

DIVISION OF
NATURAL SCIENCE
AND MATHEMATICS

Chemistry

In addition to the courses below, students in the Chemistry major are also required to take the following General Education courses (see pages 54-58).

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|---------------------------------------|--|
| ENG 106 | Argumentative Writing |
| ENG 107 | Academic Writing |
| ENG 208 | Sophomore Core – Social Responsibility |
| CMP 102 | Fundamental Computer Literacy I (0.5 c.u.) |
| ECN 200 | Introduction to Economics (0.5 c.u.) |
| MTH 114 | Precalculus |
| AAC course | Arts as Catalyst (1 c.u.) |
| HUM GELS | Humanities GELS (2 c.u.s) |
| CAT/HUM GELS | (1 c.u.) Creative Arts & Technology GELS or Humanities GELS |
| SOC SCI GELS | Social Science GELS (2 c.u.s) |
| General Education Electives (2 c.u.s) | |

Many courses have prerequisites which are listed in the course description. Please be sure that necessary prerequisites have been taken before enrolling in any course.

Students wishing New Jersey Teaching Certification must be admitted to the B.A. in Education and satisfy the courses listed in the Chemistry co-concentration (see page 142). Should a student decide to major in the discipline exclusively, he/she will need to submit a change of major declaration and satisfy all the requirements listed below. Students who wish to double major must complete the requirements of both majors.

There are two Chemistry concentrations:

- **General Chemistry**
- **Biochemistry**

Both majors are required to take the following core courses:

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|---------|---|
| CHM 111 | General Chemistry I |
| CHM 112 | General Chemistry II |
| CHM 211 | Chemical Analysis & Instrumentation |
| CHM 212 | Chemical Analysis & Instrumentation Laboratory (0.5 c.u.) |
| CHM 301 | Organic Chemistry I |
| CHM 302 | Organic Chemistry II |
| CHM 303 | Organic Chemistry I Laboratory (0.5 c.u.) |
| CHM 304 | Organic Chemistry II Laboratory (0.5 c.u.) |
| CHM 311 | Physical Chemistry I |
| CHM 313 | Physical Chemistry I Laboratory (0.5 c.u.) |
| CHM 401 | Biochemistry I |
| CHM 404 | Biochemistry I Laboratory (0.5 c.u.) |
| CHM 450 | Chemistry Seminar (0.5 c.u.) |
| MTH 221 | Calculus & Analytic Geometry I |
| MTH 222 | Calculus & Analytic Geometry II |
| PHY 210 | University Physics I |
| PHY 211 | University Physics II |

GENERAL CHEMISTRY CONCENTRATION

The General Chemistry concentration is satisfied by successfully completing the following additional courses:

| | | | |
|---------|--|---------|---|
| CHM 312 | Physical Chemistry II | CHM 414 | Advanced Inorganic Chemistry |
| CHM 314 | Physical Chemistry II Laboratory (0.5 c.u.) | CHM 415 | Advanced Inorganic Chemistry Laboratory (0.5 c.u.) |

BIOCHEMISTRY CONCENTRATION

The Biochemistry concentration is satisfied by successfully completing the following additional courses:

| | | | |
|---------|------------------------------|---------|--|
| BIO 111 | General Biology I | CHM 402 | Biochemistry II |
| BIO 212 | General Biology II | CHM 405 | Biochemistry II Laboratory (0.5 c.u.) |
| BIO 213 | Molecular & Cellular Biology | | |

MINOR IN CHEMISTRY

A minor in Chemistry requires 7.5 course units:

| | |
|---------|--|
| CHM 111 | General Chemistry I |
| CHM 112 | General Chemistry II |
| CHM 301 | Organic Chemistry I |
| CHM 303 | Organic Chemistry I Laboratory (0.5 c.u.) |

And three additional upper-level courses, two of which have laboratory components, chosen in consultation with the chemistry faculty.

Chemistry Courses

NOTE: Courses marked with an asterisk (*) require special fees. See page 14.

■ **General Education Course (Primary Competency Addressed)**

CHM 100 CHEMISTRY FOR EVERYONE*

■ (Scientific and Technological Skills)

This course, an introduction to the structure, properties, and behavior of materials, is intended for non-science majors. Principles of chemistry are illustrated through demonstrations, laboratory exercises, and applications to everyday life. Prior study of chemistry is not required. 1 c.u.

Science majors may not enroll in this course without the consent of the Instructor.

Not open to students who have received credit for another college chemistry course.

