CHEMISTRY

Chemistry is the science of molecules: what they are, how they are made, and what they do. We are embedded in a world of naturally occurring and synthetic molecules. A familiarity with chemistry is not only fundamental to other sciences, but is relevant to government, art, economics, and archaeology.

Students and faculty in the Wesleyan Chemistry Department study important modern chemical problems in both the classroom and the research laboratory. Research in the department spans organic and inorganic nanomaterials, new recyclable polymers, the molecular basis of neurodegenerative diseases, understanding the structures and dynamics of proteins, the development of biofuels, the structures of molecules in the interstellar medium, the development of new therapeutic and diagnostic drugs, and computational approaches to complex chemical systems.

FACULTY

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EMERITI

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UNDERGRADUATE PROGRAM DEPARTMENTAL ADVISING EXPERTS

All departmental faculty.

- Undergraduate Chemistry Major (https://catalog.wesleyan.edu/departments/chem/ugrd-chem/)
- Undergraduate Chemistry Minor (https://catalog.wesleyan.edu/departments/chem/ugrd-chem-mn/)
- Doctor of Philosophy in Chemistry (https://catalog.wesleyan.edu/departments/chem/grad-chem/)
- Master of Arts in Chemistry (https://catalog.wesleyan.edu/departments/chem/grad-chem-ma/)

CHEM115 Chemistry in Your Life
This course will cover a wide range of topics of current interest that will show how chemistry is ever present in the world. In particular, the course will discuss the molecular basis of topics such as crime scene DNA testing, COVID-19 detection and vaccine development, the physical effects of drinking alcohol, and more.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM115F Chemistry in Your Life (FYS)
This course will cover a wide range of topics of current interest that will show how chemistry is ever present in the world. In particular, the course will discuss the molecular basis of topics such as crime scene DNA testing, COVID-19 detection and vaccine development, the physical effects of drinking alcohol, and more.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM118 DNA
This course provides an interdisciplinary view of the DNA molecule and its impact upon medicine, law, philosophy, agriculture, ethics, politics, and society at large. The course has two parts. In the first part, we will learn the chemistry and physics of DNA and the processes by which the information stored in DNA is expressed. In the second part of the course, we will discuss what DNA has done and still can do for us--for example, treat and prevent genetic diseases, improve our food through genetic engineering, achieve criminal justice through genetic fingerprinting, understand the evolutionary origin of humans, and enrich our idea of what it is to be human. The course assumes basic knowledge of chemistry and biology at the general high school level. Independent exploration and inquiry are encouraged.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM119 Biology and Chemistry in the Modern World: A Survey of Drugs and Disease
This course will cover a wide range of topics of current interest that are at the intersection of biology and chemistry. In particular, the molecular basis of issues related to drugs and disease will form a focus of the course. Topics to be discussed will include psychoactive and performance-enhancing drugs, mad cow, cancer, viral and bacterial diseases, and the chemistry of foods.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B119**
Prereq: **None**

CHEM121F Chemophobia: Precaution or Panic? (FYS)
Chemophobia is an aversion to or prejudice against chemistry and chemicals. There is abundant evidence of this across the mass media, and while some important issues have been brought to the forefront in this way, the hype and misunderstanding surrounding other issues has had adverse effects on our society. This course will look at both sides of the debate surrounding chemicals in our everyday lives--in our food, in our consumer products, and in our environment. We will begin with a discussion of how we arrived at our current perceptions of chemistry, and then we will delve into the facts and science behind some of the topical issues of concern to differentiate between what is merely hype and what we ought to be concerned about. This course is intended for anyone interested in the topic, regardless of their current knowledge of chemistry.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM127 Molecules on the Menu: From Classic Cuisine to Molecular Gastronomy
Cooking and baking are, at their core, chemistry in the kitchen. The taste, texture, structure, and appearance of our favorite foods result from the interactions--and reactions--of molecules. This course will explore the way that molecules interact with one another during the preparation of different recipes as well as how these molecules respond to external physical factors such as heat, cold, or stirring to give the final tasty result. By understanding what is happening when we follow a particular recipe, we will discover how to adapt recipes to our own tastes, troubleshoot recipes in different situations, and substitute ingredients.

The course will include a combination of lectures, cooking demonstrations, and weekly short experiments during which we will seek to answer questions such as: What is a cookie? How does one cook a "perfect" egg? Is it possible to cook without applying heat?
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM137F The Self-Made Tapestry: Pattern Formation in Nature (FYS)
The natural world is filled with intricate patterns: for example, the characteristic stripes and spots of animals, the shifting landscapes of wind-blown desert sand dunes, the hexagonal forms of honeycombs, the near perfect six-fold symmetry of snowflakes, the branching patterns of arterial structures, convection patterns in fluids, and the forms of soap films. Research suggests that many of these diverse patterns arise from a few relatively simple mechanisms that are independent of the fine details of each system. We will examine a wide range of these natural phenomena to develop insights into how complex morphologies may appear from a few simpler pattern-forming principles.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM141 General Chemistry I
CHEM 141 is the first half of a standard introductory course in general chemistry, intended for science majors and appropriate for premedical studies. Proficiency in algebra is required. Prior completion of a high school chemistry course is typical, but not required. Students with advanced academic preparation in high school (especially AP/IB/A-Level CHEM) will not be granted credit if they enroll in this course and should instead take CHEM143. The topics covered will include measurement and dimensional analysis; atomic structure; electronic structure; formula calculations and the mole; stoichiometry; solutions and aqueous reactions, part 1; heat and enthalpy; structure and bonding; and states of matter. The full-year course is completed with CHEM 142.

