

CHEMISTRY (CHE)

CHE 101 Introduction to Chemistry I (0-3 credits)

Designed to provide an introduction to general chemistry, the course includes atomic theory, molecular bonding, states of matter, chemical equations, solutions, and acid-base theory.

Course Rotation: Fall, Spring, and Summer.

CHE 101B Introduction to Chemistry (Laboratory) (1 credits)

CHE 101C Introduction to Chemistry I (Lecture) (2 credits)

CHE 101D Chemistry Discussion Group (0 credits)

Discussion for Introduction to Chemistry.

Course Rotation: Fall, Spring, and Summer

CHE 102 Introduction to Chemistry II (0-3 credits)

Course of study designed to provide the student with an introduction to organic chemistry and the properties of compounds of biological significance such as carbohydrates, proteins, enzymes, vitamins, and hormones.

Course Rotation: Spring.

CHE 102B Introduction to Chemistry II (Laboratory) (1 credits)

CHE 102C Introduction to Chemistry II (Lecture) (2 credits)

CHE 103 Elements of Chemistry I (0-4 credits)

Designed to provide an introduction to general chemistry, the course includes atomic theory, molecular bonding, states of matter, chemical equations, solution and acid-based theory. A research paper is required.

Course Rotation: Fall and Summer.

Prerequisites: Not open to students who have taken CHE 101.

CHE 103D Topic: Chemistry Discussion Group (0 credits)

CHE 104 Elements of Chemistry II (0-4 credits)

Course of study designed to provide the student with an introduction to organic chemistry and the properties of compounds of biological significance such as carbohydrates, proteins, enzymes, vitamins, and hormones. A research paper is required.

Course Rotation: Spring.

CHE 105 Consumer Chemistry (4 credits)

The application of chemical principles to the study of consumer products. Topics include the composition and properties of medicines, beauty aids, automotive products, chemicals in foods, household cleaners, and photographic products.

Course Rotation: NYC: Spring - Even years. PLV: Fall.

CHE 106 Chemistry of Food and Cooking (0-3 credits)

This is a lab science course that looks at cooking on a scientific basis. It explains the basic materials from which our food comes and how those components interact in the process of food preparation, the many methods of processing them and the perceptions of taste that dictate the features of food that are emphasized.

Course Rotation: PLV, Fall

CHE 107 Forensic Chemistry I (0-3 credits)

An introductory course of the laboratory techniques in forensic science. There will be an emphasis upon the fundamental laboratory principles of chemistry as they apply to criminal investigations. Students will learn and perform typical forensic laboratory techniques: refractometry, spectroscopy, pH meter, chromatography, microscopy, wet analysis.

Course Rotation: NY, PLV, Online: Fall, Spring and Summer.

CHE 108 Forensic Chemistry II (3 credits)

A course in forensic science with an emphasis upon the fundamental chemistry of criminal investigations. The principles of chemical science are integrated with a study of the methods and techniques in forensic science.

Course Rotation: NY, PLV, Online: Spring

CHE 109 Science and Art (3 credits)

This course is an introduction into the fascinating topic of "Science and Art". It is offered only to non-science majors and it involves the application of scientific principles as they pertain to art. It emphasizes science and its application in the art world, disciplines thought to be worlds apart, entwine to give a clearer and more accurate and complete picture. The damaging effects of the environment and pollution on art and artifacts will also be discussed. To help the student understand some scientific concepts and their applications, several labs have been designed for this purpose.

Course Rotation: NYC, PLV: Fall.

CHE 110 The Chemical World (0-3 credits)

An introductory course for the non-science major providing a basic understanding of chemistry and its impact on human life. Topics covered include: the fundamentals of chemistry, and a selection from among the chemistry of foods, drugs, health and disease, air and water pollution radiation, nuclear power, and other applied areas of chemistry.

Course Rotation: Fall, Spring, and Summer.

CHE 111 General Chemistry I (0-4 credits)

An introduction for science majors to atomic and molecular structure. Topics include matter and energy, gaseous state, chemical calculations, atoms, sub-atomic particles, electronic structure of atoms, bonding theory, and thermodynamics. Laboratory coordinated with lecture includes quantitative procedures.

Course Rotation: Fall, Spring and Summer.

