

Chemistry

CHEM 100. Chemical Science (3)

This course is designed primarily for future elementary school teachers. It introduces the student to the basic concepts of chemistry including atoms, radioactivity, bonding, chemical equations, solutions, acids and bases, and some aspects of organic and biochemistry. The latter part of the course is devoted to the study of chemical science as it applies to the elementary school: mini lectures, demonstrations, experiments, games, textbook and journal reviews are presented by the students. Circumstances permitting, the course ends with practice teaching at an elementary school. Computers are used as aids to instruction and as laboratory tools. The course CHEM 100L must be taken concurrently with this course.

CHEM 100L. Chemical Science Laboratory (1)

The laboratory emphasizes learning by discovery and by student-designed (or modified) experiments. Current or prior enrollment in CHEM 100 is required.

CHEM 101. Chemistry in Society I (3)

A study of the fundamental principles of chemistry with particular emphasis on the role of chemistry in our culture and everyday affairs. Topics to be covered include the scientific method, atomic theory, redox chemistry, organic chemistry, and nuclear chemistry. The sequence CHEM 101 and 102 can be used to fulfill the general studies requirement of a year of laboratory science. This course must be taken before CHEM 102 Chemistry in Society II.

CHEM 102. Chemistry in Society II (3)

The further development of the topics covered in CHEM 101 with expansion of materials to include energy, natural resources, consumer products, ecological chemistry, toxicology, and drugs. Prerequisite: CHEM 101.

CHEM 101L, 102L. Chemistry in Society Laboratory (1 each)

The laboratory emphasizes the learning by discovery and by student-designed (or modified) experiments. Current or prior enrollment in CHEM 101, CHEM 102 is required. Prerequisite for CHEM 102L is CHEM 101L.

CHEM 120, CHEM 122. College Chemistry (3 each)

An in-depth treatment of the fundamental principles of chemistry and their application to physiological, pharmaceutical, and biochemical processes. The courses **CHEM 101L and CHEM 122L** must be taken simultaneously with the appropriate semester of CHEM 120 and CHEM 122. Together with CHEM 120L and CHEM 122L, this course can be used to fulfill the general studies requirement of a year of laboratory science.

CHEM 120L, CHEM 122L. College Chemistry Laboratory (1 each)

This course introduces the student to the isolation of natural products, the synthesis of drugs, biochemical reactions, and the use of modern instrumentation for the separation and the qualitative and quantitative analysis of chemicals. College Chemistry Laboratory

must be taken simultaneously with the appropriate semester of College Chemistry (CHEM 120 and CHEM 122).

CHEM 207, CHEM 209. General Chemistry (3 each)

A first-year chemistry course for students whose major area of study is biology, chemistry, mathematics, medical technology, pre-medicine, or pre-pharmacy. Studied are such fundamental concepts of chemistry as the structure of atoms and compounds; the nature of solids, liquids, and gases; the reactions of inorganic and organic compounds; the study of acids, bases, buffers, and salts; and kinetics, equilibrium, and electrochemistry. CHEM 207 is offered in the fall; CHEM 209 in the spring. CHEM 207L and CHEM 209L are to be taken with CHEM 207 and CHEM 209 respectively. Prerequisite: Background in chemistry and algebra.

CHEM 207L. General Chemistry Laboratory I (1)

A three-hour per week laboratory course in general chemistry. Topics are selected from qualitative inorganic analysis, spectroscopic analysis, gas laws, calorimetry, and chromatography. Should be taken concurrently with CHEM 207.

CHEM 209L. General Chemistry Laboratory II (1)

A three-hour per week laboratory course in general chemistry. Topics are selected from volumetric analysis, spectroscopic analysis, electrochemistry, synthesis, gas laws, and chromatography. Should be taken concurrently with CHEM 209.

CHEM 301. Inorganic Chemistry (3)

The theoretical principles of chemical bonding and molecular structure are correlated with the chemical and physical properties of inorganic compounds. Includes covalent and ionic bonding, periodic trends, systematic study of the representative, transition, inner-transition and inert gas elements, structure determination, and reaction mechanisms. Prerequisites: CHEM 207, CHEM 209.

CHEM 308. Radiochemistry (3)

A study of the principles underlying the nature of radioactivity and of the various chemical, biological, and industrial applications of radioisotopes. Particular emphasis is placed on stellar nucleosynthesis, fission, fusion, reactor design, accelerators, and theories of the nucleus. Prerequisites: CHEM 207, CHEM 209.

CHEM 311. Chemical Pharmacology (3)

This course is an introduction to the structure, mechanisms of action, and clinical application of drugs currently in use. The emphasis is on general pharmacological principles and on a survey of a wide spectrum of agents; chemical aspects of pharmacology are stressed where they contribute significantly to the understanding of drug action. Prerequisites: One semester of anatomy/physiology and one semester of chemistry; or, permission of the instructor.

