

# CHEMISTRY (CHEM)

## CHEM 104 - Introduction Chemistry I

This course is the first course in a two-semester sequence for non-science majors which introduces the fundamental principles of Chemistry. Although this course serves as a prerequisite for the next course in the sequence (CHEM 106), it is also designed as a stand-alone course. This allows students to take either this course alone or the two-semester sequence and still obtain a basic understanding of chemical principles. The principles of chemistry are developed and illustrated through selective application. Note: This course is not a substitution for CHEM 107 and students cannot receive credit for CHEM 104 and CHEM 107. Also note that this course does not serve as a prerequisite for CHEM 108.

Credits: 3

Term(s) Typically Offered: Offered Every Term

## CHEM 106 - Introductory Chemistry II

This is the second course in a two-semester sequence of an introductory chemistry course for non-science majors. The course will build on the principles presented in CHEM 104 which is a prerequisite for this course and will focus on the areas of organic and biochemistry. As with CHEM 104, this course will concentrate on the basic principles of chemistry and illustrate them through selected applications.

Prerequisites: CHEM 104<sup>C</sup> or CHEM 107<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Winter, Spring&Summer

## CHEM 107 - General Chemistry I

Topics include nomenclature, stoichiometry, kinetic-molecular theory, gas laws, electronic structure, periodicity, and chemical bonding. Stoichiometry is emphasized.

Prerequisites: (ACSD 110<sup>D</sup> or ESAP 110<sup>D</sup>) or MATH 199<sup>D</sup> or minimum score of Y in 'WAIVE ACSD110 W HIGHER MATH' or minimum score of 30 in 'ALEKS PPL Assessment'

<sup>D</sup> Requires minimum grade of D.

Credits: 3

Term(s) Typically Offered: Offered Fall & Summer Terms

## CHEM 108 - General Chemistry II

Topics include intermolecular forces, solutions, colloids, chemical kinetics, thermodynamics, equilibria (acid-base, solubility, and complex ion), electro-chemistry, and the transition elements.

Prerequisite: CHEM 107<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring & Summer Terms

## CHEM 110 - Contemporary Chemistry Laboratory

Laboratory to accompany Chemistry 104 providing basic chemistry and environmentally related experiences. One two-hour laboratory per week.

Prerequisite: CHEM 104 (may be taken concurrently)<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 1

Term(s) Typically Offered: Offerings Vary

## CHEM 111 - General Chemistry I Lab

A laboratory to accompany CHEM 107. Laboratory experiments are designed to develop basic laboratory skills and illustrate concepts.

Prerequisite: CHEM 107 (may be taken concurrently)<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 1

Term(s) Typically Offered: Offered Fall & Summer Terms

## CHEM 112 - General Chemistry II Lab

A laboratory to accompany CHEM 108. Laboratory experiments illustrate the concepts of General Chemistry II.

Prerequisites: CHEM 107<sup>C</sup> and CHEM 111<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Spring & Summer Terms

## CHEM 113 - Clinical Chemistry Laboratory

Laboratory to accompany CHEM 103 providing basic chemistry and health-related experiences. One two-hour laboratory per week.

Prerequisite: CHEM 104 (may be taken concurrently)<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 1

Term(s) Typically Offered: Offerings Vary

## CHEM 139 - Foundations of Academic Discovery

Foundations of Academic Discovery serves as the entry point to the Rock Integrated Studies Program. With its strong faculty-student interaction, the course promotes intellectual inquiry, critical and creative thinking, and academic excellence. Through varied content, the course introduces students to academic discourse and information literacy while exploring topics such as diversity and inclusion and global awareness. This course will set students along the path to becoming engaged with issues and scholarship important to a 21st century education while they learn about themselves and their place in the world.

Credits: 3

Term(s) Typically Offered: Offered as Needed

Enrollment limited to students with a semester level of Freshman 1 or Freshman 2.

Enrollment limited to students with the ROCK STUDIES 2 STUDENT or ROCK STUDIES STUDENT attributes.

## CHEM 190 - Experimental

A unique and specifically focused course within the general purview of a department which intends to offer it on a "one time only" basis and not as a permanent part of the department's curriculum.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

## CHEM 195 - Workshop

A workshop is a program which is usually of short duration, narrow in scope, often non-traditional in content and format, and on a timely topic.

