will begin with an idea, review primary literature, brainstorm project ideas, pose a testable hypothesis, plan experiments and execute a small research project.
Prerequisites: CHEM F212, CHEM F321; or permission of instructor.
Lecture + Lab + Other: 1 + 3 + 0

CHEM F314  Analytical Instrumental Laboratory  (W, n)
3 Credits
Offered Spring
A laboratory course focusing on the acquisition and interpretation of spectroscopic and chromatographic data for qualitative characterization and quantitative chemical measurements. Students will learn to design and execute experiments with a variety of instruments, critically evaluate experimental data, and communicate their findings through scientific writing.
Prerequisites: CHEM F212; WRTG F211X or WRTG F213X; must be a chemistry major; or permission of instructor.
Lecture + Lab + Other: 1 + 6 + 0

CHEM F321  Organic Chemistry I  (n)
4 Credits
Offered Fall
A systematic study of the more important functional groups of carbon compounds, including their mechanisms of reaction, methods of synthesis, and physical and spectroscopic properties. Lab portion will include an introduction to synthetic techniques and spectroscopy.
Prerequisites: CHEM F106X or permission of instructor.
Lecture + Lab + Other: 3 + 3 + 0

CHEM F325  Organic Chemistry II  (n)
4 Credits
Offered Spring
A systematic study of the more important functional groups of carbon compounds, including their mechanisms of reaction, methods of synthesis and physical and spectroscopic properties. Lab portion will include synthesis and characterization by spectroscopy.
Prerequisites: CHEM F321.
Lecture + Lab + Other: 3 + 3 + 0

CHEM F331  Physical Chemistry I  (n)
4 Credits
Offered Fall
Principles of thermodynamics and kinetics with applications to phase equilibria, solutions, chemical equilibrium and electrochemistry. Course teaches these concepts using both lecture and laboratory instruction.
Prerequisites: CHEM F106X; MATH F252X; PHYS F104X or PHYS F212X; or permission of instructor.
Lecture + Lab + Other: 3 + 3 + 0

CHEM F332  Physical Chemistry II  (n)
4 Credits
Offered Spring
Atomic and molecular structure, and spectroscopy, and statistical mechanics. Course teaches these concepts using both lecture and laboratory instruction.
Prerequisites: CHEM F331; MATH F253X; or permission of instructor.
Lecture + Lab + Other: 3 + 3 + 0

CHEM F351  General Biochemistry: Metabolism
3 Credits
Offered Spring
The biochemistry of metabolism. Topics include: chemistry of amino acids and its implication, protein structure-function, enzyme catalysis, glucose and glycogen metabolism and regulation, bioenergetics, lipid metabolism and biomembranes, amino acid metabolism and regulation of metabolism. Biomedical relevance and contemporary techniques will be addressed if appropriate.
Prerequisites: CHEM F321; or permission of instructor.
Recommended: CHEM F331.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F360  Cell and Molecular Biology  (n)
3 Credits
Offered Fall or Spring
An introduction to the structure and function of cells. Topics include: the structure and function of cellular components, including proteins, membranes and organelles; understanding how cells communicate; and how information is processed in the cell via DNA replication, transcription and translation.
Prerequisites: BIOL F260; CHEM F105X; CHEM F106X or concurrent enrollment.
Cross-listed with BIOL F360.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F402  Inorganic Chemistry  (n)
3 Credits
Offered Fall
Symmetry and group theory, molecular orbital theory, solid state chemistry, acids and bases, redox reactions, non-aqueous solvents, descriptive chemistry of some main group elements.
Prerequisites: CHEM F202; CHEM F322; CHEM F325.
Lecture + Lab + Other: 1 + 6 + 0