CHEM 315, CHEM 316. Organic Chemistry(3 each)

This course is designed for students with an interest in chemistry, the life sciences, or in health-related fields. It surveys the classes of organic compounds from hydrocarbons to synthetic and natural macromolecules. Attention is focused on the applications of organic chemistry to biological, medical, and energy-related problems. Prerequisites: CHEM 207, CHEM 209. The courses CHEM 315L and CHEM 316L must be taken concurrently with CHEM 315 and CHEM 316, respectively.

CHEM 315L. Organic Chemistry I Laboratory (1)

This laboratory features organic synthesis, mechanistic studies, and modern instrumental techniques for the separation (using TLC, GC, or HPLC) and characterization (using IR, NMR, MS, or polarimetry) of organic compounds. Current or prior enrollment in CHEM 315 is required.

CHEM 316L. Organic Chemistry II Laboratory (1)

This course is a continuation of CHEM 315 and uses the same techniques. Current or prior enrollment in CHEM 316 is required.

CHEM 321. Analytical Chemistry (3)

A one-semester course covering the theory of classical volumetric, gravimetric, and electrochemical techniques and the calculations associated with these techniques. Also covered are the statistical methods needed for the critical evaluation of data.

Prerequisites: CHEM 207, CHEM 209. CHEM 321L should be taken concurrently.

CHEM 321L. Analytical Chemistry Laboratory (1)

A one-semester laboratory course covering the lab procedures for classical volumetric, gravimetric, and electrochemical analyses. Prerequisites: CHEM 207, CHEM 209, CHEM 207L, CHEM 209L. CHEM 321 should be taken concurrently.

CHEM 322. Instrumental Analysis (3)

A one-semester course covering the theory and practice of modern instrumental methods for chemical analysis. Methods covered include atomic and molecular spectroscopy, chromatography, mass spectroscopy, surface analysis, and electrochemistry. Instrument design, sampling techniques, and analytical strengths and weaknesses of the various methods are covered. Prerequisites: CHEM 321 and CHEM 321L. CHEM 322L should be taken concurrently.

CHEM 322L. Instrumental Analysis Laboratory (1)

A one-semester laboratory course that provides experience with modern instrumental methods for chemical analysis. Techniques covered include atomic and molecular spectroscopy, chromatography, mass spectroscopy, and electrochemistry. CHEM 322 should be taken concurrently.

CHEM 325. Computers in Science (3)

A one-semester course that serves as an introduction to the use of computers for data collection, data analysis, and data presentation. Topics covered include scientific calculations and plotting with spreadsheets, elementary programming, scientific report writing, and computer interfacing to scientific instrumentation.

CHEM 327. Solution Chemistry (3)

A one-semester course to be taken by the student in the sophomore or junior year. A study of the physical and chemical properties of the liquid state is pursued, with particular emphasis placed on aqueous solution. The preparation of solutions of various concentrations is reviewed. Thermodynamics is introduced. Other major areas are kinetics, equilibria between phases and electrochemistry. Prerequisites: CHEM 207, CHEM 209, MATH 105.

CHEM 327L. Solution Chemistry Laboratory (1)

A three-hour per week laboratory course to be taken with Solution Chemistry CHEM 327. Aqueous and nonaqueous solutions will be prepared and their physical and chemical properties will be investigated. Corequisite or prerequisite: CHEM 327.

CHEM 329. Biochemistry I (3)

Biochemical structure and function with initial emphasis placed on the properties of carbohydrates, lipids, and proteins and the relationship between structure and function. The special role of these biomolecules in the structure and function of biological membranes is then presented. This is followed by an introduction to enzymes and the mechanisms of enzyme action. Attention is then given to the nucleic acids and includes the genetic role, structure, and replication of DNA and the role of RNA in protein synthesis. Prerequisites: CHEM 315 and BIOL 305.

CHEM 329L. Biochemistry I Laboratory(1)

A three-hour per week laboratory course to be taken with CHEM 329 Biochemistry I. The course will comprise an overview and application of techniques associated with biochemical research, data gathering, and analysis. The students will be introduced to various computer-based methodologies of data analysis molecular modelling and presentation. In addition, the course will involve development of experimental design, reproducible lab techniques, and record keeping. Corequisite or prerequisite: CHEM 329.

