CHEMISTRY (CHEM)

CHEM 105 Chemistry and the Environment (4)
Is intended for non-science majors. This lecture/lab course strives to develop a broad outlook on the role of chemistry in everyday life (energy, pollution, water, food, drugs, etc.). Emphasis is on the historical, scientific, political and moral dimensions of the decision process. A variety of learning techniques will be utilized, such as formal lectures, discussion groups, audio-visuals, laboratory demonstrations, collaborative learning, and field trips (where appropriate). The laboratory component is designed to show chemistry in practice and enable students to solve environmental problems using chemistry.
Meets general education requirements: GE-Math/Science/Comp Sci Elec, GE-Scientific Inquiry
IAI Course Number: P1 903L

CHEM 120 Foundations of Chemistry (5)
Designed for students in health-related majors as well as for those seeking to fulfill general education requirements. It provides an introduction to inorganic, organic, and biological chemistry and the principles that govern them. The course will focus on the interrelatedness of all these areas as well as their practical applications to health science. The principles selected from the general and organic chemistry areas will be the ones directly linked to the topics studied in biochemistry. This will allow specific emphasis to be placed on the close link between the structure of a molecule and its function. The laboratory component will reinforce some of the lecture topics, but will also focus on how the scientific method is really used to solve problems. Student should have completed 2 years of high school algebra.
Meets general education requirements: GE-Math/Science/Comp Sci Elec, GE-Scientific Inquiry

CHEM 121 General Chemistry I (4)
Prerequisite: CHEM 123 (may be taken concurrently) and MATH 099
Introduces the student to some of the basic concepts in chemistry, especially in regards to the nature of matter from the standpoint of atoms, molecules, and ions. The structure of the atom is examined in depth, with emphasis on the energy of electrons and how this energy determines periodicity of the elements and the bonding of elements to form compounds. The mole concept is covered in great detail and is used to solve stoichiometric calculations. The properties of gases and gas laws will be used in molecular weight, stoichiometric, and density calculations. Basic thermodynamics of chemical changes is covered. Student should have completed 2 years of high school algebra.
Meets general education requirements: GE-Math/Science/Comp Sci Elec, GE-Scientific Inquiry
IAI Course Number: CHM 911, P1 902L

CHEM 122 General Chemistry II (4)
Prerequisite: CHEM 121 and CHEM 123 and CHEM 124 (may be taken concurrently)
Is a continuation of CHEM 121 in which students use their knowledge of structure, bonding, solutions, and stoichiometry to study the concepts of acid-base and redox reactions, kinetics, equilibrium systems and electrochemistry.
Meets general education requirements: GE-Math/Science/Comp Sci Elec, GE-Scientific Inquiry
IAI Course Number: CHM 912

CHEM 123 General Chemistry I Lab (1)
Prerequisite: CHEM 121 (may be taken concurrently)
Gives students hands-on experience designing experiments. The process of designing experiments will focus on developing appropriate methods which address specific problems or questions, and which incorporate controls. Ways of appropriately reporting and analyzing data will be stressed as will be scientific writing and oral presentation. Students will work in collaborative groups to execute these experiments. Student should have completed 2 years of high school algebra.

CHEM 124 General Chemistry II Lab (1)
Prerequisite: CHEM 122 (may be taken concurrently) and CHEM 121 and CHEM 123
Provides students with laboratory experiences that complement the content presented in CHEM 122. The course will provide students with opportunities to solve authentic and relevant problems. Collaborative groups of students will need to apply the concepts taught in lecture and technique shown in the laboratory to design experiments. Together they will execute these experiments, analyze the results, and present their findings in written laboratory reports and oral presentations.

CHEM 160 Biological Chemistry (4)
Prerequisite: (BIOL 124/5) or (CHEM 121)
Is designed for students with career goals in allied health sciences. The focus of the course will be on the four major types of biomolecules, and their structures and functions. Emphasis will be placed on the close link between structure and function. The unique properties and roles of organic functional groups in the structures of the biomolecules are stressed. The laboratory component will reinforce some of the lecture topics and highlight basic biochemical laboratory techniques. Three lecture periods and one two-hour laboratory period are scheduled.

CHEM 194 Topics (1-4)
Is a title given to a course which covers broad themes, practices, and subject content not currently offered in the curriculum. This course is directed primarily at non-majors and may be used for general education where approved.

CHEM 199 Topics in Chemistry (1-4)
Introductory courses in the chemical sciences that usually present a broad range of topics and are often interdisciplinary. These introductory courses are usually intended for non-science majors and cannot be used for the upper division requirements in the Biology or Environmental Science major. The specifics of the course depend on student and faculty interest.
May be repeated for up to 2 hours

CHEM 224 Organic Chemistry I (3)
Prerequisite: CHEM 122 and CHEM 225 (may be taken concurrently)
Is designed for science majors. The lectures will provide students with the fundamentals of organic chemistry. The general emphasis will be on the chemistry of aliphatic and aromatic hydrocarbons, stereochemistry, and ionic reactions with special emphasis on mechanisms and synthesis.
IAI Course Number: CHM 913

CHEM 225 Organic Chemistry I Lab (1)
Is designed to teach the most common techniques used in the field of organic chemistry. The approach is investigative where theories that govern techniques are conceptualized through hands-on experience. The students will learn how to perform the following techniques: extraction, recrystallization, melting point, distillation, chromatographic separation, infrared spectroscopy, and synthesis. In addition, an introduction to chemical literature will be emphasized.
IAI Course Number: CHM 913

CHEM 226 Organic Chemistry II (3)
Prerequisite: CHEM 224 and CHEM 227 (may be taken concurrently)
Is a continuation of Organic Chemistry I. The lectures will provide students with the fundamentals of organic reactions, mechanisms, and synthesis. The emphasis will be on the chemistry of alcohols, phenols, ethers, epoxides, carbonyl chemistry, amines, macromolecules, and chemistry of drugs.
IAI Course Number: CHM 914