CHEM F406  Atmospheric Chemistry
3 Credits
Offered Spring Odd-numbered Years
Chemistry of the lower atmosphere (troposphere and stratosphere) including photochemistry, kinetics, thermodynamics, box modeling, biogeochemical cycles and measurement techniques for atmospheric pollutants; study of important impacts to the atmosphere which result from anthropogenic emissions of pollutants, including acid rain, the "greenhouse" effect, urban smog and stratospheric ozone depletion.
Prerequisites: CHEM F332 or equivalent or permission of instructor.
Stacked with CHEM F606; ATM F606.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F419  Practical Nuclear Magnetic Resonance
2 Credits
Offered Spring
Students will be trained in the basic operation of NMR instruments. Students will spend much of the class time getting hands-on experience on the NMR with student-driven NMR-based research projects. At the end of the course, students will present their projects to the rest of the class.
Prerequisites: CHEM F321.
Lecture + Lab + Other: 1 + 3 + 0
CHEM F420  Applications of NMR Spectroscopy  
3 Credits  
Offered Fall Even-numbered Years  
Application of nuclear magnetic resonance (NMR) spectroscopy in the chemical and biochemical sciences. The course will focus on the implementation and interpretation of NMR experiments for solving research problems. Topics include the basic theory of NMR and one- and two-dimensional techniques.  
Prerequisites: CHEM F321.  
Stacked with CHEM F620.  
Lecture + Lab + Other: \(3 + 0 + 0\)

CHEM F434  Chemistry Capstone Laboratory  
(W, n)  
3 Credits  
Offered Fall  
A capstone laboratory course with three major components: 1) experiments related to concepts learned in physical, analytical and inorganic chemistry courses emphasizing kinetics, spectroscopy and thermodynamics; 2) computer use in problem solving, data analysis and word processing; and 3) technical writing with emphasis on preparation of papers for publication.  
Prerequisites: CHEM F321.  
Lecture + Lab + Other: \(1 + 6 + 0\)

CHEM F440  General Biochemistry: Macromolecules  
3 Credits  
Offered Fall  
Focuses on the biochemistry of the two principal macromolecules: nucleic acids and proteins. Topics include: nucleotides metabolism, DNA structure and topology, DNA replication, DNA repair and recombination, cell cycle regulation, RNA transcription and processing, Gene expression, translation and protein metabolism. Biomedical relevance and contemporary techniques will be addressed if appropriate.  
Prerequisites: CHEM F321; or permission of instructor.  
Lecture + Lab + Other: \(3 + 0 + 0\)

CHEM F450  Environmental Toxicology  
(O)  
3 Credits  
Offered Fall Even-numbered Years  
Environmental toxicology will focus on the general properties and principles of persistent and/or poisonous (toxic) chemicals commonly encountered in air, water, fish and wildlife. Numerous natural and synthetic chemicals in the environment will be discussed from a global perspective with some bias towards Arctic and sub-Arctic regions.  
Prerequisites: CHEM F351; or one semester each of organic chemistry and cell or molecular biology; WRTG F111X; WRTG F211X or WRTG F213X; BIOL F121X or BIOL F131X or BIOL F141X; or permission of instructor.  
Cross-listed with BIOL F455.  
Stacked with BIOL F655, CHEM F655.  
Lecture + Lab + Other: \(3 + 0 + 0\)

CHEM F466  Advanced Cell and Molecular Laboratory  
3 Credits  
Offered Spring  
Modern molecular biological techniques including protein and nucleic acid gel electrophoresis, western blotting, cell fractionation, cellular respiration, enzymology and fluorescence microscopy. Lectures will be supplemented with reading from the primary literature. Student projects in this course may satisfy the capstone project requirements of the biological science degree. Student must also enroll in BIOL F400 to receive capstone credit. To receive credit, you must not only pass the course, but receive a passing grade for the capstone project.  
Prerequisites: BIOL F360, may be taken concurrent; or permission of instructor.  
Cross-listed with BIOL F466.  
Lecture + Lab + Other: \(2 + 4 + 0\)