Students considering CHEM 141 are strongly encouraged to consult https://www.wesleyan.edu/chem/undergraduate_program/first_year_students.html
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM141Z General Chemistry I
CHEM 141Z is an intensive version of CHEM141. CHEM 141Z is the first half of a standard introductory course in general chemistry, intended for science majors and appropriate for premedical studies. Proficiency in algebra is required. Prior completion of a high school chemistry course is typical, but not required. Students with advanced academic preparation in high school (especially AP/IB/A-Level CHEM) will not be granted credit if they enroll in this course and should instead take CHEM143. The topics covered will include measurement and dimensional analysis; atomic structure; electronic structure; formula calculations and the mole; stoichiometry; solutions and aqueous reactions, part 1; heat and enthalpy; structure and bonding; and states of matter. The full-year course is completed with CHEM 142 or CHEM 142Z.

Students considering CHEM 141Z are strongly encouraged to consult https://www.wesleyan.edu/chem/undergraduate_program/first_year_students.html
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM142 General Chemistry II
CHEM 142 is the second half of a standard introductory course in general chemistry, intended for science majors and appropriate for premedical studies. Proficiency in algebra is required. Prior completion of a high school chemistry course is typical, but not required. Topics covered will include solutions and aqueous reactions; kinetics; equilibrium; acids and bases; solubility equilibria; thermodynamics; electrochemistry; and nuclear chemistry.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM141 OR CHEM141Z**

CHEM142Z General Chemistry II
CHEM 142Z is an intensive version of CHEM142. CHEM 142Z is the second half of a standard introductory course in general chemistry, intended for science majors and appropriate for premedical studies. Proficiency in algebra is required. Prior completion of a high school chemistry course is typical, but not required. The topics covered will include solutions and aqueous reactions, part 2; kinetics; equilibrium; acids and bases; solubility equilibria; thermodynamics; electrochemistry; and nuclear chemistry.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM141 OR CHEM141Z**

CHEM143 Honors General Chemistry I
The CHEM 143/144 course sequence is intended for students with previous advanced academic preparation, especially AP/IB/A-Level chemistry courses. The course sequence fulfills premedical requirements. Eligible students interested in the CHEM, MB&B, and NS&B majors are strongly encouraged to choose this option as the best preparation for further study. The topical focus will be on the concepts of electronic structure, molecular geometry, and equilibrium thermodynamics, with applications to current research. Note: CHEM 143/144 does not follow the same curriculum as CHEM 141/142; CHEM143 will not be accepted as a prerequisite for CHEM142.

Students considering CHEM 143 are strongly encouraged to consult https://www.wesleyan.edu/chem/undergraduate_program/first_year_students.html
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM144 Honors General Chemistry II
CHEM 144 is the second half of the honors general chemistry sequence, which completes a full year of instruction in general chemistry for science majors and for premedical studies. The focus of the course is the fundamentals of structure and bonding, with an emphasis on predicting reactivity. Major topical coverage includes the reactivity of ions in aqueous solution, kinetics, modern electronic structure, and the chemistry of transition metal complexes, with applications to current research on, for example, food chemistry, functional materials, and artificial photosynthesis.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM143**

CHEM150 Introduction to Organic Chemistry
This course is designed as a "head start" to the organic chemistry sequence (CHEM 251/252), consisting of a weekly workshop designed to prepare students for the coming fall semester. Topics covered include structural formulas of organic compounds, organic chemical nomenclature and vocabulary, basic rules of writing organic reaction mechanisms, and how to use ChemDraw software.

Students who have completed CHEM 251 may not enroll in this course.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM141 OR CHEM143**

CHEM152 Introductory Chemistry Laboratory
This course introduces students to the application of chemical concepts in the laboratory. This one-semester course is the only laboratory course taken concurrently with general chemistry courses (CHEM 141/142 or 143/144), and it serves as the first course in a three-semester laboratory sequence designed to fulfill chemistry lab requirements for pre-medical/health studies. CHEM 152 is offered in both the fall and spring semesters. Students who place directly into CHEM 144 with advanced placement credit must take this laboratory course if they intend to take CHEM 257 in a future semester. Students who place directly into CHEM 251 with advanced placement credit do not take this laboratory course; these students should enroll directly into CHEM 257 instead.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM152Z Introductory Chemistry Laboratory
This course provides an introduction to the application of chemical concepts in the laboratory. This course is normally taken concurrently with CHEM 141, 142, 143, or 144, and it fulfills part of the chemistry lab requirement for pre-medical/health studies.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM241 Informal Science Education for Elementary School Students I
This service-learning course will focus on designing and implementing original, effective, and engaging science-based lesson plans for elementary age children in an afterschool program taking place at five local elementary schools. The classroom components include writing, testing, and critiquing lesson plans and organizing a once-a-semester event, Science Saturday. Members of the class are required to volunteer weekly, co-lead Science Saturday, complete individual work, and organize meetings for projects outside of class.
Offering: **Host**
Grading: **BMS**
Credits: **1.00**
Gen Ed Area: **None**
Identical With: **MB&B241**
Prereq: **None**

CHEM242 Informal Science Education for Elementary School Students II
This service-learning course will focus on designing and implementing original, effective, and engaging science-based lesson plans for elementary age children in an afterschool program setting at five local elementary schools. The classroom component includes writing, testing, and critiquing lesson plans and organizing a once-a-semester event, Science Saturday. Members of the class are required to volunteer weekly, co-lead Science Saturday, complete individual work, and organize meetings for projects outside of class. This course is a continuation of CHEM241.
Offering: **Host**
Grading: **Cr/U**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B242**
Prereq: **None**

