DEPARTMENT OF CHEMISTRY

College of the Sciences and Mathematics

(See also Pre-Medical Program (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/pre-medical-program))

119 Schmucker Science South
610-436-2631
Department of Chemistry (http://www.wcupa.edu/chemistry)
Melissa Cichowicz (mcichowicz@wcupa.edu), Chairperson
Tim Starn (tsstarn@wcupa.edu), Assistant Chairperson

The Department of Chemistry has been approved by the American Chemical Society’s Committee on Professional Training since 1972. Graduates of the B.S. in Chemistry program and the B.S. in Biochemistry program who meet the necessary standards receive ACS certification. Graduates of the B.S. in Forensic and Toxicological Chemistry receive FEPAC certification.

The Department of Chemistry offers five undergraduate degree programs:

• The B.S. in Chemistry program (approved by the American Chemical Society [ACS]) provides a rigorous scientific foundation in all major areas of chemistry. This degree prepares the graduate for a career in a wide variety of chemically related areas including the chemical, petroleum, environmental, and pharmaceutical sectors. In addition, it serves as a basis for graduate and professional study leading to higher level industrial positions, teaching at the college level, or involvement in technical aspects of related fields such as law.

• The B.S. in Biochemistry program (approved by the American Chemical Society [ACS]) provides a comprehensive background in the major areas of chemistry with an emphasis in biochemistry. Students awarded this degree will be qualified for employment opportunities in chemistry and biochemistry. The program also prepares students for graduate study in chemistry and in biochemistry. This program has been placed in moratorium and is no longer accepting new students.

• The B.S. in Chemistry-Biology program provides the core courses required for admission to schools of medicine, dentistry, and veterinary medicine as well as schools of optometry, podiatry, chiropractic, and physical therapy. It also enables the student to pursue a career in biochemistry, molecular biology, and medicinal chemistry.

• The B.S. in Forensic and Toxicological Chemistry program (accredited by Forensic Science Education Programs Accreditation Commission [FEPAC]) prepares students for careers in criminalistics and toxicology. The program also serves as a basis for graduate study and specialization in these fields. A one-semester internship in a toxicology or forensic-chemistry laboratory is required for this program. Only those students who successfully complete the internship interview and pass the safety exam will receive this internship. (A background check and additional site-specific requirements may also be necessary.)

• The B.S. in Education in Chemistry program prepares students for a career in teaching chemistry in secondary schools. The program gives students experience in the major branches of chemistry so that, with proper selection of electives, graduate work in either pure chemistry, chemistry education, or education can be pursued. Sufficient flexibility is provided so that students also may become certified in general science. This program requires 127 credits for completion. See the Educator Preparation Programs (http://catalog.wcupa.edu/undergraduate/education-social-work/educator-preparation-programs) section of this catalog for an explanation of related requirements.

Majors in the five B.S. programs should consult the Department of Chemistry handbook and their advisor for current requirements, particularly regarding internships. A grade of C- or better is necessary in all required science and mathematics courses.

Undergraduate Research and Internship Programs

Although internships are not a mandatory part of all chemistry programs, they are available to majors on a selective basis. Students receive varying amounts of credit based on the number of hours spent in a work situation and on the nature of the academic work during the internship or research. Credit varies from one to 12 credits. The number of research or internship credits taken may be limited by the department.

Programs

Majors in Chemistry

• B.S. in Chemistry (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/chemistry/chemistry-bs)
• B.S. in Biochemistry (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/chemistry/biochemistry-bs) (no longer accepting new students)
• B.S. in Forensic and Toxicological Chemistry (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/chemistry/forensic-toxicological-chemistry-bs)
• B.S.Ed. in Chemistry (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/chemistry/chemistry-bsed)
• B.S. in Chemistry-Biology (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/chemistry/chemistry-biology-bs)

Minor in Chemistry

• Chemistry (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/chemistry/chemistry-minor)

Graduate Opportunities

See the graduate catalog for more information on the Chemistry program. (http://catalog.wcupa.edu/graduate/sciences-mathematics/chemistry)

Policies

• See undergraduate admissions information. (http://catalog.wcupa.edu/general-information/admissions-enrollment/undergraduate-admissions)
• See academic policies. (http://catalog.wcupa.edu/undergraduate/academic-policies-procedures)

All undergraduate students are held to the academic policies and procedures outlined in the undergraduate catalog. Students are encouraged to review departmental handbooks for program tips, suggested course sequences, and explanations of procedures. When applicable, additional policies for specific department programs may be listed below.

