

Guide to Terms

annually = course offered at least once a year during fall or spring semester
occasionally = course offered less frequently than once a year, contact advisor if interested

Prerequisite = course must be completed

Co-requisite = course must either be completed or be taken concurrently

CHE 099/Orientation to Chemistry

0 course units

(fall)

Restriction: Reserved for Chemistry majors

Required of all entering chemistry majors, this course provides an orientation to The College of New Jersey community; to chemistry faculty; and to the chemistry liberal arts and chemistry education programs offered by the Department of Chemistry including, among other topics, advisement opportunities, curriculum and scheduling, laboratory safety procedures, facilities, introduction to the library, professional societies and student affiliates, career options, and the American Chemical Society Code of Ethics. The academic component, involving common readings and assignments, is part of the course requirements. Grade is P/U and course is required for graduation (not applicable for transfer students).

SCI 111/Biochemistry and the Human Body

1 course unit

(with laboratory)

(fall, summer)

Restricted to Nursing students.

An introduction to general inorganic, organic and biochemistry, which explores the relationships between chemical processes and normal structure and function in the human body. Laboratory experiments investigate chemical reactions and develop techniques important for further study of human biology in a nursing clinical context.

CHE 201/General Chemistry I

1 course unit

(with laboratory)

(fall, spring, summer I)

Co-requisite: MAT 096

Laws and theories of matter in its various states: atomic and molecular structure from quantum and orbital interpretations; kinetics and equilibrium; periodicity and properties. Quantitative experiments coordinated with lectures. A working knowledge of elementary algebra is required. Successful completion of a high school chemistry course is strongly recommended.

CHE 202/General Chemistry II

1 course unit

(with laboratory)

(fall, spring, summer session II)

Prerequisite : CHE 201 with minimum grade of C-

Laws and theories of matter in its various states: atomic and molecular structure from quantum and orbital interpretations; kinetics and equilibrium; periodicity and properties. Quantitative experiments coordinated with lectures. A working knowledge of elementary

algebra is required. Successful completion of a high school chemistry course is strongly recommended.

CHE 310/Analytical Chemistry **1 course unit**

(with laboratory)

(fall, spring)

Prerequisite: CHE 202 with minimum grade of C-

A study of quantitative analysis including analytical data treatment, equilibrium calculations, volumetric determinations, and electrochemical analysis.

CHE 316/Sophomore Chemistry Seminar **0.25 course units**

(fall, spring)

Restriction: Reserved for Chemistry majors

Prerequisite: CHE 099

A seminar course designed for chemistry majors. Included in this course are an introduction to scientific word processing, molecular-modeling programs, and other software computer programs needed by the chemist. Other topics include use of the chemical literature and the library computer search program *SciFinder Scholar*. Professionalism and ethics, resumes, and internship opportunities will also be discussed. Grade is P/U and course is required for graduation.

CHE 317/Junior Chemistry Seminar **0.25 course units**

(fall, spring)

Prerequisite: CHE 316

Restriction: Reserved for Chemistry majors

Designed to prepare students for careers in the chemical field. Topics include graduate/professional school applications and opportunities, laboratory safety and ethics, interview skills, scientific resume writing, networking skills, information literacy, and presentations on different chemistry topics. Grade is P/U and course is required for graduation.

CHE 331/Organic Chemistry I **1 course unit**

(with laboratory)

(fall, spring, summer I)

Restriction: Required for chemistry majors, open to others on space available basis

Prerequisite: CHE 202 with minimum grade of C-

CHE331 is the first of a 2-semester sequence at the sophomore-junior level. The lecture will focus on the basic principles of organic chemistry (bonding, molecular shapes, stereochemistry), reactions of fundamental classes of organic compounds, and an introduction to spectroscopic structure determination methods. The lab will focus on basic laboratory techniques (separation, purification, identification) employed in organic chemistry. In addition, components will involve experiments or workshops designed to reinforce principles from lecture.

CHE 332/Organic Chemistry II

1 course unit

(with laboratory)

(fall, spring, summer II)

Prerequisite: CHE 331 with minimum grade of C-

CHE 332 is the second of a two-semester sequence at the sophomore-junior level for chemistry and biology majors and pre-health career students. The course will focus on the reactions of aromatic compounds, carbonyl compounds, carboxylic acid derivatives, the chemistry of amines and phenols, and special topics including chemical applications of biological compounds. The lab will focus on advanced laboratory techniques and synthesis.

CHE 350/Essentials of Biochemistry

1 course unit

(fall)

Restriction: Not open to chemistry majors

Prerequisites: BIO 211 and CHE 332

A one-semester lecture course covering amino acids and protein structure and function, intermediary metabolism, lipids, carbohydrates, and nucleic acids. Designed for non-Chemistry majors.