Prerequisites: College Preparatory Mathematics.

CHE 111A General Chemistry I (Lecture) (3 credits)

An introduction for science majors to atomic and molecular structure. Topics include matter and energy, gaseous state, chemical calculations, atoms, sub-atomic particles, electronic structure of atoms, bonding theory, and thermodynamics.

Prerequisites: College preparatory Mathematics. Open only to students enrolled at other colleges requiring Lecture only. Consult the Chemistry department for registration procedure.

CHE 111B General Chemistry I (Laboratory) (1 credits)

Prerequisites: College Preparatory Mathematics. Open only to students enrolled at other colleges requiring Lab only. Consult the Chemistry department for registration procedure.

CHE 111D General Chemistry I - Discussion Group (0 credits)

Discussion for General Chemistry.

Course Rotation: Fall, Spring, and Summer

CHE 111E General Chemistry I - Discussion Group E (0 credits)

CHE 111R General Chemistry I (0 credits)

Recitation course for General Chemistry I.

Course Rotation: Fall, Spring, and Summer

CHE 112 General Chemistry II (0-4 credits)

A study of liquids and solutions, electrolytes, acid-base theory, kinetics, equilibrium, electrochemistry and descriptive chemistry of representative metallic and non-metallic elements. Laboratory includes qualitative analysis.

Course Rotation: NYC: Spring and Summer. PLV: Fall, Spring, and Summer.

CHE 112A General Chemistry II (Lecture) (3 credits)

Prerequisites: College Preparatory Mathematics. Open only to students enrolled at other colleges requiring Lecture only. Consult the Chemistry department for registration procedure.

CHE 112B General Chemistry II (Laboratory) (1 credits)

Prerequisites: College Preparatory Mathematics. Open only to students enrolled at other colleges requiring Lab only. Consult the Chemistry department for registration procedure.

CHE 112D General Chemistry II - Discussion Group (0 credits)

Discussion course for General Chemistry II.

Course Rotation: Fall, Spring, and Summer

CHE 112R General Chemistry II (0 credits)

Recitation course for General Chemistry II.

Course Rotation: Fall, Spring, and Summer

CHE 113 Principles of Chemistry for the Health Professions (4 credits)

This course is designed for students majoring in Nursing. It combines basic concepts of inorganic, organic and biochemistry as applied to the health professions and emphasizes integration of basic concepts across disciplines and relevance to health issues. Topics include atomic theory, molecular bonding, states of matter, oxidation-reduction reactions, enzymes, and proteins, carbohydrates, lipids and nucleic acids and their relation to metabolism.

Course Rotation: Fall: NYC, PLV

CHE 113R Principles of Chemistry for the Health Professions Recitation (0 credits)

This course is designed for students majoring in Nursing. It combines basic concepts of inorganic, organic and biochemistry as applied to the health professions and emphasizes integration of basic concepts across disciplines and relevance to health issues. Topics include atomic theory, molecular bonding, states of matter, oxidation-reduction reactions, enzymes, and proteins, carbohydrates, lipids and nucleic acids and their relation to metabolism.

Course Rotation: Fall: NYC, PLV

CHE 131A Organic Chemistry I (Lecture) (3 credits)

Open to students enrolled at other colleges requiring lecture only. Please consult the Chemistry department for registration procedures.

CHE 131B Organic Chemistry I (Laboratory) (2 credits)**CHE 200 Mathematical Methods for Physical Chemistry (4 credits)**

This is a post basic calculus class that relates concepts and methods in mathematics to chemistry. The scope of this class includes Symbolic Mathematics and Mathematical Functions, The Solution of Algebraic Equations, Mathematical Functions and Differential Calculus, Integral Calculus, Calculus With Several Independent Variables, Introduction to Ordinary and Separable Partial Differential Equations, Basics of Linear Algebra and Group Theory.

Course Rotation: Spring; NY and PLV

CHE 202A Physical Chemistry I: Thermodynamics (3 credits)**CHE 203A Physical Chemistry II (Lecture) (3 credits)****CHE 203B Physical Chemistry II (Laboratory) (1 credits)****CHE 209 Crime Scene Investigation (3 credits)**

This course is designed to aid the student in understanding how physical evidence is used as an investigative tool in crime scene processing and reconstruction. An in-depth study of the scientific principles and techniques associated with the collection, presentation and analysis of specific types of evidence will be emphasized in case based studies.

