
Chemistry (CHEM)

CHEM 1000: Introductory Chemistry

Introductory course for students with no high school background in chemistry. Covers fundamental principles of scientific measurement, stoichiometry, solutions, basic atomic structure, gases. No credit if taken after CHEM 1100 or CHEM 1320.

Credit Hours: 2

Prerequisites or Corequisites: MATH 1100

CHEM 1100: Atoms and Molecules with Lab

One-semester introduction for non-science majors to the basic concepts and important applications of chemistry. Satisfies A&S requirement for a laboratory science. No credit if taken after CHEM 1000 or CHEM 1320.

Credit Hours: 4

CHEM 1100H: Atoms and Molecules with Laboratory - Honors

One-semester introduction for non-science majors to the basic concepts and important applications of chemistry. Satisfies A&S requirement for a laboratory science. No credit if taken after CHEM 1000 or CHEM 1320.

Credit Hours: 4

Prerequisites: Honors eligibility required

CHEM 1320: College Chemistry I

First of two-course sequence emphasizing principles and applications of modern chemical sciences. Covers chemical nomenclature, stoichiometry, kinetic molecular theory, atomic structure, periodic properties, and molecular structure and bonding. Satisfies laboratory science requirement.

Credit Hours: 4

Prerequisites: MATH 1100. MATH 1050 is NOT an appropriate substitution for College Algebra

CHEM 1320H: College Chemistry I - Honors

First of a two-course sequence emphasizing principles and applications of modern chemical sciences. Covers chemical nomenclature, stoichiometry, kinetic molecular theory, atomic structure, periodic properties, and molecular structure and bonding. Satisfies laboratory science requirement. Math Reasoning Proficiency Course.

Credit Hours: 4

Prerequisites: MATH 1100 or equivalent. Honors eligibility required. MATH 1050 does not satisfy the math requirement

CHEM 1330: College Chemistry II

Continuation of CHEM 1320. Covers intermolecular forces, solutions, kinetics, acid-base chemistry, electrochemistry, nuclear chemistry, thermodynamics. Satisfies requirement for a laboratory science. May be taken concurrently with CHEM 2030 or CHEM 2100.

Credit Hours: 4

Prerequisites: grade of C- or better in CHEM 1320 or CHEM 1320H

CHEM 1330H: College Chemistry II- Honors

Continuation of CHEM 1320H. Covers equilibria, kinetics, electrochemistry, nuclear chemistry, thermodynamics. Satisfies requirement for a laboratory science. May be taken concurrently with CHEM 2030 or CHEM 2100.

Credit Hours: 4

Prerequisites: grade of C- or better in CHEM 1320 or CHEM 1320H. Honors eligibility required

CHEM 1400: College Chemistry I

First of two-course sequence emphasizing principles and applications of modern chemical sciences. Covers chemical nomenclature, stoichiometry, kinetic molecular theory, atomic structure, periodic properties, and molecular structure and bonding. Satisfies laboratory science requirement. No credit for CHEM 1320 and CHEM 1400/CHEM 1401.

Credit Hours: 3

Prerequisites: MATH 1100. MATH 1050 is NOT an appropriate substitution for College Algebra

CHEM 1400H: College Chemistry I - Honors

First of two-course sequence emphasizing principles and applications of modern chemical sciences. Covers chemical nomenclature, stoichiometry, kinetic molecular theory, atomic structure, periodic properties, and molecular structure and bonding. Satisfies laboratory science requirement. No credit for CHEM 1320 and CHEM 1400/CHEM 1401.

Credit Hours: 3

Prerequisites: MATH 1100. MATH 1050 is NOT an appropriate substitution for College Algebra. Honors eligibility required

CHEM 1401: College Chemistry I Laboratory

Laboratory section that goes along with the first of two-course sequence emphasizing principles and applications of modern chemical sciences. Covers chemical nomenclature, stoichiometry, kinetic molecular theory, atomic structure, periodic properties, and molecular structure and bonding. Satisfies laboratory science requirement. No credit for CHEM 1320 and CHEM 1400/CHEM 1401.