CHEM F470  Cellular and Molecular Neuroscience  
3 Credits  
Offered Fall Even-numbered Years  
The goal of this course is to provide an overview of the cellular and molecular underpinnings of signaling in the nervous system. Discussion will be focused on properties of excitable membranes, synaptic transmission, and neurological integration. Fundamentals of the functional properties of neurons will provide the background for discussions of small neuronal circuits that regulate behavior, the cellular/molecular basis of learning and memory, and pharmacological approaches for the treatment of neuronal pathologies.  
Prerequisites: MATH F252X  
Cross-listed with MATH F251X or CHEM F470 or MATH F230X; or permission of instructor.  
Lecture + Lab + Other: \(3 + 0 + 0\)

CHEM F474  Neurochemistry  
3 Credits  
Offered Fall Even-numbered Years  
Covers basic and applied aspects of interneuronal signaling of specific neurotransmitter systems. Lectures will be based on chapters from assigned text as well as recent and historical literature relevant to these topics. Basic concepts introduced in lectures will be applied through guided discussion of original research papers. Students will learn to prepare “peer reviews” of selected papers and critically discuss original research.  
Prerequisites: BIOL F115X; CHEM F325; BIOL F417O or CHEM F470 or CHEM F475; CHEM F375.  
Lecture + Lab + Other: \(3 + 0 + 0\)

CHEM F481  Seminar  
1 Credit  
Introduction to the techniques and style of technical oral presentation generally accepted by professional chemists. Class will meet two hours per week, the first hour in closed session, the second, open to the public. Seminar attendance and participation in observing and critiquing presentations by graduate students, chemistry faculty, and their peers is required. Note: Oral communication intensive credit is earned upon successful completion of CHEM F482.  
Prerequisites: BIOL F131X or BIOL F141X.  
Lecture + Lab + Other: \(2 + 0 + 0\)
CHEM F482  Seminar  (O)  
2 Credits  
Introduction to the techniques and style of technical oral presentation generally accepted by professional chemists. Class will meet two hours per week, the first hour in closed session, the second, open to the public. Preparation of a 40 minute presentation to be delivered twice, first, to others in the course in the closed session for critiquing and suggestions for improvement and later, in the open seminar for evaluation by all. Prerequisites: CHEM F481; COJO F131X or COJO F141X.
Lecture + Lab + Other: 2 + 0 + 0

CHEM F488  Undergraduate Chemistry and Biochemistry Research  
2-3 Credits  
Advanced research topics from outside the usual undergraduate laboratory offerings. The student will be required to make presentations and turn in a final report. Research areas range from atmospheric chemistry to molecular biology. A substantial level of chemistry or biochemistry background is assumed. Prerequisites or Co-requisites: CHEM F434 or CHEM F314; or permission of instructor.
Lecture + Lab + Other: 0 + 6-9 + 0