Faculty

Professors

Felix E. Goodson (fgoodson@wcupa.edu) (1998)
A.B., Princeton University; Ph.D., University of California, Berkeley
Kurt W. Kolasinski (kkolasinski@wcupa.edu) (2006)
B.S., University of Pittsburgh; Ph.D., Stanford University
Michael J. Moran (mmoran@wcupa.edu) (1981)
B.S., St. Joseph’s College; Ph.D., University of Pennsylvania
Timothy K. Starn (tsstarn@wcupa.edu) (1996)
Assistant Chairperson, Chemistry
B.S., Ph.D., Indiana University
Typically offered in Fall & Spring.

**CHE 104. General Chemistry II. 3 Credits.**
Basic laws and theories of chemistry, including atomic structure, chemical bonding, oxidation-reduction, solutions, and ionic equilibria. Correlations of chemical principles and their application to modern descriptive chemistry. Pre / Co requisites: CHE 103 requires prerequisite of CHE 103. Typically offered in Fall & Spring.

**CHE 107. General Chemistry for Allied Health Sciences. 4 Credits.**
A one-semester treatment of the fundamentals of chemistry, including atomic structure and bonding, types of reactions, kinetics, equilibrium, and thermodynamics. May not be taken as a chemistry major elective. CRL 107 may be taken concurrently or after CHE 107. Gen Ed Attribute: Science Distributive Requirement. Typically offered in Fall & Spring.

**CHE 160. The Chemistry of Beer. 3 Credits.**
An introduction to the chemistry of beer, including its properties, ingredients, production, and origins. The chemistry and biochemistry of alcohol will also be covered. Gen Ed Attribute: Science Distributive Requirement. Typically offered in Fall & Spring.

**CHE 199. Transfer Credits. 1-10 Credits.**
Transfer Credits. Repeatable for Credit.

**CHE 230. Introduction to Organic and Biological Chemistry. 3 Credits.**
A terminal course in fundamentals of organic chemistry. Structural theory of organic molecules, molecular synthesis, and biological applications. May not be taken as a chemistry major or minor elective. Pre / Co requisites: CHE 230 requires prerequisite of CHE 104 or CHE 107 with a C- or better. Typically offered in Fall & Spring.

**CHE 231. Organic Chemistry I. 4 Credits.**
A unified conceptual introduction to organic molecular structure. Topics discussed will include structure of the atom, orbital and molecular bonding theory, nomenclature of classes of molecules, elementary molecular orbital theory, stereochemistry, nucleophilic substitution, elimination, resonance, and acid-base concepts. These concepts will be applied to the chemistry of hydrocarbons, alkyl halides, alcohols, and simple systems. Pre / Co requisites: CHE 231 requires prerequisite of CHE 104. Typically offered in Fall & Spring.

**CHE 232. Organic Chemistry II. 3 Credits.**
A survey of the classes of organic reaction from a mechanistic deductive approach. Topic will include nucleophilic and electrophilic substitution, reaction of carbonyl compounds, elimination, aromatic substitution, molecular rearrangements, oxidation reduction reactions, carbanion and amine chemistry. These reactions are applied to the remaining classes of organic compounds not covered in Organic Chemistry I. Pre / Co requisites: CHE 232 requires prerequisite of CHE 231. Typically offered in Fall & Spring.

**CHE 271. Forensic Chemistry I. 3 Credits.**
This course is a precursor to CHE 371 and its purpose is to introduce students to forensic science and its various disciplines. Students will also discuss professional practices and ethical expectations of a forensic scientist. The course content is designed for chemistry and physical chemistry majors with special emphasis on developing foundational scientific writing skills needed for upper level courses. Pre / Co requisites: CHE 271 requires prerequisites of CHE 104 and BIO 110. Consent: Permission of the Department required to add. Gen Ed Attribute: Writing Emphasis. Typically offered in Spring.

**CHE 310. Introductory Biochemistry. 3 Credits.**
The chemical nature of biological phenomena is presented. Particular emphasis is placed on the metabolic pathways and the enzymes responsible for these processes with applications to nutrition. May not be taken as a chemistry major or minor elective. Pre / Co requisites: CHE 310 requires prerequisite of CHE 230 or CHE 231. Typically offered in Fall & Spring.

**CHE 321. Analytical Chemistry I. 3 Credits.**

**CHE 333. Advanced Organic Chemistry. 3 Credits.**
An advanced mechanistic study of organic compounds, functional groups, and their reactions. Spectroscopic characterization of organic molecules will also be covered. Pre / Co requisites: CHE 333 requires prerequisite of CHE 232. Typically offered in Fall.
CHE 341. Physical Chemistry I. 4 Credits.
An introduction to physical chemistry including ideal gases, kinetic theory, three laws of thermodynamics, introduction to phase equilibrium, chemical equilibrium, application of the fundamental equation of thermodynamics, transport phenomena, chemical kinetics, introductory spectroscopy, x-ray diffraction, and the structure of solids.
Pre / Co requisites: CHE 341 requires prerequisites of CHE 103 or CHE 105 and CHE 104 or CHE 106 and MAT 161 and MAT 162.
Typically offered in Fall & Spring.