CHE 360/Forensic Chemistry

1 course unit

(with laboratory)

(fall)

Prerequisite: CHE 332

This course approaches the challenges, methods, and analyses of forensic science from a fundamental, chemical perspective. Topics include drug analysis, arson investigation, questioned document analysis, and the analysis of paint and gunshot residue samples.

CHE 370 Selected Topics in Chemistry

1 course unit

(occasionally)

Prerequisite: Approval of department chair

Selected topics of current relevance and interest in chemistry will be presented by faculty and guest lecturers with special areas of competency. Topics will be announced in advance.

Current offering:

Environmental Chemistry– (Spring) This course provides background in the science, history, and social impact of environmental chemistry. Topics include: sustainability and green chemistry, hazardous wastes and their management, toxicity of substances, pesticides, water and air quality, climate change, fossil fuels and renewable energy. *Prerequisites:* MAT 096 and CHE 202.

CHE 371/Quantum Chemistry **1 course unit**

(with laboratory)

(spring)

Prerequisites: MAT 128, PHY 202 and CHE 331

Co-requisite: CHE 310

A study of quantum mechanics as it applies to atoms and molecules, chemical bonding and spectroscopy.

CHE 372/Chemical Thermodynamics **1 course unit**

(with laboratory)

(fall)

Prerequisites: MAT 128, PHY 202, CHE 310 and CHE 331

A study of thermodynamics, kinetics, statistical mechanics, and other areas fundamental to an understanding of the physical behavior of matter.

CHE 399/Internship in Chemistry **variable course units**

(fall, spring)

Prerequisite: Permission of department chair

This arrangement provides an opportunity for practical field experience. See department chair for further information.

CHE 410/Instrumental Analysis **1 course unit**

(with laboratory)

(even years, fall)

Prerequisites: CHE 310 and CHE 371

A study of principles, applications, and operations of chemical instrumentation.

CHE 415/Separation Science **1 course unit**

(occasionally)

Prerequisite: CHE 371

Separation techniques to be covered include wet-chemistry separation and instrumental separation. Separation instrumentation is emphasized and includes capillary electrophoresis and a variety of chromatograph. Hands-on experiments are arranged for students to practice chemical separation in the laboratory.

CHE 430/Biochemistry **1 course unit**

(with laboratory)

(spring)

Prerequisites: CHE 332 and CHE 310

The fundamental principles of chemistry as they apply to biological processes with emphasis on proteomics. Designed for chemistry majors with little to no background in biology or genetics. The laboratory focuses on the development and use of lab techniques and computer skills critical to the study of biochemistry.

CHE 451/Inorganic Chemistry—Structure and Bonding **1 course unit**

(with laboratory)
(odd years, spring)

Co-requisite: CHE 371

A study of inorganic chemistry exploring modern concepts of structure and bonding with considerable emphasis placed on computer-aided molecular modeling, crystallography and spectroscopy (UV and IR).

CHE 452/Inorganic Chemistry—Reactions and Mechanisms **1 course unit**

(with laboratory)
(even years, spring)

Prerequisites: CHE 332

Co-requisite: CHE 372

A study of inorganic chemistry exploring modern concepts of synthesis and reactivity with focus placed on reaction mechanism and the role of inorganic complexes in chemical catalysis. Analysis of mechanism by spectroscopic techniques is incorporated along with an independent lab-based research project.

CHE 457/Organometallic Chemistry Laboratory **1 course unit**

(with laboratory)
(occasionally)

Prerequisites: CHE 371, CHE 372 and CHE 451

A study of modern concepts of structure and bonding in organotransition metal chemistry emphasizing synthetic methods, catalysis, and reaction mechanisms.

CHE 470/Selected Topics in Chemistry **1 course unit**

(occasionally)

Prerequisite: CHE 332 and permission of department chair

Selected topics of current relevance and interest in chemistry will be presented by faculty and guest lecturers with special areas of competency. Recent topics include mass spectrometry of biomolecules, materials chemistry, bioorganic chemistry, spectroscopy, medicinal chemistry, stereochemistry, and heterocyclic chemistry. Topics will be announced in advance.

CHE 471/Forensic Applications of Mass Spectrometry **1 course unit**

(with laboratory)
(odd years, spring)

Prerequisites: CHE 332 and CHE 310

This course discusses mass spectrometry instrumentation, and the interpretation of mass spectra obtained using GC/MS, using forensic applications and examples such as arson investigations and drug analyses.

CHE 474/Special Topics in Biochemistry

1 course unit

(Lecture and Lab; Other)

(occasionally)

Prerequisite: varies

Faculty members and/or guest lecturers will cover topics in areas of Biochemistry within their research experience, expertise, or special interests. Topics and format for the course will be announced in advance.