Credit Hour: 1

Prerequisites or Corequisites: CHEM 1400

Prerequisites: MATH 1100. MATH 1050 is NOT an appropriate substitution for College Algebra

CHEM 1401H: College Chemistry I Laboratory - Honors

Laboratory section that goes along with the first of two-course sequence emphasizing principles and applications of modern chemical sciences. Covers chemical nomenclature, stoichiometry, kinetic molecular theory, atomic structure, periodic properties, and molecular structure and bonding. Satisfies laboratory science requirement. No credit for CHEM 1320 and CHEM 1400/CHEM 1401.

Credit Hour: 1

Prerequisites or Corequisites: CHEM 1400. Honors eligibility required

Prerequisites: MATH 1100. MATH 1050 is NOT an appropriate substitution for College Algebra

CHEM 1410: College Chemistry II

Continuation of CHEM 1400. Covers intermolecular forces, solutions, kinetics, acid-base chemistry, electrochemistry, nuclear chemistry, thermodynamics. No credit for CHEM 1330 and CHEM 1410/CHEM 1411.

Credit Hours: 3

Prerequisites: CHEM 1400, CHEM 1320, or CHEM 1320H and MATH 1100

CHEM 1410H: College Chemistry II - Honors

Continuation of CHEM 1400. Covers intermolecular forces, solutions, kinetics, acid-base chemistry, electrochemistry, nuclear chemistry, thermodynamics. No credit for CHEM 1330 and CHEM 1410/CHEM 1411.

Credit Hours: 3

Prerequisites: CHEM 1400, CHEM 1320, or CHEM 1320H and MATH 1100. Honors eligibility required

CHEM 1411: College Chemistry II Laboratory

Laboratory course that goes alongside CHEM 1410. Covers intermolecular forces, solutions, kinetics, acid-base chemistry, electrochemistry, nuclear chemistry, thermodynamics. Satisfies requirement for a laboratory science. No credit for CHEM 1330 and CHEM 1410/CHEM 1411.

Credit Hour: 1

Prerequisites or Corequisites: CHEM 1410

Prerequisites: CHEM 1400 and CHEM 1401 or CHEM 1320; MATH 1100

CHEM 1411H: College Chemistry II Laboratory - Honors

Laboratory course that goes alongside CHEM 1410. Covers intermolecular forces, solutions, kinetics, acid-base chemistry, electrochemistry, nuclear chemistry, thermodynamics. Satisfies requirement for a laboratory science. No credit for CHEM 1330 and CHEM 1410/CHEM 1411.

Credit Hour: 1

Prerequisites or Corequisites: CHEM 1410

Prerequisites: CHEM 1400 and 1401; MATH 1100. Honors eligibility required

CHEM 2030: Survey of Organic Chemistry

One-semester introduction to structure and bonding, functional group chemistry, principles of reactivity, reaction mechanisms, the molecules of life.

Credit Hours: 3

Prerequisites: Grade of C- or better in CHEM 1320 or CHEM 1320H or equivalent. Recommended CHEM 1330, or CHEM 1330 concurrently

CHEM 2100: Organic Chemistry I

First course of a two-semester sequence. Structure and bonding; chemistry of hydrocarbons, alkyl halides, alcohols and ethers; reaction mechanisms; principles of reactivity and synthesis; IR and NMR spectroscopy. Only 1 hour credit if taken after CHEM 2030 or equivalent.

Credit Hours: 3

Prerequisites: grade of C- or better in CHEM 1320 or equivalent or CHEM 1330 concurrently

Recommended: CHEM 1330

CHEM 2100H: Organic Chemistry I - Honors

First course of a two-semester sequence. Structure and bonding; chemistry of hydrocarbons, alkyl halides, alcohols and ethers; reaction mechanisms; principles of reactivity and synthesis; IR and NMR spectroscopy. Only 1 hour credit if taken after CHEM 2030 or equivalent.

Credit Hours: 3

Prerequisites: grade of C- or better in CHEM 1320 or equivalent or CHEM 1330 concurrently; Honors eligibility required

Recommended: CHEM 1330

CHEM 2110: Organic Chemistry II

Continuation of CHEM 2100. Aromatic hydrocarbons, carbonyls, amines; chemistry of carbanions; reactions of polar double bonds; nucleic acids, proteins, carbohydrates and fats.