CHEM F498  Research  
1-9 Credits  

CHEM F501  Introduction to Atmospheric Sciences  
3 Credits  
Offered Fall  
Fundamentals of atmospheric science. Includes energy and mass conservation, internal energy and entropy, atmospheric water vapor, cloud microphysics, equations of motion, hydrostatics, phase oxidation, heterogeneous chemistry, the ozone layer, fundamentals of biogeochemical cycles, solar and terrestrial radiation and radiative-convective equilibrium. Also includes molecular, cloud and aerosol absorption and scattering. Prerequisites: Graduate standing. Cross-listed with ATM F601.
Stacked with ATM F401.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F601  Introduction to Atmospheric Sciences  
3 Credits  
Offered Fall  
Fundamentals of atmospheric science. Includes energy and mass conservation, internal energy and entropy, atmospheric water vapor, cloud microphysics, equations of motion, hydrostatics, phase oxidation, heterogeneous chemistry, the ozone layer, fundamentals of biogeochemical cycles, solar and terrestrial radiation and radiative-convective equilibrium. Also includes molecular, cloud and aerosol absorption and scattering. Prerequisites: Graduate standing. Cross-listed with ATM F601.
Stacked with ATM F401.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F602  Bioinorganic Chemistry  
3 Credits  
Offered Fall Even-numbered Years  
Survey of structure, functions, and chemical properties of natural metalloproteins and metalloenzymes, roles of metalloproteins in nucleic acid formation and replication, metal-based medicines. Prerequisites: CHEM F351; or CHEM F450.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F605  Aquatic Chemistry  
3 Credits  
Offered Fall Even-numbered Years  
Chemistry of aquatic systems, including the development of equilibrium and kinetic models to understanding the speciation, transformation and partitioning of inorganic chemical species in natural and engineered water systems. Emphasis is on the study of acid-base chemistry, complexation, precipitation-dissolution and reduction-oxidation reactions. Prerequisites: Graduate standing or permission of instructor. Cross-listed with ENVE F641.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F606  Atmospheric Chemistry  
3 Credits  
Offered Spring Odd-numbered Years  
Chemistry of the lower atmosphere (troposphere and stratosphere) including photochemistry, kinetics, thermodynamics, box modeling, biogeochemical cycles and measurement techniques for atmospheric pollutants; study of important impacts to the atmosphere which result from anthropogenic emissions of pollutants, including acid rain, the "greenhouse" effect, urban smog and stratospheric ozone depletion. Prerequisites/Co-requisite: ATM F601 or permission of instructor. Cross-listed with ATM F606.
Stacked with CHEM F406.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F609  Environmental Geochemistry  
3 Credits  
Offered Spring Even-numbered Years  
Focus on advanced topics and methods in chemistry of aquatic and soil environments. Detailed treatment of the thermodynamic, kinetic and structural principles involved in the description and modeling of low-temperature aqueous geochemical systems. Particular emphasis on heterogeneous interactions, including dissolution/precipitation, sorption and microbial processes, involved in the partitioning, transformation and transport of chemical species in the environment. Prerequisites: ENVE F641 or GEOS F618 or permission of instructor. Cross-listed with GEOS F633.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F618  Crystallography and Diffraction  
3 Credits  
Offered Spring Even-numbered Years  
The structure of solid-state materials and the analysis of materials using X-ray scattering techniques. Material structure topics will include crystal lattices, space-group symmetry, projections, the reciprocal lattice, and crystal chemistry. Methods for investigating the structure of materials and identification of phase will be covered in depth including: fundamentals of X-ray scattering, diffraction from single crystals, powder diffraction (quantitative) phase analysis, Rietveld refinements, texture analysis, and reflectivity. Students will be trained in the use of modern X-ray disciplines including materials chemistry, mineralogy, petrology, and engineering materials with an emphasis on methods of data collection and analysis. Prerequisite: Graduate standing; or permission of instructor.
Lecture + Lab + Other: 3 + 2 + 0

