

# CHEMISTRY

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chemistry.as.miami.edu

Dept. Code: CHM

## Degree Programs

Prospective graduate students are expected to have completed, during their undergraduate training:

The candidate must hold a B.S./B.A. degree from an accredited institution. Consideration is given to applicants who have successfully completed general chemistry (two semesters), organic chemistry (two semesters), physical chemistry (two semesters), and the related laboratories. A course in advanced inorganic chemistry is strongly recommended, and remedial work in this area may be required of students who have not taken such a course. The mathematics and physics courses that are normally included in a B.S. program in chemistry are also required.

Undergraduate deficiencies are treated as such and must be overcome during the first year of graduate study.

## Masters Program in Chemistry

- M.S. in Chemistry (<http://bulletin.miami.edu/graduate-academic-programs/arts-sciences/chemistry/chemistry-ms/>)

## Doctoral Program in Chemistry

- Ph.D. in Chemistry (<http://bulletin.miami.edu/graduate-academic-programs/arts-sciences/chemistry/chemistry-phd/>)

### CHM 615. 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 become successful researchers in science, particularly in chemistry.

Prerequisite: CHM 202 or CHM 222 with a grade of C- or higher.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

### CHM 620. Physical Organic Chemistry. 3 Credit Hours.

Aspects of chemical bonding, acids and bases, stereochemistry, aromaticity, pericyclic reactions, linear free energy relationships, transition state theory, excited state chemistry, reactive intermediaries, mechanisms of uni- and bi-molecular reactions.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

### CHM 622. Synthetic Organic Chemistry. 3 Credit Hours.

Functional group transformations, Synthon approach. Retro-synthetic analyses, multistep syntheses.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

### CHM 624. Supramolecular Chemistry. 3 Credit Hours.

Complexation, recognition, and catalysis as applied to bio-organic chemistry. Steric, polar, and lipophilic interactions as well as proximity effects in the design of synthetic enzyme mimics, cationic transport species, etc.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

### CHM 626. Structural Organic Chemistry. 3 Credit Hours.

Use of electronic and vibrational spectroscopy in structure elucidation. Structure elucidation by modern NMR; EI, CI, MALDI and Electrospray mass spectrometry. Assignment of absolute configuration of chiral centers.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 630. 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.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 635. 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.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 641. 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.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**CHM 653. 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.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**CHM 655. Electrochemistry. 3 Credit Hours.**

Modern electrochemical techniques including voltammetry, chronocoulometry, rotating disk electrode, and ultramicroelectrodes.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 665. 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.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 675. 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 681. 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.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**CHM 691. 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 692. 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 693. 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 694. 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.

**CHM 779. Chemistry Seminar. 1 Credit Hour.**

Participation in the departmental seminar program. Required each semester the student is in residence and not enrolled in CHM 680 (excluding summer sessions).

**Components:** SEM.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**CHM 780. Chemistry Seminar. 1 Credit Hour.**

Participation in the chemistry department seminar program, including an oral presentation of special topics.

**Components:** SEM.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**CHM 785. Introduction to Research. 2 Credit Hours.**

Research principles and practices, independent study in selected subject areas, and/or oral presentation of a proposed research topic. Open only to graduate students working toward the M.S. or Ph.D. in chemistry.

**Components:** SEM.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 788. Problems in Research Planning. 2 Credit Hours.**

Formulation of a research program for investigating an original problem not related to the candidate's major laboratory research. A brief written summary and an oral defense of the plan will be required.

**Components:** THI.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**CHM 810. Master's Thesis. 1-6 Credit Hours.**

The student working on his/her master's thesis enrolls for credit, in most departments not to exceed six, as determined by his/her advisor. Credit is not awarded until the thesis has been accepted.

**Components:** THI.

**Grading:** SUS.

**Typically Offered:** Fall, Spring, & Summer.

**CHM 820. Research in Residence. 1 Credit Hour.**

Used to establish research in residence for the thesis for the master's degree after the student has enrolled for the permissible cumulative total in CHM 710 (usually six credits). Credit not granted. May be regarded as full time residence.

**Components:** THI.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.

**CHM 830. Doctoral Dissertation. 1-12 Credit Hours.**

Required of all candidates for the Ph.D. The student will enroll for credit as determined by his/her advisor, but for not less than a total of 12 hours. Up to 12 hours may be taken in a regular semester, but not more than six in a summer session.

**Components:** THI.

**Grading:** SUS.

**Typically Offered:** Fall, Spring, & Summer.

**CHM 840. Post-candidacy Dissertation. 1-12 Credit Hours.**

Required of all candidates for the Ph.D. who have advanced to candidacy. The student will enroll for credit as determined by his/her advisor, but not for less than a total of 12. Up to 12 hours may be taken in a regular semester, but not more than six in a summer session.

**Components:** THI.

**Grading:** SUS.

**Typically Offered:** Fall, Spring, & Summer.

**CHM 850. Research in Residence. 1 Credit Hour.**

Used to establish research in residence for the Ph.D. and D.A., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

**Components:** THI.

**Grading:** SUS.

**Typically Offered:** Fall, Spring, & Summer.

**CHM 880. Doctoral Dissertation Seminar. 1 Credit Hour.**

Required of all candidates for the Ph.D. degree when defending their doctoral dissertation during their final term. A written dissertation and an oral defense of the Ph.D. dissertation will be required.

**Components:** THI.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.