Credit Hours: 3

Prerequisites: grade of C- or better in CHEM 2100 or equivalent, or departmental consent

CHEM 2110H: Organic Chemistry II - Honors

Continuation of CHEM 2100. Aromatic hydrocarbons, carbonyls, amines; chemistry of carbanions; reactions of polar double bonds; nucleic acids, proteins, carbohydrates and fats.

Credit Hours: 3

Prerequisites: grade of C- or better in CHEM 2100 or equivalent, or departmental consent; Honors eligibility required

CHEM 2130: Organic Laboratory I

Basic lab techniques, functional group manipulations, and short syntheses. Pre-lab and post-lab writing assignments. 1 hour recitation, 3 hours lab per week.

Credit Hours: 2

Recommended: Concurrent enrollment in CHEM 2110 or CHEM 2030. No credit for students who have previous organic laboratory credit

CHEM 2130H: Organic Laboratory I - Honors

Basic lab techniques, functional group manipulations, and short syntheses. Pre-lab and post-lab writing assignments. 1 hour recitation, 3 hours lab per week.

Credit Hours: 2

Prerequisites: Honors eligibility required

Recommended: Concurrent enrollment in CHEM 2110 or CHEM 2030. No credit for students who have previous organic laboratory credit

CHEM 2140: Organic Laboratory II

Continuation of CHEM 2130. Preparation and identification of organic compounds; application of instrumental techniques. 2 lab sessions, 1 recitation session per week.

Credit Hours: 2

Prerequisites: grade of C- or better in CHEM 2110 and CHEM 2130 or equivalent

CHEM 2170H: Honors Organic Chemistry II with Lab - Honors

Continuation of CHEM 2160H; includes laboratory. Content and structure similar to CHEM 2110, but with increased depth and breadth.

Credit Hours: 5

Prerequisites: honors eligibility, grade of B or better in CHEM 2160H or instructor's permission

CHEM 2400: Fundamentals of Inorganic Chemistry with Lab

A systematic introduction with laboratory to inorganic and organometallic compounds, reactions, and periodic properties.

Credit Hours: 3

Prerequisites: grade of C- or better in CHEM 2130

CHEM 2950: Undergraduate Research in Chemistry

A laboratory research project and/or preparation of compounds with a written final report. Cannot be substituted for other chemistry courses required for a B.S. or B.A. degree. No more than 6 hrs. total credit.

Credit Hour: 1-3

Prerequisites: sophomore standing, 2.75 GPA and/or instructor's consent

CHEM 3200: Quantitative Methods of Analysis with Lab

Principles and practice of quantitative analysis, including the basic principles of modern instrumental methods.

Credit Hours: 4

Prerequisites: CHEM 1330 or CHEM 1500H

CHEM 3300: Fundamentals of Physical Chemistry

Survey of physical chemistry. Satisfies physical chemistry prerequisite for BIOCHM 8430.

Credit Hours: 3

Prerequisites: MATH 1700, a course in organic chemistry; PHYSCS 1210 and PHYSCS 1220 or PHYSCS 2750, or PHYSCS 2760

CHEM 3700: Undergraduate Seminar in Chemistry

Methods for locating and presenting chemical information, data analysis techniques, professional issues.

Credit Hours: 3

Prerequisites: CHEM 1330 and CHEM 2100

CHEM 3700W: Undergraduate Seminar in Chemistry - Writing Intensive

Methods for locating and presenting chemical information, data analysis techniques, professional issues.

Credit Hours: 3

Prerequisites: CHEM 1330 and CHEM 2100

CHEM 3800: Internship in Chemistry

Cannot be substituted for other chemistry courses required for B.S. or B.A. degree.

