CHEMISTRY COURSE DESCRIPTIONS

CHEM 101: GENERAL CHEMISTRY I (4)
Introduction to fundamental principles of chemistry with emphasis on structure behavior correlation. Opportunity for computer use. Open to first-year students. Not open to students who have taken Chemistry 105. No prerequisite.

CHEM 101L: LABORATORY FOR GENERAL CHEMISTRY I (2)
This course allows students working in the lab to make measurements, synthesize and analyze compounds, and use Microsoft Excel to analyze the data obtained from their experiments. Students use both the traditional as well as the state-of-the-art instruments including an FID gas chromatograph and an FTIR spectrophotometer. Open to first-year students. Corequisite: CHEM 101.

CHEM 102: GENERAL CHEMISTRY II (4)
Fundamental principles of chemistry, including the study of molecular structure, chemical bonding, states of matter, thermodynamics, chemical kinetics, and chemical equilibria. Open to first-year students. Not open to students who have taken CHEM 105. Prerequisite: CHEM 101.

CHEM 102L: LABORATORY FOR GENERAL CHEMISTRY II (2)
Introduction to aspects of gases, colligative properties, chemical kinetics, equilibrium, and spectrophotometry. Open to first-year students. Corequisite: CHEM 102.

CHEM 105: PRINCIPLES OF CHEMISTRY (4)
Review of stoichiometry, equilibria, reaction rates, atomic structure, bonding, and thermodynamics. Designed for students who have had chemistry in high school. Open to first-year students who by placement examination demonstrate that they have a working knowledge of important elementary principles of chemistry. Not open to students who have taken CHEM 101 or CHEM 102.

CHEM 105L: LABORATORY FOR PRINCIPLES OF CHEMISTRY (2)
Introduction to selected aspects of synthesis, classical and instrumental analysis, safety, and the laboratory notebook. Open to first-year students. Prerequisite: q. Corequisite: CHEM 105.

CHEM 112: ENVIRONMENTAL ANALYSIS (4)
This class is mainly a hands-on class. It introduces the student to some of the chemistry background, the analytical techniques, and instruments used in the chemical analysis of environmental pollutants. Also listed as ES 112. Meetings: Lecture 1.5 hr., lab 3 hrs. Open to first-year students. Prerequisite: one to two years of high school chemistry.

CHEM 114: EXPERIENCE CHEMISTRY (4)
This is a hands-on course where students spend one afternoon a week in the laboratory working on such problems as how to tell if a glass of water is Evian or good old water from a Hollins fountain, how much acid you consume when you drink a can of soda, how much aspirin is in a Bufferin or Anacin tablet, or is there any aspirin in these tablets at all. These and other problems are dealt with using some simple and some advanced laboratory instruments. The once a- week lecture is used to look at the chemistry behind the experimental work. Prerequisites: one year of high school chemistry.

CHEM 115: FORENSIC SCIENCE: CSI HOLLINS (4)
Forensic science is any science used in public, in court, or in the justice system—any science used for the purposes of the law. Forensic scientists are involved in all aspects of criminal cases; their work serves both the defense and the prosecution. The forensic scientist's goal is the evenhanded use of all available information to determine the facts and, subsequently, the truth. This interdisciplinary course will explore and give students hands-on experience with many areas of scientific activity in forensics where laboratory and field investigation are important. Not intended for students majoring in biology or chemistry. Open to first-year students. No prerequisite.

CHEM 120: CHEMISTRY AND COOKING (4)
As Harold McGee, author of *On Food and Cooking*, a book which is arguably one of the most important treatises on the culinary arts, puts it, "[c]ooking is applied chemistry, and the basic concepts of chemistry—molecules, energy, heat, reactions—are keys to a clearer understanding of what our foods are and how we transform them." In this course we examine the nature of food and explore the fascinating changes it undergoes during cooking processes. Some attention will be given to human nutrition, and the course will have an integrated laboratory component. No prerequisite. Open to first-year students.

