CHEMISTRY AND BIOCHEMISTRY (CHEM)

CHEM 1010: Chemical Concepts
Chemistry and Biochemistry
Introduction to the basic concepts and mathematical tools needed to study and understand basic chemistry. Intended for students who have not completed high school chemistry and need additional preparation before undertaking the general chemistry course sequence, Chem 105/106/115/116. Does not satisfy the University Core Curriculum science requirement. May not be used for major or minor credit. 3 lecture, 1 recitation hour.
4 credits
Prerequisites
MATH 0990 if required.
Potentially offered with the following Instruction Type(s):
Lecture
Course Fees:
$50.00

CHEM 1030: Survey of Chemistry I
Chemistry and Biochemistry
This course is an overview of topics in chemistry for nonscience majors. Designed specifically to satisfy the science requirement of the core curriculum. Associated lab is Chem 113. May not be used for major or minor credit in chemistry.
3 credits
Prerequisites
MATH 0990 if required.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 1031: Survey of Chemistry Lab. I
Chemistry and Biochemistry
Laboratory to accompany Chem 103 or Chem 201. May not be used for major or minor credit in chemistry.
1 credit
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 1040: Survey of Chemistry II
Chemistry and Biochemistry
This course is an overview of topics of current interest in chemistry for nonscience majors. Designed specifically to satisfy the science requirement of the core curriculum. Associated lab is Chem 114. May not be used for major or minor credit.
3 credits
Prerequisites
CHEM 1030 and DS 0099 if required.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 1041: Survey of Chemistry Lab. II
Chemistry and Biochemistry
Laboratory to accompany Chem 104 or Chem 202. May not be used for major or minor credit in chemistry.
1 credit
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 1050: General Chemistry I
Chemistry and Biochemistry
This course covers atomic and molecular structure, stoichiometry, solutions, physical properties of gases, liquids, and solids, chemical bonding, kinetics, thermodynamics and equilibrium, acid-base chemistry and the descriptive chemistry of the elements.
3 credits
Prerequisites
(min grade of B in CHEM 1010) or (min grade of B in MATH 1210 and MATH 1230) or (min grade of B in MATH 1250 or higher) or (min 24 on ACT Math) or (min 76 on ALEKS PPL) or (min 560 on SAT Math) or (min 580 on SATR Math).
Corequisites
CHEM 1051
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 1051: General Chemistry Lab. I
Chemistry and Biochemistry
Students who withdraw from Chem 105 must withdraw from Chem 115.
1 credit
Prerequisites
(min grade of B in CHEM 1010) or (min grade of B in MATH 1210 and MATH 1230) or (min grade of B in MATH 1250 or higher) or (min 24 on ACT Math) or (min 76 on ALEKS PPL) or (min 560 on SAT Math) or (min 580 on SATR Math) and (One Way-Co-Requisite CHEM 1050).
Corequisites
CHEM 1050
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 1052: Gen. Chem. Honors Recitation I
Chemistry and Biochemistry
Amplification of the topics covered in Chem 105.
1 credit
Corequisites
CHEM 1050
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 1060: General Chemistry II
Chemistry and Biochemistry
Continuation of Chem 105.
3 credits
Prerequisites
min grade of C in CHEM 1050.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 1061: General Chemistry Lab. II
Chemistry and Biochemistry
Students who withdraw from Chem 106 must withdraw from Chem 116.
1 credit
Prerequisites
One Way-Co-Requisite CHEM 1060.
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 1062: Gen. Chem Honors Recitation II
Chemistry and Biochemistry
Amplification of the topics covered in Chem 106.
1 credit
Prerequisites
One Way-Co-Requisite CHEM 1060.
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 1190: Fund of Forensic Science I
Chemistry and Biochemistry
This introductory lecture course establishes the theoretical foundation of forensic science and its role in the criminal justice system. It covers the history of forensic science, core scientific principles, legal frameworks for evidence admissibility, and ethical considerations for practitioners. Students will explore forensic disciplines, evidence types, and investigative methods through in-depth theoretical study, emphasizing scientific methods, legal standards, and professional responsibilities.
1 credit
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 1210: Fndmtls. of Organic Chemistry
Chemistry and Biochemistry
For those requiring a less detailed study of organic chemistry. May not be used for major or minor credit. (3 lecture, 3 lab hours).
4 credits
Prerequisites
(CHEM 1010 and CHEM 102) or (CHEM 1060 and CHEM 1061).
Potentially offered with the following Instruction Type(s):
Lecture/Lab
Course Fees:
$250.00

