CHEMISTRY

chemistry.as.miami.edu

Dept. Code: CHM

Introduction

Each undergraduate chemistry degree program requires:

Code	Title	Credit Hours
Core Courses		
CHM 121	Principles of Chemistry	4
CHM 113	Chemistry Laboratory I	1
CHM 221	Introduction to Structure and Dynamics	4
CHM 205	Chemical Dynamics Laboratory	1
CHM 222	Organic Reactions and Synthesis	4
CHM 206	Organic Reactions and Synthesis Laboratory	2
CHM 214	Quantitative Analytical Chemistry	3
One year of Calculus		
At least two semesters of Physics Plus Lab		
Total Credit Hours		**19**

The requirements for a major are flexible and should conform to the objectives of the student. A grade of C- or higher must be earned in all courses taken for major or minor credit hour, and the Chemistry GPA must be 2.00 or higher. Credit hours earned in CHM 381 **does not count** toward the major or minor.

Educational Objectives

The mission of the Bachelor's degree program in the Chemistry Department is to promote an understanding and appreciation of the role of chemistry in modern society, especially as it relates to and integrates with other biological and physical sciences and societal issues facing humanity today such as the environment, health issues and technological advances.

Degree Programs

Three programs lead to degrees with a chemistry major.

1. The B.A. degree
2. The B.S. degree
3. The B.S. degree with certification by the American Chemical Society Committee for Professional Training of Chemists.

Departmental Honors

Honors in Chemistry may be earned by students who complete the B.S. degree in chemistry, plus at least five credit hours of CHM 488 and one credit hour of CHM 490, all with an average grade of at least 3.30. A written Honors Thesis and oral defense on the subject of the Honors Research must be presented by the student and approved by a Department Honors Committee.

Writing Requirement

To satisfy the College of Arts and Sciences writing requirement in the discipline, students majoring in Chemistry should take CHM 320, CHM 364 or WRS 233.

Credit for Courses at the 100- and 200-Level

Credit hour may be earned in only one of the courses CHM 103, CHM 121 or CHM 151. Credit hour may not be earned in both CHM 104 and CHM 221.

Dual Degrees

- B.S./M.S. in Chemistry Five-Year (https://bulletin.miami.edu/undergraduate-academic-programs/arts-sciences/chemistry/bs-ms-chemistry/)

CHM 101. Chemistry and Society. 3 Credit Hours.
The basic principles of chemistry for the non-science major with an emphasis on understanding the chemistry of the world around us, especially as it pertains to the choices we make as consumers and as a society. Integrated themes include energy, the environment, food and nutrition, health and personal care, and other contemporary societal issues.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

CHM 103. Chemistry for the Health Sciences I. 3 Credit Hours.
Essentials of chemistry as they apply to biological systems
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

CHM 104. Chemistry for the Health Sciences II. 3 Credit Hours.
A continuation of CHM 103, with emphasis on organic and biological chemistry, including biochemical processes and metabolism. Lecture, 3 hours.
Prerequisite: CHM 103 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 105. Chemistry for the Health Sciences I (Laboratory). 1 Credit Hour.
Designed for those students in CHM 103 requiring a laboratory course. Laboratory, 3 hours.
Pre/Corequisite: CHM 103 with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Fall.

CHM 106. Chemistry for the Health Sciences II (Laboratory). 1 Credit Hour.
Designed for those students in CHM 104 requiring a laboratory course. Laboratory, 3 hours.
Pre/Corequisite: CHM 104 with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 110. Chemical Problem Solving. 3 Credit Hours.
Chemical problem solving strategies to prepare students for more advanced studies in the sciences. Focusing on basic concepts in chemistry, chemical problem solving, and mathematical preparation for future studies.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 111. Principles of Chemistry I. 3 Credit Hours.
Fundamental principles of chemical science.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 112. Principles of Chemistry II. 3 Credit Hours.
Continuation of CHM 111. Lecture, 3 hours.
Prerequisite: CHM 111 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 113. Chemistry Laboratory I. 1 Credit Hour.
Basic laboratory techniques in chemistry.
Corequisite: CHM 121 with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 114. Chemistry Laboratory II. 1 Credit Hour.
Continuation of CHM 113. Intermediate laboratory techniques and quantitative analysis. To accompany CHM 112. Laboratory, 3 hours.
Corequisite: CHM 112 Or CHM 221 And with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 115. Introductory Biology/Chemistry Laboratory I. 1 Credit Hour.
Integrated biology and chemistry laboratory exercises for first year students.
Co-req: CHM 121 and BIL 150.
Components: LAB.
Grading: GRD.
Typically Offered: Fall.

