CHEMISTRY (CHEM)

Courses

CHEM 100 EVERYDAY CHEMISTRY 4 Units
A terminal course covering the basic concepts of chemistry and how they relate to our everyday lives. Chemistry concepts are covered at the particulate level and then connected to our macroscopic world. The lab provides deeper exploration and hands-on experiments. This course meets the General Education GL requirement and is designed primarily for non-natural science majors.
COREQ: MATH 139 OR MATH 140 OR MATH 141 OR MATH 142 OR WAIVER; REQUIREMENT MAY BE COMPLETED PRIOR TO ENROLLMENT.

CHEM 102 GENERAL CHEMISTRY I 5 Units
An introduction to chemistry including matter and energy, atomic and molecular structure, bonding, reactions and stoichiometry, gas laws, and changes of state. This course is primarily designed for natural science, pre-health, and occupational and environmental safety majors needing two or more semesters of chemistry.
PREREQ: A GRADE OF C OR HIGHER IN MATH 139 OR MATH 141 OR MATH 142 OR WAIVER. MATH 142 MAY BE TAKEN CONCURRENTLY.

CHEM 104 GENERAL CHEMISTRY II 5 Units
This course, along with CHEM 102, forms the foundation of further chemistry studies. The topics covered include intermolecular forces, solutions, colligative properties, kinetics, equilibrium, acid-base theory and equilibria, thermodynamics, electrochemistry, and nuclear chemistry.
PREREQ: CHEM 102 WITH A C OR BETTER AND MATH 142 WITH A C OR BETTER

CHEM 112 CHEMISTRY FOR OCCUPATIONAL AND ENVIRONMENTAL APPLICATIONS 3 Units
This course will explore the bonding, structure, properties and reactivity of the main classes of organic compounds focusing on acid/base, redox, and radical reactions. The safety concerns of these reactions will be discussed and predicted by using chemical information found in online and text sources.
PREREQ: (C OR BETTER IN CHEM 100 OR CHE 124) OR CHEM 102 OR CHE 125 OR CHE 145 OR (UWX CH140 AND UWX CH144) OR DEPARTMENT CONSENT

CHEM 115 GENERAL, ORGANIC, & BIOLOGICAL CHEMISTRY 1 4 Units
This is the first semester of a two semester sequence (CHEM 115/116). Topics covered in CHEM 115 include measurements, atomic structure, periodic trends, chemical reactions, mole concepts, gas laws, reaction rates, equilibrium, acids and bases, and an introduction to organic chemistry including representations, functional groups, and nomenclature. The course is composed of a 3 credit lecture and 1 credit laboratory.
PREREQ: C- OR BETTER IN MATH 139 OR MATH 142 UNREQ: A STUDENT MAY EARN CREDIT FOR ONLY ONE OF THE FOLLOWING: CHEM 102 OR CHEM 115 OR CHE 125 OR CHE 145

CHEM 116 GENERAL, ORGANIC, & BIOLOGICAL CHEMISTRY 2 3 Units
This is the second semester of a two semester sequence (CHEM 115/116). Topic covered include conformations and isomers of organic compounds, exploration of common organic functional groups, descriptive analysis of proteins, carbohydrates, and lipids including their metabolism. The course is a 3 credit lecture only course.
PREREQ: C- OR BETTER IN CHEM 115

CHEM 184 NEW CHEMIST SEMINAR 1 Units
An introduction to career tracks and career opportunities in chemistry. This course will feature readings on different career possibilities in chemistry, visiting lectures by practicing chemists, and information to familiarize you with the Chemistry Department. Professional skills, identification of career tracks, and scientific and technical communication will be emphasized. One hour lecture per week.
PREREQ: CHEMISTRY MAJOR OR INSTRUCTOR CONSENT

CHEM 251 ORGANIC CHEMISTRY - I 3 Units
Introductory chemistry of the compounds of carbon, their structures and reactions. Taken primarily by chemistry majors and pre-professional students. The foundation for understanding organic reactions is established with an emphasis on bonding, functional groups, three dimensional structure of organic molecules, relationship between structure and reactivity, kinetics, and reaction mechanisms. Three hours of lecture per week.
PREREQ: CHEM 104

CHEM 252 ORGANIC CHEMISTRY - II 3 Units
A continuation of CHEM 251. The goal is to further examine the structure & reactivity relationship with emphasis on reactions and synthesis. It also illustrates how structural features considered in 251, combined with organic reactions learned in 252, can be sources of insight in the overall design of natural products and synthesized materials. Three hours of lecture per week.
PREREQ: CHEM 251

