2015-2016 Chemistry Course Descriptions

CHE 100N Chemistry in Society. This course involves the study of the basic principles of chemistry and their applications to society. Specific topics are decided upon by the instructor but may include environmental issues, forensic science, energy, food, etc. This course does not count toward a major or minor in chemistry or a major in biochemistry. Three class hours and one three hour laboratory per week. 4 Semester Hours.

CHE 110N Foundations of Chemistry. This introductory course begins with an emphasis on the atomic and molecular nature of matter and the stoichiometric relationships of reactions. These fundamental principles will be applied to reactions in aqueous solutions, the ideal gas law, and an introduction to thermochemistry. Special emphasis will be placed on skills necessary to succeed in chemistry including problem solving strategies. This course is intended for students with 0 or 1 year of high school chemistry or as a preparatory course for CHE 120. Three class hours and one three hour laboratory per week. 4 Semester Hours.

CHE 115 Organic and Biochemistry for Nursing. This course focuses on basic organic chemistry and fundamental biochemistry. Topics include Lewis structures, physical properties, basic nomenclature, and chemical reactions of the major classes of organic compounds. Stereochemistry and acid-base topics are also included. The course applies organic chemistry to biochemicals with an emphasis on health-related applications. Topics include amino acids and proteins, enzymes, carbohydrates, lipids, nucleic acids, vitamins and coenzymes, and basic metabolism. Clinical topics include, but are not limited to, diabetes mellitus, clinical isoenzymes, lipoprotein profiles, drug therapies, and ethanol metabolism. Prerequisites: Admission to the Nursing Program and successful completion of CHE 110 with a grade of "C" or better. Students wishing to continue in the Nursing Program must earn a "C" or higher in this course. 4 Semester Hours.

CHE 120N Concepts in Chemistry. This introductory course is a study of atomic structure, intermolecular interactions, chemical kinetics, equilibrium, and chemical thermodynamics. This course provides a chemical basis needed for the continuing study of chemistry and other natural sciences. Prerequisite: 1 or 2 years of high school chemistry or CHE 110. Three class hours and one three hour lab period. 4 Semester Hours.

CHE 210 Environmental Chemistry. A study of the chemical reactions controlling the cycling of natural chemical species and anthropogenic pollutants in the water, soil and air environments of our earth system. The chemical processes operating in the natural environment including acid-base, complexation, redox, photochemical and biotic degradation phenomena are examined. Throughout the course, the chemistry underlying current issues of water, soil and air pollution, focusing on nutrient, metal and organic contaminants, are studied. Three hours of lecture and three hours of laboratory each week. Prerequisite: CHE 120. 4 Semester Hours.

CHE 212 Introduction to Green Chemistry. This course explores in detail the 12 principles of green chemistry and evaluates how the use of "greener" chemistry in industry and the laboratory can contribute to a more sustainable world. Includes some recent innovations by chemists and engineers and their real world applications. Prerequisite: CHE 120. Three class hours and one three-hour laboratory per week. 4 Semester hours.

CHE 214 Inorganic Chemistry I. A study of the physical and chemical properties of inorganic substances from a consideration of atomic structure, the nature of the chemical bond and the periodic system of the elements. Prerequisite: CHE 120. Three class hours and one three-hour laboratory per week. 4 Semester Hours.

CHE 220 Analytical Chemistry I. A study of the principles of chemical equilibrium and their applications to problems of chemical analysis. Includes an introduction to statistics and optical, electrochemical and chromatographic methods of analysis. Prerequisites: CHE 120 or permission of instructor. Three class hours and one three-hour laboratory per week. 4 Semester Hours.

CHE 231 Organic Chemistry I. A first course in the chemistry of carbon compounds designed for chemistry majors and premedical students. Emphasis is placed on the study of the nature and consequences of covalent bonds as encountered in organic compounds. The major aspects of the chemistry of aliphatic hydrocarbons and saturated functional groups are included. The principles of chirality and both IR and NMR spectroscopy also are studied. The laboratory concentrates on organic microlab techniques including gas chromatography and spectroscopy. Prerequisite: CHE 120. Three class hours and one three-hour laboratory per week. 4 Semester Hours.

