

CHEMISTRY (CHEM)

CHEM 1010 CHEMISTRY IN THE ENVIRONMENT AND SOCIETY (3 credits)

A study of modern society's impact on our environment and the chemistry needed to understand it. The primary focus is the underlying chemistry of the effects of energy production and properties of fuels while including social, political and economic connections. Impacts on air and water quality, climate change, and fossil fuels are discussed. Additional course topics may also include the ozone layer, plastics, medicine and nutrition. (Fall, spring) Fulfills a University General Education Natural/Physical Science Requirement.

Prerequisite(s)/Corequisite(s): MATH 1310 or MATH 1220 with a grade of C- or better or equivalent.

Distribution: Natural/Physical Sci General Education lecture

CHEM 1014 CHEMISTRY IN THE ENVIRONMENT AND SOCIETY LABORATORY (1 credit)

Laboratory for CHEM 1010, a survey of the relationship of chemistry to current problems in environmental control, medicine, technology and energy production. (Fall, Spring)

Prerequisite(s)/Corequisite(s): CHEM 1010 to be taken concurrently or completed previously with grade of C- or better.

Distribution: Natural/Physical Sci General Education lab course

CHEM 1120 STRATEGIES IN CHEMICAL PROBLEM SOLVING (2 credits)

This course focuses on the development of problem solving skills and learning strategy tools in the context of first semester college chemistry topics. It is primarily intended for students seeking a stronger background before enrolling in CHEM 1140 or CHEM 1180. However, the content should be valuable for a variety of courses. Not available for natural science credit, nor intended to meet chemistry requirements for other programs. (Fall)

Prerequisite(s)/Corequisite(s): MATH 1310 or MATH 1220 with C- or better or equivalent. MATH 1310 or MATH 1220 may also be taken concurrently. Not open to non-degree graduate students.

CHEM 1140 FUNDAMENTALS OF COLLEGE CHEMISTRY (4 credits)

A comprehensive introduction to the basic principles of chemistry. This course is intended for all students needing a one-semester introductory course with laboratory including allied health students continuing to CHEM 2210, or those seeking a stronger background before enrollment in CHEM 1180. (Fall, spring, possibly summer). Fulfills a University General Education Natural/Physical Science Requirement.

Prerequisite(s)/Corequisite(s): MATH 1310 with a C- or better or equivalent. CHEM 1144 concurrent or prior with C- or better.

Distribution: Natural/Physical Sci General Education lecture

CHEM 1144 FUNDAMENTALS OF COLLEGE CHEMISTRY LABORATORY (1 credit)

Laboratory explorations of chemical measurements, modeling, reactions and analyses. To be taken with CHEM 1140. (Fall, spring, possibly summer).

Prerequisite(s)/Corequisite(s): CHEM 1140 concurrent or prior with C- or better.

Distribution: Natural/Physical Sci General Education lab course

CHEM 1180 GENERAL CHEMISTRY I (3 credits)

A comprehensive survey of chemical principles; the first course in a two-semester sequence primarily for majors and those in the sciences. It is assumed that students will have a good background in elementary chemical principles. CHEM 1184 normally to be taken concurrently. (Fall, Spring, Summer) Fulfills a University General Education Natural/Physical Science Requirement.

Prerequisite(s)/Corequisite(s): Placement above or completion of MATH 1320 or MATH 1340 or MATH 1360 (C- or better) OR MATH 1310 or MATH 1220 (C- or better) and completion of CHEM 1120 (B- or better) OR CHEM 1140 (C- or better). CHEM 1184 concurrent or prior (C- or better).

Distribution: Natural/Physical Sci General Education lecture

CHEM 1184 GENERAL CHEMISTRY I LABORATORY (1 credit)

A laboratory program designed to enhance laboratory skills and illustrate chemical principles. (Fall, Spring, Summer) Fulfills a University General Education Natural/Physical Science requirement.

Prerequisite(s)/Corequisite(s): CHEM 1180 concurrent or prior with a grade of C- or better.