CHM 110 FUNDAMENTALS OF CHEMISTRY*

This course prepares students for CHM 111 and includes measurements, matter, energy, chemical/physical changes, elements, compounds, the mole concept, formulas, nomenclature, chemical equations, stoichiometry, behavior of gases, atomic structure, the Periodic Table, chemical bonding, solutions, acids, and bases. The course consists of lecture, recitation and one three-hour laboratory per week. 1 c.u.

Prerequisite: Appropriate score on Algebra placement test.

CHM 111 GENERAL CHEMISTRY I*

This is a comprehensive introduction to the principles of chemistry. The course is intended primarily for students who are majoring in the natural sciences or enrolled in science-based pre-professional programs. Topics include atomic structure, chemical bonding, stoichiometry, patterns of reactivity, gas laws, thermochemistry, and quantum theory. The course consists of lecture, recitation, and one three-hour laboratory per week. 1 c.u.

Prerequisite: CHM 110 or one year of high school Chemistry.

Corequisite: MTH 105 or MTH 114.

CHM 112 GENERAL CHEMISTRY II*

This course is a continuation of CHM 111. Topics covered include theories of covalent bonding, the liquid and solid states, physical properties of solutions, kinetics, equilibria, chemical thermodynamics, oxidation-reduction, and electrochemistry. The course consists of lecture, recitation, and one three-hour laboratory per week. 1 c.u.

CHM 120 FUNDAMENTALS OF INORGANIC, ORGANIC AND BIOCHEMISTRY*

This course covers selected principles of inorganic, organic and biochemistry in application to living systems. The course includes lecture, one hour of recitation, and three hours of laboratory per week. This course cannot be used to help fulfill the chemistry requirement for science majors. 1 c.u.

Corequisites: ACF 94; ENG 106.

CHM 211 CHEMICAL ANALYSIS AND INSTRUMENTATION

The course covers the theoretical and experimental principles of chemical analysis and ionic equilibria. Gravimetric, volumetric, electrochrometric, and instrumental methods are covered from the quantitative point of view. The course consists of lecture and recitation. 1 c.u.

Prerequisite: CHM 112.

CHM 212 CHEMICAL ANALYSIS AND INSTRUMENTATION LABORATORY*

This four hour laboratory is associated with CHM 211. The course emphasizes wet chemistry techniques which include gravimetric and volumetric methods of analysis. Separation methods such as chromatography are also discussed along with some spectroscopy. Instrumental techniques of IR, UV-VIS, HPLC and Atomic Absorption may also be explored. 0.5 c.u.

Prerequisite: CHM 112.

Corequisite: CHM 211.

CHM 301 ORGANIC CHEMISTRY I

This course is intended to be a year long study of the structure and reactions of organic compounds. The course focuses on functional groups and reaction mechanisms. Applications to compounds of general public interest are discussed. The course consists of lecture and recitation. 1 c.u.

Prerequisite: CHM 112.

CHM 302 ORGANIC CHEMISTRY II

This course is a continuation of CHM 301. 1 c.u.
Prerequisite: CHM 301.

CHM 303 ORGANIC CHEMISTRY I LABORATORY*

This four hour laboratory is associated with CHM 301. The course can (but doesn't have to) be taken concurrently with CHM 301. The course includes basic organic chemical instrumentation, analysis, and techniques. 0.5 c.u.
Prerequisite: CHM 301 or concurrent registration.

CHM 304 ORGANIC CHEMISTRY II LABORATORY*

This four hour laboratory is associated with CHM 302 and is a continuation of CHM 303. In addition to wet chemistry, the course includes lectures and laboratory exercises on the topics of nuclear magnetic resonance and infrared spectroscopies. 0.5 c.u.
Prerequisites: CHM 301, CHM 303 and CHM 302 or concurrent registration in CHM 302.

CHM 311 PHYSICAL CHEMISTRY I

This course is a formal development of thermodynamic and equilibrium principles and their application to both chemical reactions and a variety of physical, biological, and engineering processes. The course includes lecture and recitation. 1 c.u.
Prerequisites: CHM 112; MTH 222; PHY 210.
Corequisite: PHY 211.

CHM 312 PHYSICAL CHEMISTRY II

This course presents a formal development of kinetics and theories of molecular structure with applications to chemical reactivity as well as physical and biological properties. The course includes lecture and recitation. 1 c.u.
Prerequisites: CHM 311; PHY 211.