CHEM F620  Applications of NMR Spectroscopy  
3 Credits  
Offered Fall Even-numbered Years  
Applications of nuclear magnetic resonance (NMR) spectroscopy in the chemical and biochemical sciences. The course will focus on the implementation and interpretation of NMR experiments for solving research problems. Topics include the basic theory of NMR and one- and two-dimensional techniques. Prerequisites: Graduate standing or permission of instructor. Cross-listed with CHEM F420.
Lecture + Lab + Other: 3 + 0 + 0
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<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Offered Years</th>
<th>Prerequisites</th>
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<tr>
<td>CHEM F621</td>
<td>Enzymology and Bio-Organic Chemistry</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
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<td></td>
<td>Applications of the methods and concepts of physical</td>
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<td>organic chemistry to enzyme-catalyzed reactions.</td>
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<td>Prerequisites:</td>
<td>CHEM F351.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<td>CHEM F622</td>
<td>Biosynthesis of Plant Natural Products</td>
<td>3</td>
<td>Fall Even-numbered Years</td>
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<td>Three major pathways of plant secondary metabolism:</td>
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<td>terpene, shikimate and acetoxyanogenic pathways.</td>
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<td>Includes discussion of offshoots of these pathways to</td>
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<td>various classes of alkaloids. Use of stable and</td>
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<td>radioisotopes in conjunction with modern NMR spectroscopy</td>
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<td>and kinetic isotope effects will be stressed.</td>
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<td>Prerequisites:</td>
<td>CHEM F325.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<td>CHEM F623</td>
<td>Molecular Modeling</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
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<td>Theory and practice of quantum and molecular mechanics</td>
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<td>methods in organic, physical, inorganic and environmental</td>
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<td>chemistry and biochemistry; applications of</td>
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<td>computational software on workstations and multi-processor</td>
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<td>servers.</td>
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<td>Prerequisites:</td>
<td>Graduate standing in chemistry of biochemistry, one year</td>
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<td>each of undergraduate organic, physical and analytical</td>
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<td>chemistry or equivalent or permission of instructor.</td>
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<td>Recommended:</td>
<td>CHEM F402.</td>
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<td>Lecture + Lab + Other: 2 + 0 + 3</td>
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<td>CHEM F628</td>
<td>Advanced Immunology</td>
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<td>Spring Even-numbered Years</td>
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<td>Advanced level of knowledge and understanding of the</td>
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<td>structural and molecular basis of the innate and</td>
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<td>adaptive immune responses in terms of a complex system.</td>
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<td>Prerequisites:</td>
<td>Cross-listed with BIOL F628</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<td>CHEM F631</td>
<td>Environmental Fate and Transport</td>
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<td>Spring Even-numbered Years</td>
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<td>Examination of the physical properties that govern the</td>
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<td>behavior, fate and transport of contaminants released</td>
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<td>into the environment. Topics include air-water partitioning</td>
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<td>and exchange, organic solvent-water partitioning,</td>
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<td>diffusion, sorption, chemical and biological transformation</td>
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<td>reactions, and modeling concepts.</td>
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<td>Cross-listed with ATM F631.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<td>CHEM F632</td>
<td>Molecular Spectroscopy</td>
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<td>Fall Odd-numbered Years</td>
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<td>Application of quantum mechanics to molecular bonding and</td>
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<td>spectroscopy. Topics include: applications of lasers to</td>
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<td>probe chemical reactivity, photochemistry and the</td>
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<td>detection of trace compounds in mixtures. Variable</td>
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<td>content. May be repeated for credit.</td>
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<td>Prerequisites:</td>
<td>CHEM F332; or permission of instructor.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<td>CHEM F654</td>
<td>Protein Structure and Function</td>
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<td>Spring Even-numbered Years</td>
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<td>Contemporary topics in peptide and protein biochemistry.</td>
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<td>Topics include peptide synthesis, protein modification,</td>
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<td>comparative aspects of structure, protein engineering,</td>
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<td>enzyme and receptor function as well as molecular</td>
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<td>Prerequisite:</td>
<td>CHEM F351.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<tr>
<td>CHEM F655</td>
<td>Environmental Toxicology</td>
<td>3</td>
<td>Fall Even-numbered Years</td>
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<td></td>
<td>Environmental toxicology will focus on the general</td>
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<td>properties and principles of persistent and/or</td>
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<td></td>
<td>poisonous (toxic) chemicals commonly encountered in air,</td>
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<td>water, fish and wildlife. Numerous natural and</td>
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<td>synthetic chemicals in the environment will be discussed</td>
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<td>from a global perspective with some bias towards Arctic</td>
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<td>and sub-Arctic regions.</td>
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<td>Prerequisites:</td>
<td>CHEM F351; BIOL F303; or one semester each of organic</td>
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<td></td>
<td>chemistry and cell or molecular biology; or permission of</td>
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<td>Cross-listed with</td>
<td>BIOL F656.</td>
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<td>instructor.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<tr>
<td>CHEM F657</td>
<td>Molecular Foundations of Gene Expression</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
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<td></td>
<td>The molecular regulation of gene expression in prokaryotes</td>
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<td></td>
<td>and eukaryotes in the context of development and disease.</td>
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<td></td>
<td>Major topics include: protein/DNA interactions,</td>
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<td>structure-function relations of transcription factors,</td>
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<td>signal transduction, control of transcription and</td>
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<td>translation, chromatin structure and DNA replication.</td>
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<td>Prerequisites:</td>
<td>CHEM F351; CHEM F456; CHEM F461 or equivalent; or</td>
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<td>permission of instructor.</td>
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<td>Lecture + Lab + Other: 3 + 0 + 0</td>
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<tr>
<td>CHEM F658</td>
<td>Current Techniques in Biochemistry</td>
<td>3</td>
<td>Spring Even-numbered Years</td>
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<td>Focuses on current techniques in biochemistry. This is a</td>
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<td>laboratory intensive course covering: Restriction Enzymes</td>
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<td>polymerase chain reaction (PCR), DNA electrophoresis,</td>
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<td>Enzyme Linked Immunosorbert Assays (ELISA), DNA</td>
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<td>recombination and cloning, protein purification by</td>
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<td>affinity chromatography, protein electrophoresis,</td>
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<td>Western blots, enzyme kinetics, protein quantification</td>
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<td>by spectrophotometry, and basic tissue culture techniques.</td>
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<td>It is an important goal of this graduate course to</td>
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<td>emphasize experimental design, evaluation, and</td>
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<td>trouble shooting within each of the biochemical</td>
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<td>techniques and also to challenge students to develop</td>
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<td>their own experimental designs, evaluate the scope and</td>
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<td>limitations of the design/technique, and propose solutions</td>
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<td>for potential problems.</td>
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<td>Prerequisite:</td>
<td>CHEM F351; CHEM F450; graduate standing; or permission</td>
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<td>of instructor.</td>
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<td>Lecture + Lab + Other: 1 + 6 + 0</td>
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CHEM F660  Chemical Oceanography
3 Credits
Offered Spring
An integrated study of the chemical, biological, geological and physical processes that determine the distribution of chemical variables in the sea. Topics include biogeochemical cycles and the use of tracers to follow these complex chemical cycles. The chemistry of carbon is considered in detail. Interactions with the atmosphere and lithosphere (including implications of the mid-ocean ridge vent system to ocean chemistry) are examined.
Prerequisites: Graduate standing.
Cross-listed with MSL F660.
Stacked with MSL F461.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F666  Scientific Teaching
2 Credits
Offered Spring Even-numbered Years
This course explores methods for teaching science at the university level. Emphasis is placed on methods of course design, instructional techniques, assessment and course management that have been shown by research to improve student learning. This course is intended for graduate students in the sciences who have an interest in improving their teaching skills. The course format will be a mixture of discussion, workshops and seminars. If the course is over-enrolled, priority will be given to teaching assistants who are assigned to teach large, introductory level (100 or 200 level) courses during the semester they are taking this course.
Prerequisites: Graduate standing; or permission of instructor.
Cross-listed with STO F666; BIOL F666; GEOS F666.
Lecture + Lab + Other: 2 + 0 + 0

