CHEMISTRY (CHEM)

CHEM 100 CHEMISTRY AND CURRENT PROBLEMS (3)
Chemistry concepts and their application to current topics such as environment, energy, food, and health-related chemistry. Three lecture demonstration hours. Gen Ed II.A or Core: Biological & Physical Sciences.

CHEM 103 FOUNDATIONS OF CHEMISTRY (3)
Development of reasoning and quantitative skills for problem solving. Introduction to atomic structure, chemical reactions, chemical nomenclature, formulas, symbols and equations, basic skills of laboratory work. Three lecture hours. Not for credit toward Chemistry major or minor. Does not satisfy University Core requirement. S/U grading.

CHEM 104 INTRODUCTION TO ENVIRONMENTAL CHEMISTRY (4)
Principles of chemistry that are relevant to environmental issues, including water quality, nutrient pollution, air pollution, and specific classes of environmental contaminants. Three lecture hours and three laboratory hours. Prerequisite: three years of high school mathematics. Gen Ed II.A or Core: Biological & Physical Sciences. Lab/Class fee will be assessed.

CHEM 112 HONORS CHEMISTRY AND CURRENT PROBLEMS (3)
Discussion of a selected aspect of chemistry and its applications to technology, environment and society. Topics will vary. Three lecture-demonstration hours. Prerequisites: high school chemistry recommended. Honors College. GenEd II.A.

CHEM 115 HONORS CHEMISTRY FOR ALLIED HEALTH PROFESSIONS I (4)
An introduction to the concepts of general chemistry, including states of matter, atomic structure and periodic table, molecular structure, chemical reactions, intermolecular forces, solutions, buffers and pH and radio activity. Laboratory includes data handling and chemical and instrumental techniques. May not be used as a prerequisite for the Chemistry major program. Three lecture hours and one three hour laboratory. Prerequisite: MATH 115 or MATH 119 (either may be taken concurrently). Must be admitted to the Honors College. Gen Ed II.A or Core: Biological & Physical Sciences. Lab/Class fee will be assessed.

CHEM 121 ALLIED HEALTH CHEMISTRY I LECTURE (3)
Atomic and molecular structure, stoichiometry, chemical reactions, states of matter, solutions, intermolecular forces, acids, bases and buffers, chemical equilibrium, reaction energies and rates. Not open to those who successfully completed CHEM 105/ CHEM 115. CHEM 121 is a quantitative course and students are expected to be proficient in algebraic manipulations, exponentials, logarithms and graphical interpretation. Corequisite: CHEM 121L. Core: Biological and Physical Sciences or GenEd II.A.

CHEM 121L ALLIED HEALTH CHEMISTRY I LABORATORY (1)
Laboratory experiments to support concepts of Allied Health Chemistry I Lecture. Not open to those who successfully completed CHEM 105/ CHEM 115. Corequisite: CHEM 121. Core: Biological and Physical Sciences or GenEd II.A. Lab/class fee will be assessed.

CHEM 131 GENERAL CHEMISTRY I LECTURE (3)
Atomic and molecular structure; theories of bonding, stoichiometry; chemical reactions; gases; solutions. Open to science/math majors/minors only. Not open to those who successfully completed CHEM 110. CHEM 131 is a quantitative course and students are expected to be proficient in algebraic manipulations and graphical interpretation. Corequisite: CHEM 131L. Core: Biological & Physical Sciences or GenEd II.A Lab/class fee will be assessed.

CHEM 131L GENERAL CHEMISTRY I LABORATORY (1)
Laboratory experiments to support concepts of General Chemistry I Lecture. Not open to those who successfully completed CHEM 110. Corequisite: CHEM 131. GenEd II.A or Core: Biological & Physical Sciences. Lab/class fee will be assessed.

CHEM 132 GENERAL CHEMISTRY II LABORATORY (1)
Laboratory experiments to support concepts of General Chemistry II Lecture. Not open to those who successfully completed CHEM 111. CHEM 132 is a quantitative course and students are expected to be proficient in algebraic manipulations, exponentials, logarithms and graphical interpretation. Corequisite: CHEM 132L. Prerequisites: CHEM 131 & CHEM 131L. Core: Biological & Physical Sciences or GenEd II.A.

CHEM 132L GENERAL CHEMISTRY II LABORATORY (1)
Laboratory experiments to support concepts of General Chemistry II Lecture. Not open to those who successfully completed CHEM 111. Corequisite: CHEM 132. GenEd II.A or Core: Biological & Physical Sciences. Lab/class fee will be assessed.

CHEM 210 ANALYTICAL CHEMISTRY (5)
Theory and practice of chemometrics, gravimetry, titrimetry, chromatography, electrochemistry, and spectrophotometry. Three lecture hours, one laboratory-lecture hour, and three hours of laboratory. Prerequisites: CHEM 132 and CHEM 132L. Lab/Class fee will be assessed.