CHEM 197F: FIRST-YEAR SEMINAR - CONTRIBUTION OF SCIENCE TO GLOBAL ISSUES (4)
In today's world, over one billion people live in poverty, are plagued with disease, and live without enough food or clean water. Environmentally, things are not promising; there is global warming, pollution levels are higher than ever, the polar ice caps are melting and disappearing at an ever faster rate, the overall global temperature is rising, and natural disasters are becoming rampant. Politically, more countries than ever are in turmoil because of greed, corruption, power, and ignorance. As a result, many people are dying. Against this backdrop, human innovative and technological advances in the past 50 years far outpace advances made in the past 2,000 years. Even though such technological advances have enabled countries to be economically connected, allowing for unparalleled economic, business, and political growth, so many problems still exist in today's world. In this course, we explore how science can either be part of the problem or contribute to solving global issues. Selected seminar topics will focus on compelling questions related to the contribution of science to these global, economic, environmental, business, and political issues. Placement to be determined during the summer. Also listed as PHYS 197F.

CHEM 197F: FIRST-YEAR SEMINAR - WOMEN OF DISCOVERY (4)
In January 2005 in Cambridge, Mass., Harvard president Lawrence Summers said that innate differences between men and women might be one reason fewer women than men succeed in science and math careers. Contrary to his remarks, many women at Hollins excel in science and mathematics. In this course, we shall investigate successful women mathematicians', scientists', and physicians' styles of leadership in research, education, academic administration, business, and government. We shall learn about women who have been leaders in the past (e.g. Sister Kenny, Virginia Apgar, Rachel Carson, Barbara McClintock) and hear from women who are currently leaders in their fields. Students will read about theories of leadership and learn about the diversity of experiences among, and skills shared by, women math, science and medical leaders. They will develop a Web site about women scientists and mathematicians that includes alumnae histories and a catalog of alumnae who will serve as mentors to current undergraduates. Students will use problems that have been studied by well-known scientists and mathematicians in short projects that give them experience with some "thinking tools" such as observing, abstracting, recognizing patterns, imaging, analogizing, and modeling. Placement to be determined during the summer. Also listed as GWS 197F. Offered Term 1.

CHEM 204: GENERAL CHEMISTRY II (4)
Fundamental principles of chemistry, including the study of molecular structure, chemical bonding, states of matter, thermodynamics, chemical kinetics, and chemical equilibria. Open to first-year students. Not open to students who have taken CHEM 105. Prerequisite: CHEM 101.

CHEM 204L: LABORATORY FOR GENERAL CHEMISTRY II (2)
Introduction to aspects of gases, colligative properties, chemical kinetics, equilibrium, and spectrophotometry. Open to first-year students. Corequisite: CHEM 204.

CHEM 214: ANALYTICAL CHEMISTRY I (4)
An introduction to the basic processes of chemical analysis and the theories that govern them. Prerequisites: CHEM 105 and CHEM 105L (or CHEM 102 and CHEM 102L).

CHEM 214L: LABORATORY FOR ANALYTICAL CHEMISTRY (2)
This course will introduce you to different analytical techniques used in the academic, industrial, and government laboratories. You will learn to separate components of a mixture and analyze them quantitatively using procedures from those involving gravimetry to such state-of-the-art instruments as atomic absorption and diode array spectrophotometers and FID gas chromatograph. Corequisite: CHEM 214.

CHEM 221: ORGANIC CHEMISTRY I (4)
An introduction to structure, bonding, nomenclature, and physical properties of aliphatic and aromatic compounds, conformational analysis, stereochemistry, functional groups, and organic reactions. Prerequisites: CHEM 105 and CHEM 105L (or CHEM 102 and CHEM 102L); or permission.

CHEM 221L: LABORATORY FOR ORGANIC CHEMISTRY I (2)
Introduction to the procedures involved in preparing, purifying, separating, and analyzing simple organic compounds using microscale techniques. Introduction to the use of gas chromatography for qualitative and quantitative analysis and of infrared spectrophotometry for structural analysis of organic compounds. Corequisite: CHEM 221.