CHEM F670  Cellular and Molecular Neuroscience
3 Credits
Offered Fall Even-numbered Years
The goal of this course is to provide an overview of the cellular and molecular underpinnings of signaling in the nervous system. Discussions will be focused on properties of excitable membranes, synaptic transmission, and neurological integration. Fundamentals of the functional properties of neurons will provide the background for discussions of small neuronal circuits that regulate behavior, the cellular/molecular basis of learning and memory, and pharmacological approaches for the treatment of neuronal pathologies.
Prerequisites: Two F300-level courses in BIOL or CHEM; MATH F251X or MATH F230X; or permission of instructor.
Recommended: MATH F252X.
Cross-listed with BIOL F679.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F671  Receptor Pharmacology
3 Credits
Offered Fall Even-numbered Years
Covers basic drug/receptor theory to train students to a) assess affinity and efficacy of receptor ligands; b) work with and interpret functional assays and binding results; c) critically evaluate original research regarding receptor pharmacology with an emphasis on ligand-gated ion channels and G-protein coupled receptors; and c) identify testable hypotheses and design experiments to test these hypotheses.
Prerequisites: Upper-division or graduate biochemistry or neurochemistry course or permission of instructor.
Recommended: BIOL F417.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F674  Membrane Biochemistry and Biophysics
3 Credits
Offered Fall Even-numbered Years
Basic biophysical and molecular processes associated with membrane-mediated events in the context of cellular physiology. Major topics include biochemical and biophysical characteristics of membrane lipids; structure-function relation of membrane proteins; protein trafficking/targeting; vesicle transport and membrane fusion/exocytosis; the nature of membrane excitability; and the role of membrane in bioenergetics.
Prerequisites: CHEM F351; CHEM F456; CHEM F461 or equivalent; or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F675  Cellular Signaling
3 Credits
Offered Spring Odd-numbered Years
Cellular signaling is of vital importance in complex biomolecular systems, development, physiology, and pathology and thus, constitutes a major topic in modern medical and pharmacological research. This course concentrates on cellular signal transduction and regulation in higher animals and humans. Major topics include G-proteins, Protein kinases, Ca2+, cAMP, lipid mediators, adaptor proteins and signal recognition domains.
Prerequisites: Upper division or graduate biochemistry or neurochemistry course or permission of instructor.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F676  Neurochemistry
3 Credits
Offered Fall Odd-numbered Years
Covers basic and applied aspects of interneuronal signaling of specific neurotransmitter systems. Lectures will be based on chapters from assigned text as well as recent and historical literature relevant to these topics. Basic concepts introduced in lectures will be applied through guided discussion of original research papers. Students will learn to prepare “peer reviews” of selected papers and critically discuss original research.
Prerequisites: BIOL F115X; CHEM F325; BIOL F417 or CHEM F470 or PSY F335.
Stacked with CHEM F474.
Lecture + Lab + Other: 3 + 0 + 0