CHEM251 Organic Chemistry I
This course offers an introduction to the chemistry of carbon compounds with emphasis on the relationship between structure and reactivity. The laboratory course CHEM257 is normally elected concurrently but is not required. Students with advanced placement credit who wish to enroll in CHEM251 without having previously taken chemistry courses at Wesleyan are strongly encouraged to consult https://www.wesleyan.edu/chem/about_the_major/first_year_students.html
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM142 OR CHEM142Z OR CHEM144**

CHEM252 Organic Chemistry II
This course is a continuation of the chemistry of carbon compounds with emphasis on the chemistry of important functional groups. The laboratory course CHEM258 is normally elected concurrently but is not required.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM251**

CHEM257 Intermediate Chemistry Laboratory
This course is a continuation of CHEM 152, and it is designed to prepare students for more advanced chemistry lab courses. This course is normally taken concurrently with CHEM 251, and it fulfills part of the chemistry lab requirement for pre-medical/health studies. Students who place directly into CHEM 251 with AP/IB credit should enroll in this course without taking CHEM 152.
Offering: **Host**

Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Prereq: **(CHEM142 OR CHEM142Z OR CHEM144) AND (CHEM152 OR CHEM152Z)**

CHEM258 Organic Chemistry Laboratory
CHEM 258 is offered as an experience to reinforce the concepts learned in organic chemistry lecture courses and to provide hands-on experience to safely carry out basic organic synthesis laboratory techniques. This course will provide students with advanced experience in organic chemistry laboratory experiments. Students will learn to assemble laboratory apparatus for basic experimental techniques such as vacuum filtration, recrystallization, reflux reaction setup, simple distillation, melting point analysis, and thin layer chromatography.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Prereq: **(CHEM251 AND CHEM257)**

CHEM296 Braving the Elements: A Calderwood Seminar in Public Writing about Chemistry
Writing is hard. Writing about chemistry for a general audience is just a bit harder, but the ability to communicate technical information to the public and to policy makers has never been more important. Good chemistry writing requires a solid grasp of the science, the ability to identify the most essential concepts, and the talent to express them in non-technical, jargon-free language. All of these are learnable skills. Participants will produce pieces in a variety of short forms (e.g., essay, policy summary, annotated figure) to become better writers. In the Calderwood Seminar tradition, the course will be structured as a workshop with students serving as both writers and editors.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **CHEM252**

CHEM307 Molecular Biophysics Journal Club I
This course includes presentation and active discussion of a series of current research articles in the field of molecular biophysics and biophysical chemistry from journals including but not limited to the Biophysical Journal, Biopolymers, Current Opinion iIn Structural Biology, Journal of Biomolecular Structure and Dynamics, and the Annual Review of Molecular Biophysics and Biomolecular Structure.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B507, MB&B307, CHEM507, PHYS317, PHYS517**
Prereq: **None**

CHEM308 Molecular Biophysics Journal Club II
Presentation and active discussion of a series of current research articles in the field of molecular biophysics and biophysical chemistry from the Biophysical Journal, Biopolymers, Current Opinion in Structural Biology, Journal of Biomolecular Structure and Dynamics, and the Annual Review of Molecular Biophysics and Biomolecular Structure.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B508, MB&B308, CHEM508, PHYS318, PHYS518**
Prereq: **None**

CHEM309 Molecular and Cellular Biophysics
This course is an integrated consideration of the biophysics and biophysical chemistry of biological systems from molecules to cells. The objective is to develop a critical sense of the quantitative data currently being obtained from microscopy to spectroscopy, considering both ensemble and single-molecule experiments, and to gain familiarity and facility with interpretation using mathematical and computational models. Biological systems are inherently complex, and some form of modeling is always involved in developing an explanation of how they work. However, these models typically involve only a few basic constructs (simple harmonic motion, ideal fluids, two-state Ising models, random walks, electrostatic interactions, classical dynamics, rate equations, QM energy levels, distribution functions, and network analysis) and only elementary aspects of linear algebra, calculus, differential equations, and statistics. This course deals with how these constructs are integrated in the framework of Boltzmann statistical mechanics to formulate mathematical models of biological phenomena, how these models are validated and refined, and how they are used to form explanations and make testable predictions. Model systems to be considered include the nucleosome, the ribosome, membrane dynamics and ion channels, molecular devices and motors, prototype signal transduction systems, and regulatory processes. This course is suitable for physics and chemistry students who wish to learn about biological applications and for molecular and cellular biology students to develop skills with quantitative physicochemical modes of inquiry applied to the life sciences.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B309, CHEM509, MB&B509, PHYS339, PHYS539**
Prereq: **None**

CHEM314 Environmental Chemistry
This course is designed for students with college-level general and organic chemistry background. Examples of topics to be covered include energy production and consumption, chemical pollution and environmental clean-up, among others. Analysis and criticism of environmental literature are included.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **(CHEM141 AND CHEM142 AND CHEM251 AND CHEM257) OR (CHEM143 AND CHEM144 AND CHEM251 AND CHEM257)**

