

# COURSE INFORMATION

## CHEMISTRY COURSES

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### CH 100 INTRODUCTION TO INORGANIC CHEMISTRY

FALL/SPRING/ALL YEARS

3 credit hours

This is a one-semester course for students preparing for technical training in natural sciences or laboratory work. The course covers the elementary principles of inorganic chemistry emphasizing nomenclature, stoichiometry, and solution chemistry. It includes three hours of lecture weekly. The lab, CH100L, MUST be taken concurrently. Prerequisite: Completion of MA085 a-b or MA089. Corequisite: CH100L.

### CH 100L INTRODUCTION TO INORGANIC CHEMISTRY LABORATORY

FALL/SPRING/ALL YEARS

1 credit hour

CH100L is the laboratory portion of CH100 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: CH100.

### CH 101 INTRODUCTION TO ORGANIC CHEMISTRY

FALL/SPRING/ALL YEARS

3 credit hours

This course covers basic concepts in organic chemistry and is tailored for students preparing for technical training in the natural sciences. The course covers the chemical and physical properties of simple carbon compounds and its applications. Corequisite: CH101L. Prerequisite: CH100 and CH100L, or consent of instructor.

### CH 101L INTRODUCTION TO ORGANIC CHEMISTRY LABORATORY

FALL/SPRING/ALL YEARS

1 credit hour

CH101L is the laboratory component of CH101 and must be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: CH101. Prerequisite: CH100 and CH100L.

### CH 102 GENERAL CHEMISTRY

FALL ONLY/ALL YEARS

3 credit hours

This course is designed for science majors and minors and emphasizes an in-depth study of modern chemical principles, theories, and laws pertaining to atomic structure, nature of the chemical bond, and stoichiometric considerations of all aspects of inorganic chemistry. It includes three hours of lecture weekly. The lab, CH102L, MUST be taken concurrently. Prerequisite: Demonstrated proficiency at the MA161 level or concurrent enrollment in 161a. Corequisite: CH102L.

### CH 102L GENERAL CHEMISTRY LABORATORY

FALL ONLY/ALL YEARS

1 credit hour

CH102L is the laboratory portion of CH102 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: CH102.

## CH 103 GENERAL CHEMISTRY

SPRING ONLY/ALL YEARS

3 credit hours

This course is a continuation of CH102-102L with further study of reactions and stoichiometric problems. The periodic table is studied with emphasis on physical and chemical group properties. Thermo chemistry, electrochemistry, nuclear chemistry and organic chemistry are introduced with respect to data gathering and simple deduction. It includes three hours of lecture weekly. The lab, CH103L, MUST be taken concurrently. Prerequisites: CH102-102L, and MA161a or MA161b or MA165 or higher level, or placement at this level. (CH100-100L may be substituted for CH102-102L by program consent). Corequisite: CH103L.

## CH 103L GENERAL CHEMISTRY LABORATORY

SPRING ONLY/ALL YEARS

1 credit hour

CH103L is the laboratory portion of CH103 and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Corequisite: CH103.

## CH 110 CHEMISTRY AND SOCIETY

FALL ONLY/ALL YEARS

3 credit hours

This is an introductory course that covers a broad perspective on the knowledge and insights that chemistry provide to our environment and society. The course will offer online (via Moodle platform) and will highlight topics related to basic principles of chemistry, modern applications of chemistry, and environmental issues of chemistry. It is intended for non-science major students who might not have a background in chemistry. Instructors consent.

## CH 110L CHEMISTRY AND SOCIETY LABORATORY

FALL ONLY/ALL YEARS

1 credit hour

This course introduces students to the fundamental of scientific method. Students will conduct experimentation through a virtual laboratory and produce laboratory report online. The laboratory exercises will complement the topics covered in the theory, including, gas laws, stoichiometry, acids and bases, and quantitative analysis. Other topics that demonstrate the relevance of chemistry in our everyday experience will be included as needed. All the labs will be conducted online (virtually) at [www.latenitelabs.com](http://www.latenitelabs.com), which is a well-established platform for conducting virtual experiments and currently used by Schools and Universities in USA. Corequisite: CH110.

## CH 310A ORGANIC CHEMISTRY

FALL ONLY/ALL YEARS

3 credit hours

This is a full-year lecture sequence covering the general principles of organic chemistry with emphasis on structure, stereochemistry, nomenclature, basic reactions and mechanisms and the occurrence and uses of main classes of compounds. Prerequisite: CH103-103L.

