

DEPARTMENT OF CHEMISTRY COURSE DESCRIPTIONS
Chemistry (CHEM)

CHEM 101. Physical Science.

Co-requisites: MATH 111, CHEM 101L. May not be taken for credits toward majors in the Departments of Biology or Chemistry. This course is an introduction to modern concepts of Astronomy, Physics, Chemistry, Meteorology and Geology. Studies include the structure of the universe and the laws of mechanics that govern it. The nature of the elements and the substances that they form are also investigated. Studies also include the nature of heat, light, and sound.

Overviews of weather and the structure of the earth are included.

Three hours lecture per week. Three hours.

CHEM 101L. Physical Science Laboratory.

Co-requisite: CHEM 101. May not be taken for credits toward majors in the Departments of Biology or Chemistry. This lab is designed to develop laboratory skills, and focus on safety procedures and experimental design and observation. The lab also reinforces the principles and concepts taught in Chem. 101 by means of hands-on application.

The student will learn the metric system, preparation of gases and chemicals, and the basics of heat, energy, electricity and mechanics. Students will acquire enhanced writing skills through the recording of data and preparation of reports. One two-hour lab per week. One hour.

CHEM 103. Earth Science.

Prerequisite: CHEM 101. May not be taken for credits toward majors in the Departments of Biology (Except Biology Education) or Chemistry. This course is an introduction to the principles of geology, meteorology and hydrology. Discusses the origins, current status, and interactions of the various ecosystems affecting life on earth. For students majoring in education. Cannot be used as an elective for science or math majors. Three hours lecture, two hours laboratory per week. Four hours.

CHEM 121. General Chemistry I.

Prerequisites: MATH 111. Corequisites: MATH 112 and ENGL

101. This course is an introduction to the modern concepts of matter and the changes which it undergoes. The study includes topics such as the description of matter and the nature of atoms, molecules, and molecular bonding. Formulae and equations representing these changes are also studied. The study follows with a discussion of the kinetic theory of gases and reviews of liquids and solutions (including acids, bases, and salts). Three hours of lecture and three hours of laboratory per week. Four hours.

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CHEM 122. General Chemistry II.

Prerequisites: A "C" or better in CHEM 121. A continuation of

CHEM 121 covering chemical kinetics, thermodynamics, equilibrium, oxidation and reduction reactions, and applications of these phenomena. The inorganic chemistry of the elements IA-VIIIA and an introduction to organic and biochemistry are also presented. Three hours of lecture and three hours of laboratory per week. Four hours.
CHEM 191-192. Freshman Seminar I & II.

Prerequisites: Academic advisement in the Department of Chemistry or academic advisement in Student Support Services with an intended major amongst those offered by the Department of Chemistry.

This course provides background information, skills, and selfevaluations to help students make a successful transition from the structured, closely monitored high school environment to the more unstructured, independent life at college. Included in the topics covered are time management, study skills, personalized curriculum planning, problem solving, grades enhancement, special demands of science courses, and successful laboratory performance. This course provides exposure to and information on some of the career options available to students in the Department of Chemistry. Outside speakers present seminars to the students. Students are encouraged and assisted in applying for summer internships and undergraduate research experiences. One-half hour each semester. One hour.

CHEM 200. Special Topics.

Perquisites: CHEM 121 or a major within the Division of Natural Science and Mathematics. Seminar and/or laboratory course covering current topics selected by the Department. Two hours.

CHEM 201. Analytical Chemistry.

Perquisites: CHEM 122 and MATH 112. An introduction to the principles and procedures of modern quantitative analysis. Quantitative aspects of stereochemistry, solution chemistry, and chemical equilibria are studied. Electroanalytical chemistry, complexometry and separation techniques are also covered. Standard volumetric and gravimetric techniques are covered. Emphasis is on quantitative measurements by non-instrumental methods. Three hours of lecture, three hours of lab and one hour of recitation per week. Four hours.

CHEM 231. Organic Chemistry I.

Prerequisites: CHEM 122. The fundamental aspects of chemical bonding, structural theory, stereochemistry and reaction mechanisms of organic compounds are introduced. Nomenclatures, occurrence,
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properties, preparations and reactions of aliphatic and aromatic compounds are included. Three hours of lecture and one three-hour laboratory per week. Four hours.

CHEM 232. Organic Chemistry II.

Prerequisite: CHEM 231. Nomenclatures, properties, preparations and reactions of organic compounds via functional group organization

are studied. Types of reaction mechanisms and spectroscopic methods of analyzing organic compounds are introduced. Three hours of lecture and one three-hour laboratory per week. Four hours.

CHEM 291-292. Sophomore Seminar I & II.

Prerequisites: Academic advisement in the Department of Chemistry or academic advisement in Student Support Services with an intended major amongst those offered by the Department of Chemistry.

Weekly session designed to introduce sophomore chemistry students to the scientific method, scientific writing and problem solving.