Course Rotation: PLV: Spring.

CHE 213 Foundations of Organic Chemistry (0-4 credits)

This is an introductory course to organic chemistry, including some biochemistry. This course is intended for students in science-related programs requiring one semester of organic chemistry. Nomenclature, structure, bonding, reactions, mechanisms, synthesis, and stereochemistry of organic compounds will be covered. Students will be engaged in "Active Learning" which requires students to do meaningful learning activities to and think about what they are doing and why they are doing it. Activities include homework assignments, online quizzes, and laboratory experiments. Not open to majors in Biochemistry, Chemistry, Chemical Engineering, Biological Psychology and Biology. This course cannot be substituted for CHE 223.

Course Rotation: NYC & PLV: Fall

CHE 221 Analytical Methods and Techniques (0-4 credits)

Theoretical and mathematical concepts of both gravimetric and volumetric analyses: quantitative separations, formation and properties of precipitates, acidimetry and alkalimetry, pH, titration curves, and redox reactions. Lab involves analysis of representative samples employing gravimetric and volumetric techniques.

Course Rotation: Fall

CHE 223 Organic Chemistry I (0-5 credits)

A study of organic compounds and organic reactions. Emphasis is placed on the use of reaction mechanisms and the relationship between structure and reactivity. Topics include the alkanes, the alkenes, the alkynes, alicyclic hydrocarbons, aromatics, stereochemistry and spectroscopy. Laboratory includes instruction in the preparation of organic compounds and the use of instrumental techniques.

Course Rotation: Fall and Summer.

CHE 223A Organic Chemistry I (Lecture) (3 credits)

A study of organic compounds and organic reactions. Emphasis is placed on the use of reaction mechanisms and the relationship between structure and reactivity. Topics include the alkanes, the alkenes, alicyclic hydrocarbons, aromatics, stereochemistry, and spectroscopy.

Prerequisites: CHE 112 or equivalent and College Preparatory Mathematics. Open only to students enrolled at other colleges requiring Lecture only.

Consult the Chemistry department for registration procedure.

CHE 223B Organic Chemistry I (Laboratory) (2 credits)

Laboratory includes instruction in the preparation of organic compounds and the use of instrumental techniques.

Prerequisites: CHE 112 or equivalent and College Preparatory Mathematics. Open only to students enrolled at other colleges requiring Lab only.

Consult the Chemistry department for registration procedure.

CHE 223R Organic Chemistry I Recitation (0 credits)

One-hour recitation course for students registered into CHE 223, Organic Chemistry I.

Course Rotation: NY and PL: Fall, Spring, and Summer.

CHE 224 Organic Chemistry II (0-5 credits)

A continuation of CHE 223. Topics include alkyl halides, alcohols, phenols, ethers, carboxylic acids and derivatives, aldehydes, ketones, amines, condensation reactions, carbohydrates, amino acids and reaction mechanisms. Laboratory includes advanced synthetic methods and qualitative organic analysis.

Course Rotation: Spring and Summer.

CHE 224A Organic Chemistry II (Lecture) (3 credits)

Prerequisites: Open only to students enrolled at other colleges requiring lecture only. Consult the Chemistry department for registration procedures.

CHE 224B Organic Chemistry II (Laboratory) (2 credits)

Prerequisites: Open only to students enrolled at other colleges requiring lab only. Consult the Chemistry department for registration procedures.

CHE 224R Organic Chemistry II Recitation (0 credits)

One-hour recitation course for students registered into CHE 224, Organic Chemistry II.

Course Rotation: NY and PL: Fall, Spring, and Summer.

CHE 226A Biochemistry (Lecture) (3 credits)

CHE 230A Advanced Inorganic Chemistry (Lecture) (3 credits)

CHE 246 Chemistry of Food Processing (0-4 credits)

CHE 290 Chemistry Seminar (1 credits)

CHE 296 Topics in Chemistry (3 credits)

This course will treat one or more topics such as advanced analytical techniques, pharmacological chemistry, environmental chemistry, and immunochemistry, which are not part of the standard course offerings of the department. With permission, it may be taken more than once for credit. Formerly CHE 199.