## CH 310B ORGANIC CHEMISTRY

SPRING ONLY/ALL YEARS

3 credit hours

This is a full-year lecture sequence covering the general principles of organic chemistry with emphasis on structure, stereochemistry, nomenclature, basic reactions and mechanisms and the occurrence and uses of main classes of compounds. Prerequisite: CH103-103L.

## CH 311 BASIC LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY

FALL ONLY/ALL YEARS

2 credit hours

This course consists of laboratory work in organic chemistry with emphasis on the development of manipulative skills in such techniques as distillations, reduced pressure fractionations, chromatography, and crystallization, and constructions of apparatus utilized in the preparations, purification, identification and study of simple organic compounds. Six hours of laboratory are held per week. Corequisite: CH310a.

## CH 312 LABORATORY TECHNIQUES IN ORGANIC CHEMISTRY

SPRING ONLY/ALL YEARS

2 credit hours

This course is a continuation of CH311 with emphasis on continued development of manipulative skills as required by preparation, purification, identification and study of more complex organic compounds. It consists of six hours of laboratory work per week. Prerequisite: CH311. Corequisite: CH310b.

## CH 330 QUANTITATIVE ANALYSIS

FALL ONLY/ODD YEARS

3 credit hours

This course is a study of select quantitative schemes as utilized in volumetric and gravimetric analyses with emphasis upon acquiring an understanding of the basic theoretical principles involved. Laboratory emphasis is on the development of useful techniques consistent with the present state of the art and reduction to laboratory practice of the theories studied. It includes three hours of lecture weekly. The lab, CH330L, MUST be taken concurrently. Prerequisite: CH103-103L. Corequisite: CH330L.

## CH 330L QUANTITATIVE ANALYSIS LABORATORY

FALL ONLY/ODD YEARS

2 credit hours

CH330L is the laboratory portion of CH330 and MUST be taken concurrently. The course consists of six hours of laboratory work per week. Corequisite: CH330.

## CH 350 FOUNDATIONS OF PHYSICAL CHEMISTRY

FALL ONLY/EVEN YEARS

3 credit hours

This is a one-semester lecture course covering the basic principles and general applications of physical chemistry. Laws of thermodynamics, thermochemical equilibria, ionic equilibria, phase equilibria, chemical kinetics, electrochemistry, surface chemistry, photochemistry, basic spectroscopy/ imaging and macromolecules are studied. It includes three hours lecture weekly. Prerequisites: MA203, CH103, CH103/L. Corequisite: CH350L.

## CH 350L Foundations of Physical Chemistry LABORATORY

FALL ONLY/EVEN YEARS

1 credit hour

This course is the laboratory component of CH350. It covers the experimental exercise that relates to the topics dealt with in the lecture. Topics covered will include thermodynamics, kinetics, spectroscopy, equilibrium, acid-base equilibrium, and electrochemistry. Prerequisites: MA203, CH103, CH103/L. Co-requisite: CH350.

## CH 392 LABORATORY TEACHING AND ASSISTING

FALL/SPRING/ALL YEARS

1 - 3 credit hours

This course provides for practical educational experience in undergraduate course laboratories. It may be taken more than once for credit. Prerequisite: Completion of course in which laboratory is offered, or of an equivalent course and consent of instructor.

## CH 400 CHEMISTRY SERVICE LEARNING

FALL/SPRING/ALL YEARS

1 - 2 credit hours

Chemistry Service-Learning course is patterned after Service-Learning initiative established by the American Chemical Society. Service Learning is part of an education program that integrates community service with classroom instruction to enhance learning, teach civic responsibility, and strengthen communities. For the chemical sciences, service-learning projects can vary greatly depending on community needs and the instructor's curriculum. Projects can include environmental testing, water clean-up, chemical safety workshops, classroom assistance in an elementary-high school, support and assistance in chemistry outreach, and volunteer mentoring or tutoring for elementary, middle or high school students. The course will require 45 hours per credit. Prerequisites: CH-310a CH-310b CH-311 CH-312 CH-330 CH-330L or consent of instructor.

## CH 410 INSTRUMENT METHODS OF ANALYSIS

SPRING ONLY/EVEN YEARS

3 credit hours

This course is a study of potentiometric, colorimetric, spectrophotometric, polarographic, calorimetric and other instrument methods of analysis, as available. Emphasis is on practical utilization of instrumentation in the field of analytical chemistry. It includes three hours of lecture weekly. The lab, CH410L, MUST be taken concurrently. Prerequisites: CH310a-b, 311, 312, 330, and MA161a-b or consent of program. Corequisite: CH410L.