CHEM317 Quantitative Chemical Analysis
Measurement and chemical analysis are at the very heart of the chemical sciences. Practicing chemists depend heavily on chemical analysis, as do medical professionals, environmental scientists, and many others. Quantitative chemical analysis is the science of determining "how much"--as in, "how much toxic lead is in your drinking water?" In this course, you will first learn how to treat measured chemical data to extract meaningful information, and then we will proceed to study classical methods of chemical analysis, expanding upon your knowledge of general chemistry. A practical laboratory experience will reinforce the curriculum and build your skills as a chemist. This course is part of the required curriculum listed in the American Chemical Society Guidelines for Bachelor's Degree Programs, and this course is highly recommended for students who intend to pursue graduate studies and/or employment in a chemical discipline.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **E&ES395**
Prereq: **(CHEM142 OR CHEM142Z OR CHEM144) AND (CHEM152 OR CHEM152Z)**

CHEM318 Instrumental Analysis
Chemical analysis has kept pace with the advent of modern technology through the development of instruments capable of ever-improving levels of detection for both qualitative and quantitative analysis. Many students are exposed to the use and interpretation of these modern methods of chemical analysis, but this experience typically comes with little understanding of how and why these instruments work. This course will investigate instrumentation across three broad categories of analysis: electrochemical, spectrochemical, and separations. The lecture course will be supplemented with a practical laboratory experience. Instrumental analysis is part of the required curriculum listed in the American Chemical Society Guidelines for Bachelor's Degree Programs, and this course is highly recommended for students who intend to pursue graduate studies and/or employment in a chemical discipline.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **E&ES396**
Prereq: **(CHEM142 OR CHEM142Z OR CHEM144) AND (CHEM152 OR CHEM152Z)**

CHEM321 Biomedicinal Chemistry
This course is designed to explore the molecular basis of disease and treatment options. Topics will reflect the importance of chemistry and biochemistry in the advancement of medicine today and will include treatment of metabolic disorders, rational drug design, and mode of drug action. A large portion of the course will be dedicated to learning computer programs used in computational drug design as part of a final drug design project.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B321**
Prereq: **(CHEM251 AND [CHEM383 or MB&B383])**

CHEM323 Biochemistry of Neurodegenerative Disease
Broadly defined, neurodegenerative disease occurs when a specific class of neuron dies and thus fails in its biological action. In this course, we will delve into the many different, intricate ways neuron death can occur and cause disease. From the chemistry of neurotransmitters, aggregation of proteins, and the collapse of neuromuscular junctions, many areas of the neurobiology can go awry. The focus of the course will be on understanding the complex interplay of small molecules and proteins that keep neurons healthy and functional. In this course, we will use current primary literature and lecture to understand the varied topics. This course aims to improve skills in reading and analysis of primary literature as well as the written and oral presentation of scientific findings.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **NS&B323**
Prereq: **BIOL181 AND CHEM252**

CHEM325 Introduction to Biomolecular Structure
This course aims to provide a framework for understanding three-dimensional structures of proteins, nucleic acids, and their complexes. The first half of the course emphasizes structural modules and topological patterns in major classes of proteins and nucleic acids. The second part of the course covers novel structural motifs, such as helix-turn-helix, zinc-finger, and leucine zipper, that are responsible for recognition of specific nucleotide sequences in nucleic acids by proteins. Analysis of structures using tools available on the Web and independent exploration of protein and nucleic acid databases are strongly encouraged.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B325**
Prereq: **None**

CHEM335 Protein Folding: From Misfolding to Disease
Amyloidogenesis, the process by which proteins and peptides misfold to form amyloid fibers, is at the root of several different diseases, including Parkinson's disease, Alzheimer's disease, mad cow disease, and type II diabetes to name a few. This course will focus on current research in the field that seeks to understand why a functional, well-folded protein adopts the misfolded amyloid form. In the course of discussing the misfolded nature of these proteins, we will review central elements of protein structure and stability to better understand the protein-folding landscape and the process of misfolding. We will also discuss how the process of misfolding leads to the different diseases and disease pathologies. We will read current literature that studies the molecular nature of these diseases and discuss the strategies used to detect, identify and study these misfolded proteins in the body and in the test-tube.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-MBB**
Identical With: **MB&B535, MB&B335, CHEM535**
Prereq: **MB&B208 OR MB&B325**

CHEM337 Physical Chemistry I
A rigorous introduction to quantum mechanics, this course covers wave mechanics, operator methods, matrix mechanics, perturbation theory, angular momentum, molecular vibrations, atomic and molecular structure, symmetry, and spectroscopy.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **(CHEM142 OR CHEM142Z OR CHEM144) AND MATH122**

CHEM338 Physical Chemistry II
This course investigates chemical aspects of statistical mechanics and the laws of thermodynamics including free energy, chemical potential and chemical equilibria, and rates of chemical reactions.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM337**

CHEM340 Quantum Chemistry
This course is an introduction to modern molecular electronic structure calculations. Through in-class lectures and in-class exercises students will become familiar with some of the most popular methods for electronic structure calculations in molecules using the Gaussian computational chemistry package. The main emphasis of the course is to provide the students with the tools to devise their own computational chemistry calculations and to be able to assess whether any given calculation is likely to provide meaningful answers to chemical questions.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Identical With: **CHEM540**
Prereq: **CHEM337 OR PHYS315 OR PHYS515**

CHEM345 Molecular Spectroscopy
This is a lecture/discussion course in various selected topics in modern high-resolution spectroscopy. Microwave spectroscopy, angular momentum theory, electronic spectroscopy of diatomic molecules and vibrational normal mode analysis, and other topics will be covered dependent upon class interest.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM358 Structure and Mechanism
This course will cover several important aspects of traditional and contemporary physical organic and mechanistic chemistry, including frontier molecular orbital theory and pericyclic reactions, organic photochemistry reactive intermediates (carbocations, carbanions, radicals, and carbenes), the thermodynamics and kinetics of organic reactions, and polymer chemistry.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM252**