CHEM 301 PROFESSIONAL ETHICS FOR SCIENTISTS (3)
Integrity of scientific literature and the responsibilities of scientists to associates and the public. Discussion of principles and case studies emphasizing the physical sciences. Not open to those who have successfully completed WRIT 335, CHEM 335 or IDNM 305. Does not count toward Chemistry major or minor. Requires grade of C or better to fulfill Core or GenEd requirement. Prerequisites: three courses in ASTR, BIOL, CHEM, ENVS, GEOL, PHYS, or PHISC and at least two courses with laboratory; ENGL 102. Core: Advanced Writing Seminar or GenEd I.D.

CHEM 310 INSTRUMENTAL ANALYSIS (4)
Theory and practice of spectroscopic, chromatographic, and electrochemical instruments, their design and modification to solve practical problems. Three lecture hours and four laboratory hours. Prerequisites: CHEM 210, and CHEM 330 or CHEM 331. Lab/Class fee will be assessed.

CHEM 323 ORGANIC CHEMISTRY (4)
Atomic Structure; Valence-bond, Molecular orbital, and crystal-field theories of bonding; structure and bonding in ionic and metallic solids; chemistry of main-group and transition-metal compounds; acid-base theories; organometallic compounds; syntheses and characterizations of main-group and transition-metal compounds. Three lecture hours and three laboratory hours. Not open to students who successfully completed CHEM 321. Prerequisites: CHEM210 and CHEM331 or CHEM330. Lab/Class fee will be assessed.

CHEM 330 ESSENTIALS OF ORGANIC CHEMISTRY (5)
A one-term survey course in organic chemistry for non-chemistry majors taught on a conceptual basis. Not part of a traditional two-term organic chemistry sequence. Emphasis will be on principles, mechanisms, and modern techniques. Laboratory will include synthesis and identification of organic compounds. Three lecture hours, one recitation hour, and one three hour lab. Prerequisites: CHEM 132 and CHEM 132L. Lab/Class fee will be assessed.
CHEM 331 ORGANIC CHEMISTRY I (5)
Structure, stereochemistry, reactions and their mechanisms, preparation and properties of alkanes, alkenes, alkynes, alkyl halides and alcohols. Laboratory techniques include purification, spectroscopic (IR, NMR) and chromatographic (GLPC) methods of identification, and synthesis. Three lecture hours, one hour of laboratory lecture, and one three-hour lab. CHEM 331 and CHEM 332 comprise a traditional two-term organic chemistry sequence. Prerequisites: CHEM 132 and CHEM 132L. Lab/Class fee will be assessed.

CHEM 332 ORGANIC CHEMISTRY II (5)
Structure, reactions and their mechanisms, preparation and properties of alcohols, ethers, aldehydes, ketones, carboxylic acids and their derivatives, amines, carbohydrates, etc. Laboratory emphasizes synthetic techniques and modern qualitative organic analysis using chemical reactions and IR, UV, and NMR. Three lecture hours, one hour of laboratory lecture and one three-hour lab. CHEM 331 and CHEM 332 comprise a traditional two-term organic chemistry sequence. Prerequisite: CHEM 331. Lab/Class fee will be assessed.

CHEM 345 PRINCIPLES PHYSICAL CHEM (3)
Empirical derivations of the unifying physical principles of chemistry. Emphasis on applications including environmental chemistry and biochemistry. Not open to students who successfully completed CHEM 340 or CHEM 341. Prerequisites: CHEM 132 and CHEM 132L and (MATH 211 or MATH 273) and (PHYS 211 or PHYS 241).

CHEM 346 THEORETICAL FOUNDATIONS OF PHYSICAL CHEMISTRY (3)
Theoretical principles unifying the vast body of chemical observations. Extensive use of differential and integral calculus in developing mathematical models describing the behavior of chemical systems. Prerequisites: CHEM 345, MATH 274, PHYS 212 or PHYS 242.

CHEM 351 BIOCHEMISTRY I (3)
An overview of the chemistry of proteins, nucleic acids, carbohydrates, and lipids. Basic enzyme catalysis and kinetics, biochemical genetics, membrane structure, bioenergetics, and analytical methods. General principles of metabolism applied to several major pathways. Three lecture hours. Prerequisite: CHEM 330 or CHEM 332.

CHEM 356 BIOCHEMISTRY LAB (2)
Physical methods in biochemistry including spectrophotometry, centrifugation and ultra-centrifugation, electrophoresis, and chromatography. Isolation and purification of proteins and nucleic acids. Enzyme kinetics and the binding of small molecules to macromolecules. One lecture hour and three laboratory hours. Prerequisite: CHEM 351 (may be taken concurrently). Lab/Class fee will be assessed.

CHEM 357 BIOCHEMISTRY II (3)
Carbohydrate and lipid metabolism and their regulation, overview of amino acid and nucleotide metabolism, membrane structure and function, DNA-protein interactions and regulation of gene expression, and other topics in biochemistry. Prerequisite: CHEM 351.