CHEM 2010: Environmental Chemistry I
Chemistry and Biochemistry
Agricultural chemicals, water pollution, essential foods, processed foods, food additives, drugs. Not open to students who have taken first-year chemistry. Not applicable to a major or minor in chemistry. Not acceptable for certification in chemistry of secondary school teachers. When taken in conjunction with Chem 113, satisfies science requirements of the core curriculum. May not be used for major or minor credit.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 2020: Environmental Chemistry II
Chemistry and Biochemistry
Population growth, nondegradable waste, mineral and energy sources, aerosols, air pollution, consumer chemicals. Not open to students who have taken first-year chemistry. Not applicable to a major or minor in chemistry. Not acceptable for certification in chemistry of secondary school teachers. When taken in conjunction with Chem 114, satisfies science requirements of the core curriculum. Chem 201 is not a prerequisite for Chem 202. May not be used for major or minor credit.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 2190: Fund of Forensic Chem Lab
Chemistry and Biochemistry
This practical laboratory course focuses on crime scene investigation and forensic evidence processing. Through weekly labs and workshops, students develop skills in evidence recognition, documentation, collection, and analysis, including forensic photography, sketching, impression evidence, biological evidence handling, and bloodstain pattern analysis. The course emphasizes proper scene management, chain of custody, and safety protocols, culminating in case presentations showcasing professional forensic investigation skills.
2 credits
Prerequisites
One Way Co-Requisite or Pre-Requisie CHEM 1190.
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 2210: Elementary Organic Chemistry I
Chemistry and Biochemistry
Structures and spectroscopy of organic compounds; organic reactions and their mechanisms.
3 credits
Prerequisites
min grade of C in CHEM 1060.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 2211: Elem. Organic Chem. Lab. I
Chemistry and Biochemistry
Investigation of organic functional groups; preparation and purification techniques. Students who withdraw from Chem 221 must withdraw from Chem 225.
1 credit
Prerequisites
CHEM 1061.
Corequisites
CHEM 2210
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 2212: Org. Chem. Honors Recitation I
Chemistry and Biochemistry
Amplification of the topics covered in Chem 221.
1 credit
Corequisites
CHEM 2210
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 2220: Elem. Organic Chemistry II
Chemistry and Biochemistry
Continuation of Chem 221.
3 credits
Prerequisites
min grade of C in CHEM 2210.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 2221: Elem. Organic Chem. Lab. II
Chemistry and Biochemistry
Continuation of Chem 225. Students who withdraw from Chem 222 must withdraw from Chem 226.
1 credit
Prerequisites
CHEM 2211 and One Way-Co-Requisite CHEM 2220.
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 2222: Org. Chem Honors Recitation II
Chemistry and Biochemistry
Amplification of the topics covered in Chem 222.
1 credit
Corequisites
CHEM 2220
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 2515: Intro. to Individual Research
Chemistry and Biochemistry
Students conduct a research project under faculty supervision. May be repeated for a maximum of 6 hours of credit. May not be used for major or minor credit.
0 - 2 credits
Prerequisites
CHEM 1050 and CHEM 1051.
Potentially offered with the following Instruction Type(s):
Independent Study
Course Fees:
$75.00 per credit hour

CHEM 2710: Biochemical Concepts
Chemistry and Biochemistry
Survey of the chemistry of biochemical molecules and metabolism. May not be used for major or minor credit.
3 credits
Prerequisites
CHEM 1210 or CHEM 2210.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 2999A: Intry. Spec. Topics in Chem.
Chemistry and Biochemistry
This course covers introductory special topics in chemistry. Topics may vary. May be repeated once for credit with a change in content. This course will not satisfy hours toward a major or minor in the Department of Chemistry and Biochemistry.
1 - 4 credits
Prerequisites
CHEM 1060.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 3140: Quantitative Analysis
Chemistry and Biochemistry
Introduction to the theory and practice of chemical analysis, including acid-base, oxidation-reduction, and precipitation titrations; spectrophotometry; ion-selective electrodes; and chromatography. (2 lecture, 6 lab hours).
4 credits
Prerequisites
min grade of C in CHEM 2220 and CHEM 2221 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab
Course Fees:
$250.00