Assignments and discussions will concentrate on basic science skills, including scientific experimentation and analyses, reading comprehension for scientific literature, writing and problem solving skills. Reviews in preparation for departmental and standardized exams will be covered. Final grades will be based upon attendance and completion of assignments. One-half hour each semester. One hour.

CHEM 304. Inorganic Chemistry.

Prerequisites: CHEM 201, CHEM 231, and MATH 201. An advanced survey of theoretical and descriptive inorganic chemistry emphasizing such topics as atomic and molecular structure, periodic trends, theory of bonding, descriptive chemistry of transition metals and physical methods of examining inorganic compounds. Three hours of lecture and three hours of laboratory per week. Four hours.

CHEM 305. Physical Chemistry I.

Prerequisites: MATH 201, PHY 204, and CHEM 122

The applications of mathematics and physics to the solution of problems in chemistry. Topics covered are gases, the kinetic-molecular theory, the laws of thermodynamics, phases, solutions, equilibria, electrochemistry and chemical kinetics. Three hours of lecture and three hours of lab per week. Four hours.

CHEM 306. Physical Chemistry II.

Prerequisite: CHEM 305. A continuation of Physical Chemistry I.

Topics covered are quantum theory, chemical bonds, spectroscopy, molecular structure, statistical mechanics and crystal structure. Three hours of lecture and three hours of lab per week. Four hours.

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CHEM 391-392. Junior Seminar I & II.

Prerequisite: Academic advisement in the Department of Chemistry and Junior status. Weekly sessions designed to initiate the senior proposal preparation process for junior chemistry majors. Students will select a proposal topic and will collect and review scientific literature related to their thesis. Students will also present an in-class seminar from the literature review of their proposal topic. Current signal papers in the scientific literature will be reviewed by in-class discussions. Final grades will be based upon attendance and upon the successful completion of an acceptable literature review for the

senior research proposal. One half-hour each semester. One hour.

CHEM 401. Biochemistry I.

Prerequisites: CHEM 232 and BIOL 121 or BIOL 122. An introduction to the chemistry of biological compounds including a systematic study of carbohydrates, lipids, amino acids, proteins, nucleic acids, and enzymes kinetics. Metabolism of biological compounds is studied, as are the interrelations among the carbon, nitrogen, and energy cycles. A laboratory program designed to introduce the student to enzyme kinetics and the use of quantification. A brief introduction to instrumentation will be included. Three hours lecture and three hours laboratory per week. Four hours.

CHEM 402. Biochemistry II.

Prerequisite: CHEM 401. A continuation of Biochemistry I with an emphasis on the chemistry of physiological systems. Topics include but are not limited to biosynthesis of amino acids and nucleotides, molecular biology, coenzymes and vitamins, and immunogenetics. A laboratory program designed to introduce the student to the study of biological molecules includes experiments with procedures for the quantification, isolation, and characterization of various cellular components. Three hours lecture and three hour laboratory per week. Four hours.

CHEM 404. Instrumental Methods.

Prerequisites: CHEM 201 and MATH 201. An advanced level study of the theories and techniques of instrumental analysis. The nature of electromagnetic radiation and its applications to UV-visible, infrared, atomic absorption and mass spec are studied. Gas chromatography (GC), high-pressure liquid chromatography (HPLC), Nuclear Magnetic Resonance (NMR), polarographic and electroanalytical techniques are covered. The scientific application of electronics and optics are emphasized. Three hours lecture, three hours lab and one hour recitation per week. Four hours.

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CHEM 420. Undergraduate Research.

Prerequisite: Junior standing and completion of CHEM 231 & 232 or permission of the department. This course provides an opportunity for exposure to research under the guidance of a faculty member. Students will be shown how to use current literature and how to apply experimental techniques in the investigation of an original research project. A written report will be submitted before completion of course (ACS style guide). This course may be used to receive credit for summer internship research if approved by the department before the internship takes place. The course, if taken in-house, will meet for 3 hours (minimum) each week and three credit hours will be awarded. If used to receive credit for an internship, the program must consist of a minimum of 6 weeks of research and a written report must be submitted to department of Chemistry. Three credit

hours

CHEM 491-492. Senior Seminar I & II.

Prerequisites. Advisement in the Chemistry Department and Senior standing or permission of the department. First Semester seniors will work toward the completion of a proposal draft to their proposal advisor. Second semester seniors will present a proposal defense seminar to the department. Final grades will be based upon attendance and upon the successful and timely completion and submission of the senior proposal. One-half hour each semester. One hour.

Environmental Science (ESCI)

ESCI 221. Principles of Environmental Science.