CHM 121. Principles of Chemistry. 4 Credit Hours.
Fundamental principles of chemical science for studies in the discipline.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 151. Chemistry for Engineers. 3 Credit Hours.
Fundamental principles of chemistry for engineering students. Not recommended for students that plan to enter Medical School. Lecture, 3 hours.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 153. Chemistry Laboratory for Engineers. 1 Credit Hour.
An introductory laboratory course to accompany CHM 151. The techniques of chemistry for engineering students.
Corequisite: CHM 151 with a grade of C- or higher AND freshman or sophomore standing OR permission of the instructor.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 160. Being a Scientist. 3 Credit Hours.
Although for thousands of years humanity has been curious to know the inner workings of the Nature surrounding them, science, as we know it, has emerged as a tool in this context only during the last two centuries. In this course, development of a few important concepts in physics, chemistry and biology will be discussed to illustrate what is needed to be a successful scientist. It will attempt to interlink concepts, personalities, geography and the history. Familiarity with the growth and the current status of science should help young minds to build a world where peace, prosperity and good health prevail.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 201. Organic Chemistry I (Lecture). 3-4 Credit Hours.
The chemistry of carbon compounds. Required of chemistry majors, and premedical students; recommended for majors in life sciences. Lecture, 3 hours.
Prerequisite: CHM 112 Or CHM 221 And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 202. Organic Chemistry II (Lecture). 3 Credit Hours.
Continuation of CHM 201. Lecture, 3 hours.
Prerequisite: CHM 201 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 204. Introductory Biology/Chemistry Laboratory II. 1 Credit Hour.
Integrated biology and chemistry laboratory exercises for first year students.
Co-req: CHM 221 and BIL 160.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 205. Chemical Dynamics Laboratory. 1 Credit Hour.
Introduction to techniques of chemistry.
Corequisite: CHM 221 with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 206. Organic Reactions and Synthesis Laboratory. 2 Credit Hours.
Continuation of CHM 205
Prerequisite: CHM 205. And Corequisite: CHM 202 or CHM 222. And with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 207. Chemical Dynamics and Organic Synthesis Laboratory. 2 Credit Hours.
Introduction to techniques in Chemistry. For students in the HHMI program only.
Prerequisite: CHM 205 And Corequisite: CHM 222.
Components: LAB.
Grading: GRD.
Typically Offered: Fall.

CHM 214. Quantitative Analytical Chemistry. 3 Credit Hours.
An introduction to quantitative chemical analysis. Topics will include statistical analysis of analytical data, a review of stoichiometry, analytical separation processes, chemical and acid-base equilibria, and an introduction to potentiometric, titrimetric, gravimetric, and spectrophotometric methods of analysis.
Prerequisite: CHM 202 or 222 with a grade of C- or higher. And MTH 162. or MTH 172.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 221. Introduction to Structure and Dynamics. 4 Credit Hours.
The chemistry of carbon compounds.
Prerequisite: CHM 112 or CHM 121 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 222. Organic Reactions and Synthesis. 4 Credit Hours.
Continuation of CHM 221.
Prerequisite: CHM 201 or 221 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 316. Instrumental Analytical Chemistry. 3 Credit Hours.
Modern methods of quantitative analysis. Lecture, 3 hours.
Prerequisite: CHM 360 and CHM 214 Or CHM 360 and CHM 304. And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 317. The Chemistry of Food and Taste.. 3 Credit Hours.
The chemical compositions of the raw materials and end products, and a survey of the changes that these undergo when exposed to human manipulations.
Prerequisite: CHM 202 or CHM 222.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 320. Instrumental Methods in Chemistry and Biochemistry. 2 Credit Hours.
Instrumental methods in modern chemistry and biochemistry, including spectrometric, electrochemical, and chromatographic (separation) Laboratory, 8 hours. Satisfies writing requirement.
Prerequisite: CHM 214 or CHM 304 And Corequisite: CHM 316. And with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 331. Physical Chemistry for Premedical Students. 3 Credit Hours.
Fundamentals of thermodynamics as applied to gases, liquids and solutions; chemical kinetics and other selected topics. Lecture, 3 hours.
Prerequisite: CHM 112 or CHM 121 with a grade of C- or higher and MTH 161 and PHY 102.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 360. Physical Chemistry I (Lecture). 3 Credit Hours.
Introduction to physical chemistry including thermodynamics, gaseous and liquid states, solutions, homogeneous and heterogeneous equilibrium. Lecture, 3 hours.
Prerequisite: CHM 112 or 121 with a grade of C- or higher And MTH 162 or MTH 172. Requisite: One Semester of Physics.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