CHE 232 Organic Chemistry II. A continuation of CHE 231. This course covers the major aspects of the chemistry of unsaturated functional groups and selected aromatic and heterocyclic compounds. Emphasis is placed on reaction mechanisms. The laboratory is designed to apply the techniques acquired in CHE 231 to synthesis, identification and mechanism problems. Prerequisite: CHE 231. Three class hours and one three-hour laboratory per week. 4 Semester Hours.

CHE 255 Basic Neurochemistry. This course is an introduction to the chemistry of the central nervous system. Topics will include neurocellular anatomy, growth, differentitation and development, and intercellular and intracellular signaling. Prerequisites: CHE 231. 2 Semester Hours.

CHE 320 Analytical Chemistry II. A study of the principles and applications of instrumental techniques used for analytical measurements such as spectrophotometry, chromatography, etc. Three class hours and one three-hour laboratory per week. Prerequisites: CHE 220 and current or prior enrollment in PHY 102 and MTH 142. 4 Semester Hours.

CHE 341 Physical Chemistry with Laboratory. An examination of the laws of classical thermodynamics associated with energy, entropy and Gibbs energy. These topics of study are developed from an atoms first approach via basic quantum mechanics and statistical mechanics. The laboratory involves the determination of a variety of thermodynamic functions studied in lecture including heat capacity, enthalpy and equilibrium constants and the exploration of basic quantum mechanical properties via spectroscopy. Prerequisites: CHE 120, PHY 102 and MTH 142. Three class hours and one three-hour laboratory per week. 4 Semester Hours.

CHE 370 Biochemistry. To understand what makes living organisms different than their environment, one must investigate their chemical makeup. The structures and properties of the four major classes of biological molecules, proteins, carbohydrates, lipids and nucleic acids will be studied. Other topics include enzyme kinetics, mechanisms of enzyme action and regulation of enzymes. Prerequisites: CHE 232 and BIO 140. Three class hours per week. 3 Semester Hours.

CHE 371 Biochemistry Laboratory. Biochemistry has changed the way we look at biology and chemistry by integrating the two to explain biological principles. In this laboratory students will use a variety of techniques including spectroscopy, chromatography and electrophoresis to learn about the chemistry of the four major classes of biological molecules: proteins, carbohydrates, lipids and nucleic acids. Special emphasis will be placed on the current use of computers in structural biochemistry. Specifically, students will gain experience in protein purification, enzyme kinetics and inhibition and analysis of DNA restriction digests. One three-hour laboratory per week. Corequisite: CHE 370. 1 Semester Hour.

CHE 374 Medicinal Chemistry. This course focuses on the fundamental aspects and current methodologies involved in the drug discovery process. The fundamental aspects include the physical, chemical, and pharmaceutical properties of drugs. A receptor-based, target-centered approach will be used to present the concepts central to the study of drug action. Application to the chemotherapy of cancer, immunomodulators, and viral and microbial diseases will be examined. Prerequisites: CHE 232. Two class hours. 2 Semester Hours.

CHE 381/382/481/482 Chemistry Seminar. Library research on a subject related to research interest of the student is followed by an oral presentation and discussion. Each student is responsible for giving one seminar in both junior and senior years. In addition, guest speakers from academia and industry will speak to the class. Prerequisites: Junior or senior standing, respectively. 1 Semester Hour each.

CHE 390 Research. The student will propose and carry out a defined, original research project in the field of chemistry under the supervision of a faculty member. A total of 60 hours of literature and laboratory research is expected for each credit hour taken. A formal written report of the research is due at the end of the semester. The course may be taken for more than one semester. Credit variable, 1-4 Semester Hours.

CHE 414 Inorganic Chemistry II. A survey of the descriptive chemistry of the elements. In addition, time is devoted to the study of bioinorganic systems, organometallic chemistry and pollution studies. Prerequisites: CHE 214, CHE 232, Senior standing or permission of instructor. Four class hours per week. 4 Semester Hours.