Credit Hour: 1-6

Prerequisites: departmental consent

CHEM 3820: Introduction to Archaeological Chemistry

(same as ANTHRO 3820). This course will introduce students to the field of archaeological science and its contributions to our knowledge of the human past. It will review current topics, recent advances, and major debates in the field, with emphasis on the applied analytical chemistry methods that are commonly used. It will cover methodologies including neutron activation analysis, mass spectrometry, X-ray fluorescence, and biomolecular approaches used in the study of ceramics, pigments, glass, metals, biominerals (bone, teeth, shell), and sediments relevant to archaeological and cultural heritage contexts. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: One of CHEM 1320 and/or CHEM 1330

Recommended: ANTHRO 2020 or ANTHRO 2021

CHEM 4001: Topics in Chemistry - General

Organized study designed to broaden the knowledge base of students. Subjects on analytical, inorganic, organic and physical chemistry covered.

Credit Hour: 1-99

Prerequisites: departmental consent

CHEM 4010: Advanced Chemistry Laboratory

Advanced methods for the synthesis and characterization of organic, inorganic, and organometallic compounds.

Credit Hours: 3

Prerequisites: CHEM 2400, CHEM 2140, or CHEM 2190H, CHEM 3200, CHEM 4330 (or CHEM 4330 corequisite)

CHEM 4050: Problems in Chemistry

Individual study under the direction of a faculty member that supplements regular course work.

Credit Hour: 1-99

Prerequisites: instructor's consent

CHEM 4160: Intermediate Organic Chemistry

Stresses synthetic organic chemistry at an intermediate level.

Credit Hours: 3

Prerequisites: at least one year organic chemistry

CHEM 4170: Medicinal Chemistry

Chemical mechanisms of drug action. Topics include drug metabolism and action, chemical toxicology and medicines, enzyme activity, and specific drug case studies.

Credit Hours: 3

Prerequisites: CHEM 2110 or instructor's consent

CHEM 4200: Instrumental Methods of Analysis with Lab

(cross-leveled with CHEM 7200). Chemical instrumentation methods including electrochemistry, spectroscopy, and advanced separations techniques.

Credit Hours: 3

Prerequisites: CHEM 3200, a semester of physical chemistry

CHEM 4280: Environmental Chemistry

Surveys the chemistry of air and water environments; discusses the chemistry of waste treatment.

Credit Hours: 3

Prerequisites: 8 hours chemistry including organic and analytical

CHEM 4310: Physical Chemistry I

Lecture only. Topics include the kinetic theory of gases, chemical kinetics, thermodynamics and chemical equilibrium.

Credit Hours: 3

Prerequisites: CHEM 2100, MATH 1700, and PHYSCS 1220 or PHYSCS 2760

CHEM 4330: Physical Chemistry II

Lecture only. Covers wave mechanics, bonding, molecular spectroscopy and statistical mechanics.

Credit Hours: 3

Prerequisites: MATH 2300 or instructor approval. May be taken independently of CHEM 4310

CHEM 4330H: Physical Chemistry II - Honors

Covers wave mechanics, bonding, molecular spectroscopy and statistical mechanics.

Credit Hours: 3

Prerequisites: MATH 2300 or instructor approval. May be taken independently of CHEM 4310. Honors eligibility required

CHEM 4340: Physical Chemistry Laboratory

This course is intended to introduce the practice of experimental physical chemistry including applying the principles of thermodynamics, kinetics, and spectroscopy in experiments.

Credit Hours: 3

Prerequisites: Grade of C- or better in CHEM 3200; CHEM 4330 or CHEM 4330 concurrently

CHEM 4400: Inorganic Chemistry

(cross-leveled with CHEM 7400). Atomic and molecular structure, bonding, kinetics and mechanism, ligand field theory, coordination compounds, acids and bases.

Credit Hours: 3

Prerequisites: CHEM 2400

CHEM 4490: Physics and Chemistry of Materials

(same as NU_ENG 4319, PHYSICS 4190, BIOL_EN 4480; BME 4480; cross-leveled with CHEM 7490, NU_ENG 7319, PHYSICS 7190, BIOL_EN 7480). Physics and Chemistry of Materials is a 3 credit hours course offered every spring semester for students from Physics, Chemistry, Engineering and Medical Departments and consists of lectures, laboratory demonstrations, two mid-term and one final exam. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: PHYSICS 2750, CHEM 1320 or equivalent, or instructor's consent

CHEM 4600: Introduction to Radiochemistry with Lab

Introduces application of radio-tracer techniques to chemical research.