CHEM 3190: Chem & Phys Meth. of Forensic
Chemistry and Biochemistry
This course provides an introduction to the application of chemical principles and scientific methodology to the analysis of forensic evidence, such as glass, soil, fingerprints, paint, firearms, and arson debris.
4 credits
Prerequisites
min grade of C in CHEM 2190 and CHEM 3140 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture
Course Fees:
$250.00

CHEM 3310: Physical Chemistry I
Chemistry and Biochemistry
Professional course. Quantum chemistry and molecular orbital theory, thermodynamics and statistical mechanics, kinetics and reaction dynamics, spectroscopy.
3 credits
Prerequisites
CHEM 2220 and MATH 2612 and (PHYS 2120 or PHYS 2140) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 3320: Physical Chemistry II
Chemistry and Biochemistry
Quantum chemistry and molecular orbital theory; spectroscopy.
3 credits
Prerequisites
CHEM 2220 and MATH 2612 and (Phys 2120 or Phys 2140) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 3321: Physical Chemistry Lab. I
Chemistry and Biochemistry
Laboratory course to accompany Chem 331 or 332.
1 credit
Prerequisites
24 Earned Credits and One Way-Co-Requisite CHEM 3310 or CHEM 3320.
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 3340: Biophysical Chemistry
Chemistry and Biochemistry
Introduction to physical and chemical principles applied to biological and life sciences.
3 credits
Prerequisites
CHEM 2220 and MATH 2612 and (PHYS 2120 or PHYS 2140) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 3400: Introduction to Astrochemistry
Chemistry and Biochemistry
This course provides an overview of the chemistry of space, based on the interdependent triangle of observation, experiment, and theory. Topics include the origin of atoms and molecules, chemical processes during planet formation, and planetary atmospheres in the solar system and beyond.
3 credits
Prerequisites
CHEM 1060 and 24 earned credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 3515: Individual Research
Chemistry and Biochemistry
Research project conducted by the student under faculty supervision. May be repeated for a maximum of 9 hours of credit.
1 - 3 credits
Prerequisites
CHEM 2220 and CHEM 2221 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Independent Study, Lecture
Course Fees:
$75.00 per credit hour

CHEM 3730: Intermediate Biochemistry
Chemistry and Biochemistry
This course is a survey of biochemical molecules and metabolism. May not be used for credit toward the major in chemistry.
3 credits
Prerequisites
min grade of C in CHEM 2210 and 24 Earned Credits.
Corequisites
CHEM 2220
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 3810: Chemistry for Teachers I
Chemistry and Biochemistry
Analysis of the concepts and models of chemistry with emphasis on computational skills for school teachers. Appropriate for persons seeking certification as chemistry or science teachers. May not be counted toward a degree in any of the sciences. (3 lecture, 2 lab hours each). (3 lecture, 2 lab hours).
4 credits
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 3820: Chemistry for Teachers II
Chemistry and Biochemistry
Analysis of the concepts and models of chemistry with emphasis on computational skills for school teachers. Appropriate for persons seeking certification as chemistry or science teachers. May not be counted toward a degree in any of the sciences. (3 lecture, 2 lab hours).
4 credits
Prerequisites
CHEM 3810 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 3830: Chemistry for Teachers III
Chemistry and Biochemistry
Analysis of the concepts and models of chemistry with emphasis on computational skills for school teachers. Appropriate for persons seeking certification as chemistry or science teachers. May not be counted toward a degree in any of the sciences. (3 lecture, 2 lab hours).
4 credits
Prerequisites
CHEM 3820 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 3999A: Intmd. Spec. Topics in Chem.
Chemistry and Biochemistry
This course covers intermediate special topics in chemistry. Topics may vary. May be repeated once for credit with a change in content. This course will not satisfy hours toward a major or minor in the Department of Chemistry and Biochemistry.
1 - 4 credits
Prerequisites
CHEM 2220 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4010: Inorganic Chemistry
Chemistry and Biochemistry
Application of physical chemical principles to the study of inorganic systems.
3 credits
Prerequisites
CHEM 3320 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4011: Inorganic Chemistry Lab.
Chemistry and Biochemistry
Synthesis, identification and study of physical and chemical properties of selected inorganic compounds.
1 credit
Prerequisites
24 Earned Credits and One Way-Co-Requisite CHEM 4010.
Corequisites
CHEM 4010
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 4150: Computer Methods in Chemistry
Chemistry and Biochemistry
Interfacing of computers to chemical instrumentation; data collection and analysis using computer methods.
3 credits
Prerequisites
CHEM 2220 and CHEM 3140 and MATH 2612 and (PHYS 2120 or PHYS 2140) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4212: Recitation in Organic Chem. I
Chemistry and Biochemistry
Expansion of material from elementary chemistry courses and transmission of basic concepts to elementary organic chemistry students.
1 credit
Prerequisites
CHEM 2220 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4222: Recitation in Organic Chem. II
Chemistry and Biochemistry
Continuation of Chem 421.
1 credit
Prerequisites
CHEM 2220 and CHEM 4212 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4231: Organic Analysis
Chemistry and Biochemistry
Expanded organic chemistry topics. Development of separation, purification, and identification skills in a problem-solving context. (1 lecture, 3 lab hours).
2 credits
Prerequisites
CHEM 2220 and CHEM 2221 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab
Course Fees:
$250.00