CHE 431 Advanced Organic Chemistry. Understanding topics in advanced organic chemistry requires knowledge of both synthetic and mechanistic chemistry. Synthetic chemists use reaction methodology to construct target compounds; mechanistic chemists study the detailed mechanisms by which these reactions proceed. Topics in synthetic chemistry include functional group transformations, retrosynthetic analysis and named reactions. Topics in mechanistic organic chemistry include kinetics, general and specific acid/base catalysis, kinetic isotope effects, linear free energy relationships, analysis of reaction coordinates and rearrangements. Prerequisite: CHE 232. 2 Semester Hours.

CHE 434 Advanced Spectral Analysis. An advanced course for the characterization of compounds with a focus on IR, UV-vis, NMR and MS analysis. Spectral interpretation will include multi-dimensional NMR and MS fragmentation analysis. Prerequisites: CHE 220 and CHE 232. Two hours per week of class and instrument time. 2 Semester Hours.

CHE 442 Applied Thermodynamics and Kinetics. Thermodynamic theories and laws will be applied to real systems including gases, liquids, solids, electrolytes, and phase changes in matter. The study of thermodynamics will be extended to non-equilibrium systems. Chemical kinetics, theories of reaction rates, and transport properties will be studied. Prerequisites: CHE 341. 2 Semester Hours.

CHE 443 Computational Chemistry and Spectroscopy. The theories of basic quantum mechanics will be extended to multielectron atoms, molecules, and chemical reactions. Computational tools and ab initio calculations will be introduced and developed using a project based approach. The powerful interplay between spectroscopy and quantum mechanics will be examined. Prerequisites: CHE 341. 2 Semester Hours.

CHE 455 Advanced Neurochemistry. This course is an advanced study of the chemistry of the central nervous system. Topics will include metabolism, sensory transduction, neural processing, and neurodegenerative diseases. Prerequisite: CHE 370. 2 Semester Hours.

CHE 472 Advanced Biochemistry: Metabolism, Nutrition and Pharmacology. Advanced study in biochemistry. Application of the laws and theories of chemistry to specific biological processes involved in metabolism, nutrition, and pharmacology. Topics include integration of major metabolic pathways, and the role of regulation including hormonal control. Prerequisites: CHE 370. 4 Sem. Hrs.

CHE 473 Advanced Biochemistry: Metabolism, Nutrition and Pharmacology Laboratory. In this laboratory students will use a variety of techniques including spectroscopy, chromatography and electrophoresis to learn about the chemistry involved in metabolism, nutrition, and pharmacology. Special emphasis will be placed on the current use of computers in structural biochemistry. One three-hour laboratory per week. Corequisite: CHE 472. 1 Semester Hour.

CHE 474 Advanced Biochemistry: Structural Biochemistry. Advanced study in biochemistry. Application of the laws and theories of chemistry to the specific study of the structure/function relationships in biological systems. Topics will include structural motifs of protein structure, DNA transcription and translation mechanisms, immune system recognition, and viral particle assembly. Prerequisites: CHE 370. 2 Semester Hours.

CHE 475 Advanced Biochemistry: Gene Expression, Genomics and Biotechnology Laboratory. In this laboratory students will use a variety of techniques including spectroscopy, chromatography and electrophoresis to learn about the chemistry involved with gene expression, genomics and biotechnology laboratory. Special emphasis will be placed on the current use of computers in structural biochemistry. One three-hour laboratory per week. Corequisite: CHE 474. 1 Semester Hour.

CHE 476 Advanced Biochemistry Laboratory. This laboratory course builds upon previous biochemistry laboratory experience to expose students to advanced biochemistry laboratory techniques including, but not limited to, protein expression and purification, isolation and manipulation of DNA, and culminates in an open-inquiry based project. Prerequisites: CHE 370 and CHE 371. Credit variable, 1-2 Semester Hours.

CHE 490 Senior Research. This course is required of all chemistry and biochemistry majors. This course has as its requirements the completion of a senior research project which will be communicated to the department in a poster and research paper. A total of four credits must be completed in one or both semesters of the senior year. Prerequisites: Chemistry or biochemistry major with senior standing. Credit variable, 1-4 Semester Hours.