Course Rotation: TBA.

CHE 296A Topic: Modern Methods of Organic Synthesis (0-2 credits)

CHE 296B Topic: Environmental Chemistry (1 credits)

CHE 296C Topic: Material Science (3 credits)

CHE 296D Topic: Scientific Aspects of Crime Scene Investigation (0-3 credits)

CHE 296E Topics in Chemistry: Physical Biochemistry of Membranes (3 credits)

Prerequisites: PHY 301 and CHE 326 or permission of Department Chairperson. COURSE DESCRIPTION:

CHE 300 Introduction to Physical Chemistry (0-4 credits)

A one-semester course that covers the basic principles and applications of Physical Chemistry. It is designed for students majoring in sciences other than Chemistry and Biochemistry. It studies the concepts of energy-matter interaction. It starts with the basic thermodynamic relationships that describe the macroscopic aspects of energy exchange in systems with many components and many phases, such as real solutions. The thermodynamics part concludes with its implementation in understanding chemical equilibrium and reaction kinetics. Then the approach enters the microscopic level and the principles of Quantum Mechanics are introduced. The discussion is extended to elements of Molecular Quantum Mechanics and spectroscopy. Though the mathematical rigor of physical chemistry is maintained in this introductory course, emphasis is given to the physical and chemical principles.

Course Rotation: NYC: Fall.

CHE 301 Physical Chemistry I: Quantum Mechanics and Spectroscopy (0-4 credits)

Lecture: Introduction of principles and applications to model systems of quantum mechanics. Electronic structure of one- and many-electron atoms and theory of chemical bonding in diatomic and polyatomic molecules. Principles and applications of molecular spectroscopy: rotational, vibrational, electronic, and nuclear magnetic resonance. Group theory and Symmetry. Elements of photochemistry. Computational Lab: Theory and application of first-principles computer simulations methods (based on quantum mechanics) of chemical and electronic structure of molecules, including Hartree-Fock theory, density functional theory, and correlated wave-function methods. Covers enhanced sampling, ab initio molecular dynamics, and transition-path-finding approaches as well as errors and accuracy in total and free energies. Students complete computational assignments. Traditional experiments may be included according to campus special programs. (CHE301 and CHE302 may be taken in either order)

Course Rotation: NYC: Fall

CHE 301A Physical Chemistry I: Thermodynamics (Lecture Only) (3 credits)

Not open to Chemistry or Biochemistry majors.

CHE 302 Physical Chemistry II: Thermodynamics, Molecular Interactions and Kinetics (0-4 credits)

Lecture: Establishment of connection between the microscopic world of quantum mechanics and the macroscopic world of thermodynamics. Topics included but not limited to: properties of gases, kinetics, elementary statistical thermodynamics, and thermodynamics of single and multi-component systems, intermolecular forces. Computational Lab: Discussion of applications such as the study and prediction of properties of chemical systems, including heterogeneous, molecular, and biological catalysts (enzymes), and physical properties of materials. Students complete computational assignments. Traditional experiments may be included according to campus special programs. (CHE301 and CHE302 may be taken in either order)

Course Rotation: NYC & PLV: Spring

CHE 302A Physical Chemistry II (Lecture II) (3 credits)

Topics include: spectroscopic methods of studying molecular structure, electrical and magnetic properties of molecules, symmetry and group theory, chemical kinetics, liquids, catalysis and an introduction to quantum chemistry and statistical thermodynamics.

Course Rotation: Spring.

CHE 305 Quantum Chemistry (3 credits)

A course of study in the theory and application of quantum mechanics in chemistry. Among topics considered are: mathematics for quantum chemistry, Schrodinger and Heisenberg approaches, the hydrogen atom, approximation methods, electronic structure of diatomic and polyatomic molecules, and group theoretical procedures.

Course Rotation: NYC: Fall - Even years.

CHE 310 Green Chemistry (0-4 credits)

A fundamental approach of Green Chemistry is to endeavor to reduce or eliminate hazards associated with the development of a chemical product from its inception to its degradation back into the environment. Green Chemistry also provides the exciting challenge of innovating at the molecular design level to meet societal needs and provide new opportunities for economic development. This course will address the use of Green Chemistry principles, in terms of energy, clean water and food to sustain our growing population without adverse effects on human health and the environment.