CHEM 260 INORGANIC CHEMISTRY 4 Units
CHEM 260 is an introduction to inorganic chemistry with emphasis on descriptive chemistry, bonding theories, acid-based theories, coordination chemistry and solid state chemistry.
PREREQ: CHEM 104

CHEM 261 ORGANIC CHEMISTRY LABORATORY 2 Units
Basic organic manipulative techniques and simpler syntheses are considered. Spectroscopic topics are introduced. Generally taken concurrently with CHEM 251. Two three-hour laboratories per week.
COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN CHEM 251

CHEM 262 ORGANIC CHEMISTRY LABORATORY - INTERMEDIATE 2 Units
A continuation of CHEM 261. Includes more advanced synthetic work and kinetic and mechanistic investigations, and spectroscopic techniques. Generally taken concurrently with CHEM 252. Two three-hour laboratories per week.
PREREQ: CHEM 261 COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN CHEM 252

CHEM 270 INTRODUCTION TO GREEN CHEMISTRY 3 Units
A lecture course covering the principles and common methods of green chemistry. Topics will include: atom economy, reduction of amount and toxicity of waste from chemical processes, reduction of energy use in chemical processes, assuring safety in chemical processes.
PREREQ: CHEM 112 OR CHEM 116 OR CHEM 251

CHEM 271 GREEN CHEMISTRY LABORATORY 1 Units
The principles of green chemistry will be illustrated in this lab course. Topics will include atom economy, reduction of quantity and toxicity of waste, alternative solvents, renewable feedstocks, catalysts, and reaction monitoring.
COREQ: CHEM 270

CHEM 298R INTRODUCTION TO UNDERGRADUATE RESEARCH *Repeatable* 1-3 Units
Undergraduate research experience related to chemistry for Freshman or Sophomores. Study of selected topic or topics under the direct supervision of a faculty member. Repeatable up to 4 times for a maximum of 6 credits. Credits in this course may not be used to fulfill minor or major requirements in chemistry.
COREQ: CHEM 102

CHEM 352 QUANTITATIVE ANALYSIS 5 Units
An introduction to volumetric, gravimetric and photometric techniques and fundamental methods of instrumental analysis. Three one-hour lectures and four hours of laboratory per week.
PREREQ: CHEM 104

CHEM 370 PHYSICAL CHEMISTRY - QUANTUM MECHANICS IN CHEMISTRY 3 Units
The importance of quantum mechanics to chemical systems is presented. Topics include quantization of rotational and vibrational motion, quantum mechanical description of electrons and atomic structure, quantum mechanical description of covalent bonding and how that affects understanding of chemical reactivity. Three hours of lecture weekly.
PREREQ: CHEM 352 COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN MATH 254 AND (PHYSCS 141 OR PHYSCS 181)

CHEM 371 PHYSICAL CHEMISTRY - THERMODYNAMICS AND KINETICS 3 Units
This course presents the fundamentals of chemical thermodynamics and of kinetics. Thermodynamic topics will include the fundamentals of energy, entropy and free energy and their application to chemical systems. Kinetic topics will include the basics of describing chemical kinetics, common methods of simplifying complex kinetics and an introduction to chemical dynamics. Three hours of lecture weekly.
PREREQ: CHEM 352 COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN MATH 254 AND (PHYSCS 141 OR PHYSCS 181)

CHEM 454 BIOCHEMISTRY OF MACROMOLECULES 3 Units
The chemistry of the major compounds of living organisms, e.g., proteins, carbohydrates, lipids and nucleic acids, are studied. Meets for 3 lectures/week, and is required for all Chemistry majors.
PREREQ: BIOLOGY 141 AND CHEM 251

CHEM 455 ADVANCED ORGANIC CHEMISTRY 3 Units
Lectures on advanced topics in organic chemistry. (Fall only)
PREREQ: CHEM 252

CHEM 456 BIOCHEMISTRY OF METABOLISM AND SIGNALING 3 Units
The chemistry of biological systems, focusing on metabolism and biochemical signaling. Three lectures/week. For Chemistry majors (Biochemistry emphasis), Biology majors (allied health focus) and students interested in Biochemistry postgraduate education.
PREREQ: (BIOLOGY 251 AND BIOLOGY 253 AND CHEM 251) OR (CHEM 251 AND CHEM 454) OR INSTRUCTOR CONSENT

CHEM 458 ADVANCED BIOCHEMISTRY LABORATORY 2 Units
A laboratory course that teaches biochemical research techniques through guided original research projects.
PREREQ: BIOLOGY 141 AND CHEM 251 COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN (CHEM 454 OR BIOLOGY 456 OR CHEM 456)