Distribution: Natural/Physical Sci General Education lab course

CHEM 1190 GENERAL CHEMISTRY II (3 credits)

A study of acid-base theory, ionic equilibria, complexation, oxidation-reduction, thermodynamics and kinetics. CHEM 1194 to be taken concurrently. (Fall, Spring, Summer)

Prerequisite(s)/Corequisite(s): CHEM 1180 and 1184 with a grade of C or better. Concurrent enrollment in CHEM 1194.

CHEM 1194 GENERAL CHEMISTRY II LABORATORY (1 credit)

Quantitative analysis and study of solution equilibria. Includes statistics applied to quantitative analysis. (Fall, Spring, Summer)

Prerequisite(s)/Corequisite(s): CHEM 1180 and 1184 with a grade of C or better or department recommendation of advanced placement. Prereq or coreq: CHEM 1190 (if prereq must be with a grade of C or better).

CHEM 2210 FUNDAMENTALS OF ORGANIC CHEMISTRY (4 credits)

Lecture three hours and discussion one hour. Chemistry of carbon compounds. A one-semester course designed primarily for students in biology, elementary science education, home economics, nursing and allied health fields.

Prerequisite(s)/Corequisite(s): CHEM 1140 and CHEM 1144, or CHEM 1190 and CHEM 1194 with a grade of C or better in each.

CHEM 2214 to be taken concurrently.

CHEM 2214 FUNDAMENTALS OF ORGANIC CHEMISTRY LABORATORY (1 credit)

Elementary organic chemistry laboratory to be taken concurrently with CHEM 2210.

Prerequisite(s)/Corequisite(s): CHEM 1140 and CHEM 1144, or CHEM 1190 and CHEM 1194 with a grade of C or better in each.

CHEM 2210 to be taken concurrently.

CHEM 2250 ORGANIC CHEMISTRY I (3 credits)

The fundamental chemistry of carbon compounds. (Fall, Spring, Summer)

Prerequisite(s)/Corequisite(s): CHEM 1190 and CHEM 1194 with a grade of C- or better.

CHEM 2260 ORGANIC CHEMISTRY II (3 credits)

A continuation of the foundational study of the compounds of carbon. (Fall, Spring)

Prerequisite(s)/Corequisite(s): CHEM 2250 with a grade of C- or better, obtained within the prior twelve months. CHEM 2274 concurrent or prior with a grade of C- or better.

CHEM 2274 ORGANIC CHEMISTRY LABORATORY (2 credits)

A laboratory course in the skills and techniques of experimentation in organic chemistry. (Fall, Spring)

Prerequisite(s)/Corequisite(s): CHEM 1194 with a grade of C- or better and CHEM 2260 concurrent or prior with C- or better.

CHEM 2400 QUANTITATIVE ANALYSIS (3 credits)

Theory of quantitative analysis applied to gravimetric and volumetric analysis; theory of error and evaluation of analytical data; introduction to instrumental analysis and separation methods. (Fall)

Prerequisite(s)/Corequisite(s): CHEM 1190 and CHEM 1194 with a grade of C or better or equivalent. CHEM 2404 to be taken concurrently.

CHEM 2404 QUANTITATIVE ANALYSIS LAB (1 credit)

Laboratory application of principles of quantitative analysis and experience with its unit operations. Use of reaction chemistry, separations, potentiometry and spectrophotometry in determinations. Introduction to quality control. (Fall)

Prerequisite(s)/Corequisite(s): CHEM 1190 and CHEM 1194 with a grade of C or better. CHEM 2400 to be taken concurrently.

CHEM 2500 INTRODUCTION TO INORGANIC CHEMISTRY (3 credits)

A survey of the inorganic chemistry of metallic and nonmetallic species, including atomic, molecular and crystal structures, composition, properties and reactivities. (Spring).

Prerequisite(s)/Corequisite(s): CHEM1190 with a grade of C- or better.

CHEM 2930 APPLIED TOPICS IN CHEMISTRY (1-3 credits)

More thorough examination of a chemistry topic than in the regular curriculum. Content (e.g. polymers, forensics, brewing and cooking, chemical industry, historical chemistry, art and chemistry, glassblowing) will vary with offering.