Course Rotation: NY: Spring

CHE 313 Essentials of Biochemistry (0-3 credits)

Essentials of Biochemistry is a non-majors course meant to give students a fundamental understanding of the building blocks of life and metabolic processes. This includes, but is not limited to, the study of nucleic acids, proteins, lipids, and carbohydrates as well as associated topics such as the central dogma of life, genetic engineering, protein structure and function, enzyme catalysis and inhibition, membrane transport, biosignaling, and metabolism. Students will learn these concepts through weekly reading, watching online lectures, completing online problem sets, and conducting virtual lab assignments.

Course Rotation: NYC: Summer 2

CHE 322 Chemical Separations (3 credits)

An introduction to the use of various separation methods. The course provides a thermodynamic basis for separation and includes consideration of the role and selection of different solvents. Specific separation methods are discussed.

Course Rotation: Fall.

CHE 326 Biochemistry (0-4 credits)

Study of structure and biological function of proteins, enzymes and coenzymes; enzyme kinetics; metabolism - glycolysis, TCA cycle, lipid degradation, amino acid degradation; electron transport; nucleic acids - RNA, DNA, replication, transcription; genetic code; protein synthesis.

Course Rotation: Fall.

CHE 326A Biochemistry (Lecture Only) (3 credits)

Study of structure and biological function of proteins, enzymes and coenzymes; enzyme kinetics; metabolism - glycolysis, TCA cycle, lipid degradation, amino acid degradation; electron transport; nucleic acids - RNA, DNA, replication, transcription; genetic code; protein synthesis.

Course Rotation: Fall.

CHE 328 Advanced Biochemistry (3 credits)

Advanced study of selected topics in biochemistry and molecular biology. Topics include: enzymology; metabolism and oxidative phosphorylation; membranes and transport; photosynthesis; muscle action; hormones; control of gene expression; eukaryote chromosomes; viruses; recombinant DNA; immunology.

Course Rotation: Spring.

CHE 329 Advanced Biochemistry Laboratory (0-2 credits)

Isolation, characterization and analysis of DNA, RNA and the enzymes that control their synthesis. Induction-repression and gene transformation experimentation in a bacterial system.

Course Rotation: Spring.

CHE 330 Advanced Inorganic Chemistry (0-4 credits)

A study which focuses on trends in properties, structure, and reactivity of inorganic elements and their compounds, with emphasis on symmetry and molecular orbital theory. Laboratory experiments emphasize techniques and analytical methods used in the synthesis and structural analysis of inorganic compounds.

Course Rotation: Spring.

CHE 331 Instrumental Analysis (0-4 credits)

Theory and practice of instrumental measurement including spectrophotometric, electro-analytical, chromatographic techniques, and other instrumental methods as applied to analytical chemistry.

Course Rotation: Spring.

CHE 333 Advanced Organic Chemistry (3 credits)

Topics of current interest, including bonding, structure-reactivity relationships, reaction mechanisms, experimental evidence for pericyclic reactions, photochemistry, and modern synthetic methodology and strategies.

Course Rotation: Fall - Even years.

Prerequisites: CHE 224 or permission of department chair.

CHE 335 Molecular Modeling and Machine Learning for Drug Discovery (3 credits)

This course is designed to introduce computational methods used in studying protein-small molecule recognition and molecular modeling that play an increasingly important role in pharmaceutical research and discovery.

Course Rotation: NYC: Spring

CHE 338 Spectroscopy, Theory and Practice (0-4 credits)

This course is designed to employ the theory and application of advanced instrumentation methods (IR, MS, NMR) to the investigation of chemical structure.

Course Rotation: PLV: Spring - Odd years.

CHE 340 Polymer Chemistry (3 credits)

This course is designed to introduce the student to the important theoretical and practical concepts in high polymer chemistry.

Course Rotation: PLV: Spring - Odd years.

CHE 355 Industrial Chemistry (3 credits)

This course provides an overview of the role of chemistry in the industrial world. Fundamentals of experimental design as well as topics such as phosphorous chemistry, wine chemistry, toxic chemicals evaluation and enzyme immunoassay on solid phase will be discussed.