CHE 342. Physical Chemistry II. 3 Credits.
Advanced thermodynamics including nonideal gases, nonideal systems, and thermodynamics at surfaces; introduction to statistical mechanics; quantum chemistry; advanced chemical kinetics, including kinetics near equilibrium, catalytic kinetics, and activated complex theory; and dynamic electrochemistry.
Pre / Co requisites: CHE 342 requires prerequisites of CHE 104 or CHE 341 and MAT 161 and MAT 162 and PHY 170 and PHY 180.
Typically offered in Spring.

CHE 371. Forensic Chemistry II. 3 Credits.
The course provides upper level undergraduate chemistry students basic and advanced concepts of forensic science. The course content is designed to provide a foundational understanding of the chemistry of materials routinely encountered as evidence in a forensic lab and the techniques used to analyze them. Those students taking the lab course associated with this lecture course will practice the principles learnt in this course.
Pre / Co requisites: CHE 371 requires prerequisites of CHE 232 and CHE 321.
Typically offered in Fall.

CHE 403. Chemistry of the Environment. 3 Credits.
The chemistry of the atmosphere, hydrosphere, and biosphere; man's impact on these areas. May also be offered with lab.
Pre / Co requisites: CHE 403 requires prerequisite of CHE 104.
Typically offered in Spring.

CHE 410. Advanced Independent Study or Research. 2-6 Credits.
Taken under the direct supervision of a faculty member. May be taken for two semesters for a total of six credits.
Typically offered in Fall & Spring.
Repeatable for Credit.

CHE 411. Advanced Inorganic Chemistry. 3 Credits.
Structure and properties of the elements and inorganic compounds from a theoretical point of view. Atomic structure and the periodic law; molecular structure and bonding, including symmetry and MO theory; structure, bonding, and reactivity of transition-element compounds and main group compounds; acid-base chemistry.
Pre / Co requisites: CHE 411 requires prerequisite of CHE 341.
Typically offered in Spring.

CHE 418. Chemical Information. 1 Credit.
Instruction in the use of a modern chemical library, reference and data acquisition, synthetic procedures, and computer data bases.
Pre / Co requisites: CHE 418 requires prerequisite of CHE 231.
Typically offered in Fall.

CHE 424. Advanced Analytical Chemistry. 3 Credits.
Basic principles of applied instrumental analysis. Special emphasis on the use of spectrophotometric and electroanalytical instrumentation.
Pre / Co requisites: CHE 424 requires prerequisites of CHE 321 and CHE 341 and co-requisite of CHE 342.
Typically offered in Spring.

CHE 433. Advanced Topics in Chemistry. 3 Credits.
A topic of current interest in chemistry. Topic to be announced before registration.
Pre / Co requisites: CHE 433 requires a prerequisite of CHE 341.
Typically offered in Fall & Spring.
Repeatable for Credit.

CHE 436. Polymer Chemistry. 3 Credits.
Polymerization kinetics, rheology of polymer melts, crystallization parameters, and monomer reactivity in copolymerization.
Pre / Co requisites: CHE 436 requires prerequisite of CHE 232.
Typically offered in Spring.

CHE 450. Internship in Chemistry. 1-12 Credits.
A full- or part-time work-study appointment in a hospital, or a commercial, governmental, or industrial laboratory supervised jointly by an on-site supervisor and Department of Chemistry faculty member.
Typically offered in Fall & Spring.
Repeatable for Credit.

CHE 451. Internship in Forensic Chemistry. 1-12 Credits.
This course gives the student exposure to and hands-on experience in the field of biomedical research. Intended to be a full-time appointment in a hospital, medical school, or research institute, it may be modified to be part-time to better meet a student's needs. Supervised jointly by an on-site supervisor and a Department of Chemistry faculty member. The analytical methodology in the laboratory will include techniques applicable to bio-medical research.
Consent: Permission of the Department required to add.
Typically offered in Fall & Spring.

CHE 452. Internship in Chemistry-Biology. 6-12 Credits.
A full- or part-time work-study appointment in a clinical, commercial, governmental, or industrial laboratory supervised jointly by an on-site supervisor and a Department of Chemistry faculty member. The analytical methodology in the laboratory will include techniques applicable to forensic toxicology and/or criminalistics.
Pre / Co requisites: CHE 452 requires prerequisites of CHE 232 and CHE 471 and BIO 357.
Consent: Permission of the Department required to add.
Typically offered in Fall & Spring.
Repeatable for Credit.