Prerequisite(s)/Corequisite(s): Completion 4 credit hours of university chemistry with grade(s) of C+ or better, or 8 CH of chemistry with grades of C or better.

CHEM 2950 INTRODUCTION TO RESEARCH IN CHEMISTRY (1 credit)

This course is intended to give students, possessing at least a high school background in chemistry, the opportunity to work with faculty and/or advanced students on an established research project. The creativity and communication expectations of these students will be less than for students enrolled in the 4000 level research courses. Guided laboratory/library work on an established research project.

Prerequisite(s)/Corequisite(s): Permission of instructor. Not open to non-degree graduate students.

CHEM 3030 ENVIRONMENTAL CHEMISTRY (3 credits)

The study of the chemistry of water, air and earth by application of fundamental principles of chemistry to environmental processes:

Prerequisite(s)/Corequisite(s): CHEM 1180 and CHEM 1184, CHEM 1190 and CHEM 1194, CHEM 2210 or CHEM 2214, or CHEM 2260 and CHEM 2274 and one of the following: CHEM 2400 and CHEM 2404, CHEM 2500, BIOL 2440 or GEOL 2750 (all chemistry courses must be with a grade of C or better)

CHEM 3210 INTRODUCTION TO MOLECULAR MODELING (3 credits)

The course covers the advantages and limitations of current modeling systems, the criteria for choosing the appropriate modeling system to best solve a given problem and the computer resources needed to conduct the modeling experiments. Following an introduction to the theory behind a variety of modeling systems, students model organic and bioorganic compounds in projects designed to mimic real world applications. (Alternate Spring semesters). (Cross-listed with CHEM 8215).

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 2274 with a grade of C- or better.

CHEM 3250 ADVANCED ORGANIC LABORATORY (1 credit)

Advanced course in laboratory practices.

Prerequisite(s)/Corequisite(s): CHEM 2260, CHEM 2274 with a grade of C or better, and permission. (Offered on demand)

CHEM 3350 PHYSICAL CHEMISTRY I (3 credits)

A presentation of selected topics from the areas of classical thermodynamics and electrochemistry. (Fall) (Cross-listed with CHEM 8355).

Prerequisite(s)/Corequisite(s): CHEM 2260, CHEM 2274, CHEM 2400, CHEM 2404, PHYS 2120; MATH 1960. (Chemistry courses must be with a grade of C or better). Concurrent enrollment in CHEM 3354.

CHEM 3354 PHYSICAL CHEMISTRY I LABORATORY (1 credit)

Physical chemistry laboratory covering topics in thermodynamics, kinetics and electrochemistry, to be taken concurrently with CHEM 3350/8355.

Instruction and practice in scientific writing is also an emphasis of the course. Fulfills the third writing course requirement for students majoring in chemistry when NSCI 3940 and another approved laboratory course have been completed with a C- or better. Offered in Fall. (Cross-listed with CHEM 8359)

Prerequisite(s)/Corequisite(s): CHEM 2404, CHEM 2274; Coreq: CHEM 3350.

Distribution: Writing in the Discipline Sequenced Course

CHEM 3360 PHYSICAL CHEMISTRY II (3 credits)

A presentation of selected topics from the areas of quantum mechanics, spectroscopy, kinetics and statistical mechanics. (Spring) (Cross-listed with CHEM 8365).

Prerequisite(s)/Corequisite(s): CHEM 3350 and CHEM 3354 with a grade of C- or better.

CHEM 3364 PHYSICAL CHEMISTRY II LABORATORY (1 credit)

Physical chemistry laboratory covering topics in quantum mechanics, computational chemistry, spectroscopy, and kinetics, to be taken concurrently with CHEM 3360. Fulfills the third writing course requirement for students majoring in chemistry when NSCI 3940 and another approved laboratory course have been completed with a C- or better. Offered in Spring. (Cross-listed with CHEM 8369).

Prerequisite(s)/Corequisite(s): CHEM 3350 and 3354 with a grade of C- or better, to be taken concurrently with CHEM 3360.