CHM 364. Physical Chemistry (Laboratory I). 1 Credit Hour.
Representative experiments in physical chemistry. Laboratory, 4 hours. This course can be taken to satisfy the College of Arts and Sciences writing requirement in the discipline.
Pre/Corequisite: CHM 360 or CHM 331 And with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Fall.

CHM 365. Physical Chemistry II (Lecture). 3 Credit Hours.
Chemical kinetics, introductory quantum chemistry, molecular spectroscopy.
Prerequisite: CHM 360 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 381. Workshop Leaders in Chemistry I. 1 Credit Hour.
Students engaged in Peer-Led Team Teaching of workshops for students may enroll for this course. May be repeated.
Components: THI.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 391. Chemistry Internship for Credit. 1-3 Credit Hours.
Provides chemistry majors with an opportunity to apply skills learned in coursework within settings outside the university. For example students can work in local schools, assisting instructors and mentoring students. They can also work in companies or government agencies for a defined period of time with clearly delineated goals to expand their expertise and practical knowledge of chemistry. Each enrolled student will be closely mentored by a faculty member.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 401. Environmental Chemistry. 3 Credit Hours.
Major environmental features of the earth; Role of natural and synthetic chemicals in the environment; Atmospheric and aquatic pollution; Application of acid- base theory and oxidation reduction to environmental problems.
Prerequisite: CHM 201 or CHM 222. And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 404. Readings in Chemistry. 1 Credit Hour.
This course would introduce students to the primary research literature in chemistry. Students will first learn how to read, interpret, and critically evaluate scientific papers across subfields such as organic, inorganic, analytical, physical, and biochemistry. The subfields discussed would depend on the expertise/interest of the instructor of the course. The course should emphasize developing chemistry scientific literacy, discussion skills, and an understanding of how chemical methodologies and discoveries are communicated.
Prerequisite: CHM 222.
Components: SEM.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 441. Inorganic Chemistry (Lecture). 3 Credit Hours.
The relation of atomic and molecular structure to chemical and physical properties; introduction to nonaqueous solvents, coordination compounds, solid state chemistry and nuclear reactions. Lecture, 3 hours. Prerequisite: CHM 360.
Prerequisite: CHM 360 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 442. Inorganic Chemistry (Laboratory). 1 Credit Hour.
Synthesis of inorganic compounds and determination of their physical and chemical properties. Laboratory, 3 hours.
Co-requisite: CHM 441 with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 464. Physical Chemistry (Laboratory II). 1 Credit Hour.
Continuation of CHM 364. Laboratory, 4 hours.
Prerequisite: CHM 441 with a grade of C- or higher.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 488. Undergraduate Research. 0-3 Credit Hours.
Laboratory research under the direction of a member of the chemistry faculty. Thesis optional. Course may be repeated for credit.
Components: THI.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 490. Honors Research. 1-3 Credit Hours.
Laboratory research under the direction of a member of the Chemistry faculty. Thesis required. Course may be repeated for credit.
Components: THI.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 515. Makings of a Scientist. 3 Credit Hours.
By analyzing achievements and advise of few successful scientists, chemists in particular will highlight what qualities are needed to be a successful scientist. Importance of motivation, perseverance, communication skills, adhering to ethical guidelines and ability to deal with colleagues and co-workers will be brought out. Career options available for a trained chemist and how different each one is will be pointed out. Overall this is a course in multi-mentoring of graduate students who are aiming for a career in science and hope to be successful researchers in science, particularly in chemistry.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 516. ADV ANALYTICAL CHM. 3 Credit Hours.

Components: LEC.
Grading: GRD.