CHEM 4415: Forensic Chemistry Senior Res.
Chemistry and Biochemistry
Forensic chemistry students conduct a research project under faculty supervision.
3 credits
Prerequisites
CHEM 4690 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Independent Study
Course Fees:
$225.00

CHEM 4515: Senior Individual Research
Chemistry and Biochemistry
Students conduct senior research project under faculty supervision. May be repeated for a maximum of 6 hours of credit.
1 - 3 credits
Prerequisites
CHEM 2220 and CHEM 2221 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Independent Study

CHEM 4593: Forensic Science Internship
Chemistry and Biochemistry
Supervised internship at a local, state or federal crime laboratory.
3 credits
Prerequisites
CHEM 4690 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Internship

CHEM 4635: Senior Research and Discovery
Chemistry and Biochemistry
Research project conducted by the student under faculty supervision. Written report and either poster presentation or oral seminar presentation required. May be repeated once for credit.
1 - 3 credits
Prerequisites
CHEM 2221 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Independent Study
Course Fees:
$75.00 per credit hour

CHEM 4690: Intro. to Instrumental Anlys.
Chemistry and Biochemistry
Introduction to modern analytical instrumentation and methods, including chromatography (GLC and HPLC), spectroscopy (atomic emission, infrared, UV-visible, NMR, and fluorescence), and mass spectrometry. (2 lecture, 6 lab hours).
4 credits
Prerequisites
min grade of C in CHEM 3140 and (CHEM 3310 or CHEM 3320 or CHEM 3340) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab
Course Fees:
$250.00

CHEM 4700: Forensic DNA Analysis
Chemistry and Biochemistry
Introduction to the modern DNA analysis and profiling techniques used by state and federal crime laboratories, including DNA typing, PCR amplification, interpretation of DNA profiles and courtroom testimony. (2 lecture, 6 lab hours).
4 credits
Prerequisites
CHEM 4690 and 24 Earned Credits.
Corequisites
CHEM 4710
Potentially offered with the following Instruction Type(s):
Lecture/Lab
Course Fees:
$250.00

CHEM 4710: Biochemistry I
Chemistry and Biochemistry
Chemistry of biological macromolecules including proteins, carbohydrates, lipids and nucleic acids. Special topics in ligand binding, kinetics, and noncovalent forces.
3 credits
Prerequisites
min grade of C in CHEM 2220 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4720: Biochemistry II
Chemistry and Biochemistry
Intermediary metabolism, including catabolic and anabolic processes involving carbohydrates, lipids, proteins, and nucleic acids.
3 credits
Prerequisites
min grade of C in CHEM 2220 and CHEM 4710 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 4721: Biochemistry Lab.
Chemistry and Biochemistry
This course is an introduction to modern analytical techniques used for the separation and characterization of the biochemical macromolecules. (3 lab hours).
1 credit
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Laboratory
Course Fees:
$250.00

CHEM 5000: Safety in the Chemical Lab.
Chemistry and Biochemistry
Assigned readings and demonstrations on the use and handling of hazardous chemicals and chemical apparatus. Z grade
3 credits
Potentially offered with the following Instruction Type(s):
Independent Study