Distribution: Writing in the Discipline Sequenced Course

CHEM 3414 INSTRUMENTAL METHODS (1 credit)

Laboratory course involving use of modern instrumentation to conduct analytical determinations following standard methods. Topics include use of standards, field sampling and sample storage. (Fall, Spring) (Cross-listed with CHEM 8419).

Prerequisite(s)/Corequisite(s): CHEM 2400 and CHEM 2404 with a grade of C or better.

CHEM 3424 SPECTROMETRIC CHARACTERIZATIONS (1 credit)

Laboratory course involving the use of spectrometric instrumentation for the identification of compounds containing organic functional groups. (Fall, alternate years) (Cross-listed with CHEM 8429).

Prerequisite(s)/Corequisite(s): CHEM 2260, CHEM 2274, CHEM 2400 and CHEM 2404 with a grade of C or better.

CHEM 3514 INORGANIC PREPARATIONS (1 credit)

Laboratory preparation and characterization of representative types of inorganic compounds by various standard and special techniques. (Spring)

Prerequisite(s)/Corequisite(s): CHEM 2274, CHEM 2400, CHEM 2404, CHEM 2500 with a grade of C- or better.

CHEM 3610 PRINCIPLES OF BIOCHEMISTRY FOR THE HEALTH SCIENCES (3 credits)

This course covers the introduction of biochemistry, biomolecules, and metabolism. It is primarily intended for students entering allied health fields.

Prerequisite(s)/Corequisite(s): CHEM 2210 or CHEM 2260 with a C- or better. Not open to non-degree graduate students.

CHEM 3650 FUNDAMENTALS OF BIOCHEMISTRY (3 credits)

A survey of biochemistry emphasizing: cell structure, energy, and water; amino acid and protein structure/function, enzymes, and protein isolation; carbohydrates and carbohydrate metabolism (glycolysis, glycogen metabolism); aerobic metabolism (citric acid cycle and oxidative phosphorylation); lipids, membranes, transport, cholesterol, and lipid metabolism; and nucleic acids. (Fall, Spring)

Prerequisite(s)/Corequisite(s): CHEM 2210 and CHEM 2214 or CHEM 2260 and CHEM 2274 with a grade of C- or better. Other comparable courses taken at accredited colleges or universities are acceptable. CHEM 3654 must be taken concurrently.

CHEM 3654 FUNDAMENTALS OF BIOCHEMISTRY LABORATORY (1 credit)

A laboratory course to help integrate the concepts learned in the fundamentals of biochemistry lecture with the development of biochemical laboratory skills including data analysis. (Fall, Spring)

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 2274; and either CHEM 2400 or BIOL 3020, all with a C- or better. BIOL//CHEM 4650 must be taken concurrently.

CHEM 3710 ESSENTIALS OF MEDICINAL CHEMISTRY (3 credits)

This course is an introduction to human drug discovery, mechanism of action, metabolism, and drug-drug interaction, while demonstrating the interdisciplinary nature of medicinal chemistry. An emphasis is placed on drug design, drug structure, and the relationship of structure to drug action and metabolism. (Spring)

Prerequisite(s)/Corequisite(s): ENGL 1160 and CHEM 2260/ CHEM 2274 with a grade of C- or better.

CHEM 4230 ADVANCED ORGANIC CHEMISTRY - SYNTHESIS (3 credits)

An advanced lecture course in modern theories and organic reactions with application to synthesis. (Alternate Fall semesters) (Cross-listed with CHEM 8236).

Prerequisite(s)/Corequisite(s): CHEM 2260 with a grade of C- or better.

CHEM 4240 ADVANCED ORGANIC CHEMISTRY - MECHANISM (3 credits)

An advanced lecture course in organic chemical reactions. (Cross-listed with CHEM 8246).

Prerequisite(s)/Corequisite(s): CHEM 2260, CHEM 3350 and CHEM 3360 with a grade of C or better, or graduate. (CHEM 3350, CHEM 3360 may be taken concurrently.)