Credit Hours: 3

Prerequisites: CHEM 1330

CHEM 4800: Chemistry Teaching Practicum

Provides practical experience teaching introductory chemistry in discussion and laboratory settings. For students pursuing dual degrees in chemistry and secondary education. For students pursuing simultaneous dual degrees in chemistry and secondary education. Graded on S/U basis only.

Credit Hours: 3

Prerequisites: senior standing; departmental consent required

CHEM 4950: Senior Research

A laboratory research project with approved written goals and a final written report. It may be taken twice.

Credit Hours: 3

Prerequisites: a 2.75 GPA, departmental consent

CHEM 4990H: Senior Honors Research I

A laboratory research experience with a student-instructor prepared outline approved by the Honors Director, a final written report and a final oral presentation and examination. May replace CHEM 4950 in ACS Certification Track or 4000+ level elective requirement for

Medicinal Chemistry track. Must take CHEM 4990H and CHEM 4991H for departmental honors.

Credit Hours: 3

Prerequisites: a 3.33 GPA, departmental consent, and approval of project outline. Honors eligibility required

CHEM 4991H: Senior Honors Research II

A laboratory research experience with a student-instructor prepared outline approved by the Honors Director, a final written report and a final oral presentation and examination.

Credit Hours: 3

Prerequisites: a 3.33 GPA, departmental consent, approval of project outline. Honors eligibility required

CHEM 7087: Seminar in Chemistry for Beginning Graduate Students

Seminar in Chemistry for Beginning Graduate Students

Credit Hour: 1

CHEM 7200: Instrumental Methods of Analysis with Lab

(cross-leveled with CHEM 4200). Chemical instrumentation methods including electrochemistry, spectroscopy, and advanced separations techniques.

Credit Hours: 3

Prerequisites: CHEM 3200, a semester of physical chemistry

CHEM 7300: Intermediate Physical Chemistry

Treatment of atomic and molecular, structure and spectroscopy based on quantum concepts. Designed to provide a broad base of knowledge in these fundamental areas to beginning graduate students in chemistry.

Credit Hours: 3

Prerequisites: departmental consent

CHEM 7400: Inorganic Chemistry

(cross-leveled with CHEM 4400). Atomic and molecular structure, bonding, kinetics and mechanism, ligand field theory, coordination compounds, acids and bases.

Credit Hours: 3

Prerequisites: CHEM 2400

CHEM 7490: Physics and Chemistry of Materials

(same as NU_ENG 7319, PHYSICS 7190, BIOL_EN 7480; cross-leveled with CHEM 4490, NU_ENG 4319, PHYSICS 4190, BIOL_EN 4480, BME 4480). Physics and Chemistry of Materials is a 3 credit

hours course offered every spring semester for students from Physics, Chemistry, Engineering and Medical Departments and consists of lectures, laboratory demonstrations, two mid-term and one final exam. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: PHYSICS 2750, CHEM 1320 or equivalent, or instructor's consent

CHEM 8003: Topics in Chemistry - Natural Science

Organized study of selected topics. Subjects and earned credit may vary from semester to semester. Repeatable upon consent of department.

Credit Hour: 1-99

Prerequisites: instructor's consent

CHEM 8050: Non-Thesis Research in Chemistry

Does not lead to dissertation.

Credit Hour: 1-99

CHEM 8085: Topics in Chemistry

Organized study of selected topics. Subjects and earned credit may vary from semester to semester. Repeatable upon consent of department.

Credit Hour: 1-99

Prerequisites: instructor's consent

CHEM 8087: Seminar in Chemistry

Seminar in Chemistry

Credit Hour: 1

CHEM 8090: Thesis/Dissertation (pre-candidacy) Research in Chemistry

Research leading to thesis. Graded on a S/U basis only.

Credit Hour: 1-99

CHEM 8150: Organic Reaction Mechanisms

Organic reaction mechanisms are discussed within a framework of structure-reactivity relationships. Particular attention directed to the chemistry of reactive intermediates and the application of stereochemical and molecular orbital concepts.

Credit Hours: 3

Prerequisites: 1 year of Organic Chemistry and Physical Chemistry

CHEM 8160: Organic Spectroscopy

Structural analysis of organic compounds involving problem solving using modern NMR, IR, UV-VIS, MS CD/ORD and other spectroscopic techniques.

