CHEM - CHEMISTRY

CHEM 131 Chemistry I - Fundamentals of General Chemistry (3 Credits)
An overview of the Periodic Table, inorganic substances, ionic and covalent bonding, bulk properties of materials, chemical equilibrium, and quantitative chemistry. CHEM 131 is the first course in a four-semester sequence for students majoring in the sciences, other than Chemistry and Biochemistry majors.
Prerequisite: Must have math eligibility of MATH 120 or higher.
Corequisite: CHEM 132.
Recommended: For Science majors.
Credit Only Granted for: CHEM 103, CHEM 131, CHEM 135, CHEM 153 or CHEM 146.
Formerly: CHEM 103.
CHEM 132 General Chemistry I Laboratory (1 Credit)
Introduction to the quantification of chemical substances, including the concept of the mole and chemical stoichiometry. Additional work involves the synthesis of ionic substances and their qualitative characterization. Must be taken concurrently with CHEM 131.
Prerequisite: Must have math eligibility of MATH 120 or higher.
Corequisite: CHEM 131.
Credit Only Granted for: CHEM 103, CHEM 132, CHEM 136, CHEM 143, CHEM 147 or CHEM 177.
Formerly: CHEM 103.
CHEM 134 Chemical Principles for Engineering (1 Credit)
Basic chemistry for engineering students. Introduction to organic structures and polymers, gas laws, liquids, solids, phase changes, chemical kinetics and electrochemistry.
Prerequisite: Minimum grade of C- in CHEM 131; or minimum grade of C- in CHEM 146.
Credit Only Granted for: CHEM 134 or CHEM 135.
CHEM 135 General Chemistry for Engineers (3 Credits)
The nature and composition of matter, solutions, chemical reactions, equilibria, and electrochemistry, with applications to various fields of engineering.
Prerequisite: Must have math eligibility of MATH 120 or higher.
Credit Only Granted for: CHEM 103, CHEM 113, CHEM 131, CHEM 135, or CHEM 146.
CHEM 136 General Chemistry Laboratory for Engineers (1 Credit)
A laboratory course for engineering majors intending to take CHEM 231 and CHEM 232.
Prerequisite: Must have completed or be concurrently enrolled in CHEM 135 and must have math eligibility of MATH 120 or higher.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.
CHEM 146 Principles of General Chemistry (3 Credits)
An overview of the Periodic Table, inorganic substances, ionic and covalent bonding, bulk properties of materials, chemical equilibrium, and quantitative chemistry. CHEM 146 is the first course in a four-semester sequence for Chemistry and Biochemistry majors.
Prerequisite: Must have math eligibility of MATH 140 or higher.
Corequisite: CHEM 177.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry).
Credit Only Granted for: CHEM 103, CHEM 131, CHEM 135, CHEM 143, or CHEM 146.
Formerly: CHEM 143.
CHEM 177 Introduction to Laboratory Practices and Research in the Chemical Sciences (2 Credits)
First semester laboratory course required for CHEM and BCHM majors. Introduction to laboratory techniques, including safety practices, scientific ethics, and presentation of current research topics.
Prerequisite: Must have math eligibility of MATH 120 or higher.
Corequisite: CHEM 146, CHEM 131, or CHEM 135.
Restriction: Must be in a major within CMNS-Chemistry & Biochemistry department; or permission of CMNS-Chemistry & Biochemistry department.
Credit Only Granted for: CHEM 132, CHEM 136, CHEM 147, or CHEM 177.
CHEM 231 Organic Chemistry I (3 Credits)
The chemistry of carbon: aliphatic compounds, aromatic compounds, stereochemistry, arenes, halides, alcohols, esters and spectroscopy.
Prerequisite: CHEM 131, CHEM 135, or CHEM 146; and (CHEM 132, CHEM 136, CHEM 147, or CHEM 177); and a grade of C- or better in the prerequisites is required of College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM 232.
Credit Only Granted for: CHEM 104, CHEM 231, CHEM 233 or CHEM 237.
Formerly: CHEM 233.
CHEM 232 Organic Chemistry Laboratory I (1 Credit)
Provides experience in developing some basic laboratory techniques, recrystallization, distillation, extraction, chromatography.
Prerequisite: CHEM 131 and CHEM 132; or (CHEM 135 and CHEM 136); or (CHEM 146 and CHEM 147). And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM 231.
Credit Only Granted for: CHEM 104, CHEM 231, CHEM 233 or CHEM 237.
Formerly: CHEM 233.
CHEM 237 Principles of Organic Chemistry I (4 Credits)
The chemistry of carbons: aliphatic compounds, aromatic compounds, stereochemistry, arenes, halides, alcohols, esters, and spectroscopy.
Prerequisite: CHEM 131, CHEM 135, or CHEM 146; and (CHEM 132, CHEM 136, or CHEM 147); and a grade of C- or better in the prerequisites is required of College of Computer, Mathematical, and Natural Sciences majors and recommended for all students. Or permission of CMNS-Chemistry & Biochemistry department.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry) ; or must be in a major in ENGR-A. James Clark School of Engineering.
Credit Only Granted for: CHEM 233, (CHEM 231 and CHEM 232), or CHEM 237.
CHEM 241 Organic Chemistry II (3 Credits)
A continuation of CHEM 231 with emphasis on molecular structure; substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules.
Prerequisite: CHEM 231 and CHEM 232; or CHEM 237. And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Credit Only Granted for: CHEM 241, CHEM 243 or CHEM 247.
Formerly: CHEM 243.
CHEM242 Organic Chemistry Laboratory II (1 Credit)
Synthetic organic chemistry through functional group manipulation, introduction to instrumental analysis essential to analysis and structure elucidation.
Prerequisite: CHEM231 and CHEM232; or CHEM237. And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM241.
Credit Only Granted for: CHEM243 or CHEM247.
Formerly: CHEM243.