CHEM 372 PHYSICAL CHEMISTRY LABORATORY (2)
Introductory experiments in physical chemistry involving thermodynamics, kinetics and spectroscopy to characterize properties of materials and chemical systems. Four laboratory-lecture hours. Prerequisites: CHEM 210 and CHEM 345 (CHEM 345 may be taken concurrently). Lab/Class fee will be assessed.

CHEM 391 SPECIAL PROBLEMS IN CHEMISTRY I (1-3)
A laboratory or library problem in chemistry to be selected by the student in consultation with the instructor. Students are required to submit a written report. May be repeated for a maximum of 6 units provided a different topic is taken. Prerequisite: consent of the instructor.

CHEM 392 SPECIAL PROBLEMS IN CHEMISTRY II (1-3)
A laboratory or library problem in chemistry to be selected by the student in consultation with the instructor. Students are required to submit a written report. May be repeated for a maximum of 6 units. Prerequisite: consent of the instructor.

CHEM 393 SPECIAL PROBLEMS IN CHEMISTRY III (1-3)
A laboratory or library problem in chemistry to be selected by the student in consultation with the instructor. Students are required to submit a written report. May be repeated for a maximum of 6 units. Prerequisite: consent of the instructor.

CHEM 394 SPECIAL PROBLEMS IN CHEMISTRY IV (1-3)
A laboratory or library problem in chemistry to be selected by the student in consultation with the instructor. Students are required to submit a written report. May be repeated for a maximum of 6 units. Prerequisite: consent of the instructor.

CHEM 395 INTERNSHIP IN CHEMISTRY (3)
Students will be given credit in this cooperative education program for approved experience in chemistry in the private or public sector. A portfolio of their work will be submitted by students and evaluated by the Chemistry Faculty. May be repeated once as CHEM 395 for a maximum of 6 units. Graded S/U. Prerequisites: CHEM 332 and CHEM 210, 3.0 GPA overall and junior class standing.

CHEM 396 INTERNSHIP IN CHEMISTRY (3)
Students will be given credit in this cooperative education program for approved experience in chemistry. A written final report will be submitted by students. May be repeated for credit as CHEM 396 for a maximum of 6 units. Graded S/U. Prerequisite: CHEM 395.

CHEM 401 COMMUNICATION SKILLS IN CHEMISTRY (1)
Effective scientific communication skills will be developed, culminating in student presentations to the Chemistry Department. Topics will be selected from chemical literature. Attendance at departmental seminars is required. Prerequisites: CHEM 210, CHEM 332.

CHEM 450 ECOLOGICAL BIOCHEMISTRY (3)
Examining diversity of natural products involved in biochemical interactions between plants, animals (including insects, humans, and other herbivores) and microbial flora. Effects that changes in the chemistry of these compounds have on function in ecological systems. Not open to students who have taken BIOL 450. Prerequisites: CHEM 330 or CHEM 331, and BIOL 200/BIOL 200L (BIOL 201) or BIOL 202.

CHEM 461 ADVANCED LECTURE TOPICS (1-3)
Advanced studies in one of the major topics in chemistry. Content will depend on instructor. This course may be repeated for a maximum of 9 units with a different topic. Prerequisites: CHEM 345, CHEM 332 and consent of instructor.

CHEM 462 ADVANCED LABORATORY TECHNIQUES (1-2)
An advanced, focused laboratory in chemistry. Content will depend on the instructor. This course may be repeated for a maximum of 6 units as a laboratory experience with a different focus. Prerequisites: CHEM 332, CHEM 372 and consent of instructor. Lab/Class fee will be assessed.

CHEM 472 APPLICATIONS OF ENVIRONMENTAL CHEMISTRY (3)
Fate and transport of chemical contaminants; physico-chemical processes controlling pollutant partitioning and distribution; implications of chemical speciation on toxicity to biota. Prerequisites: CHEM 210; CHEM 330 or CHEM 332; or consent of instructor.
CHEM 480 CHEMICAL TOXICOLOGY (3)
Study of the fate, effects, and mechanisms of action of toxicants; physical and biological factors affecting transport, transformation and toxicity of chemical stressors; emphasis on forensic and environmental applications. Prerequisites: CHEM 351, BIOL 200/ BIOL 200L (BIOL 201), or consent of instructor.

CHEM 491 RESEARCH IN CHEMISTRY (1-3)
An original experimental or theoretical investigation to be conducted under the supervision of a chemistry faculty member. Projects may span multiple semesters, and students may repeat the course for credit provided a different topic description is specified for each semester. A student should expect to complete a formal written report and/or presentation. Prerequisite: consent of instructor.

CHEM 499 HONORS THESIS IN CHEMISTRY (2)
Writing of an honors thesis based on independent research done under the direction of a faculty member. Oral presentation of the work in a public seminar. Prerequisites: consent of instructor, and open only to students who have been approved as departmental honors candidates.