CHEM 5040: Analytical Envir. Chemistry
Chemistry and Biochemistry
This course will focus on the analytical chemistry of pollutants and instrumental techniques used to identify and quantify them.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5050: Teaching Undergraduate Science
Chemistry and Biochemistry
This course is designed for STEM graduate students and upper-level undergraduates seeking a career in academe. This course includes both discussion and practice of effective teaching techniques, assessments and technologies, an overview of current science education research, and equity and inclusion in the undergraduate science classroom. Graduate student status in a STEM program or consent of the instructor
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5060: Research Methods in STEM Ed.
Chemistry and Biochemistry
This course is an introduction to methods and tools available for conducting pedagogically sound STEM education research. Quantitative, qualitative, and mixed methods are discussed and practiced.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5120: Advanced Instrumental Analysis
Chemistry and Biochemistry
Theoretical and experimental treatment of gas and liquid chromatography, Fourier-transform NMR spectroscopy and mass spectrometry. (2 lecture, 3 lab hours).
3 credits
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 5130: Principles of Analytical Chem.
Chemistry and Biochemistry
A survey of the basic principles of analytical techniques and instrumentation.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5140: Fndmtls. of Electrochemistry
Chemistry and Biochemistry
Introduction to the theory and principles of electrochemistry, including modern electroanalytical techniques and microelectrodes.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5150: Applied Spectroscopy
Chemistry and Biochemistry
Application of theoretical principles to the interpretation of the various types of spectroscopy. (2 lecture, 3 lab hours).
3 credits
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 5180: Molecular Biochemistry I
Chemistry and Biochemistry
Examination of the organization and functional mechanisms of gene expression at the molecular level.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5190: Molecular Biochemistry II
Chemistry and Biochemistry
Continuation of Chem 580.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5191: Chemical Separations
Chemistry and Biochemistry
"Theoretical and mathematical treatment of chromatography and other separation techniques."
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5240: Principles of Organic Chem.
Chemistry and Biochemistry
A survey of the basic principles of organic chemistry with physical chemical principles.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5250: Org. Spectroscopy & Spectromet
Chemistry and Biochemistry
This course is an introduction to spectroscopic methods used to elucidate the structure of complex organic molecules.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5270: Adv. Org. Chem., Struc. Mech.
Chemistry and Biochemistry
Resonance and molecular orbital theory, linear free energy relations, and reaction mechanisms.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5280: Adv. Org. Chem., Struc. Synth
Chemistry and Biochemistry
Conformational analysis, carbanion chemistry, and synthetic reactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5290: Stereochemistry
Chemistry and Biochemistry
Configurational and conformational analysis of molecules; the steric course of organic chemical reactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5300: Advanced Organic Synthesis
Chemistry and Biochemistry
A study of the literature, reactions, and planning methods that are used in modern organic synthesis.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5310: Adv. Phys. Chem., Qtm. Chem.
Chemistry and Biochemistry
Elementary quantum chemistry; solution of the Schrodinger equation for simple chemical systems; molecular orbital theory.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5320: Chemical Thermodynamics
Chemistry and Biochemistry
Discussion of irreversible and equilibrium thermodynamics and application to various chemical problems.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5340: Physical Biochemistry
Chemistry and Biochemistry
Macromolecules: structure and function; thermodynamics and kinetics of confrontational transitions and macromolecule-ligand interactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5350: Principles of Physical Chem. I
Chemistry and Biochemistry
A survey of the principles of physical chemistry. Thermodynamics, kinetics, quantum mechanics, spectroscopy, statistical mechanics.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5360: Adv. Phys. Chem., Rxn. Dyn.
Chemistry and Biochemistry
Kinetic theory; molecular reaction dynamics; transition state theory.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5380: Princ. of Physical Chem. II
Chemistry and Biochemistry
Continuation of a survey of the principles of physical chemistry. Thermodynamics, kinetics, quantum mechanics, spectroscopy and statistical mechanics.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5440: Chem. Apps. of Group Theory
Chemistry and Biochemistry
Introduction to the principles of symmetry and group theory and their application to the description of molecular structure in terms of the chemical bonding models (VB, MO, and LF) and spectral properties (magnetic, vibrational, and electronic).
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5450: Chemical Literature
Chemistry and Biochemistry
Introduction to and practice in the use of chemical abstracts, journals, and other library reference materials. Z grade
3 credits
Potentially offered with the following Instruction Type(s):
Independent Study