Credit Hours: 3

Prerequisites: CHEM 4330 or equivalent or instructor's consent

CHEM 8170: Applications of the Reactions of Organic Chemistry

Credit Hours: 3

Prerequisites: CHEM 8150

CHEM 8210: Analytical Measurement

Fundamental and applied aspects of scientific measurements. Topics include: Statistics, signal-to-noise, frequency analysis, sources of noise, digital and analog filtering, time vs. frequency domain measurements, Fourier transformation, sampling, convolution/deconvolution, autocorrelation and cross-correlation. Directed toward entering graduate students.

Credit Hours: 3

CHEM 8230: Separations and Chromatography

Classical and instrumental methods of separation: gas, paper, thin film, and column chromatography; ion exchange.

Credit Hours: 3

CHEM 8240: Mass Spectrometry

This course will cover various aspects of modern mass spectrometry. Topics will include instrumentation, theory, uses and interfaces to mass spectrometry. Graded on A-F basis only.

Credit Hours: 3

CHEM 8250: Analytical Spectroscopy

Selected topics dealing with recent advances in analytical chemistry.

Credit Hours: 3

CHEM 8260: Surface Analysis and Characterization

Covers various aspects of modern methods of surface analysis and characterization. Topics include instrumentation, theory, and data reduction methods. Major sections include electron spectroscopy, microscopy, and vibrational spectroscopy as applied to surfaces. Graded on A-F basis only.

Credit Hours: 3

CHEM 8265: Fluorescence Spectroscopy

Advanced analytical chemistry course that explores the fundamental principles and uses of modern fluorescence spectroscopy in biology, materials science, chemistry, physics and engineering. Special emphasis is placed on the methodologies used to obtain specific information about a particular chemical system. Graded on A-F basis only.

Credit Hours: 3

CHEM 8270: Advanced Analytical Chemistry

Continuation of CHEM 8250.

Credit Hours: 3

CHEM 8280: Bioanalytical Chemistry

This course is aimed at introducing students to the instrumental and theoretical principles by which biological molecules are measured in vivo and in vitro. The course explores how protein, DNA and metabolite structures and quantities are determined in the laboratory with an emphasis on understanding historical methods up through cutting edge approaches in each field. The theory of measurement techniques, separation techniques and related instrumentation are explored in the context of understanding the chemical equilibria that govern each instance. Students will leave this course with a broad understanding for how many biological molecules are measured and what the limitations of various techniques may be. Graded on A-F basis only.

Credit Hours: 3

CHEM 8285: Nanochemistry

Covers various aspects of nanochemistry. Topics include synthesis and characterization of nonmaterial, nanotoxicity, and catalysis. Graded on A-F basis only.

Credit Hours: 3

CHEM 8310: Quantum Chemistry

Introduction to formal quantum mechanical theory, quantum measurement, simple model problems having exact solutions, angular momenta, approximation methods (perturbation theory, variation principle, WKB), and the structure of many-electron atoms.

Credit Hours: 3

Prerequisites: CHEM 4330 or equivalent or instructor's consent

CHEM 8320: Chemical Kinetics

Factors affecting rates, orders and mechanisms of chemical reactions, with emphasis on current theories and experimental techniques.

Credit Hours: 3

Prerequisites: CHEM 4330 or equivalent or instructor's consent

CHEM 8330: Computational Chemistry

Theory and application of modern computational techniques (molecular mechanics, ab initio and semiempirical molecular orbital methods) for predicting the structures, energies, and properties of molecules and molecular systems.

Credit Hours: 3

Prerequisites: CHEM 3300 or equivalent or instructor's consent

CHEM 8340: Statistical Mechanics

Principles of statistical mechanics and their application to chemical systems; ensemble theory; condensed phases.

