

CHEMISTRY

The Department of Chemistry strives to prepare students to be independent researchers and exposes them to advanced instrumentation and coursework that strengthens communication skills. The graduate program is regionally, nationally, and internationally recognized. Because much of Northeast Ohio industry is based on chemicals and chemistry products, the department is committed to improving the lives of people in the campus, community, region, state, and nation through its chemical expertise.

Visit the Department of Chemistry website (<https://www.uakron.edu/chemistry/>) to learn more about its faculty and facilities.

- Chemistry, MS (<https://bulletin.uakron.edu/graduate/colleges-programs/arts-sciences/chemistry/chemistry-ms/>)
- Chemistry, PhD (<https://bulletin.uakron.edu/graduate/colleges-programs/arts-sciences/chemistry/chemistry-phd/>)

Chemistry (CHEM)

CHEM 501 Biochemistry Lecture I (3 Units)

Biochemistry of amino acids, carbohydrates, lipids, and nucleic acids: structure/function relations. Enzymes as catalysts: kinetics and regulation. Cofactors. (Formerly 3150:501)

CHEM 502 Biochemistry Lecture II (3 Units)

Prerequisite: CHEM 501. Overview of metabolism; thermodynamics; carbohydrate, fatty acid, amino acid, and nucleoside anabolism and catabolism; hormonal control of metabolism. Photosynthesis. (Formerly 3150:502)

CHEM 506 Biochemistry of Gene Expression (3 Units)

Prerequisites: CHEM 501, or permission of the department. DNA, RNA, and protein synthesis, translation and transcription. Gene function and expression, cell cycle and cancer, genetic engineering, gene silencing, gain of function studies. (Formerly 3150:506)

CHEM 510 Special Readings in Analytical Chemistry (1-3 Units)

Selected topics in advanced analytical chemistry for which no course exists. (May be repeated) (Formerly 3150:510)

CHEM 511 Special Readings in Inorganic Chemistry (1-3 Units)

Selected topics in advanced inorganic chemistry for which no course exists. (May be repeated) (Formerly 3150:511)

CHEM 512 Special Readings in Organic Chemistry (1-3 Units)

Selected topics in advanced organic chemistry for which no course exists. (May be repeated) (Formerly 3150:512)

CHEM 513 Special Readings in Physical Chemistry (1-3 Units)

Selected topics in advanced physical chemistry for which no course exists. (May be repeated) (Formerly 3150:513)

CHEM 515 Special Readings in Biochemistry (1-3 Units)

Selected topics in advanced biochemistry for which no course exists. (May be repeated) (Formerly 3150:515)

CHEM 572 Advanced Inorganic Chemistry (3 Units)

Concepts of atomic structure integrated in systematic classification of elements. Periodic table. Chemistry of the representative elements. Transition elements including coordination compounds, organometallics and metal carbonyls. (Formerly 3150:572)

CHEM 590 Workshop in Chemistry (1-3 Units)

(May be repeated) Group studies of special topics in chemistry. May not be used to meet undergraduate or graduate major requirements in chemistry. (Formerly 3150:590)

CHEM 592 Special Topics: Chemical Education (1-3 Units)

(May be repeated up to 6 credits) Consideration of topics in chemical education. (Formerly 3150:592)

CHEM 599 Master's Degree Research (1-6 Units)

For properly qualified candidates for master's degree. Supervised original research in analytical, inorganic, organic, physical or biochemistry. (Formerly 3150:599)

CHEM 603 Biochemistry Lecture III (3 Units)

Prerequisites: CHEM 501 and CHEM 502. DNA, RNA and protein metabolism. Translation and transcription. Gene function and expression. (Formerly 3150:603)

CHEM 610 Basic Quantum Chemistry (3 Units)

Quantum mechanics with applications to molecular systems. Includes angular momentum, molecular hamiltonians, variation and perturbation methods and molecular orbital theories. (Formerly 3150:610)

CHEM 611 Spectroscopy (3 Units)

Prerequisite: CHEM 610. Interaction of light with matter, linear and nonlinear spectroscopies. Rotational, vibrational and electronic spectroscopy. Radiationless transitions and photochemistry. (Formerly 3150:611)

CHEM 619 Transition-Metal Organometallics (3 Units)

The organometallic chemistry of the transition metal elements. Topics covered include synthesis, characterization methods, structure, bonding, reactivity, and application. (Formerly 3150:619)

CHEM 620 Main Group Organometallics (3 Units)

The organometallic chemistry of main group elements. Topics covered include synthesis, characterization methods, structure, bonding, reactivity, and applications. (Formerly 3150:620)

CHEM 625 Chemistry Seminar (1 Unit)

Lectures on current research topics in chemistry by invited speakers. (Formerly 3150:625)

CHEM 629 Physical Inorganic Chemistry (3 Units)

Detailed treatment of chemistry of transition elements. Group theoretical applications, ligand field theory, kinetics and mechanism magnetism, electronic spectra, molecular orbital theory. (Formerly 3150:629)

CHEM 630 Theoretical Inorganic Chemistry II (2 Units)

Prerequisite: CHEM 629. Detailed treatment of chemistry of transition elements. Group theoretical applications, ligand field theory, kinetics and mechanism, electronic spectra, molecular orbital theory. (Formerly 3150:630)

CHEM 631 Metals in Medicine (3 Units)

Prerequisite: CHEM 572. This course will cover the synthesis and development of metal based medicines including the tumor drug cisplatin, technetium 99m based imaging agents, and silver antimicrobials. (Formerly 3150:631)

CHEM 635 Thermodynamics & Statistical Thermodynamics (3 Units)