CHEM 5460: Chem for HS Sci. Teacher I
Chemistry and Biochemistry
A review of the basic principles of chemistry and an overview of the new technology, instructional materials, and methods used for teaching chemistry at the high-school level. Appropriate for high-school teachers seeking certificate renewal or supplemental endorsement. May not be counted toward a degree in the sciences. May be repeated once for credit.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5470: Chem. for HS Sci. Teacher II
Chemistry and Biochemistry
A review of the basic principles of chemistry and an overview of the new technology, instructional materials, and methods used for teaching chemistry at the high-school level. Appropriate for high-school teachers seeking certificate renewal or supplemental endorsement. May not be counted toward a degree in the sciences. May be repeated once for credit.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5480: Workshop-Mdl Sch. Sci. Tchrs
Chemistry and Biochemistry
Selection and application of instructional materials and methods for secondary school chemistry. May not be counted toward an advanced degree in any of the sciences.
1 - 2 credits
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 5499A: Advanced Spec. Topics in Chem.
Chemistry and Biochemistry
This course covers advanced special topics in chemistry. Topics may vary. May be repeated once for credit with a change in content.
1 - 4 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5500: Safety in the Chemical Lab.
Chemistry and Biochemistry
Assigned readings and demonstrations on the use and handling of hazardous chemicals and chemical apparatus. Z grade
3 credits
Potentially offered with the following Instruction Type(s):
Independent Study

CHEM 5540: Analytical Envir. Chemistry
Chemistry and Biochemistry
This course will focus on the analytical chemistry of pollutants and instrumental techniques used to identify and quantify them.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5550: Teaching Undergraduate Science
Chemistry and Biochemistry
This course is designed for STEM graduate students and upper-level undergraduates seeking a career in academe. This course includes both discussion and practice of effective teaching techniques, assessments and technologies, an overview of current science education research, and equity and inclusion in the undergraduate science classroom. Graduate student status in a STEM program or consent of the instructor
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5560: Research Methods in STEM Ed.
Chemistry and Biochemistry
This course is an introduction to methods and tools available for conducting pedagogically sound STEM education research. Quantitative, qualitative, and mixed methods are discussed and practiced.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5620: Advanced Instrumental Analysis
Chemistry and Biochemistry
Theoretical and experimental treatment of gas and liquid chromatography, Fourier-transform NMR spectroscopy and mass spectrometry. (2 lecture, 3 lab hours).
3 credits
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 5630: Principles of Analytical Chem.
Chemistry and Biochemistry
A survey of the basic principles of analytical techniques and instrumentation.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5640: Fndmtls. of Electrochemistry
Chemistry and Biochemistry
Introduction to the theory and principles of electrochemistry, including modern electroanalytical techniques and microelectrodes.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5650: Applied Spectroscopy
Chemistry and Biochemistry
Application of theoretical principles to the interpretation of the various types of spectroscopy. (2 lecture, 3 lab hours).
3 credits
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 5680: Molecular Biochemistry I
Chemistry and Biochemistry
Examination of the organization and functional mechanisms of gene expression at the molecular level.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5690: Molecular Biochemistry I
Chemistry and Biochemistry
Theoretical and mathematical treatment of chromatography and other separation techniques.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5691: Chemical Separations
Chemistry and Biochemistry
"Theoretical and mathematical treatment of chromatography and other separation techniques."
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5740: Principles of Organic Chem.
Chemistry and Biochemistry
A survey of the basic principles of organic chemistry with physical chemical principles.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5750: Org. Spectroscopy & Spectromet
Chemistry and Biochemistry
This course is an introduction to spectroscopic methods used to elucidate the structure of complex organic molecules.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5770: Adv. Org. Chem., Struc. Mech.
Chemistry and Biochemistry
Resonance and molecular orbital theory, linear free energy relations, and reaction mechanisms.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5780: Adv. Org. Chem., Struc. Synth
Chemistry and Biochemistry
Conformational analysis, carbanion chemistry, and synthetic reactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5790: Stereochemistry
Chemistry and Biochemistry
Configurational and conformational analysis of molecules; the steric course of organic chemical reactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5800: Advanced Organic Synthesis
Chemistry and Biochemistry
A study of the literature, reactions, and planning methods that are used in modern organic synthesis.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5810: Adv. Phys. Chem., Qtm. Chem.
Chemistry and Biochemistry
Elementary quantum chemistry; solution of the Schrodinger equation for simple chemical systems; molecular orbital theory.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5820: Chemical Thermodynamics
Chemistry and Biochemistry
Discussion of irreversible and equilibrium thermodynamics and application to various chemical problems.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5840: Physical Biochemistry
Chemistry and Biochemistry
Macromolecules: structure and function; thermodynamics and kinetics of confrontational transitions and macromolecule-ligand interactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5850: Principles of Physical Chem. I
Chemistry and Biochemistry
A survey of the principles of physical chemistry. Thermodynamics, kinetics, quantum mechanics, spectroscopy, statistical mechanics.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5860: Adv. Phys. Chem., Rxn. Dyn.
Chemistry and Biochemistry
Kinetic theory; molecular reaction dynamics; transition state theory.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5880: Princ. of Physical Chem. II
Chemistry and Biochemistry
Continuation of a survey of the principles of physical chemistry. Thermodynamics, kinetics, quantum mechanics, spectroscopy and statistical mechanics.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5940: Chem. Apps. of Group Theory
Chemistry and Biochemistry
Introduction to the principles of symmetry and group theory and their application to the description of molecular structure in terms of the chemical bonding models (VB, MO, and LF) and spectral properties (magnetic, vibrational, and electronic).
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5950: Chemical Literature
Chemistry and Biochemistry
Introduction to and practice in the use of chemical abstracts, journals, and other library reference materials. Z grade
3 credits
Potentially offered with the following Instruction Type(s):
Independent Study