## CH 410L INSTRUMENT MTHDS OF ANALYS LAB

SPRING ONLY/EVEN YEARS

2 credit hours

Ch 410L is the laboratory portion of CH 410 and MUST be taken concurrently. Corequisite: CH 410

## CH 413 FORENSIC CHEMISTRY

SPRING ONLY/EVEN YEARS

3 credit hours

This course builds on the principles and applications of analytical methods in chemistry to forensic science field. The course will cover quality assurance and quality control, chemical equilibria, physical evidence, drug analysis, toxicology, explosives, combustion and arson, firearms, colors, and paints. Instrumentation and forensic analysis methods will be covered. Corequisite: CH-413L Prerequisites: CH-310b CH-312 CH-350 CH-350L CH330 CH330L and Instructors consent.

## CH 413L FORENSIC CHEMISTRY LABORATORY

1 credit hour

This course will cover the experimental methods used in forensic analysis. It will focus on chemical and instrumental methods for identifying and quantifying substances for forensic investigations. Chemical test and instrumental methods will apply including gas chromatograph. Fourier Transform Infra-red. Atomic Absorption Spectroscopy, and Ultra-violet Spectroscopy. Corequisite: CH-413 Prerequisites: CH-310b CH-312 CH-350 CH-350L CH330 CH330L and Instructors consent.

## CH 419 BIOCHEMISTRY

SPRING ONLY/ALL YEARS

3 credit hours

This course covers the principles of protein chemistry and enzyme nomenclature, catalysis, kinetics and control. It includes three hours of lecture weekly. The lab, BI/CH419L, MUST be taken concurrently. Prerequisites: CH310a, CH310b, CH311 and CH312; or concurrent enrollment. Corequisite: BI/CH419L.

## CH 419G BIOCHEMISTRY

SPRING ONLY/ALL YEARS

3 credit hours

This course covers the principles of protein chemistry and enzyme nomenclature, catalysis, kinetics and control. It includes three hours of lecture weekly. The lab, BI/CH419L, MUST be taken concurrently. Prerequisites: CH310a, CH311, CH310b and CH312; or concurrent enrollment. Corequisite: BI/CH419G/L.

## CH 419G/L BIOCHEMISTRY LABORATORY

SPRING ONLY/ALL YEARS

1 credit hour

This course is the laboratory portion of BI/CH419G and MUST be taken concurrently. The course consists of one three-hour laboratory period per week. Prerequisites: CH310a, CH311, CH310b and CH312; or concurrent enrollment. Corequisite: BICH419G.

## CH 419L BIOCHEMISTRY LABORATORY

SPRING ONLY/ALL YEARS

1 credit hour

CH/BI419L is the laboratory portion of CH/BI419 and MUST be taken concurrently. The course consists of one three-hour laboratory per week. Prerequisites: CH310a, CH311, CH310b and CH312; or concurrent enrollment. Corequisite: CH/BI419.

## CH 420 NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

SPRING ONLY/EVEN YEARS

3 credit hours

Principles and applications of NMR spectroscopy, utilizing examples from organic, inorganic, and biological chemistry are covered. The course involves three hours of classroom study per week. Prerequisites: CH310a-b, CH312, MA204 and consent of instructor.

## CH 430 INORGANIC CHEMISTRY

SPRING ONLY/EVEN YEARS

3 credit hours

This course is a study of topics such as bonding models in inorganic chemistry, structure and reactivity of the covalent bond, experimental determination of molecular structure, chemical forces, coordination chemistry from theoretical, structural and reaction mechanistic perspectives, chemical applications of group theory and molecular symmetry. It includes three hours of lecture per week. Prerequisites: CH103-103L, MA204 or consent of program.

## CH 450A PHYSICAL CHEMISTRY

FALL ONLY/EVEN YEARS

4 credit hours

This is a full-year lecture sequence covering the application of physical principles to chemistry with theoretical, mathematical treatment. Laws of thermodynamics, thermochemical equilibria, ionic equilibria, phase equilibria, chemical kinetics, quantum theory, molecular structure, statistical mechanics, electrochemistry, surface chemistry and photochemistry are studied. It includes four hours lecture weekly. Prerequisites: MA203, MA204 and MA205 or consent of program.

## CH 450B PHYSICAL CHEMISTRY

SPRING ONLY/ODD YEARS

4 credit hours

This is a full-year lecture sequence covering the application of physical principles to chemistry with theoretical, mathematical treatment. Laws of thermodynamics, thermochemical equilibria, ionic equilibria, phase equilibria, chemical kinetics, quantum theory, molecular structure, statistical mechanics, electrochemistry, surface chemistry and photochemistry are studied. It includes four hours lecture weekly. Prerequisites: MA203, MA204 and MA205 or consent of program.