CHEM 227 Organic Chemistry II Lab (1)
Prerequisite: CHEM 225
Is an investigative approach where the theories that govern synthesis are conceptualized through hands-on experience. The emphasis is on chemical synthesis, biosynthesis, spectroscopy, and qualitative organic identification of organic compounds.
IAI Course Number: CHM 914

CHEM 322 Biochemistry (3)
Prerequisite: CHEM 224 and CHEM 225
Correlates the functions and shapes of biomolecules with the unique chemistry of their monomeric units. Specifically, the structures and functions of proteins and carbohydrates are studied. Understanding the chemistry of these biomolecules demonstrates the general principle of how chemistry dictates the types of reactions the biomolecules are involved in, the reaction mechanisms, and the ways these reactions are regulated. This culminates in a survey of carbohydrate metabolism and its regulation, which demonstrates all the major biochemical principles.

CHEM 323 Biochemistry Lab (2)
Prerequisite: CHEM 225 and CHEM 322 (may be taken concurrently)
Provides students with research experiences in protein biochemistry. The overall goal is for students to not only understand basic biochemical techniques but use these techniques to answer a specific question. Students will have the flexibility to design their own research projects. A variety of techniques will be utilized and may include but is not limited to genomics, proteomics, enzyme assays, protein assays, enzyme kinetics, protein purification methods, and gel electrophoresis.

CHEM 324 Biochemistry II (3)
Prerequisite: CHEM 322
The continuation of Biochemistry I which has the overarching goals of introducing the language of biochemistry, understanding how macromolecular structure determines function, and understanding how energy is required by and transformed in biological systems. Topics covered in the second semester include photosynthesis, lipid and membrane structures, membrane transport, biosignaling, amino acid and lipid biosynthesis and catabolism, and hormonal regulation of metabolism.

CHEM 331 Instrumental Analysis (3)
Prerequisite: CHEM 224 and CHEM 225
Is designed to give the students a broad experience in the theory of instrumentation. The labs will be investigative in nature, requiring students to use the Internet and chemical literature to explore practical ways of using instruments for solving chemical problems qualitatively and quantitatively. Students will survey the theory and application of instruments such as visible, ultra violet, infrared, and fluorescence spectrophotometry as well as nuclear magnetic resonance, atomic absorption, chromatography and mass spectrometry. Two lecture periods and one three-hour laboratory meet per week.

CHEM 341 Medicinal Chemistry (3)
Prerequisite: CHEM 226
Covers many of the fundamental concepts of medicinal chemistry including the invention, discovery and identification of biologically active compounds; their targets, mode of action and metabolism; and principles of rational drug design.

CHEM 345 Perspectives in Evolution (3)
Prerequisite: CHEM 226 or BIOL 255
Examines Darwin's theory of evolution and natural selection and recent biology research that supports the role evolution has had in shaping organisms.

CHEM 375 Advanced Investigative Experience in Chemistry (3)
Prerequisite: CHEM 226
Exposes students to scientific investigation in greater depth than is achieved in standard laboratory courses and introduces them to scientific research. Students will be presented with a specific, multifaceted scientific question that they will explore in small groups. Each group will investigate one component of the overall question using critical thinking and the scientific method via traditional bench testing, fieldwork and/or numerical methods. The groups will then work together as a class to assimilate their results into a coherent explanation/solution to the overarching question.

CHEM 410 Senior Seminar (3)
This capstone course for biochemistry majors further develops their undergraduate research projects from previous semesters. Students will demonstrate critical thinking, an ability to synthesize scientific literature, an understanding of the scientific process and the ability to communication biochemical concepts in writing and oral presentations.
Restrictions: Students with a semester level of Senior may not enroll. Enrollment is limited to students with a major in Chemistry. Enrollment is limited to students with a concentration in Biochemistry.

CHEM 422 Bioanalytical Chemistry (4)
Prerequisite: CHEM 226
Give students an understanding how chemists analyze biochemical samples as well as how to properly collect and interpret experimental data. The laboratory component of the course is investigative in nature and allows students to gain experience with much of the instrumentation used in analytical chemistry. Students will survey the theory and application of techniques such as UV-Vis, fluorescence, infrared, and Raman spectroscopy, mass spectrometry, gas and liquid chromatography, electrophoresis, and electrochemistry. Reading the chemical literature will also be a point of emphasis.

CHEM 450 Biophysical Chemistry (3)
Prerequisite: CHEM 226 and PSCI 212 and MATH 181
Gives students a deeper understanding of the physical and mathematical underpinnings of chemistry as applied to biochemical systems. The course will focus on thermodynamics (the 1st and 2nd laws, phase and chemical equilibria, ion transport), kinetics (transitions state theory, Marcus theory), quantum mechanics (the Schrödinger equation, molecular orbital theory, methods of computational chemistry, modeling of protein structure0, and spectroscopy (optical spectroscopy, x-ray crystallography, NMR). Each topic will be connected to relevant examples in biochemistry.

CHEM 494 Topics in Chemistry (1-5)
Is a course which covers specific themes, practices, and subject content not currently offered in the curriculum. This course is directed primarily to student majoring in the subject area and could be used to complete major requirements. The course will provide an in-depth study of a specific topic.
May be repeated for up to 4 hours

CHEM 495 Directed Study (1-3)
Is an academic learning experience designed by the instructor. Student must have a 3.0 GPA or higher.

CHEM 496 Independent Study (1-3)
Is an academic learning experience in which the student initiates, designs and executes the course under the supervision of the instructor. Must have a 3.0 GPA or higher.