CHEM247 Principles of Organic Chemistry II (4 Credits)
A continuation of CHEM237 with emphasis on molecular structure, substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules.
Prerequisite: Minimum grade of C- in CHEM237; or permission of CMNS-Chemistry & Biochemistry department.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry); or must be an honors student.
Credit Only Granted for: CHEM243 or CHEM247.

CHEM271 General Chemistry and Energetics (2 Credits)
An introduction to the physical aspects of chemistry; chemical kinetics, thermodynamics and electrochemistry in the context of current chemistry research.
Prerequisite: CHEM241 and CHEM242; or CHEM247. And a grade of C- or better in the prerequisites for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM272.
Credit Only Granted for: CHEM113, CHEM153, CHEM271 or CHEM276.
Formerly: CHEM113.

CHEM272 General Bioanalytical Chemistry Laboratory (2 Credits)
An introduction to analytical chemistry with an emphasis on bioanalytical instrumentation and techniques.
Prerequisite: CHEM241 and CHEM242; or CHEM247. And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM271.
Credit Only Granted for: CHEM227, CHEM272 or CHEM277.

CHEM276 General Chemistry and Energetics - Majors (2 Credits)
An introduction to the physical aspects of chemistry for Biochemistry and Chemistry majors. Chemical kinetics, thermodynamics and electrochemistry in the context of current chemistry research.
Prerequisite: Minimum grade of C- in CHEM241 and CHEM242; or minimum grade of C- in CHEM247.
Corequisite: CHEM277.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry).
Credit Only Granted for: CHEM113, CHEM153, CHEM271 or CHEM276.
Formerly: CHEM113.

CHEM277 Fundamentals of Analytical and Bioanalytical Chemistry Laboratory (3 Credits)
Quantitative analysis, inorganic analytical chemistry, and an introduction to bio-analytical instrumentation and techniques.
Prerequisite: Minimum grade of C- in CHEM241 and CHEM242; or minimum grade of C- in CHEM247.
Corequisite: CHEM276.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry).
Credit Only Granted for: CHEM153, CHEM227, CHEM272 or CHEM277.

CHEM386 Experiential Learning (3-6 Credits)
Prerequisite: Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student’s internship sponsor.
Restriction: Junior standing or higher.

CHEM389 Pedagogy and Instruction in Chemistry (1-2 Credits)
Methodologies, theory and educational tools applicable to the field of undergraduate chemistry education. Examples covered will use content from introductory general and organic chemistry courses.
Prerequisite: Permission of instructor; and minimum grade of B- in CHEM231; and must have completed or be concurrently enrolled in CHEM241.
Repeatable to: 6 credits.

CHEM395 Professional Issues in Chemistry and Biochemistry (1 Credit)
Seminar on professional issues. Professional responsibilities, ethics, interview techniques, career opportunities, graduate/professional school, race and gender issues.
Restriction: Junior standing or higher; and must be in one of the following programs (Chemistry; Biochemistry).

CHEM398 Special Projects (2 Credits)
Honors projects for undergraduate students.

CHEM399 Introduction to Chemical Research (1-3 Credits)
Basic (chemical) research conducted under the supervision of a faculty member.
Restriction: Junior standing or higher; and permission of CMNS-Chemistry & Biochemistry department.

