CHEMISTRY

http://www.as.miami.edu/chemistry

Dept. Code: CHM

Introduction
Each undergraduate chemistry degree program requires:

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<th>Credit Hours</th>
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One year of Calculus
At least two semesters of Physics Plus Lab

Total Credit Hours 16

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 and CHM 382 do 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 or ENG 233.

Credit for Courses at the 100- and 200-Level
Credit hour may be earned in only one of the courses CHM 103, CHM 111 or CHM 151. Credit hour may not be earned in both CHM 104 and CHM 201.

CHM 099. Preparatory Chemistry I. 3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 100. History of Chemistry. 3 Credit Hours.
Focuses on the development of the chemical sciences from the early 1700 BC until modern day. An emphasis on placing these scientific events into context with current societal needs is included.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

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 102. Fundamentals of Chemistry II. 3 Credit Hours.
A continuation of Chemistry 101.
Prerequisite: CHM 101.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 103. Chemistry for Life Sciences I (Lecture). 3 Credit Hours.
Essentials of inorganic chemistry as it applies to biological systems. Designed for (but not limited to) those planning health-related careers. Lecture, 3 hours.
Corequisite: CHM 105.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.
CHM 104. Chemistry for Life Sciences II (Lecture). 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.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

CHM 105. Chemistry for Life Sciences I (Laboratory). 1 Credit Hour.
Designed for those students in CHM 103 requiring a laboratory course. Laboratory, 3 hours.
Prerequisite: CHM 103. Or Corequisite: CHM 103.
Components: LAB.
Grading: GRD.
Typically Offered: Fall.

CHM 106. Chemistry for Life Sciences II (Laboratory). 1 Credit Hour.
Designed for those students in CHM 104 requiring a laboratory course. Laboratory, 3 hours.
Prerequisite: CHM 104. Or Corequisite: CHM 104.
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.

CHM 111. Principles of Chemistry I. 3 Credit Hours.
Fundamental principles of chemical science. The beginning course for science majors and premedical students. Lecture, 3 hours.
Prerequisite: MTH107. And Co-requisite: MTH108 or 140 or 141 Or Placement into MTH161 or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 112. Principles of Chemistry II. 3 Credit Hours.
Continuation of CHM 111. Lecture, 3 hours.
Prerequisite: CHM 111.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 113. Chemistry Laboratory I. 1 Credit Hour.
Laboratory techniques of chemistry. To accompany CHM 111. Laboratory, 3 hours.
Corequisite: CHM 111 or CHM 121.
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.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 115. Chemistry For The Biosciences I. 4 Credit Hours.
This is the first course in a three course sequence designed to meet the needs of Life Science students interested in pursuing professional education in the health sciences. Topics to be covered in this course include: basic atomic structure, reaction stoichiometry, gases, chemical equilibrium, acids and bases, thermodynamics, and chemical kinetics. Co-registration with a separate recitation section is required.
Prerequisite: MTH107. And Co-requisite: MTH108 or 140 or 141 Or Placement into MTH161 or higher.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

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.
Prerequisites: MTH 105 or MTH 107. Or Corequisites: MTH 105 or MTH 107.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & 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.
Prerequisite: CHM 151. Or Corequisite: CHM 151.
Components: LAB.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 201. Organic Chemistry I (Lecture). 3 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.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 202. Organic Chemistry II (Lecture). 3 Credit Hours.
Continuation of CHM 201. Lecture, 3 hours.
Prerequisite: CHM 201.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 205. Organic Chemistry Laboratory I. 1 Credit Hour.
Introduction to techniques of organic chemistry. Laboratory, 3 hours.
Corequisite: CHM 201 or CHM 222.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 206. Organic Chemistry Laboratory II. 1 Credit Hour.
Continuation of CHM 205. Laboratory, 3 hours.
Prerequisite: CHM 205. And Corequisites: CHM 202 or CHM 222.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

CHM 214. Quantitative Analytical Chemistry. 3 Credit Hours.
Prerequisites: CHM 202, MTH 162 or MTH 172.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.
CHM 221. CHM211 Chemistry for the Biosciences II. 4 Credit Hours.
This is the second course in a three course sequence designed to meet the needs of Life Science students interested in pursuing professional education in the health sciences. Topics to be covered in this course include: electronic atomic structure, basic quantum mechanics, molecular geometry, identification of organic molecules, and interpretation of chemical structures via spectroscopic methods. Co-registration with a separate recitation section is required.
Prerequisite: CHM 121.
Components: LEC.
Grading: GRD.

CHM 222. CHM212 Chemistry for the Biosciences III. 4 Credit Hours.
This is the third course in a three course sequence designed to meet the needs of Life Science students interested in pursuing professional education in the health sciences. Topics to be covered in this course include: organic chemical reactivity, reaction prediction analysis, organic reaction mechanisms, electronic interactions, energy states, and reactivity of biomolecules. Co-registration with a separate recitation section is required.
Prerequisite: CHM 221.
Components: LEC.
Grading: GRD.

CHM 300. Emerging Scholars Chemistry Workshop. 1-2 Credit Hours.
A Workshop for Bridge the Baccalaureate Program Scholars enrolled in CHM 1045 and CHM 1046 at Miami Dade College to review course content and work through chemistry problems
Components: WKS.
Grading: GRD.
Typically Offered: Fall.

CHM 304. Structural Identification of Organic Compounds. 3 Credit Hours.
The fundamental principles of ultraviolet/visible, infrared, nuclear magnetic resonance and mass spectrometry. How the combination of these sophisticated analytical techniques can be used to elucidate the structures of organic compounds.
Prerequisite: CHM 202 and CHM 206.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

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.
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: 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 Co-requisite: CHM 316.
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, 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.
Prerequisites: CHM 112, 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.
Prerequisite: CHM 360 or CHM 331. Or Corequisite: CHM 360 or CHM 331.
Components: LAB.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 365. Physical Chemistry II (Lecture). 3 Credit Hours.
Chemical kinetics, introductory quantum chemistry, molecular spectroscopy.
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 groups of CHM 111 and/or CHM 112 students may enroll for this course. May be repeated.
Components: THI.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 382. Workshop Leaders in Chemistry II. 1 Credit Hour.
Students engaged in Peer-Led Team Teaching of workshops for groups of CHM 111 and/or CHM 112 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 400. Introduction to Teaching in Chemistry Labs. 1 Credit Hour.
Components: SEM.
Grading: GRD.
Typically Offered: Spring.

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.
Components: LEC.
Grading: GRD.
Typically Offered: 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 365.
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. CHM 541 is a co-requisite for ACS chemistry majors. Laboratory, 3 hours.
Prerequisite: CHM 365 and CHM 541.
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 365.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

CHM 488. Undergraduate Research. 1-3 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: Fall & Spring.

CHM 520. Physical Organic Chemistry. 3 Credit Hours.
Aspects of chemical bonding, acids and bases, stoeochemistry, 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 and CHM 360.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

CHM 522. Synthetic Organic Chemistry. 3 Credit Hours.
Functional group transformations, Synthon approach. Retro-synthetic analyses, multistep syntheses.
Prerequisite: CHM 202.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

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.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 525. Structural Organic Chemistry. 3 Credit Hours.
Prerequisite: CHM 202.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

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: Spring.
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 304 and CHM 360.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

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 and CHM 202.
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 365.
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 365.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

CHM 555. 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 365.
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 spectrosopies, 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.
Prerequisites: CHM 214, CHM 316.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

CHM 591. Topics in Chemistry. 1-3 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. 1-3 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.