CHM 313 PHYSICAL CHEMISTRY I LABORATORY *

This four hour laboratory is associated with CHM 311. Laboratory work emphasizes measurement of thermodynamic data such as heats of combustion, heat capacities, enthalpies, and free energies. Physical properties of materials are also explored and data are presented with construction of phase diagrams. 0.5 c.u.
Prerequisites: CHM 112; MTH 222; PHY 210.
Corequisites: CHM 311; PHY 211.

CHM 314 PHYSICAL CHEMISTRY II LABORATORY *

This four hour laboratory is associated with CHM 312. Laboratory work emphasizes measurement of kinetic data and properties of materials associated with structure and bonding. Rate laws and proposed mechanisms are determined by initial rate or integrative methods. Spectroscopic and other instrumental methods are used to determine structures. 0.5 c.u.
Prerequisites: CHM 311, CHM 313; PHY 211.
Corequisite: CHM 312.

CHM 390 SCIENCE INTERNSHIP (Also BIO 390)

This course provides a combined work-study experience in which students work in an approved scientific environment doing relevant job-related functions while also attending seminars in which they report on their work assignments, discuss experiences, study employment demands, and receive counsel. A faculty committee (including one member outside the major) assesses the internship report. 1 c.u.
Prerequisites: Junior or Senior standing with a GPA of at least 2.5 in the Biology or Chemistry major and consent of the appropriate program Director.

CHM 401 BIOCHEMISTRY I (Also BIO 401)

The course presents proteins, lipids, and carbohydrates from the perspective of organic functional group chemistry, physical chemistry, analytical chemistry, and biochemistry. The acid-base properties, kinetics, thermodynamics and reactions of these biomolecules will be covered. Structure correlated to function will be integral component of the discussion. The course consists of lecture and recitation. 1 c.u.
Prerequisite: CHM 301, 303.
CHM 302/304 is strongly recommended.

CHM 402 BIOCHEMISTRY II (Also BIO 402)

This course covers the biochemistry of the nucleic acids and proteins. Topics include DNA replication, transcription, translation, gene regulation, and protein function. The overall regulation of metabolic pathways will also be addressed. 1 c.u.
Prerequisite: BIO 213.

CHM 403 ADVANCED CHEMICAL CONCEPTS

This course includes selected advanced topics in analytical, physical, inorganic, and organic chemistry. As topics change, the students can take the course again for credit.
Course unit value will be announced with the topic.
Prerequisite: Four courses in Chemistry above the 110 level.

CHM 404 BIOCHEMISTRY I LABORATORY*

(Also BIO 404)

The course considers the qualitative and quantitative aspects of protein, lipid, and carbohydrate analyses. The laboratory includes applications of wet chemistry, as well as analytical techniques such as chromatography [column, thin layer, paper, and high performance liquid chromatography (HPLC)], colorimetric and spectrophotometric analyses, polarimetry, titrimetry and statistical data analysis. 0.5 c.u.

Prerequisite: CHM 303.*Corequisite:* BIO/CHM 401.**CHM 405 BIOCHEMISTRY II LABORATORY ***

(Also BIO 405)

The course covers basic techniques for the extraction, purification, and characterization of DNA, RNA, and protein molecules. 0.5 c.u.

Prerequisite: BIO 213.*Corequisite:* BIO/CHM 402.**CHM 414 ADVANCED INORGANIC CHEMISTRY**

The course approaches modern inorganic chemistry by integrating descriptive and physical principles using molecular orbital theory to describe chemical bonding and reactivity. Structures, magnetic properties, and spectra of transition metal complexes are described using the crystal and ligand field theories. Special topics, such as, catalysis, organometallics, and bioinorganics are included. The course includes lecture and recitation. 1 c.u.

Prerequisite: CHM 211.**CHM 415 ADVANCED INORGANIC CHEMISTRY LABORATORY***

This four hour laboratory is associated with CHM 414. Laboratory work emphasizes the syntheses and characterization of transition metal complexes. 0.5 c.u.

Prerequisites: CHM 211, CHM 212.*Corequisite:* CHM 414.**CHM 450 CHEMISTRY SEMINAR**

The seminar is intended to serve as a capstone experience for chemistry and biochemistry majors. Students will learn how to search the literature in their area of concentration, prepare two well-researched papers (one short, one long), and present those papers in front of their peers, as well as faculty in the discipline. 0.5 c.u.

Prerequisites: Chemistry or*Biochemistry major with Junior or**Senior standing in the major.**Two semesters of Organic Chemistry are required.***CHM 461 CHEMISTRY RESEARCH***

This is a one or two semester course consisting of library and laboratory research. Credit may be arranged in advance by the advisor, but may not exceed one course each term. 1 c.u.

Prerequisite: Consent of major Advisor.