Course Rotation: PLV: Fall - Odd years.

Prerequisites: CHE 301 or permission of Department Chair.

CHE 363 Materials Science (3 credits)

A course in the physical and chemical science of modern materials - metals, semiconductors, ceramics, polymers, glasses, alloys, etc. Various bonding mechanisms and structures are studied as well as chemical, thermal, electrical and mechanical characteristics.

Course Rotation: PLV: Spring - Odd years.

Prerequisites: PHY 112 and CHE 301 or permission of Department Chair. This course is the same as PHY 363.

CHE 370 Advanced Biophysical Chemistry: Membrane Transport and Ionic Channels (3 credits)

With the realization that a controlled transport of materials between the cell and the environment and between the various compartments of a cell is essential for the cell's proper functioning, a great deal of studies has been devoted to membrane transport. This course is an account of the physic-chemical principles and mechanisms found to be involved in the membrane transport. Ionic channels; are elementary excitable elements in the cell membranes of nerve, muscle, and other tissues. Sperm, white blood cells, and endocrine glands all also require channels to act. They produce and transducer electrical signals in living cells. Recently, new techniques of biochemistry, pharmacology, and membrane biophysics have played an increasingly wide role in studying ionic transport across biomembranes. This course is meant to be accessible to undergraduate and graduate students in chemistry, physics, biology, pharmacology, physiology, and other disciplines who are interested in excitable cells. Being multidisciplinary per se, the course introduces all the major ideas that a student in the area would be expected to know including physic-chemical principles of membranes: theories of membrane transport: passive, facilitated, and active transport; membrane electrochemistry and physiology, ionic channels and their reconstitution in lipid bilayers, blocking and separation of Na, K and Ca currents through ionic channels; experimental techniques for the study and characterization of biomembranes and ionic channels. Lab experiments on fabrication spherical (liposomes) and planar lipid bilayers are also included as part of the course. Upon completion of the course, students are expected to understand the molecular and physicochemical mechanisms underlying the ionic permeability changes in the course of excitation and signaling which can be accounted for by the opening and closing of different ionic channels.

Course Rotation: PLV: Spring

CHE 390 Honors Project in Chemistry (3 credits)

CHE 392 Chemistry Seminar I (1 credits)

The student will make presentations for group discussion on current advances and research in chemistry. Required of all chemistry majors in the junior year.

Course Rotation: Fall.

Prerequisites: Junior standing except for Engineering students.

CHE 395 Independent Study in Chemistry (1-9 credits)

With the approval of the appropriate faculty member, the department chairperson, and the academic dean, students may select a topic for guided research that is not included in the regular course offerings. The student meets regularly with the faculty member to review progress. A research project or paper must also be submitted.

Course Rotation: TBA.

Prerequisites: Junior standing and a Minimum CQPA of 3.00.

CHE 395A Independent Study in Chemistry (A) (1-9 credits)**CHE 395B Independent Study in Chemistry (B) (1-9 credits)****CHE 395C Independent Study in Chemistry (C) (1-9 credits)****CHE 480 Research in Chemistry (3 credits)**

Conference, library and laboratory research. Students will pursue, by selection and individual invitation of the departmental faculty, research projects under faculty supervision in the areas of inorganic, organic, biochemical, physical and analytical chemistry. Each student will submit a report of his or her research at the close of the semester and give an oral presentation.

Course Rotation: TBA.

Prerequisites: Permission of Department Chair.

CHE 491 Chemistry Internship I (3 credits)

Direct experience in the working environment designed to enhance and extend knowledge gained in the classroom. The student reports to a regular assignment and receives guidance and direction from professionals. The student works on projects requiring reports and meets regularly with a departmental advisor who will provide overall supervision.

Course Rotation: Fall and Spring

Prerequisites: Junior Standing, Recommendation of The Department Chairperson and Acceptance in a position.

CHE 492 Chemistry Seminar II (1 credits)

The student will make presentations for group discussion on current advances and research in chemistry. Required of all chemistry majors in the Senior year.

Course Rotation: Spring.

Prerequisites: Senior standing, except Engineering students.