Credit Hours: 3

Prerequisites: CHEM 4330 or equivalent or instructor's consent

CHEM 8360: Atomic-Scale Simulations

This course will provide an in-depth introduction to the methods and applications of atomic-scale simulation methods (mainly classical molecular dynamics, hereafter "MD") for graduate students in chemistry, physics, materials science, and engineering. One of the beauties of MD methods is that, if applied judiciously and with skill, they provide exquisitely high-fidelity information about the fundamental properties and processes that occur on time scales ranging from femtoseconds to nanoseconds (or longer) and space scales ranging from Ångstroms to approximately microns. In many cases, this information can be used to guide or assess theoretical developments, interpret experiments, or provide insights or predictions for thermodynamic or non-equilibrium states that are not easily achieved or are difficult to probe experimentally. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: Instructor consent

CHEM 8370: Introduction to Astrochemistry

Introduction to Astrochemistry is a graduate-level course covering the chemistry and physics which gave rise to the Modern Universe, as well as that which currently governs the way in which new species are formed, destroyed, and measured. We examine the events that immediately followed the Big Bang, the vast interstellar medium, Solar system and planet formation, and the number of routes by which complex organic molecules form. Throughout this course, it will be clear that the Universe, though largely inhospitable, is host to a rich chemistry that gave rise to life as we know it. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: CHEM 4330 or equivalent

CHEM 8410: Chemistry of the Main Group Elements

Descriptive inorganic chemistry of the main group elements. Textbook material extensively supplemented with information from the current chemical literature.

Credit Hours: 3

CHEM 8420: Supramolecular Chemistry

The basics of supramolecular chemistry will be covered, including host-guest complexes, reorganization, complementarily, thermodynamic interactions, self assembly and biochemical, molecular device and crystal engineering applications. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: BS in Chemistry, Biochemistry or Chemical Engineering

CHEM 8430: Coordination Chemistry and Reactivity

The chemistry of the transition elements (d-block) and their reactivity will be discussed, including bonding, coordination numbers, oxidation states, and reactivity (kinetics). Graded on A-F basis only.

Credit Hours: 3

Prerequisites: CHEM 4400 or equivalent; graduate standing in chemistry or instructor's consent

CHEM 8440: Inorganic Structural Methods

Chemical bonding, application of group theory, spectroscopy; diffraction as applied to structure determination; structural implications of dipole moment and magnetic susceptibility measurements.

Credit Hours: 3

CHEM 8450: Organometallics

Condensations effected by organometallics; dissolving metal reductions; sandwich compounds and related organotransition metal derivatives.

Credit Hours: 3

CHEM 8470: Actinide Chemistry

The course covers the inorganic and organometallic chemistry of the actinides. Graded on A-F basis only.

Credit Hours: 3

CHEM 8480: Chemistry of Nanomaterials

This course will cover several aspects of nanomaterials including synthesis and processing of small particles, as well as their characterization by crystallography, scanning tunneling microscopy

magnetism, and other optical properties. Also studied will be the application of quantum confinement to the electronic and optical properties of nanomaterials and the development of photonic materials. The nanostructure of organic polymers, micelles, and the process of biomineralization to make organic-inorganic hybrid materials will also be discussed.

Credit Hours: 3

CHEM 8600: Radiochemistry and Detection with Lab

An introductory course in the applications of radionuclides in chemistry. Topics include radioactive decay, interactions of radiation with matter, radioactive tracers, and nuclear methods of analysis. Directed towards entering graduate students.

Credit Hours: 3

CHEM 8610: Advanced Radiochemistry

Reviews current advances in radiochemistry, hot atom chemistry, radiation chemistry, nuclear spectrometry.

Credit Hours: 3

Prerequisites: CHEM 8600 or equivalent

CHEM 8630: Radiopharmaceutical Chemistry

The radiotracer concept, history of nuclear medicine, radionuclide production, organic and inorganic chemistry of radiopharmaceutical chemistry, and applications will be discussed. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: undergraduate organic and inorganic chemistry; graduate standing in chemistry or instructor's consent

CHEM 8640: Biological Radiochemistry

(same as V_M_S 8640). Covers the interaction of radiation on biological material The effects of radiation overdose is discussed along with the use of radiation in therapy. Graded on A-F basis only.

Credit Hours: 3

CHEM 9090: Post-candidacy Dissertation Research in Chemistry

Research leading to Ph.D. dissertation. Graded on a S/U basis only.

Credit Hour: 1-99