## CH 451 PHYSICAL CHEMISTRY I LABORATORY

SPRING ONLY/ODD YEARS

2 credit hours

This course covers the mathematical tools normally utilized in experimental physical chemistry and experimental contact with thermodynamics, chemical equilibrium, chemical kinetics, and phase equilibrium. It consists of six hours of laboratory weekly. Prerequisite: Consent of program.

## CH 480 SPECIAL TOPICS IN CHEMISTRY

FALL/SPRING/ALL YEARS

2 - 3 credit hours

This course will provide an in-depth study of a specific area or areas of chemistry that are novel, and not represented in the regular offerings within the program. The topics offered may include offerings in forensic chemistry, food chemistry, polymer chemistry, advance in the thermodynamics, medicinal chemistry, environmental chemistry, wine chemistry, chemical sensor, electrochemistry, bioanalytical chemistry, coordination chemistry, nanoparticles, natural products, organic synthesis, metabolomics, nuclear chemistry, industrial chemistry, surface chemistry, geochemistry, or other areas of interest or expertise. This course also provides customized opportunities to capitalize on the currently expertise in teaching and research being conducted at the Chemistry Program and related fields in the natural science, including visiting scholars. Prerequisites: CH-310a, CH-310b, CH-311, CH-312, CH-330, CH-330L, MA-203 and Instructors Consent.

## CH 491 CHEMISTRY SEMINAR

FALL/SPRING/ALL YEARS

1 - 2 credit hours

This is a course designed to familiarize the student with research or reviews and surveys of chemical literature. Students will conduct research on selected topic using chemical literature and present the findings in a seminar presentation. Students may also choose to prepare a seminar paper in addition to the seminar presentation for 2 credits. It may be taken more than once for credit with the consent of the program. Prerequisites: Upper division status and consent of program.

## CH 495 RESEARCH METHODS IN CHEMISTRY

AS REQUIRED

4 credit hours

This course will provide students with in depth research experience in a specific topic in chemical sciences. Students will undertake a project on the selected topic under the close guidance of a selected faculty. The research methods will involve the formulation of a hypothesis, conducting a literature survey, writing of project proposal, designing and conducting experimentation, data collection and analysis, and presentation of results. Students will be required to write a full project report and present their data at a seminar or conference at the end of the course. The experimental requirement for this research course will require advanced planning and preparation. Thus students planning to take this course are strongly advised to inform the chair of the program and the instructor at least one semester prior to taking this course. Prerequisites: CH330/330L, CH310A/310B, CH311, CH312 and consent of instructor. This course can serve as an upper division elective course for the Chemistry majors. It can also be taken to fulfill the elective requirement for graduate programs in either Environmental Science, or Biology, or Sustainable Agriculture Food and Natural Resources.

## CH 495G RESEARCH METHODS IN CHEMISTRY

### AS REQUIRED

4 credit hours

This course will provide students with in depth research experience in a specific topic in chemical sciences. Students will undertake a project on the selected topic under the close guidance of a selected faculty. The research methods will involve the formulation of a hypothesis, conducting a literature survey, writing of project proposal, designing and conducting experimentation, data collection and analysis, and presentation of results. Students will be required to write a full project report and present their data at a seminar or conference at the end of the course. The experimental requirement for this research course will require advanced planning and preparation. Thus students planning to take this course are strongly advised to inform the chair of the program and the instructor at least one semester prior to taking this course. Prerequisites: CH330/330L, CH310A/310B, CH311, CH312 or consent of instructor. This course can serve as an upper division elective course for the Chemistry majors. It can also be taken to fulfill the elective requirement for graduate programs in either Environmental Science, or Biology, or Sustainable Agriculture Food and Natural Resources. This course can serve as an upper division elective course for the chemistry majors. It can also be taken to fulfill the elective requirement for graduate programs in either Environmental Science, or Biology, or Sustainable Agriculture Food and Natural Resources.

## CH 498 CHEMISTRY INTERNSHIP

1 - 3 credit hours

This course will provide students with practical skills and application of chemical knowledge in a chemistry related work environment. Students will also learn and apply communication and interaction skills in a work environment. Students desiring to take this course must have the internship course approved by the Program. Arrangement of an internship for credit is a collaborative process between the student, the supervising organization, and the academic department. An internship agreement form must be signed by all parties before the final approval of the course. The internship work must be primarily chemistry in nature. Students must complete the respective numbers of hours for the desired credit: 45 hours per credit, 90 hours for 2 credits, and 135 hours for 3 credits. Prerequisites: CH-310a, CH-310b, CH-311, CH-312 and CH-330 CH-330L. Instructors Consent.