CHEM359 Advanced Organic Synthesis
The control of reactivity and selectivity to achieve specific syntheses is one of the overarching goals of organic chemistry. This course is intended to provide advanced undergraduate and graduate students in chemistry with a sufficient foundation to comprehend and use research literature in organic chemistry. Concentrating on the most important reactions and efficient synthetic methods used for organic synthesis, this course presents the material by reaction type. The planning and execution of multistep synthesis will also be included.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM251 AND CHEM252**

CHEM361 Advanced Inorganic Chemistry
This course is a survey of the chemistry of the inorganic elements, focusing on the relationship between electronic structure, physical properties, and reactivity across the periodic table. Major emphases include chemical applications of group theory in electronic structure and spectroscopy and reaction mechanisms of inorganic transformations.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM252**

CHEM373 Polymer Chemistry
The commercialization of plastics in the 20th century revolutionized our materials economy. In this course, we will examine the foundational principles of macromolecular chemistry, including polymer properties, synthesis, and characterization. Not only will we study the founding of polymer science, we'll look to the future and examine how we can design more sustainable materials.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM252**

CHEM375 Integrated Chemistry Laboratory I
This advanced lab course in chemistry involves work from the major subdisciplines: organic, inorganic, biochemistry, physical, and instrumental. Emphasis will be placed on integrated aspects of chemical synthesis, spectroscopic characterization and determination of physical properties in each exercise. Students will practice safety, scientific literacy, and scientific writing skills and will develop strong laboratory, problem solving and analytical skills.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM252 AND CHEM258**

CHEM376 Integrated Chemistry Laboratory II
The Integrated Laboratory sequence is a capstone for the chemistry major and is designed to provide students with: 1) documented experience in a variety of standard laboratory techniques and the operation of a range of analytical instruments; 2) advanced skills in searching, reading, and critically assessing the primary literature; and 3) practice in communicating science effectively in written, visual, and oral formats. Students, in collaboration with the course staff, develop individualized courses of study to achieve these goals.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM375**

CHEM377 Chemistry of Materials and Nanomaterials
This course will provide an introduction to materials chemistry, with a special emphasis on nanomaterials. Topics covered will include colloidal metal nanomaterials; semiconductors and quantum dots; carbon nanotubes, fullerenes, and graphene; metal-organic frameworks; self-assembly and metamaterials; electron and scanning probe microscopies; and lithography. The course will also discuss applications of these materials and techniques in areas such as plasmonics and sensing, catalysis, energy generation, and medicine.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **PHYS377**
Prereq: **CHEM251**

CHEM379 Nanomaterials Lab
This course will be a combination of weekly lecture and laboratory exercises designed to introduce students to new developments in the chemistry of materials and nanomaterials. Concepts and theoretical background will be discussed during weekly lectures. Students will then apply those concepts to the preparation of materials/nanomaterials in weekly lab sections. Students will synthesize quantum dots, build solar cells, pattern surfaces using both photolithography and soft lithography, make conductive carbon nanofiber films, prepare high-temperature superconductors, and learn scanning probe microscopy techniques.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **(CHEM257 AND CHEM258)**

CHEM381 Physical Chemistry for the Life Sciences
The course is concerned with the basic physicochemical principles and model systems essential to understanding, explaining, and predicting the behavior of biological systems in terms of molecular forces. The course integrates fundamental concepts in thermodynamics, kinetics, and molecular spectroscopy with the structures, functions, and molecular mechanisms of biological processes. The objectives of the course are to (1) familiarize life science students at the advanced undergraduate and beginning graduate level with basic physicochemical laws, theories, and concepts important to the life sciences; (2) provide a working knowledge of mathematical methods useful in life science

research; (3) develop a critical perspective on explanation of biological processes and understanding biological systems; and (4) survey the main applications of physical chemistry in the life sciences. Theory, methodology, and biophysical concepts are distributed throughout the course.
Offering: **Crosslisting**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-MBB**
Identical With: **MB&B381, MB&B581, ENVS382**
Prereq: **(CHEM251 AND MATH120) OR (CHEM251 AND MATH121)**

CHEM382 Practical and Theoretical NMR
Nuclear magnetic resonance (NMR) is an extremely powerful and flexible technique that can be used to analyze molecules sized from just a few atoms up to tens of thousands of atoms. This course will provide an introduction to how NMR spectroscopy works and background on the important theoretical aspects relevant for the most common NMR experiments. Time will be spent gaining practical experience in conducting NMR experiments both during and outside class. The ultimate goal of both the theoretical and hands on sections of this course is to enable you to correctly select and perform NMR experiments necessary to characterize molecules. In addition to learning how NMR hardware is used to produce spectra, we also cover important tasks like sample preparation and the finer points of data processing that will help you get better data. Beyond simple one-dimensional experiments, we will discuss a number of different multidimensional NMR experiments for determining the structures of small organic molecules, including COSY, HSQC, HMBC, and NOE. Furthermore, you will learn how protein structures are solved using 2D and 3D experiments, and how the motion of those proteins can be measured at the atomic level.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B382**
Prereq: **None**

CHEM383 Biochemistry
This rigorous introductory course to the principles and concepts of contemporary biochemistry presents both the biological and chemical perspectives. The major themes will be the structure and function of the major macromolecules (proteins, lipids, and carbohydrates), the basis and measurement of enzymatic activity, and general mammalian and plant cellular metabolism.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B383**
Prereq: **CHEM252 AND MB&B208**