CHEM 460 ADVANCED INORGANIC CHEMISTRY 4 Units
Advanced Inorganic Chemistry is a continuation of CHEM 260, Inorganic Chemistry. This course will provide a more detailed study of group theory, molecular orbital theory, and coordination chemistry. As a cross-disciplinary course, topics such as organometallic chemistry, catalysis, nanoscience, inorganic analysis, and materials science, with examples drawn from the primary literature will be explored.
PREREQ: CHEM 252 AND CHEM 260

CHEM 470 EXPERIMENTAL PHYSICAL CHEMISTRY - QUANTUM MECHANICS IN CHEMISTRY 1 Units
A laboratory course in experimental physical chemistry with an emphasis on experiments relating to quantum mechanics using a variety of experimental techniques. Three hours of laboratory per week.
COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN CHEM 370

CHEM 471 EXPERIMENTAL PHYSICAL CHEMISTRY - THERMODYNAMICS AND KINETICS 1 Units
A laboratory course in experimental physical chemistry with an emphasis on experiments relating to thermodynamics and kinetics using a variety of techniques. Three hours of laboratory per week.
COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN CHEM 371

CHEM 480 INSTRUMENTAL METHODS OF ANALYSIS 4 Units
A survey of optical and electrometic determinations, separation methods and basic instrumentation as applied to chemical analysis. Three one-hour lectures and one three-hour laboratory period per week.
PREREQ: CHEM 252 AND CHEM 352

CHEM 481 INSTRUMENTAL DESIGN AND MAINTENANCE 1 Units
A laboratory course that provides hands-on experince in performing preventative maintenance on instrumentation. Students will study instrumental designs and gain troubleshooting skills. Laboratory instruments covered in this course include balances, IR, GC, GCMS, HPLC, AA, ICP, CVAFS, FS, NMR and UV-VIS.
PREREQ: CHEM 480

CHEM 484 TOPICS IN CHEMISTRY 1 Units
A course where students will use chemical and scientific literature, be introduced to the seminar concept, and participate in the study and discussion of current developments in chemistry. The student will review a topic and present that topic orally and in writing. This course may not be used as part of the Chemistry minor.
PREREQ: CHEMISTRY MAJOR COREQ: PRIOR COMPLETION OR CONCURRENT ENROLLMENT IN (CHEM 370 OR CHEM 371)

CHEM 488 SENIOR HONORS THESIS *Repeatable* 1 Units
The senior honors thesis is a requirement of the honors program which is designed to recognize a student's exceptional dedication and ability. Students will complete a substantial research project in their senior year. Results must be written up as a thesis, presented in a seminar, and defended orally.
PREREQ: SENIOR STANDING AND CHEM 498

CHEM 490 WORKSHOP *Repeatable* 1-4 Units
Variable topics. Group activity oriented presentations emphasizing "hands on" and participatory instructional techniques.

CHEM 492 SUPERVISED TEACHING AIDE *Repeatable* 1-2 Units
This course provides students with teaching experience in a college-level chemistry laboratory course they have previously taken. It includes instruction on how to best operate as a teaching aide and in depth instruction on the experiments and instrumentation used in that chemistry course.

CHEM 493 CHEMISTRY INTERNSHIP *Repeatable* 1-3 Units
Variable Topics

CHEM 494 CHEMISTRY SEMINAR *Repeatable* 1 Units
Variable topics.Group activity. An advanced course of study in a defined subject matter area emphasizing a small group in intense study with a faculty member. Units in this course may not be used to fulfill minor requirements in Chemistry.

CHEM 496 SPECIAL STUDIES *Repeatable* 1-3 Units
Variable topics. Group activity. Not offered regularly in the curriculum but offered on topics selected on the basis of timeliness, need, and interest, and generally in the format of regularly scheduled Catalog offerings. Repeatable two times for a maximum 6 credits in degree.

CHEM 497 EXCHANGE STUDY *Repeatable* 1-12 Units
Variable topics.

CHEM 498 INDEPENDENT STUDY IN CHEMISTRY *Repeatable* 1-3 Units
Study of a selected topic or topics under the direction of a faculty member. Repeatable for a maximum of 6 credits in major/degree. Credits in this course may not be used to fulfill minor requirements in Chemistry.

CHEM 498R INDEPENDENT STUDY - UNDERGRADUATE RESEARCH *Repeatable* 0.5-3 Units
Study of a selected topic or topics under the direction of a faculty member. Repeatable for a maximum of 6 credits in major/degree. Credits in this course may not be used to fulfill minor requirements in Chemistry.