CHEM 4250 ADVANCED ORGANIC CHEMISTRY: MECHANISM AND MODELING (4 credits)

Presentation of advanced topics in organic chemistry focused on structure, bonding and reaction mechanisms. The use of molecular modeling software as means to predict structure, relative stabilities and reaction thermodynamics are covered in a hands-on environment. The course will survey various modeling methods and show its relevance to molecular orbital theory. The basic methodologies used to explore organic mechanisms are presented and then used to study mechanistic details of various reaction types. Students cannot count both CHEM 4250 and CHEM 4240 toward their degree. (Cross-listed with CHEM 8256).

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 2274 with a C- or better

CHEM 4310 POLYMER CHEMISTRY (3 credits)

An introduction to the chemical and physical properties of polymers. Emphasis will be on physical properties and structure/property relationships. Topics will include kinetics and synthesis. Students will gain an understanding of the characteristics of polymers and their applications.

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 3350, each with a grade of C- or better, or instructor permission. Not open to non-degree graduate students.

CHEM 4400 INSTRUMENTAL ANALYSIS (3 credits)

Study of instrumentation for use in quantitative and trace analysis. Advanced instrumental methods and electronics for instrumentation are included. (Spring) (Cross-listed with CHEM 8406).

Prerequisite(s)/Corequisite(s): CHEM 3360, CHEM 3364 and CHEM 3414 with a grade of C or better. Concurrent enrollment in CHEM 4404.

CHEM 4404 INSTRUMENTAL ANALYSIS LABORATORY (1 credit)

Use of instrumentation in quantitative and trace analysis. Advanced instrumental methods and electronics for instrumentation are included. (Spring) (Cross-listed with CHEM 8409).

Prerequisite(s)/Corequisite(s): CHEM 3360, CHEM 3364, CHEM 3414 with a grade of C or better. Concurrent enrollment in CHEM 4400.

CHEM 4500 ADVANCED INORGANIC CHEMISTRY (3 credits)

The application of bonding models for understanding of the composition, structure, and reactions of inorganic molecules, including organometallic and bioinorganic complexes. (Cross-listed with CHEM 8506).

Prerequisite(s)/Corequisite(s): CHEM 2500 and CHEM 3350 with a grade of C- or better. CHEM 3350 may be taken concurrently.

CHEM 4510 SOLID STATE INORGANIC CHEMISTRY (3 credits)

A study of the structural and electronic basis of materials properties in the solid state. Properties examined include electrical conductivity, ferromagnetism, ferroelectricity, and superconductivity. Some experimental work will be conducted.

Prerequisite(s)/Corequisite(s): CHEM 2500 and CHEM 3350 with a grade of C- or better; or permission of instructor.

CHEM 4540 GEOCHEMISTRY (3 credits)

This course will cover the application of chemical principles to geologic systems. Specific topics covered will include the origin of elements and their distribution in the earth, geochronology, stable isotope systems, aqueous geochemistry and crystal chemistry. These topics will be integrated to the study of igneous, metamorphic and sedimentary rocks and ore deposits.

Prerequisite(s)/Corequisite(s): GEOL 1170, MATH 1950, CHEM 1190 and GEOL 2750 or CHEM 2500 (chemistry courses must have a grade of C or better)

CHEM 4610 BIOCHEMISTRY OF METABOLISM (4 credits)

The course covers the structure-function relationships of proteins, carbohydrates, lipids and nucleotides, with an emphasis on the biochemistry of metabolism and molecules of metabolism. It is primarily intended to prepare students for health-related professional schools. (Spring)

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 2274 with a grade of C- or better.

CHEM 4650 BIOCHEMISTRY I (3 credits)

A comprehensive introduction to biochemistry emphasizing: structure-function relationships for proteins, carbohydrates, lipids, and nucleic acids; protein purification; enzyme kinetics and mechanisms; membranes and membrane transport; carbohydrate metabolism including glycolysis, the citric acid cycle and oxidative phosphorylation; and important applications of thermodynamics and the properties of water to living systems. (Fall) (Cross-listed with BIOL 4650, BIOL 8656, CHEM 8656).

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 2274; and either CHEM 2400 or BIOL 3020, all with a C- or better. Other comparable courses taken at accredited colleges or universities are acceptable. CHEM 4654 must be taken concurrently.