CHEM 222: ORGANIC CHEMISTRY II (4)
Organic reactions and their mechanisms. Prequisites: CHEM 221 and CHEM 221L.

CHEM 222L: LABORATORY FOR ORGANIC CHEMISTRY II (2)
Syntheses and analyses of more complex organic compounds using microscale and small-scale techniques. Practice in developing experimental procedures. Use of gas chromatography and infrared and UV-Vis spectrophotometry in structural analysis of organic compounds. Introduction to nuclear magnetic resonance spectrometry. Corequisite: CHEM 222.

CHEM 241: INORGANIC CHEMISTRY I (4)
Introduction to the structures, physical properties, and reactivities of the elements and their compounds. Both theoretical and descriptive aspects of this material will be covered. Prerequisites: CHEM 105 and CHEM 105L (or CHEM 102 and CHEM 102L); or permission.

CHEM 241L: LABORATORY FOR INORGANIC CHEMISTRY I (2)
Introduction to inorganic synthesis and to classical and instrumental methods of qualitative and quantitative analysis in inorganic chemistry. Corequisite: CHEM 241.

CHEM 244: INORGANIC CHEMISTRY II (4)
Introduction to the chemistry of the d-block elements and their compounds. Specific topics include symmetry; structures of and bonding in complexes; reactions and reaction mechanisms of complexes; nuclear magnetic resonance, electronic absorption, and infrared spectra of complexes; organometallic complexes; and selected chemistry of the first-row transition elements. Prerequisites: CHEM 241 and CHEM 241L.

CHEM 244L: LABORATORY FOR INORGANIC CHEMISTRY II (2)
Introduction to synthesis and analysis of complexes of first-row transition metal ions. Corequisite: CHEM 244.

CHEM 290: INDEPENDENT STUDY (2 or 4)
Independent study conducted below the advanced level. Application must be made with faculty prior to registration.

CHEM 320: ADVANCED ORGANIC CHEMISTRY (4)
Selected topics in organic chemistry. Prerequisites: CHEM 214 and CHEM 214L; CHEM 222 and CHEM 222L.

CHEM 320L: LABORATORY FOR ADVANCED ORGANIC CHEMISTRY (2)
Advanced techniques of organic synthesis. Experimental design. Instrumental analysis of organic compounds. Short research project. Corequisite: CHEM 320.

CHEM 331: PHYSICAL CHEMISTRY I (4)
Fundamental principles of physical chemistry, including kinetic molecular theory of gases, thermodynamics, and study of phase equilibria. Also listed as PHYS 331. Prerequisites: PHYS 202 and PHYS 202L; CHEM 105 and CHEM 105L (or CHEM 102 and CHEM 102L); MATH 242; or permission.

CHEM 331L: LABORATORY FOR PHYSICAL CHEMISTRY I (2)
The experiments carried out in the lab relate to the main topics covered in the class, including heat capacities of gases, thermodynamics properties of different systems, and phase diagrams. Corequisite: CHEM 331.

CHEM 332: PHYSICAL CHEMISTRY II (4)
Thermodynamics of solutions of electrolytes and nonelectrolytes, electrochemistry, transport properties of gases, an introduction to chemical kinetics and quantum mechanics, and application to basic problems in atomic and molecular structure and spectroscopy. Also listed as PHYS 332. Prerequisites: CHEM 331 and CHEM 331L.

CHEM 332L: LABORATORY FOR PHYSICAL CHEMISTRY II (2)
The experiments carried out in the lab relate to the main topics covered in the class, including electrochemistry, transport properties of liquids, ionic conductance, chemical kinetics and introductory quantum chemistry. Corequisite: CHEM 332.

CHEM 335: QUANTUM MECHANICS (4)
Also listed and described as PHYS 335.