CHEM385 NMR as a Tool for Structure Elucidation of Organic Compounds
Nuclear Magnetic Resonance (NMR) spectroscopy has emerged as such an extremely powerful tool for structure elucidation of organic compounds that its importance cannot be overstated. Automation of NMR data collection is becoming mainstream, and this course will focus on skills associated with spectral interpretation of organic compounds without involving complex mathematical equations. The course will take off with the basic principles and theory as applicable to 1H and 13C NMR, then walk you through the tips and tricks for the analysis of spectra to identify functional groups, atom connectivity, and assignment to the molecular structure in a step-by-step manner, leading to the capability of reading an NMR spectrum to reveal the structure the way a physician reads an ECG (electrocardiogram) to know your heart's rhythm and electrical activity. The fundamentals of several 1D and 2D NMR techniques--such as DEPT, COSY, HSQC, HMBC, and NOE--and their importance in problem solving strategies for structural elucidation will be highlighted. The problem solving and analysis skills obtained by performing structural elucidation will be useful in fields beyond chemistry.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM251 AND CHEM252**

CHEM386 Biological Thermodynamics
This course is addressed to undergraduate and graduate students interested in biological chemistry and structural biology. The course presents thermodynamic methods currently used to relate structure to function in biological molecules. Topics include binding curves, chemical ligand linkages, binding polynomial, cooperativity, site-specific binding processes, and allosteric effects. Several models for allosteric systems, such as the Monod-Wyman-Changeux model, the induced-fit model, and the Pauling model, are analyzed in detail. Applications of these models are illustrated for functional regulation of respiratory proteins and for protein-nucleic-acid complexes involved in control of gene expression.
Offering: **Host**
Grading: **OPT**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B386**
Prereq: **(MATH121 AND MATH122)**

CHEM387 Enzyme Mechanisms
The chemical mechanisms involved in the action of a series of typical enzymes will be considered.
Offering: **Host**
Grading: **A-F**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B387**
Prereq: **[CHEM383 or MB&B383]**

CHEM389 Pericyclic Reactions
Pericyclic reactions, which are also known by the name concerted organic reactions, are important topics in any chemistry postgraduate/undergraduate curriculum representing an important class of concerted processes involving pi-systems. Pericyclic reactions are governed by Woodward-Hoffmann rules. Concerted reorganization of bonding takes place throughout a cyclic array of continuously bonded atoms in these reactions. Cycloadditions, cheletropic reactions, electrocyclic reactions, sigmatropic rearrangements, and group transfer reactions are some of the major types of pericyclic reactions. Though initially considered as reactions aloof to solvent effects or the presence of catalysts, it has recently been shown that it is possible to influence pericyclic reactions using mechanical stress, catalysts, and notably enzymes. This course will uncover all the major topics in pericyclic reactions.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM251 AND CHEM252**

CHEM390 Practical Methods in Biochemistry
This course centers on currently used techniques for protein separation, characterization, and purification, such as ultracentrifugation, gel electrophoresis, and chromatography. These topics will be introduced within the general context of the behavior of macromolecules in solution. The relative stability of proteins in different media, the forces stabilizing protein structure, and the interaction of proteins will be discussed. We will explicitly consider different techniques used to study proteins. Relatively novel techniques to be discussed include surface plasmon resonance, microarray methods and mass spectrometry, and single molecule microscopy. In the course, we will go through

three or four different protein purification protocols and discuss the methods used in each one. We will also touch upon the commonly used spectroscopic techniques used to characterize proteins, including absorption, fluorescence, and circular dichroism. The course will focus on biochemical techniques and understanding the physical principles underlying these techniques and will also discuss tactics for optimizing established isolation and purification procedures and for isolating and characterizing an unknown protein.

The course content is appropriate for advanced undergraduates (juniors/seniors) and beginning graduate students from chemistry, biology, molecular biophysics or MB&B.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-MBB**
Identical With: **MB&B340**
Prereq: **[MB&B208] OR [CHEM383 or MB&B383]**

CHEM395 Structural Biology Laboratory
One of the major catalysts of the revolution in biology that is now under way is our current ability to determine the physical properties and three-dimensional structures of biological molecules by x-ray diffraction, nuclear magnetic resonance (NMR) spectroscopy, and other spectroscopic methods. This course is designed to familiarize students with current research techniques in biochemistry and molecular biophysics. Students will perform spectroscopic investigations on a protein that they have isolated and characterized using typical biochemical techniques, such as electrophoresis, enzyme extraction, and column chromatography. The course will provide hands-on experience with spectroscopic methods such as NMR, fluorescence, UV-Vis absorption, and Raman as well as bioinformatic computational methods. All of these methods will be applied to the study of biomolecular structure and energetics. This course provides a broad knowledge of laboratory techniques valuable for independent research at the undergraduate level and beyond.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-MBB**
Identical With: **MB&B395, PHYS395**
Prereq: **(CHEM142 OR CHEM142Z OR CHEM144) AND (CHEM325 OR MB&B208 OR PHYS207)**

CHEM396 Molecular Modeling and Design
This course will introduce students to the practical and theoretical aspects of computationally modeling and designing biological macromolecules, with a particular emphasis on protein structures. Students will run molecular dynamics simulations with Gromacs (http://www.gromacs.org) and do protein structure predication/design with Rosetta (https://www.rosettacommons.org). Over the course of the semester students will embark on a group research project, likely related to redesigning proteins that show potential for use as drugs. Both Gromacs and Rosetta use the Mac/Linux command-line, so having some familiarity with that prior to the course would be helpful but not required.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **CHEM596**
Prereq: **MB&B208 OR BIOL265 OR CHEM381 OR CHEM325 OR MB&B335 OR CHEM338 OR CHEM383 OR PHYS316 OR PHYS340 OR BIOL266**