CHEM F686  Chemical Research Mentoring
2 Credits
This course provides graduate students the opportunity to mentor undergraduates in chemical research within a structured environment, from developing a research idea to executing a small research project. The focus of this course is to refine mentoring skills that contribute to the professional development of maturing chemical professionals. Offered Spring
Prerequisites: Graduate standing in a scientific discipline.
Lecture + Lab + Other: 1 + 3 + 0

CHEM F688  Biochemical and Molecular Biology Seminar
1 Credit
A seminar on various topics related to biochemistry and molecular biology including discussions of recent literature and research results.
Lecture + Lab + Other: 1 + 0 + 0
CHEM F691  Research Presentation Techniques
1 Credit
Offered Fall
Review of recent research in chemistry to expose students to recent findings, methodologies and concepts in a broad range of chemistry and related disciplines. How to present and defend research proposals. Course may be repeated for credit.
Prerequisites: Graduate standing in physical sciences or permission of instructor.
Lecture + Lab + Other: 1 + 0 + 0

CHEM F692  Seminar
1-6 Credits
Graded Pass/Fail.
Lecture + Lab + Other: 1-6 + 0 + 0

CHEM F692P  Seminar
1-6 Credits
Lecture + Lab + Other: 1-6 + 0 + 0

CHEM F698  Non-thesis Research/Project
1-9 Credits
Graded Pass/Fail.
Lecture + Lab + Other: 0 + 1-9 + 0

CHEM F699  Thesis
1-12 Credits
Lecture + Lab + Other: 0 + 0 + 0