CHEM 340: ADVANCED INORGANIC CHEMISTRY (4)
Selected topics in inorganic chemistry, including chemical and physical behavior of some of the less familiar elements, nonstoichiometric compounds, types and structures of complexions, ligand and crystal field theories. Investigation into both the factual and the theoretical aspects of inorganic chemistry that are of use

or interest to the students enrolled. Prerequisites: CHEM 222 and CHEM 222L; CHEM 244 and CHEM 244L; CHEM 331 and CHEM 331L. Corequisites: CHEM 332 and CHEM 332L.

CHEM 350: SPECIAL TOPIC - PHARMACEUTICALS, THEIR DISCOVERY, REGULATION, AND MANUFACTURE (4)
Topics may include but not necessarily be limited to: (1) drug discovery; (2) development of clinically usable drugs including optimization of novel lead structures and assessment of pharmacodynamics, safety and efficacy of promising drug candidates; (3) "case studies" of the development and use of certain classes of widely used drugs.; (4) FDA approval and FDA-regulated testing process. Prerequisites: CHEM 221 and CHEM 221L; CHEM 222 or CHEM 241.

CHEM 351: BIOCHEMISTRY (4)
The chemical nature of biological molecules and the relationship of their structure and function; the function of carbohydrates, nucleic acids, proteins, and lipids in living systems. Introduction to metabolism. Also listed as BIOL 351. Prerequisites: CHEM 222 and CHEM 222L; or the equivalent.

CHEM 351L: LABORATORY FOR BIOCHEMISTRY (2)
Experimental techniques used in biochemistry: potentiometry, centrifugation, chromatography, electrophoresis, spectrophotometry; isolation, purification, and characterization of proteins and nucleic acids, enzymology. Development of a research proposal and practice writing a grant proposal. Also listed as BIOL 351L. Corequisite: CHEM 351.

CHEM 352: ADVANCED BIOCHEMISTRY (4)
Topics such as enzyme kinetics, structure-function relationships in biological molecules, bioinorganic chemistry, and the physical chemistry of biological systems will be discussed. Also listed as BIOL 352. Prerequisite: CHEM 351.

CHEM 352L: LABORATORY FOR ADVANCED BIOCHEMISTRY (2)
Study of formation and properties of lipid micelles, denaturation of proteins and protein folding; isolation and characterization of a protein obtained using techniques of recombinant DNA. Short research project. Corequisite: CHEM 352.

CHEM 354: PHARMACEUTICAL CHEMISTRY (4)
Selected topics related to pharmaceuticals, their discovery, testing, regulation, and manufacture, including: structures and modes of action of the major classes of drugs; new methods used in drug discovery and development of clinically useful drugs; assessment of pharmacokinetics, pharmacodynamics, safety and efficacy of promising drug candidates; the role of various regulatory agencies in approval and use of drugs. Prerequisite: CHEM 222 and CHEM 222L.

CHEM 354L: LABORATORY FOR PHARMACEUTICAL CHEMISTRY (2)
Synthesis and qualitative and quantitative analyses of pharmaceutical substances, including use of analytical instruments. Corequisite: CHEM 354.

CHEM 390: INDEPENDENT STUDY IN CHEMISTRY (2 or 4)
Independent study conducted at the advanced level. Experimental component is normally required. May be offered during the summer and may be repeated up to a total of three courses. Application must be made with faculty prior to registration.

CHEM 399: INTERNSHIP (4)
May be proposed in any term. Application must be made with faculty prior to registration.

CHEM 480: SENIOR RESEARCH (4)
Open to seniors majoring in chemistry and to other qualified students with permission of the department. Students are required to give a one-hour seminar on some topic in chemistry chosen in consultation with a department member and using the primary literature. Required one regular term and Short Term. Application must be made with faculty prior to registration.

CHEM 490: SENIOR HONORS RESEARCH (4, 4)
Open to majors with permission of the department. Required both regular terms and Short Term. Interested majors should consult the chair of the department no later than the end of the second term of their junior year. Application must be made with faculty prior to registration.