CHEM401 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM402 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM407 Senior Tutorial (downgraded thesis)
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.
Offering: **Host**
Grading: **A-F**

CHEM408 Senior Tutorial (downgraded thesis)
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.
Offering: **Host**
Grading: **A-F**

CHEM409 Senior Thesis Tutorial
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM410 Senior Thesis Tutorial
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM411 Group Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM412 Group Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM419 Student Forum
Student-run group tutorial, sponsored by a faculty member and approved by the chair of a department or program.
Offering: **Host**
Grading: **Cr/U**

CHEM420 Student Forum
Student-run group tutorial, sponsored by a faculty member and approved by the chair of a department or program.
Offering: **Host**
Grading: **Cr/U**

CHEM421 Undergraduate Research, Science
Individual research projects for undergraduate students supervised by faculty members.
Offering: **Host**
Grading: **OPT**

CHEM422 Undergraduate Research, Science
Individual research projects for undergraduate students supervised by faculty members.
Offering: **Host**
Grading: **OPT**

CHEM423 Advanced Research Seminar, Undergraduate
Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

CHEM424 Advanced Research Seminar, Undergraduate
Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

CHEM491 Teaching Apprentice Tutorial
The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.
Offering: **Host**
Grading: **OPT**

CHEM492 Teaching Apprentice Tutorial
The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.
Offering: **Host**
Grading: **OPT**

CHEM495 Research Apprentice, Undergraduate
Project to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **Cr/U**

CHEM496 Research Apprentice, Undergraduate
Project to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **Cr/U**

CHEM500 Graduate Pedagogy
The elements of good teaching will be discussed and demonstrated through lectures, practice teaching sessions, and discussions of problems encountered in the actual teaching environment. The staff consists of faculty and experienced graduate students. An integral part of the course is a required one-day workshop BEFORE the first day of formal classes.

Training in pedagogy in the first semester of attendance is required for all incoming Wesleyan MA and PhD students who have not already fulfilled this requirement at Wesleyan. BA/MA students are not required to get training in pedagogy but may choose to do so.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **None**
Identical With: **ASTR500, BIOL500, E&ES500, MB&B500, MUSC500, PHYS500, PSYC500, MATH500**
Prereq: **None**

CHEM501 Individual Tutorial for Graduates
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM502 Individual Tutorial for Graduates
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM504 Selected Topics, Graduate Science
Topic to be arranged in consultation with the tutor. A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students.
Offering: **Host**
Grading: **OPT**

CHEM507 Molecular Biophysics Journal Club I
This course includes presentation and active discussion of a series of current research articles in the field of molecular biophysics and biophysical chemistry from journals including but not limited to the Biophysical Journal, Biopolymers, Current Opinion iIn Structural Biology, Journal of Biomolecular Structure and Dynamics, and the Annual Review of Molecular Biophysics and Biomolecular Structure.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B507, MB&B307, CHEM307, PHYS317, PHYS517**
Prereq: **None**

CHEM508 Molecular Biophysics Journal Club II
Presentation and active discussion of a series of current research articles in the field of molecular biophysics and biophysical chemistry from the Biophysical Journal, Biopolymers, Current Opinion in Structural Biology, Journal of Biomolecular Structure and Dynamics, and the Annual Review of Molecular Biophysics and Biomolecular Structure.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.50**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B508, MB&B308, PHYS318, PHYS518, CHEM308**
Prereq: **None**

CHEM509 Molecular and Cellular Biophysics
This course is an integrated consideration of the biophysics and biophysical chemistry of biological systems from molecules to cells. The objective is to develop a critical sense of the quantitative data currently being obtained from microscopy to spectroscopy, considering both ensemble and single-molecule experiments, and to gain familiarity and facility with interpretation using mathematical and computational models. Biological systems are inherently complex, and some form of modeling is always involved in developing an explanation of how they work. However, these models typically involve only a few basic constructs (simple harmonic motion, ideal fluids, two-state Ising models, random walks, electrostatic interactions, classical dynamics, rate equations, QM energy levels, distribution functions, and network analysis) and only elementary aspects of linear algebra, calculus, differential equations, and statistics. This course deals with how these constructs are integrated in the framework of Boltzmann statistical mechanics to formulate mathematical models of biological phenomena, how these models are validated and refined, and how they are used to form explanations and make testable predictions. Model systems to be considered include the nucleosome, the ribosome, membrane dynamics and ion channels, molecular devices and motors, prototype signal transduction systems, and regulatory processes. This course is suitable for physics and chemistry students who wish to learn about biological applications and for molecular and cellular biology students to develop skills with quantitative physicochemical modes of inquiry applied to the life sciences.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **MB&B309, CHEM309, MB&B509, PHYS339, PHYS539**
Prereq: **None**

CHEM511 Group Tutorial, Graduate
Topic to be arranged in consultation with the tutor.
Offering: **Host**
Grading: **OPT**

CHEM512 Group Tutorial, Graduate
Topic to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

CHEM521 Chemistry Colloquium I
Weekly seminars by distinguished national and international chemists.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Prereq: **CHEM251**

CHEM522 Chemistry Colloquium II
Weekly seminars by distinguished national and international chemists.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Prereq: **CHEM251**