Rigorous treatment of laws of thermodynamics and their applications to selected chemical systems. Fundamentals of statistical thermodynamics and applications to systems in chemical equilibrium. (Formerly 3150:635)

CHEM 636 Chemical Kinetics (3 Units)

Phenomenological kinetics, experimental methods of investigation and analysis of reaction systems. Theoretical treatments of reaction rates. (Formerly 3150:636)

CHEM 640 Chemical Separations (3 Units)

General theory, instrumentation and application of methods of separation. Emphasis on modern chromatographic techniques and recent advances. (Formerly 3150:640)

CHEM 641 Spectral Methods (3 Units)

Theory and application of instrumental measurements. Interpretation of data. (Formerly 3150:641)

CHEM 645 X-Ray Crystallography (3 Units)

The theoretical and practical aspects of single crystal x-ray crystallography are discussed. Topics covered include diffraction, space groups, structure solution and refinement. (Formerly 3150:645)

CHEM 670 Spectroscopic Identification of Organic Compounds (3 Units)

Determination of the structures of organic compounds by spectroscopic analysis: ORD/CD, UV-VIS spectroscopy, IR spectroscopy, mass spectrometry, FT-NMR spectroscopy, 2D-NMR. (Formerly 3150:670)

CHEM 679 Inorganic Polymers (3 Units)

Prerequisite: CHEM 572 or permission of instructor. Synthesis, structure, bonding, characterization, and applications of polysiloxanes, polyphosphazenes, polysilanes, polycarbosilanes, poly(ferroceneophanes), sol-gel materials, coordination polymers and related materials. (Formerly 3150:679)

CHEM 683 Mechanistic & Synthetic Organic Chemistry I (3 Units)

Introduction to the structural and mechanistic aspects of organic reactions: HMO calculations, acids and bases, equilibrium, kinetics, linear free energy relationships, reactive intermediates, reaction mechanisms. (Formerly 3150:683)

CHEM 684 Mechanistic & Synthetic Organic Chemistry II (3 Units)

Prerequisite: CHEM 683. Synthetic organic chemistry from a mechanistic perspective: nucleophilic and electrophilic substitution and addition reactions, carbonyl chemistry, functional group manipulations, oxidations, reductions, cycloaddition reactions. (Formerly 3150:684)

CHEM 699 Master's Thesis (1-6 Units)

For properly qualified candidates for master's degree. Supervised original research in analytical, inorganic, organic, physical or biochemistry. (Formerly 3150:699)

CHEM 710 Special Topics in Analytical Chemistry (1-3 Units)

(May be repeated) Topics in advanced analytical chemistry. Electroanalysis, activation analysis, atomic absorption spectrometry, mass spectrometry, liquid-liquid, liquid-solid and gas chromatography, ion exchange, thermoanalytical methods, separations, standards, sampling, recent developments. (Formerly 3150:710)

CHEM 711 Special Topics in Inorganic Chemistry (1-3 Units)

(May be repeated) Consideration of topics in modern inorganic chemistry such as coordination compounds, chemistry of the solid state, representative elements, nonaqueous solvents, organometallic compounds, homogeneous catalysis. (Formerly 3150:711)

CHEM 712 Special Topics in Organic Chemistry (1-3 Units)

(May be repeated) Topics in advanced organic chemistry such as natural products, heterocyclic compounds, photochemistry. (Formerly 3150:712)

CHEM 713 Special Topics in Physical Chemistry (1-3 Units)

(May be repeated) Subjects from modern physical chemistry. (Formerly 3150:713)

CHEM 715 Special Topics: Biochemistry (1-3 Units)

(May be repeated) Recent developments in areas of biochemistry. (Formerly 3150:715)

CHEM 720 Advanced Biochemical Techniques (3 Units)

Prerequisite: CHEM 502. An advanced lecture course on physical techniques in biochemistry. Includes optical and hydrodynamic methods; radioanalytical techniques, scattering and magnetic resonance spectroscopy. (Formerly 3150:720)

CHEM 722 Enzymatic Reactions (3 Units)

Prerequisites: CHEM 501 and CHEM 502. Mechanisms of enzyme catalyzed reactions, general aspects and specific examples for phosphoryl, acyl, glycosyl transfers, eliminations, oxidation/reduction, isomerization and rearrangements. Chemistry of cofactors. (Formerly 3150:722)

CHEM 724 Bioinorganic Chemistry (3 Units)

Prerequisites: CHEM 501 and CHEM 502. Survey of the structure and properties of metal ion complexes with amino acids, nucleotides, metabolites and macromolecules; metal ion metabolism; metals in medicine. (Formerly 3150:724)

CHEM 726 Advanced Metabolism (3 Units)

Prerequisites: CHEM 501 and CHEM 502. Study of advanced pathways in carbohydrate, lipid and protein metabolism with emphasis placed on metabolic dysfunction. (Formerly 3150:726)

CHEM 740 Physical Organic Chemistry (3 Units)

Prerequisites: CHEM 683 and CHEM 684. An advanced treatment of the theory and mechanisms of organic chemistry: FMO theory, molecular mechanics, molecular strain, kinetics, thermodynamics, acidity functions, linear free energy relationships. (Formerly 3150:740)

CHEM 750 Advanced Synthetic Organic Chemistry (3 Units)

Prerequisites: CHEM 683 and CHEM 684. An advanced treatment of organic functional group manipulations in the context of the total synthesis of natural products. (Formerly 3150:750)

CHEM 899 Doctoral Dissertation (1-16 Units)

Open to qualified student accepted as a candidate for Doctor of Philosophy in Chemistry. Supervised original research undertaken in organic, inorganic, physical, analytical or biochemistry. (Formerly 3150:899)