Current Offerings:

Chemical Biology– This course takes an interdisciplinary approach to the field of Chemical Biology. The topics covered will include synthetic biology, biological synthesis, disruption of protein-protein and protein-macromolecular interactions, common techniques and assays used in chemical biology, genomics and proteomics. Students will get hands-on experience with synthesis of unnatural amino acids, solid phase peptide synthesis, purification and characterization through chromatography, and analysis of peptide folding using spectroscopic methods. *Prerequisites:* CHE 332 and CHE 430.

Insect Biochemistry and Toxicology– A comprehensive examination of insecticides from a biochemical/bioorganic perspective. The course reviews insecticide chemistry, insecticide mode of action, and the metabolism of insecticide. The evaluation of pharmacological potency, principles of insecticide selectivity and resistance, and the environmental and societal effects of insecticides will also be discussed. *Prerequisites:* CHE 332 and CHE 430.

Kitchen Chemistry (0.5 course unit)– This course provides a chemical understanding of everyday life in the kitchen. Students will learn to approach the kitchen in a scientific way and how to become better chefs and eat better themselves. *Prerequisite:* CHE 332.

CHE 476/Special Topics in Organic Chemistry

1 course unit

(Lecture and Lab; Other)

(occasionally)

Faculty members and/or guest lecturers will cover topics in Organic Chemistry within their research experience, expertise, or special interests. Topics and format for the course will be announced in advance.

Current Offerings:

Medicinal Chemistry– An introduction to drug design, synthesis, and mode of action. The objectives of this course are 1) to show how leads for biologically active compounds are generated, 2) to explain how new chemical entities are generated from lead compounds, 3) to describe what factors are responsible for a drug's biological response, 4) to describe the relationships between structure and biological function of organic compounds, and 5) to demonstrate the basic principles of ADME(T) (adsorption/distribution/metabolism/ excretion/(toxicology). *Prerequisite:* CHE 332.

The Wonders of Asymmetric Synthesis– This course focuses on the fundamentals of stereochemistry and will introduce the student to important asymmetric synthetic techniques that have greatly influenced developments in organic chemistry and the pharmaceutical industry. The laboratory portion of the course will include several multi-week experiments, in which methods of asymmetric synthesis will be performed and analysis of products using spectroscopic techniques will also be utilized.

Prerequisite: CHE 332.

CHE 478/Special Topics in Condensed Matter

1 course unit

(Lecture/Discussion and Lab; Other)

(annually)

Faculty members and/or guest lecturers will cover topics in magnetism, energy materials, semiconductors and superconductors, biophysics, crystal engineering, thermodynamic or spectroscopic characterization of materials, or other areas related to material science and condensed matter physics. Topics and format for the course will be announced in advance.

Current Offerings:

Spins– An introduction to the theory of nuclear magnetic resonance and electron paramagnetic resonance spectroscopies and their application to the study of chemical structure and dynamics.

Prerequisites: CHE 202, MAT 128, PHY 202, **and** (CHE 371 OR PHY 321)

Supramolecular Chemistry– This interdisciplinary course covers the concepts of supramolecular chemistry and its application in crystal engineering. Students will gain and understanding and appreciation for non-covalent, intermolecular interactions and their effect on property and function of materials. *Prerequisites:* CHE 202, MAT 128, PHY 202, and (CHE 371 OR PHY 321).

Methods in Biophysical Chemistry– This course focuses on the study and use of physical methods as applied to biological problems. Students will be exposed to various types of hydrodynamic techniques, optical spectroscopies, and optical microscopies. This course includes a laboratory component that makes use of a subset of discussed techniques as applied to a protein system of interest. *Prerequisites:* CHE 371 or CHE 372.

Chemical Crystallography (0.5 course unit)– In this course students will learn the basic principles of crystallography and how x-ray diffraction is used determine the structure of crystalline solids. Students will learn how to recrystallize compounds, collect diffraction data, solve crystal structures using SHELXTL software, and analyze crystal structures using CrystalMaker and Mercury software to understand intermolecular interactions. *Prerequisite:* CHE 371.

CHE 490/Student Teaching Chemistry

2 course units

(fall, spring)

Prerequisite: Meeting all criteria for admission to student teaching

Student teaching during the senior year. Teaching is conducted in approved public schools, and supervised and observed by college and public school teachers. Students learn through observation and participation in the classroom, and through responsible teaching.

CHE 493/Independent Research

variable course units

(fall, spring)

Prerequisites: submission and acceptance of research application form and permission of instructor.

This course is for students who conduct undergraduate research under close supervision of a faculty member. One semester of CHE 493 may be used to satisfy a writing intensive requirement; CHE 493 may be repeated for credit for those students who desire to do more than two semesters of mentored undergraduate research.