Credits: 1-6

Term(s) Typically Offered: Offered as Needed

## CHEM 198 - Selected Topics

A Selected Topics course is a normal, departmental offering which is directly related to the discipline, but because of its specialized nature, may not be able to be offered on a yearly basis by the department.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

**CHEM 200 - Fundamentals of Organic Chemistry**

A one semester introductory course that covers the most commonly encountered properties of the major families of organic compounds. The course is designed for students pursuing a B.S. in environmental science. Not equivalent to CHEM 201.

Prerequisites: CHEM 108<sup>C</sup> and CHEM 112<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Summer & Winter Terms

**CHEM 201 - Organic Chemistry I**

Modern theories relating molecular structure to chemical reactivity are stressed. Elucidation of molecular structure by infrared, ultraviolet, nuclear magnetic resonance and mass spectroscopy is also covered.

Prerequisites: CHEM 108<sup>C</sup> and CHEM 112<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Fall & Summer Terms

**CHEM 202 - Organic Chemistry II**

Modern theories relating molecular structure to chemical reactivity are stressed. Elucidation of molecular structure by infrared, ultraviolet, nuclear magnetic resonance and mass spectroscopy is also covered.

Prerequisite: CHEM 201<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring & Summer Terms

**CHEM 204 - Introduction to Forensic Science**

Forensic science is the application of science to the examination of physical evidence obtained in the investigation of a crime. The Introduction to Forensic Science course uses high impact practices to provide an immersed research experience for students in the different steps of the scientific method, while learning about the multidisciplinary and interdisciplinary nature of Forensic Science.

Credits: 3

Thematic Thread(s): Citizenship & Social Problems, Institutions & Human Innovations, Transfer Thread Completion Course

**CHEM 211 - Organic Chemistry Laboratory I**

A laboratory course in which students employ the synthetic techniques and analytical procedures of organic chemistry.

Prerequisites: CHEM 112<sup>C</sup> and CHEM 201<sup>\*C</sup> and CHEM 108<sup>C</sup> (may be taken concurrently).

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Fall & Summer Terms

**CHEM 212 - Organic Chemistry Laboratory II**

A laboratory course in which students employ the synthetic techniques and analytical procedures of organic chemistry.

Prerequisites: CHEM 201<sup>C</sup> and CHEM 211<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Spring & Summer Terms

**CHEM 240 - Industrial Hygiene**

Requirements to preserve worker health and safety will be surveyed.

Prerequisites: CHEM 108<sup>D</sup> and (CHEM 200<sup>D</sup> or CHEM 201<sup>D</sup>)

<sup>D</sup> Requires minimum grade of D.

Credits: 3

Term(s) Typically Offered: Offerings Vary

**CHEM 243 - Introduction to Research in Chemistry**

This is a one semester seminar covering faculty research within the chemistry department, use of library resources, internship opportunities available to undergraduate students, and basic safety training. This course is intended primarily for first-semester sophomore chemistry majors but is open to students from other majors in CHES who might be interested in pursuing undergraduate research in chemistry.

Credits: 1

Term(s) Typically Offered: Offered Fall Terms

Enrollment limited to students with a semester level of Junior 1, Junior 2, Sophomore 1 or Sophomore 2.

Enrollment limited to students in the College of Engineering & Science college.

**CHEM 270 - Industrial Chemistry**

A study of industries with emphasis on economic, technical, and possible ecological factors affecting process design. Includes on-site lectures and discussions of various industries in the area.

Prerequisites: CHEM 108<sup>D</sup> and CHEM 112<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 3

Term(s) Typically Offered: Offerings Vary

**CHEM 290 - Experimental**

A unique and specifically focused course within the general purview of a department which intends to offer it on a "one time only" basis and not as a permanent part of the department's curriculum.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

**CHEM 295 - Workshop**

A workshop is a program which is usually of short duration, narrow in scope, often non-traditional in content and format, and on a timely topic.

Credits: 1-6

Term(s) Typically Offered: Offered as Needed

**CHEM 298 - Selected Topics**

A Selected Topics course is a normal, departmental offering which is directly related to the discipline, but because of its specialized nature, may not be able to be offered on a yearly basis by the department.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

**CHEM 301 - Physical Chemistry I**

Thermodynamics and chemical kinetics. Cross listed as PHYS301.