CHEM535 Protein Folding: From Misfolding to Disease
Amyloidogenesis, the process by which proteins and peptides misfold to form amyloid fibers, is at the root of several different diseases, including Parkinson's disease, Alzheimer's disease, mad cow disease, and type II diabetes to name a few. This course will focus on current research in the field that seeks to understand why a functional, well-folded protein adopts the misfolded amyloid form. In the course of discussing the misfolded nature of these proteins, we will review central elements of protein structure and stability to better understand the protein-folding landscape and the process of misfolding. We will also discuss how the process of misfolding leads to the different diseases and disease pathologies. We will read current literature that studies the molecular nature of these diseases and discuss the strategies used to detect, identify and study these misfolded proteins in the body and in the test-tube.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-MBB**
Identical With: **MB&B535, MB&B335, CHEM335**
Prereq: **MB&B208 OR MB&B325**

CHEM540 Quantum Chemistry
This course is an introduction to modern molecular electronic structure calculations. Through in-class lectures and in-class exercises students will become familiar with some of the most popular methods for electronic structure calculations in molecules using the Gaussian computational chemistry package. The main emphasis of the course is to provide the students with the tools to devise their own computational chemistry calculations and to be able to assess whether any given calculation is likely to provide meaningful answers to chemical questions.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Identical With: **CHEM340**
Prereq: **CHEM337 OR PHYS315 OR PHYS515**

CHEM545 Modern High-Resolution Spectroscopy
This is a graduate-level lecture/discussion course in selected topics in modern high-resolution spectroscopy. Topics to be covered include microwave spectroscopy, angular momentum theory, electronic spectroscopy of diatomic molecules, and vibrational normal mode analysis. While there are no formal prerequisites for this course, a working knowledge of quantum mechanics will be assumed.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **None**

CHEM548 Seminar in Atomic and Molecular/Chemical Physics.
Weekly seminars presented jointly with the Chemistry Department under the auspices of the Chemical Physics Program. These informal seminars will be presented by students, faculty, and outside visitors on current research and other topics of interest.
Offering: **Crosslisting**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Identical With: **PHYS588**
Prereq: **None**

CHEM549 Advanced Research Seminar, Graduate
Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

CHEM550 Advanced Research Seminar, Graduate
Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

CHEM557 Seminar in Organic and Inorganic Chemistry
This graduate-level seminar in organic and inorganic chemistry will include weekly presentations and discussions based on current research. Speakers will present the details of their topic using specific examples and will place the research in a broader context with respect to the current literature while also providing adequate background information and drawing concepts together with critical concluding analysis.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Prereq: **None**

CHEM558 Seminar in Organic and Inorganic Chemistry
This graduate-level seminar in organic and inorganic chemistry will include weekly presentations and discussions based on current research. Speakers will present the details of their topic using specific examples and will place the research in a broader context with respect to the current literature while also providing adequate background information and drawing concepts together with critical concluding analysis.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Prereq: **None**

CHEM561 Graduate Field Research
Research in the field, normally on thesis project.
Offering: **Host**
Grading: **OPT**

CHEM565 Physical Methods in Chemistry
An introduction to the use of physical methods to characterize the structures and dynamics of chemical systems with a particular emphasis on applications in inorganic chemistry. Topics will include a variety of spectroscopies (e.g., optical absorption, circular dichroic techniques, infrared and Raman spectroscopies, NMR techniques), small molecule X-ray crystallography, and magnetic susceptibility measurements. Group theoretical techniques will be used extensively to develop selection rules.

Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Prereq: **CHEM361 OR CHEM337**

CHEM587 Seminar in Biological Chemistry
This course involves weekly presentations and discussions based on current research.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Identical With: **MB&B587**
Prereq: **(CHEM383 or MB&B383 or CHEM325 or MB&B325 or MB&B208)**

CHEM588 Seminar in Biological Chemistry
This course involves weekly presentations and discussions based on current research.
Offering: **Host**
Grading: **Cr/U**
Credits: **0.25**
Gen Ed Area: **None**
Identical With: **MB&B588**
Prereq: **(CHEM383 or MB&B383 or CHEM325 or MB&B325 or MB&B208)**

CHEM594 Braving the Elements: A Calderwood Seminar in Public Writing About Chemistry
Writing is hard. Writing about chemistry for a general audience is just a bit harder, but the ability to communicate technical information to the public and to policy makers has never been more important. Good chemistry writing requires a solid grasp of the science, the ability to identify the most essential concepts, and the talent to express them in non-technical, jargon-free language. All of these are learnable skills. Participants will produce pieces in a variety of short forms (e.g., essay, policy summary, annotated figure) to become better writers. In the Calderwood Seminar tradition, the course will be structured as a workshop with students serving as both writers and editors.
Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **None**

CHEM596 Molecular Modeling and Design
This course will introduce students to the practical and theoretical aspects of computationally modeling and designing biological macromolecules, with a particular emphasis on protein structures. Students will run molecular dynamics simulations with Gromacs (http://www.gromacs.org) and do protein structure predication/design with Rosetta (https://www.rosettacommons.org). Over the course of the semester students will embark on a group research project, likely related to redesigning proteins that show potential for use as drugs. Both Gromacs and Rosetta use the Mac/Linux command-line, so having some familiarity with that prior to the course would be helpful but not required.
Offering: **Crosslisting**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **NSM-CHEM**
Identical With: **CHEM396**
Prereq: **MB&B208 OR BIOL265 OR CHEM381 OR CHEM325 OR MB&B335 OR CHEM338 OR CHEM383 OR PHYS316 OR PHYS340 OR BIOL266**