

# CHEM - CHEMISTRY (CHEM)

**Note:** All 500-level CHEM courses (with the exceptions of CHEM U581, U582, U583L) require completion of CHEM U111, U112, and U331 with a C or better as prerequisite. Additional prerequisites are included in individual course descriptions. Written consent of instructor can override this requirement when deemed appropriate.

## **CHEM U101 Fundamental Chemistry I 4 Credit Hours**

Survey of inorganic and solution chemistry. Non-science majors only. Three classes or three class hours, one recitation, and two laboratory hours per week.

Corequisite(s): CHEM U101L.

Pre/Corequisite(s): MATH U121 or higher, except statistics; or consent of instructor.

## **CHEM U101L Fundamental Chemistry I Lab 0 Credit Hours**

Survey of inorganic and solution chemistry. Non-science majors only. Three classes or three class hours, one recitation, and two laboratory hours per week.

Corequisite(s): CHEM U101.

Pre/Corequisite(s): MATH U121 or higher, except statistics; or consent of instructor.

## **CHEM U106 Chemistry and Society 3 Credit Hours**

General chemical fundamentals and how these principles apply to societal issues such as the environment, genetics, and health. Recurring themes include critical evaluation of information from the media and the web, consideration of the risks and benefits of recent scientific advances for society. Non-science majors only. (CHEM U106 laboratory is available for additional credit.)

## **CHEM U106L Chemistry and Society Lab 1 Credit Hour**

Experiments, exercises, and demonstrations to accompany CHEM U106. Three laboratory hours per week. Non-science majors only.

Pre/Corequisite(s): CHEM U106.

## **CHEM U109 Chemistry of Living Things 4 Credit Hours**

General chemistry basics, organic functional groups, and structure and function of biological macromolecules in living systems. Non-science majors only. Three lecture, one recitation, and two laboratory hours per week.

Prerequisite(s): MATH U120 or higher, except statistics; or higher placement in MATH.

Corequisite(s): CHEM U109L.

## **CHEM U109L Chemistry of Living Things Lab 0 Credit Hours**

General chemistry basics, organic functional groups, and structure and function of biological macromolecules in living systems. Non-science majors only. Three lecture, one recitation, and two laboratory hours per week.

Prerequisite(s): MATH U120 or higher, except statistics; or higher placement in MATH.

Corequisite(s): CHEM U109.

## **CHEM U111 General Chemistry 4 Credit Hours**

Chemical principles with emphasis on stoichiometry, atomic structure, bonding, and molecular structure. Three class, one recitation, and two laboratory hours per week.

Prerequisite(s): MATH U121 or higher; or placement into at least MATH U126; or consent of instructor.

Corequisite(s): CHEM U111L.

## **CHEM U111L General Chemistry Lab 0 Credit Hours**

Chemical principles with emphasis on stoichiometry, atomic structure, bonding, and molecular structure. Three class, one recitation, and two laboratory hours per week.

Prerequisite(s): MATH U121 or higher; or placement into at least MATH U126; or consent of instructor.

Corequisite(s): CHEM U111.

## **CHEM U112 General Chemistry and Qualitative Analysis 4 Credit Hours**

Kinetics, chemical equilibrium, acids and bases, electrochemistry, thermodynamics, colligative properties, and inorganic qualitative analysis. Three class hours and three laboratory hours per week.

Prerequisite(s): CHEM U111.

Corequisite(s): CHEM U112L.

Pre/Corequisite(s): MATH U126 or equivalent, or higher, or consent of instructor.

## **CHEM U112L General Chemistry and Qualitative Analysis Lab 0 Credit Hours**

Kinetics, chemical equilibrium, acids and bases, electrochemistry, thermodynamics, colligative properties, and inorganic qualitative analysis. Three class hours and three laboratory hours per week.

Prerequisite(s): CHEM U111.

Corequisite(s): CHEM U112.

Pre/Corequisite(s): MATH U126 or equivalent, or higher, or consent of instructor.

## **CHEM U201 Science Career Catalyst 1 Credit Hour**

An exploration of careers in biology and chemistry. Topics include self-assessment, career planning, interviewing, professional networking, resumes, and personal statements.

Prerequisite(s): Grade of C or better in CHEM U331.

Typically Offered: Upstate Fall Offering, Upstate Spring Offering  
Cross-Listed: BIOL U201

## **CHEM U211 Introduction to Organic Chemistry I 4 Credit Hours**

Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).