Prerequisites: A grade of "C" or better in BIOL 121, BIOL 122, CHEM 121 and CHEM 122 (CHEM 111 and CHEM 112 for Bioinformatics majors). Basic concepts of environmental science and the impact of human activities on the environment will be introduced. Energy generation, population growth, food production, vector borne diseases, sources of radiation, pollution of air, land and water and their effects on living things and on the physical environment will be discussed. The basic testing and chemical and biological testing techniques are taught. Sampling methodology is reviewed. Three hours of lecture and three hours of laboratory per week. Four hours.

ESCI 222. Environmental Policies and Regulations..

Prerequisites: A grade of "C" or better in BIOL 121, BIOL 122, CHEM 121 and CHEM 122 (CHEM 111 and CHEM 112 for Bioinformatics majors). Environmental issues and concerns in modern society are explored. The policies and regulations promulgated

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by various governmental agencies to address these issues are catalogued. The standards setting and enforcement procedures are detailed along with opportunities and responsibilities of corporations, private organizations, and individual citizens. Financial liability and bonding options are discussed. The conflicting interests of society and individuals are explored. Three hours of lecture per week.

Three hours.

ESCI 321. Technology and Environmental Interaction.

Prerequisite: ESCI 222, CHEM 232, BIOL 121, BIOL 122. The role of commercialized technologies in meeting human needs is discussed. The impact of industrial and technological processes on the environment is discussed. The complex problems of acid rain, global warming, groundwater depletion, hazardous waste, and air, water and soil pollution will be considered. The role of microbial organisms and technology on the abatement and remediation of these problems is also investigated. Energy production and conservation measures are included in industrial activities. The regulatory and compliance processes are introduced. Three hours of lecture and three hours of

laboratory per week. Four hours.

ESCI 322. Environmental Management.

Prerequisite: ESCI 321. Discusses the planning, management, and conservation of terrestrial, aquatic and forest resources for a sustainable use in both urban and non-urban habitats. Residential, commercial and industrial wastes are included as both a resource and a pollutant with methods of reduction, control, and management discussed.

Three credit hours of lecture and three hours of laboratory per week. Four hours.

ESCI 407. Waste Characterization and Management.

Prerequisites: ESCI 321. Available technology is applied to classify residential, commercial, and industrial waste. Current quantities of generation are estimated. Polluting effects are identified. The most common current methods of reduction, control, and management are discussed along with possible options for the future. Three hours of lecture and three hours of laboratory per week. Four hours.

ESCI 422. Environmental Toxicology and Health.

Prerequisites ESCI 322, BIOL 309. Overviews the impact of hazardous substances on ecological systems and human health. Basic principles of toxicology, acute and chronic, ranging from molecular level to the dynamics of an ecosystem will be studied. Topics included are biodegradation, structure-activity relationship, routes of entry, mode of action, acceptable limits of toxic substances and po-

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tential biomarkers. Three hours of lecture and three hours of laboratory per week. Four hours.

Honors College (HNTH)

HNTH 391-392. Honors Thesis Seminar I & II.

Prerequisites: Junior status and Honors College membership. A two-semester sequence designed to initiate the thesis process required for graduation from the Honors College. The first semester is an introduction to research, the scientific method, scientific writing, and problem solving. Students will collect and review scientific literature related to areas of interest and select a thesis topic in addition to other course requirements described above. During the second semester, students will write a research prospectus outlining the goals and methodology for their thesis project. The student must take initiative in seeking a mentor to help in the design and supervision of the project. The deadline for submission of the prospectus to the department will fall on October 15th (for December graduation) or March 15th (for May graduation). Final grades will be based upon attendance and successful acceptance of the prospectus by the department.

One hour each semester. Two hours.

HNTH 491. Honors Thesis Seminar III.

Prerequisite: HNTH 392. A year-long writing project done during the senior year under the supervision of a mentor from the appropriate

department. The student must take initiative in seeking a mentor to help in the design and supervision of the project. A final document prepared following a specific format will be presented. The deadline for completion of the thesis is October (for December graduation) and March (for May graduation). Two (2) hours.

CHEM 121H. Honors General Chemistry I.

Prerequisites: MATH 111. Corequisites: MATH 112 and ENGL 101. This is an accelerated honors introductory lecture-laboratory course to the modern concepts of matter and the changes which it undergoes. The study includes topics such as the description of matter and the nature of atoms, molecules, and molecular bonding. Formulae and equations representing these changes are also studied. The study follows with a discussion of the kinetic theory of gases and reviews of liquids and solutions (including acids, bases, and salts). Three hours of lecture and three hours of laboratory per week. Four hours.

CHEM 122H. Honors General Chemistry II.

Prerequisites: A "C" or better in CHEM 121. An accelerated honors lecture-laboratory course that is a continuation of CHEM 121 covering chemical kinetics, thermodynamics, equilibrium, oxidation and

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reduction reactions, and applications of these phenomena. The inorganic chemistry of the elements IA-VIIIA and an introduction to organic and biochemistry are also presented. Three hours of lecture and three hours of laboratory per week. Four hours.