CHEM 330. Biochemistry II (3)

Basic concepts of metabolism with initial emphasis placed on the broad aspects of metabolism and includes a discussion of the energy requirements for reactions in living systems. The degradation of carbohydrates and the biochemical role of glycolysis, citric acid cycle, oxidative phosphorylation, and related pathways are then presented. This is followed by an examination of fatty acid metabolism, nucleotide biochemistry, and selected topics in biosynthesis. Attention is then given to mechanisms of hormone action, transport across biological membranes, and related membrane activity. Prerequisites: CHEM 329.

CHEM 330L. Biochemistry II Laboratory(1)

A second three-hours per week laboratory to be taken with CHEM 330 Biochemistry II. The course involves the application of techniques developed in CHEM 329L to problems associated with characterization of carbohydrates, proteins, and nucleic acids. Included in the experiments performed is the development of purification techniques, enzyme kinetics, and spectroscopic analysis. Prerequisites: CHEM 329 and CHEM 329L.

CHEM 331, CHEM 332. Seminar (1 each)

This course may be taken more than once for credit. The selection, organization, and presentation of topics within one's area of interest in chemistry. Topics are selected from among the current literature, review articles, and reports in scientific journals. Prerequisites: CHEM 207, CHEM 209.

CHEM 333. Environmental Chemistry (3)

The chemistry of environmental processes and problems. Topics include stratospheric chemistry, ground-level air chemistry and air pollution, the greenhouse effect and global warming, energy use and carbon dioxide emission, toxic organic and inorganic compounds, the chemistry of natural waters and water pollution, and waste management. Instrumentation for measuring pollutants is discussed. Prerequisite: One year of University-level chemistry.

CHEM 333L. Environmental Chemistry Lab (1)

The environmental chemistry laboratory will apply volumetric and instrumental techniques to the analysis of chemicals of environmental significance. Gas and liquid chromatography, mass spectroscopy, and atomic absorption, among other techniques, will be employed.

CHEM 392. Cooperative Education in Chemistry (1-9)

Cooperative education is a form of education which integrates classroom study with paid, planned, and supervised work experiences in the public and private sectors. Cooperative education allows students to acquire essential, practical skills by being exposed to the reality of the work world beyond the boundaries of campus, enhancing their self-confidence and career direction. An agreement is signed by the employer supervisor, the faculty supervisor, and the student. The co-op may be repeated for credit. Prerequisite: Sophomore standing; minimum 2.3 GPA, 2.5 major GPA; approval of the Department of Chemistry; placement by the Career Center.

CHEM 415, CHEM 416. Advanced Organic Chemistry (1-3 each)

The content of the course is flexible and can be structured to meet the needs of the student. Possible orientations include: 1) a review and extension of the principles covered in Organic Chemistry, 2) a detailed treatment of the mechanisms of organic reactions, 3) a selective study of the synthesis of organic compounds, and 4) molecular orbital theory and rate processes as applied to organic chemistry. Prerequisites: CHEM 315, CHEM 316.

CHEM 427. Spectroscopy (3)

A study of the classical and quantum theories of the interaction of radiation with matter, including an introduction to the Schrodinger wave equation. The absorption and emission of radiation by atoms and molecules are treated, with particular emphasis being placed on ultraviolet, visible, and infrared spectroscopy and resonance phenomena. Prerequisites: CHEM 207, CHEM 209, PHYS 201, PHYS 202 and math through calculus.

CHEM 427L. Advanced Physical Chemistry Lab (1)

A three hour per week laboratory course that covers advanced physical chemical laboratory methods. Techniques covered include spectroscopy (infrared, NMR UV-visible absorption), surface chemistry and electrochemistry. Prerequisites: CHEM 327 and CHEM 327L. CHEM 427 or should be taken concurrently.

CHEM 428. Thermodynamics (2)

A study of the principles underlying the content and transfer of energy in physical and chemical reactions. The classical laws of thermodynamics are introduced, and the concepts of free energy, entropy, work, and enthalpy are defined and subjected to a careful quantitative treatment. Prerequisites: CHEM 207, CHEM 209, PHYS 201, PHYS 202 and math through calculus.

CHEM 436. Advanced Protein Chemistry (3)

The course is designed as an independent/directed study with a weekly seminar component. The material to be covered will be an in-depth review of the structure and function relationships of proteins. Computer modeling and structure analysis and review of the current primary research literature will be used. The course is divided into four major topics of discussion: Part 1, a review of secondary and tertiary structure; Part 2, folding patterns and analysis and prediction of structure; Part 3, specific enzymology and protein chemistry; and Part 4, analysis of protein function by protein engineering and biophysical methods.

CHEM 450. Research in Chemistry (1-3)

This course involves the student in research in chemistry. The course is given for 1-3 credits per semester and may be taken repeatedly. CHEM 392 Cooperative Education in Chemistry may be substituted for CHEM 450.