Corequisite(s): CHEM U211L.

## **CHEM U211L Introduction to Organic Chemistry Lab 0 Credit Hours**

Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).

Corequisite(s): CHEM U211.

## **CHEM U212 Introduction to Organic Chemistry II 4 Credit Hours**

A continuation of CHEM U211. Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).

Corequisite(s): CHEM U212L.

## **CHEM U212L Introduction to Organic Chemistry II Lab 0 Credit Hours**

Survey of the chemistry of carbon compounds and introduction to the basic principles of organic chemistry. (Not for major credit in chemistry or biology).

Corequisite(s): CHEM U212.

## **CHEM U321 Quantitative Analysis 3 Credit Hours**

Principles of gravimetric, volumetric, and basic instrumental methods of analysis. Three class hours per week.

Prerequisite(s): Grade of C or better in CHEM U112.

**CHEM U321L Quantitative Analysis Laboratory 1 Credit Hour**

Practice of volumetric, gravimetric, and simple instrumental methods of analysis. Three laboratory hours per week.

Pre/Corequisite(s): CHEM U321.

**CHEM U331 Organic Chemistry I 3 Credit Hours**

Nomenclature, properties, reactions, and syntheses of carbon-containing compounds. Focus is on alkanes, alkyl halides, alkenes, alkynes, alcohols, epoxides, ethers, and free radicals.

Prerequisite(s): CHEM U112 or consent of instructor.

**CHEM U331L Organic Chemistry Laboratory I 1 Credit Hour**

A survey of laboratory methods of organic chemistry. Three laboratory hours per week.

Pre/Corequisite(s): CHEM U331.

**CHEM U332 Organic Chemistry II 3 Credit Hours**

Nomenclature, properties, reactions, synthesis, and spectroscopic characterization of carbon-containing compounds concentrating on amines, arenes, carbonyl-containing molecules, conjugated dienes, and organometallic compounds.

Prerequisite(s): CHEM U331 or consent of instructor.

**CHEM U332L Organic Chemistry Laboratory II 1 Credit Hour**

A survey of laboratory methods of organic chemistry. Three laboratory hours per week.

Prerequisite(s): CHEM U331 and CHEM U331L.

Pre/Corequisite(s): CHEM U332.

**CHEM U371 Environmental Chemistry 3 Credit Hours**

The chemistry underlying the fate and transport of chemicals in the environment (air, water, and soil), and their effects on the ecosystem. Topics include ozone cycle, smog, acid rain, greenhouse effect, acid mine drainage, pollution, analytical technologies used to screen for various classes of contaminants, drinking and wastewater treatments, energy use and problems, remediation of water and soil.

Prerequisite(s): CHEM U112.

Pre/Corequisite(s): CHEM U331; or consent of instructor.

**CHEM U371L Environmental Chemistry Lab 1 Credit Hour**

Application of physical and physiochemical methods to air, water and soil analysis.

Prerequisite(s): CHEM U112.

Corequisite(s): CHEM U371 or consent of instructor.

**CHEM U395 Internship in Chemistry 3 Credit Hours**

Supervised work experience in chemistry. A minimum of 45 hours per semester is required for zero or 1 credits; 90 hours for 2 credits; 135 hours for 3 credits. A required contractual agreement is signed by the supervisor, the student, the instructor, and department chair. Pass/Fail credit.

Prerequisite(s): Junior or senior standing.

**CHEM U397 Junior Seminar 1 Credit Hour**

Searching and reading chemical literature and presentation of papers in a journal club format. Class meets with the chemistry Senior Seminar (CHEM U599) and presentations by CHEM U599 students will be observed.

Pre/Corequisite(s): CHEM U321, CHEM U332, CHEM U332L.

**CHEM U499 Undergraduate Research 3 Credit Hours**

Directed research project introducing the student to the methods of chemical research. A written report on work accomplished is required at the end of each semester. Research involves laboratory work as determined by the instructor.

Prerequisite(s): Consent of instructor.

**CHEM U511 Inorganic Chemistry 3 Credit Hours**

Atomic structure, molecular orbital theory, coordination compounds, crystal structures, acid/base chemistry, organometallic chemistry, and a systematic study of the periodic table.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331; or consent of instructor.