Prerequisites: CHEM 108<sup>C</sup> and CHEM 112<sup>C</sup> and (PHYS 212<sup>C</sup> or PHYS 213<sup>C</sup>) and MATH 230<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Fall Terms Odd

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 302 - Physical Chemistry II**

Quantum mechanics and spectroscopy.

Prerequisites: MATH 230<sup>C</sup> and CHEM 108<sup>C</sup> and CHEM 112<sup>C</sup> and PHYS 211<sup>C</sup> and (PHYS 212<sup>C</sup> or PHYS 213<sup>C</sup>)

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring Terms Even

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 321 - Physical Chemistry Laboratory I**

Principles from Thermodynamic principles will be employed in the laboratory for determining and relating physical properties such as viscosity, surface tension, boiling and freezing points to the identity, and composition of chemical substances.

Prerequisites: CHEM 301 (may be taken concurrently)<sup>D</sup> or PHYS 301 (may be taken concurrently)<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 1

Term(s) Typically Offered: Offered Fall Terms Odd

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 322 - Physical Chemistry Laboratory II**

Applied principles from Physical Chemistry II lecture will be used for interpreting results from experiments involving kinetics, equilibria, and spectrophotometric data.

Prerequisite: CHEM 302 (may be taken concurrently)<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 1

Term(s) Typically Offered: Offerings Vary

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 335 - Biochemistry I**

The study of structures and physical properties of biological molecules.

Prerequisites: BIOL 104<sup>C</sup> and CHEM 202<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Fall Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 336 - Biochemistry Laboratory I**

A laboratory course in which the student uses techniques employed in biochemical investigations.

Prerequisites: CHEM 335 (may be taken concurrently)<sup>C</sup> and CHEM 212<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Fall Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 337 - Biochemistry II**

Investigates the basic theme of intermediary metabolism. A background for this study is gained through study of the chemistry of cellular constituents.

Prerequisites: CHEM 335<sup>C</sup> and CHEM 336<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 338 - Biochemistry Laboratory II**

This is a one-credit course in biochemical techniques used in the investigation, isolation and purification of biomolecules. The student will get an exposure to and an appreciation for problem solving utilizing a research-oriented approach.

Prerequisites: CHEM 336<sup>C</sup> and CHEM 337<sup>\*C</sup> (may be taken concurrently).

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Spring Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 340 - Air Quality Assessment**

A study of the quality of the air environment. Air quality assessment and potential problems will be examined both in lecture discussions and in laboratory or field situations. (Includes ambient air testing.) Three hours of lecture and three hours of laboratory per week.

Prerequisites: CHEM 200<sup>C</sup> or CHEM 201<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 4

Term(s) Typically Offered: Offerings Vary

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 350 - Analytical Chemistry**

Topics include gravimetric and volumetric analysis of chemical systems. Special emphasis is given to titrimetric methods based on acid-base, complexation, and oxidation-reduction reactions.

Prerequisites: CHEM 108<sup>C</sup> and CHEM 112<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 351 - Analytical Chemistry Lab**

Students develop practical skills employed in the quantitative analysis of chemical systems.

Prerequisites: CHEM 350 (may be taken concurrently)<sup>C</sup> and CHEM 108<sup>C</sup> and CHEM 112<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Spring Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 370 - Water Quality Assessment**

Water quality assessment and water quality problems will be examined both in lecture discussions and in laboratory or field situations. Three hours of lecture and three hours of laboratory per week.

Prerequisites: CHEM 200<sup>C</sup> or CHEM 201<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 4

Term(s) Typically Offered: Offerings Vary

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 390 - Experimental**

A unique and specifically focused course within the general purview of a department which intends to offer it on a "one time only" basis and not as a permanent part of the department's curriculum.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 395 - Workshop**

A workshop is a program which is usually of short duration, narrow in scope, often non-traditional in content and format, and on a timely topic.

Credits: 1-6

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 398 - Selected Topics**

A Selected Topics course is a normal, departmental offering which is directly related to the discipline, but because of its specialized nature, may not be able to be offered on a yearly basis by the department.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 415 - Forensic Analysis**

The application of analytical chemistry including instrumental methods to the investigation and interpretation of crime scene evidence.

Prerequisites: CHEM 350<sup>C</sup> and CHEM 351<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring Terms Even

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 416 - Forensic Analysis Lab**

The application of instrumental methods of analysis to the interpretation of crime scene evidence.