CHEM 5960: Chem for HS Sci. Teacher I
Chemistry and Biochemistry
A review of the basic principles of chemistry and an overview of the new technology, instructional materials, and methods used for teaching chemistry at the high-school level. Appropriate for high-school teachers seeking certificate renewal or supplemental endorsement. May not be counted toward a degree in the sciences. May be repeated once for credit.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5970: Chem. for HS Sci. Teacher II
Chemistry and Biochemistry
A review of the basic principles of chemistry and an overview of the new technology, instructional materials, and methods used for teaching chemistry at the high-school level. Appropriate for high-school teachers seeking certificate renewal or supplemental endorsement. May not be counted toward a degree in the sciences. May be repeated once for credit.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 5980: Workshop-Mdl Sch. Sci. Tchrs
Chemistry and Biochemistry
Selection and application of instructional materials and methods for secondary school chemistry. May not be counted toward an advanced degree in any of the sciences.
1 - 2 credits
Potentially offered with the following Instruction Type(s):
Lecture/Lab

CHEM 5999A: Advanced Spec. Topics in Chem.
Chemistry and Biochemistry
This course covers advanced special topics in chemistry. Topics may vary. May be repeated once for credit with a change in content.
1 - 4 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 6175: Research Method in Chemistry I
Chemistry and Biochemistry
Modern techniques and methods of research in chemistry. May be repeated for credit. (6 lab hours)
3 credits
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 6515: Res. Experience in Chemistry
Chemistry and Biochemistry
Students conduct laboratory-based research under faculty supervision. No grade. May be repeated for a maximum of 6 credits. Does not count toward the M.S. or Ph.D. in chemistry.
1 - 3 credits
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 6590: Masters Seminar
Chemistry and Biochemistry
Contributions to scientific knowledge by the master's candidate in chemistry; presentation required during the student's terminal year.
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 6997A: Thesis
Chemistry and Biochemistry
No grade
1 - 12 credits
Potentially offered with the following Instruction Type(s):
Thesis