**CHEM U512L Inorganic Chemistry Laboratory 1 Credit Hour**

Syntheses with high pressure reactions, the use of unfamiliar solvents, high temperature and inert atmosphere, and the application of infrared, ultraviolet, nuclear magnetic resonance, and mass spectroscopy to inorganic chemistry. Three laboratory hours per week.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331 or consent of instructor; and CHEM U331L.

Pre/Corequisite(s): CHEM U511.

**CHEM U522 Instrumental Methods of Analysis 4 Credit Hours**

Theory, instrumentation, and applications of modern instrumental techniques. Three class and three laboratory hours per week.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, CHEM U321, CHEM U321L, and CHEM U331; or consent of instructor.

Corequisite(s): CHEM U522L.

**CHEM U522L Instrumental Methods of Analysis Lab 0 Credit Hours**

Theory, instrumentation, and applications of modern instrumental techniques. Three class and three laboratory hours per week.

Corequisite(s): CHEM U522.

**CHEM U530 Spectrometric Identification of Organic Compounds 3 Credit Hours**

Development and application of methods of obtaining and interpreting spectrometric data in terms of structural organic chemistry. Topics include infrared, ultraviolet, visible, and nuclear magnetic resonance spectroscopy.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331 or consent of instructor; and CHEM U332.

**CHEM U534 Polymer Chemistry 3 Credit Hours**

Fundamentals of macromolecular science with an emphasis on synthesis and characterization.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112 and CHEM U331 or consent of instructor; and CHEM U332.

**CHEM U541 Physical Chemistry I 3 Credit Hours**

Chemical thermodynamics, equilibrium, and kinetics.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331 or consent of instructor; MATH U142; and PHYS U202 or PHYS U212.

**CHEM U541L Physical Chemistry I Laboratory 1 Credit Hour**

Applications of experimental and computational techniques to the study of chemical thermodynamics, equilibrium, kinetics and physical properties of substances. Three laboratory hours per week.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331; or consent of instructor.

Pre/Corequisite(s): CHEM U541.

**CHEM U542 Physical Chemistry II 3 Credit Hours**

Introduction to quantum mechanics, atomic and molecular structure, spectroscopy, and statistical mechanics.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331 or consent of instructor; and CHEM U541.

**CHEM U542L Physical Chemistry II Laboratory 1 Credit Hour**

Applications of experimental and computational techniques to the study of quantum mechanics, spectroscopy, and molecular structure. Three laboratory hours per week.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, and CHEM U331 or consent of instructor; and CHEM U541L.

Pre/Corequisite(s): CHEM U542.

**CHEM U561 Medicinal Chemistry 3 Credit Hours**

Fundamentals of the drug discovery process. Topics include drug targets, lead discovery and optimization, drug synthesis, pharmacodynamics, pharmacokinetics, the Food and Drug Administration approval process, and pharmaceutical case studies.

Prerequisite(s): CHEM U332; and grade of C or better in CHEM U111, CHEM U112, and CHEM U331; or consent of instructor.

**CHEM U581 Biochemistry I 3 Credit Hours**

Structure and function of the major classes of biological compounds and biological membranes. Content includes a kinetic and equilibrium based approach to biological transport and catalysis, signaling, and an introduction to bioenergetics.

Prerequisite(s): Grade of C or better in CHEM U332 or consent of instructor.

**CHEM U582 Biochemistry II 3 Credit Hours**

Chemistry of biological information pathways. DNA, RNA, and protein metabolism, organization of genes on chromosomes, regulation of gene expression, and applications of these topics to biotechnology problems are covered.

Prerequisite(s): BIOL U581/CHEM U581 or consent of instructor.

**CHEM U583L Biochemistry Laboratory 1 Credit Hour**

A survey of laboratory methods in biochemistry. Three laboratory hours per week.

Pre/Corequisite(s): CHEM U581 or CHEM U582.

**CHEM U599 Senior Seminar 3 Credit Hours**

Integration and assessment of chemical knowledge at an advanced level, exploration of ethical issues, research, and oral presentation.

Prerequisite(s): Grade of C or better in CHEM U111, CHEM U112, CHEM U321, CHEM U331, and CHEM U541; SPCH U201; and at least one course from CHEM U511, CHEM U522, CHEM U530, CHEM U534, CHEM U561, CHEM U581, or CHEM U582; or consent of instructor.