Prerequisites: CHEM 350<sup>C</sup> and CHEM 351<sup>C</sup> and CHEM 415<sup>\*C</sup> (may be taken concurrently).

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Spring Terms Even

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 425 - Instrumental Analysis**

A lecture course to introduce the student to the theory, advantages, disadvantages, limitations, and power of contemporary chemical instrumentation, including computational methods.

Prerequisites: CHEM 350<sup>C</sup> and MATH 225<sup>C</sup> and PHYS 211<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring Terms Odd

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 426 - Instrumental Analysis Laboratory**

A three hour per week laboratory accompanying CHEM 425.

Instrumentation and computing technology will be applied to quantitative problems of chemistry.

Prerequisite: CHEM 425 (may be taken concurrently)<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 1

Term(s) Typically Offered: Offered Spring Terms Odd

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 430 - Industrial Pollution Control Engineering**

Economic and technical problems will be discussed as related to the abatement of harmful discharges from industrial sources. Systems analysis will be employed in the examination of engineering solutions in the physical or chemical treatment of discharge. Three hours of lecture per week or a field trip.

Prerequisites: CHEM 108<sup>D</sup> and CHEM 112<sup>D</sup>

<sup>D</sup> Requires minimum grade of D.

Credits: 3

Term(s) Typically Offered: Offerings Vary

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 442 - Inorganic Chemistry**

A lecture course covering atomic structure, bonding, and properties of inorganic compounds. Coordination chemistry and other topics of current research interest are covered. Offered in alternate years.

Prerequisite: CHEM 202<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Fall Terms Even

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 450 - Chemistry Internship**

Supervised placement and research in selected public and private agencies. (Credits earned will be counted as free electives and will not be counted toward the chemistry major.)

Credits: 1-12

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 452 - Physical Inorganic Chemistry Laboratory**

A laboratory course illustrating techniques of synthesis and characterization of inorganic compounds using a variety of spectroscopic and magnetic measurements, and using computational chemistry methods to investigate the electronic structure of compounds.

Prerequisites: CHEM 212<sup>C</sup> and CHEM 442<sup>\*C</sup> (may be taken concurrently).

<sup>C</sup> Requires minimum grade of C.

Credits: 1

Term(s) Typically Offered: Offered Spring Terms Odd

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 460 - Materials Chemistry**

A one semester introductory course that covers the synthesis, analysis, and properties of polymers and solid state materials. Applications to industrial and practical application will be discussed.

Prerequisite: CHEM 202<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 3

Term(s) Typically Offered: Offered Spring Terms Odd

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 475 - Advanced Organic Synthesis**

A one semester course that includes an advanced organic chemistry synthesis laboratory. The lecture part covers modern synthetically useful reactions and their applications. The intensive laboratory offers the students an introduction to organic synthesis research, including the use of modern reagents and instruments. Students will become acquainted with techniques of preparation, purification and spectroscopic identifications of organic compounds.

Prerequisites: CHEM 202<sup>C</sup> and CHEM 212<sup>C</sup>

<sup>C</sup> Requires minimum grade of C.

Credits: 4

Term(s) Typically Offered: Offerings Vary

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 490 - Independent Study**

Independent Study courses offer a student the opportunity to carry out original, chemical research in a Chemistry Department, employing all facilities available through the department. Students must properly write and submit an ACS-style report to their faculty advisor or department chair for evaluation.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 491 - Chemistry Seminar**

For junior chemistry majors. On-line searches of the chemical literature lead to oral presentations and written reports in a selected area of research.

Credits: 1

Term(s) Typically Offered: Offered Spring Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 495 - Workshop**

A workshop is a program which is usually of short duration, narrow in scope, often non-traditional in content and format, and on a timely topic.

Credits: 1-6

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 496 - Research**

Offers a student the opportunity to carry out chemical research in the laboratory, employing all departmental facilities, and the experience of writing a thesis under the direction of a faculty mentor.

Credits: 1-3

Term(s) Typically Offered: Offered Spring Terms

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.

**CHEM 498 - Selected Topics**

A Selected Topics course is a normal, departmental offering which is directly related to the discipline, but because of its specialized nature, may not be able to be offered on a yearly basis by the department.

Credits: 1-3

Term(s) Typically Offered: Offered as Needed

Students with a semester level of Freshman 1, Freshman 2 or Sophomore 1 may **not** enroll.