CHEM 4654 BIOCHEMISTRY I LABORATORY (1 credit)

A laboratory course to help integrate the concepts learned in biochemistry lecture with the development of biochemical laboratory skills including experimental design, data analysis, presentation of results and communication of scientific information, with a focus on formal instruction in journal-style writing and notebook skills. There is an emphasis on protein properties, including enzyme activity. Fulfills the third writing course requirement for students majoring in chemistry when NSCI 3940 and another approved laboratory course have been completed with a C- or better. (Fall) (Cross-listed with BIOL 4654, BIOL 8654, CHEM 8654).

Prerequisite(s)/Corequisite(s): CHEM 2260 and CHEM 2274; and either CHEM 2400 or BIOL 3020, all with a C- or better. BIOL 4650 must be taken concurrently with BIOL 4654. CHEM 4650 must be taken concurrently with CHEM 4654.

Distribution: Writing in the Discipline Sequenced Course

CHEM 4660 BIOCHEMISTRY II (3 credits)

A continuation of the study of the structure and function of biomolecules and biochemical reactions with an emphasis on metabolism of carbohydrates, lipids, amino acids and nucleotides, and the chemistry of signal transduction and genetic information transfer. (Spring) (Cross-listed with BIOL 4660, BIOL 8666, CHEM 8666).

Prerequisite(s)/Corequisite(s): CHEM 4650 and CHEM 4654 or BIOL 4650 and BIOL 4654. CHEM 4664 must be taken concurrently (Chemistry courses must have a grade of C- or better)

CHEM 4664 BIOCHEMISTRY II LABORATORY (1 credit)

A laboratory course to help integrate the concepts learned in Biochemistry II lecture with the development of biochemical laboratory skills, to gain practical experience in experimental design, data analysis, presentation of results and communication of scientific information, with a focus on formal instruction in journal-style writing and notebook skills. There is an emphasis on nucleic acid properties. Fulfills the third writing course requirement for students majoring in chemistry when NSCI 3940 and another approved laboratory course have been completed with a C- or better. (Spring) (Cross-listed with BIOL 4664, BIOL 8664, CHEM 8664).

Prerequisite(s)/Corequisite(s): CHEM 4650 and CHEM 4654 or BIOL 4650 and BIOL 4654 with a C- or better. BIOL 4660 must be taken concurrently with BIOL 4664. CHEM 4660 must be taken concurrently with CHEM 4664.

Distribution: Writing in the Discipline Sequenced Course

CHEM 4670 PROTEIN PURIFICATION AND CHARACTERIZATION (2 credits)

This course is a study of protein biochemistry, protein purification techniques, and characterization strategies with an emphasis on chromatography and crystallography. The course has a significant laboratory component. (Cross-listed with CHEM 8676).

CHEM 4810 CHEMISTRY INTERNSHIP (1-6 credits)

Application of chemical skills in a non-academic laboratory or workplace through part-time employment or contracted work; written report required. Grading will be 'S' or 'U' only.

Prerequisite(s)/Corequisite(s): Major in Chemistry, CHEM 2260, CHEM 2274, CHEM 2400, CHEM 2404 with a grade of C or better and permission of department chair.

CHEM 4930 SPECIAL TOPICS IN CHEMISTRY (1-3 credits)

Selected special topics in chemistry. (Cross-listed with CHEM 8936).

Prerequisite(s)/Corequisite(s): CHEM 2260, CHEM 2400 with a grade of C or better. Some topics will require more advanced prerequisites and will be accepted for advanced course work in chemistry.

CHEM 4950 CHEMISTRY PROJECTS (1 credit)

Initiation of an independent student research project, and communication of the results.

CHEM 4960 CHEMISTRY PROBLEMS (1-3 credits)

Independent student research and communication of the results in a written report. If NSCI 4960 is taken concurrently, the CHEM 4960 report is replaced by an oral presentation. (Cross-listed with CHEM 8966).

Prerequisite(s)/Corequisite(s): CHEM 4950 with a grade of C or better and permission of instructor.