CHEM 7000: Intro. to Graduate Research
Chemistry and Biochemistry
An introduction to a variety of aspects related to the performance and presentation of research, with emphasis on scientific ethics. Z grade
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7010: Advanced Inorganic Chemistry I
Chemistry and Biochemistry
Atomic and molecular structure, symmetry, acid-base chemistry, the crystalline solid state, coordination chemistry; including structure, bonding, electronic spectra and reactions; main group chemistry; organometallic chemistry; and bioinorganic chemistry.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7020: Advanced Inorganic Chem. II
Chemistry and Biochemistry
Continuation of Chem 701.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7035: Inorganic Techniques
Chemistry and Biochemistry
Atomic and molecular structure; chemical bonds; solvent systems; reactions of the elements and their compounds.
3 credits
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 7050: Seminar in Chemistry
Chemistry and Biochemistry
A discussion of the current literature in organic chemistry taken primarily from journal articles appearing in the previous year. May be repeated for credit. Z grade
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 7150: Slctd Top. in Analytical Chem.
Chemistry and Biochemistry
May be repeated once for credit if topics are different.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7160: Mass Spectrometry Fundamentals
Chemistry and Biochemistry
This course will provide students an overview of mass spectrometry and its applications, especially in the analysis of organic and biological samples. Students will learn the basic information required to evaluate and design mass spectrometry-based experiments in the biomedical sciences. Topics include an introduction to modern instrumentation and a survey of techniques and applications in mass spectrometry.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7173: Internship Sem in Coll Chem.
Chemistry and Biochemistry
Preparation and delivery of lectures in chemistry for use in classroom work and laboratory experimentation. May be repeated for credit. Z grade
3 credits
Potentially offered with the following Instruction Type(s):
Internship

CHEM 7185: Res. Method in Chemistry II
Chemistry and Biochemistry
Modern techniques and methods of research in chemistry. May be repeated for credit. (6 lab hours)
3 credits
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 7225: Organic Techniques
Chemistry and Biochemistry
Important research techniques in organic chemistry and preparation of selected materials in their use.
3 credits
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 7250: Selected Top. in Organic Chem.
Chemistry and Biochemistry
May be repeated once for credit if topics are different.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7330: Slctd Top. in Physical Chem.
Chemistry and Biochemistry
May be repeated once for credit if topics are different.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7410: Slctd Top. in Inorganic Chem.
Chemistry and Biochemistry
May be repeated once for credit if the topics are different.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7504: Area Seminars
Chemistry and Biochemistry
Student seminar presentation in one of the following areas: analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, physical chemistry. (May be repeated for credit).
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 7594: Doctoral Seminar
Chemistry and Biochemistry
Contributions to scientific knowledge by the doctoral candidate in chemistry; presentation required during student's terminal year.
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

CHEM 7610: Quantum Chemistry
Chemistry and Biochemistry
Rigorous treatment of quantum theory applied to molecular systems; Hartree-Fock and density functional theory; molecular orbital theory.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7620: Theory of Molecular Structure
Chemistry and Biochemistry
Theoretical studies of rotational, vibrational, and electronic spectra; magnetic spectroscopy; molecular beam and laser scattering.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7650: Bioinorganic Chemistry
Chemistry and Biochemistry
The role of metal ions in biological processes; structure of metal ion complexes; mechanisms of enzyme-metal complex catalysis.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7710: Biochemistry I
Chemistry and Biochemistry
Chemistry of biological macromolecules, including proteins, carbohydrates, lipids, and nucleic acids. Special topics in ligand, kinetics, and noncovalent forces. An independent study project is required.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7725: Biochemical Techniques
Chemistry and Biochemistry
Specialized laboratory methodology currently used in biochemistry.
4 credits
Potentially offered with the following Instruction Type(s):
Laboratory

CHEM 7730: Biochemistry II
Chemistry and Biochemistry
Intermediary metabolism, including catabolic and anabolic processes involving carbohydrates, lipids, proteins, and nucleic acids. An independent study project is required.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7740: Selected Top. in Biochemistry
Chemistry and Biochemistry
May be repeated once for credit if topics are different.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7760: Nucleic Acid Chemistry
Chemistry and Biochemistry
The structural and functional properties of nucleic acids will be examined from a chemical perspective and correlated to their biochemical significance.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7770: Protein Structure
Chemistry and Biochemistry
Discussion of forces involved in protein folding; common structural motifs; structure-function relationships; overview of experimental and computational methods used to determine protein structure and homologies.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

CHEM 7997A: Doctoral Thesis
Chemistry and Biochemistry
Preparation of a thesis of publishable quality on a topic approved by the student's advisory committee. The topic of the thesis may deal either with a critical review of some current topic in chemistry, a credible proposal on teaching the substance of chemistry at the college level, or the student's research. No grade
1 - 6 credits
Potentially offered with the following Instruction Type(s):
Independent Study

CHEM 7998A: Dissertation
Chemistry and Biochemistry
No grade
1 - 18 credits
Potentially offered with the following Instruction Type(s):
Dissertation