CHM 520. Physical Organic Chemistry. 3 Credit Hours.
Aspects of chemical bonding, acids and bases, steoeochemistry, aromaticity, pericyclic reactions, linear free energy relationships, transition state theory, excited state chemistry, reactive intermediaries, mechanisms of uni- and bi-molecular reactions.
Prerequisite: CHM 202 or CHM 222 and CHM 360 And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 522. Synthetic Organic Chemistry. 3 Credit Hours.
Functional group transformations, Synthon approach. Retro-synthetic analyses, multistep syntheses.
Prerequisite: CHM 202 or CHM 222 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 524. Supramolecular Chemistry. 3 Credit Hours.
Complexation, recognition, and catalysis as applied to bio-organic chemistry. Steric, polar, and lipophillic interactions as well as proximity effects in the design of synthetic enzyme mimics, cationic transport species, etc.
Prerequisite: CHM 365 and CHM 520 And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 525. Structural Organic Chemistry. 3 Credit Hours.
Use of electronic and vibrational spectroscopy in structure elucidation. Structure elucidation by modern NMR; EI, CI, MALDI and Electropspray mass spectrometry. Assignment of absolute configuration of chiral centers.
Prerequisite: CHM 202 or CHM 222 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 526. CHM523 Medicinal Chemistry. 3 Credit Hours.
Medicinal chemistry is primarily concerned with the development of drug molecules, and the interpretation of their mode of action at the molecular level, with an emphasis on chemical synthesis.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 530. Fluorescence Spectroscopy and Microscopy. 3 Credit Hours.
The photophysical properties of organic compounds that illustrates the fundamental principles of fluorescence. It also explains how fluorescence spectra and images can be recorded and how these powerful analytical techniques can be used to address significant problems in biology and medicine.
Prerequisite: CHM 360 And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 535. Molecular and Supramolecular Photochemistry. 3 Credit Hours.
Generation of a model that will help rationalize/predict excited state reactions. A brief background on physical aspects of photochemistry will be given. Exploring and understanding of reactions that are triggered by light. Importance of light in life will be highlighted.
Prerequisite: CHM 201 or 221 and CHM 202 or 222 And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 541. Principles of Bonding and Reactivity in Inorganic Chemistry. 3 Credit Hours.
Bonding principles necessary to understand the structure, stability, and fundamental reactivity of main group and transition metal inorganic compounds.
Prerequisite: CHM 441 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

CHM 553. Modern Quantum Chemistry. 3 Credit Hours.
Many-electron wave functions and operators. Hartee-Fock approximation, density functional theory, configuration interaction, and many-body perturbation theory.
Prerequisite: CHM 441 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

CHM 565. Principles of Spectroscopic Techniques. 3 Credit Hours.
Spectroscopic techniques: nuclear magnetic resonance (NMR), mass spectra (MS), ultraviolet (UV), visible infrared (IR), fluorescence, and other specialized spectroscopic techniques.
Prerequisite: CHM 441 with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 575. Principles of Nuclear Magnetic Resonance and Multidimensional Spectroscopy. 3 Credit Hours.
Theory of nuclear magnetic resonance; Bloch equations; relaxation theory; time- domain versus frequency domain spectroscopies, and principles of multidimensional spectroscopy.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 581. Advanced Analytical Chemistry. 3 Credit Hours.
Provides a strong foundation in the most important concepts in advanced analytical chemistry, including electrochemistry, chemical separations, and bioanalytical chemistry, and in the different classes of instrumental analytical techniques available to current chemists.
Prerequisite: CHM 214 and CHM 316 And with a grade of C- or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 591. Topics in Chemistry. 3 Credit Hours.
Subject matter offerings based upon student demand and availability of faculty. Subtitles describing the topics to be offered will be shown in parentheses in the printed class schedule following the title, "Topics in Chemistry".
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 592. Topics in Chemistry. 3 Credit Hours.
Subject matter offerings based upon student demand and availability of faculty.Subtitles describing the topics to be offered will be shown in parentheses in the printed class schedule following the title, "Topics in Chemistry."
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 593. Readings in Chemistry. 1-3 Credit Hours.
Supervised readings on special topics. Offered by special arrangement. May be repeated for credit.
Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 594. Readings in Chemistry. 1-3 Credit Hours.
Supervised readings on special topics. Offered by special arrangement. May be repeated for credit.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.