CHEM401 Inorganic Chemistry (3 Credits)
An overview of basic concepts of the electronic structure of the elements, chemical bonding and reactivity, from simple diatomic molecules to coordination compounds. These are viewed from simple (Lewis) to the most comprehensive molecular orbital theory. Symmetry and group theory are used throughout the course.
Prerequisite: CHEM276 or CHEM271; and (CHEM247 or CHEM241).

CHEM403 Radiochemistry (3 Credits)
Radioactive decay; introduction to properties of atomic nuclei; nuclear processes in cosmology; chemical, biomedical and environmental applications of radioactivity; nuclear processes as chemical tools; interaction of radiation with matter.
Prerequisite: Must have completed one year of college chemistry and one year of college physics.

CHEM425 Instrumental Methods of Analysis (4 Credits)
Modern instrumentation in analytical chemistry. Electronics, spectroscopy, chromatography and electrochemistry.
Prerequisite: CHEM272 and CHEM271; or (CHEM276 and CHEM277).

CHEM441 Advanced Organic Chemistry (3 Credits)
An advanced study of the compounds of carbon, with special emphasis on molecular orbital theory and organic reaction mechanisms.
Prerequisite: Must have completed or be concurrently enrolled in CHEM481; and 1 course with a minimum grade of C- from (CHEM241, CHEM247). Jointly offered with CHEM641.

CHEM460 Structure Determination Using Spectroscopic Methods (3 Credits)
The use of infrared, ultraviolet-visible, proton and carbon-13 nuclear magnetic resonance and mass spectroscopy for structure determination in organic chemistry.
Prerequisite: Must have completed CHEM243; or CHEM247; or (CHEM241 and CHEM242).
Formerly: CHEM660.
CHEM471 Techniques in Pulse NMR (1 Credit)
NMR techniques to operate, adjust, and calibrate the spectrometers and acquire and process NMR data in one and two dimensional NMR applications.
Prerequisite: CHEM241 and CHEM242; or CHEM247.
Recommended: CHEM460.
Restriction: Senior standing or higher.
Additional Information: Persons with heart pacemakers and/or metal implants cannot take the course due to potential health hazards.

CHEM474 Environmental Chemistry (3 Credits)
The sources of various elements and chemical reactions between them in the atmosphere and hydrosphere are treated. Causes and biological effects of air and water pollution by certain elements are discussed.
Prerequisite: CHEM481.

CHEM480 Principles of Physical Chemistry (3 Credits)
Covers elementary thermodynamics, principles of kinetics and catalysis and selected topics in molecular quantum mechanics, spectroscopy and statistical mechanics. Topics will emphasize core subjects along with applications to biosciences, materials science, environmental science and related areas.
Prerequisite: (CHEM276 or CHEM271); and (CHEM277 or CHEM272); and (MATH141 or MATH136); and (PHYS260 and PHYS261) or PHYS132.

CHEM481 Physical Chemistry I (3 Credits)
Thermodynamics and kinetics of chemical and molecular systems. Topics may include internal energy, heat, work, enthalpy, entropy, free energy, and spontaneity as well as reaction order, differential rate laws, integrated rate laws, and rate laws for multi-step processes.
Prerequisite: Minimum grade of C- in CHEM135, or minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277. And minimum grade of C- in MATH141. And minimum grade of C- in PHYS260 and PHYS261; or minimum grade of C- in PHYS141.

CHEM482 Physical Chemistry II (3 Credits)
Quantum mechanical nature of atoms and molecules. Topics may include model systems for electronic, vibrational, rotational and translational energies as well as connections to molecular spectroscopy and thermal distributions.
Prerequisite: Minimum grade of C- in CHEM135, or minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277. And minimum grade of C- in MATH141. And minimum grade of C- in PHYS260 and PHYS261; or minimum grade of C- in PHYS141.
Credit Only Granted for: CHEM482 or BCHM485.

CHEM483 Physical Chemistry Laboratory I (2 Credits)
An introduction to the principles and application of quantitative techniques in physical chemical measurements. Experiments will be coordinated with topics in CHEM481.
Prerequisite: Must have completed or be concurrently enrolled in CHEM481.

CHEM484 Physical Chemistry Laboratory II (2 Credits)
A continuation of CHEM 483. Advanced quantitative techniques necessary in physical chemical measurements. Experiments will be coordinated with topics in CHEM 482.
Prerequisite: CHEM481 and CHEM483; and must have completed or be concurrently enrolled in CHEM482.

CHEM498 Special Topics in Chemistry (3 Credits)
Prerequisite: Prerequisite varies with the nature of the topic being considered.