CHE 460. Advanced Organic Spectroscopy. 3 Credits.
An advanced course in organic spectroscopy dealing with IR, NMR, and MS techniques. Other techniques also may be covered.
Pre / Co requisites: CHE 460 requires prerequisites of CHE 232 and CHE 341 or CHE 345.
Typically offered in Spring.

CHE 465. Forensic Microscopy. 3 Credits.
A lecture and practical study of the various microscopic techniques used to analyze various materials relevant to forensic investigations. Topics covered in the course include the properties of light and applications of stereomicroscopy, light microscopy, polarized light microscopy, microchemical tests, scanning electron microscopy and instrumental microscopy.
Pre / Co requisites: CHE 465 requires prerequisite CHE 371 and CRL 371.
Typically offered in Spring.

CHE 476. Biochemistry I. 3 Credits.
This course examines the physical and chemical characteristics of proteins, carbohydrates, lipids, and nucleic acids. The bioenergetics of carbohydrate and fat metabolism and the enzymatic control of these processes is a focal point. The bioenergetics of carbohydrate and fat metabolism and the enzymatic control of these processes is a focal point. Nucleic acids in protein synthesis is also covered.
Pre / Co requisites: CHE 476 requires prerequisite of CHE 232.
Typically offered in Fall & Spring.

CHE 477. Biochemistry II. 3 Credits.
This course is an extension of CHE 476 and considers the biosynthesis and degradation of proteins, carbohydrates, lipids, and nucleic acids. The primary focus is on the interrelationship of these molecules and the pathways involving their metabolism.
Pre / Co requisites: CHE 477 requires prerequisites of CHE 345 and CHE 476.
Typically offered in Spring.

CHE 479. Chemical Toxicology. 3 Credits.
A one-semester course in the environmental and physiological aspects of chemical toxicity. Special emphasis will be placed on documentation, sampling, and verification of materials.
Pre / Co requisites: CHE 479 requires a prerequisite of CHE 232.
Typically offered in Spring.

CHE 480. Research in Chemistry. 2-6 Credits.
The student carries out an independent chemical research project under the direction of a faculty member. The faculty member assigns the research topic and background literature readings and works closely with the student in the research laboratory giving instruction in laboratory techniques. The student may be required to write a final research report.
Typically offered in Fall & Spring.
Repeatable for Credit.
CHE 491. Seminar in Chemistry. 1 Credit.
Oral and poster presentation of papers based on laboratory or library research.
Consent: Permission of the Department required to add.
Typically offered in Fall & Spring.

CRL

CRL 103. Experimental General Chemistry I (LAB). 1 Credit.
Basic laboratory studies in college chemistry utilizing the quantitative approach. Semimicro
qualitative analysis and inorganic preparations.
Pre / Co requisites: CRL 103 requires prerequisite or co-requisite CHE 103.
Typically offered in Fall & Spring.

CRL 104. Experimental General Chemistry II (LAB). 1 Credit.
Basic laboratory studies in college chemistry utilizing the quantitative approach. Semimicro
qualitative analysis and inorganic preparations.
Pre / Co requisites: CRL 104 requires a prerequisite of CRL 103 and a prerequisite/corequisite of
CHE 104.
Typically offered in Fall & Spring.

CRL 107. General Chemistry Lab for Allied Health Services. 1 Credit.
A one-semester laboratory course to complement CHE 107. Basic laboratory techniques, both
qualitative and quantitative, will be used to illustrate principles from the lecture. CHE 107
must be taken concurrently or before CRL 107.
Pre / Co requisites: CRL 107 requires co-requisite of CHE 107.
Typically offered in Fall & Spring.

CRL 230. Introduction to Organic and Biological Chemistry Laboratory. 1 Credit.
A laboratory course to allow students in the environmental health program to gain hands-on
experience with the topics and techniques of organic and biochemistry as they apply to the
environmental health major.
Pre / Co requisites: CRL 230 requires a prerequisite or co-requisite of CRL 230.
Typically offered in Spring.

CRL 231. Experimental Organic Chemistry I Lab. 2 Credits.
Basic laboratory skills in organic chemistry including classical as well as instrumental
Pre / Co requisites: CRL 231 requires prerequisite of CRL 104 or CRL 106.
Typically offered in Fall & Spring.

CRL 232. Experimental Organic Chemistry II Lab. 2 Credits.
Basic laboratory skills in organic chemistry including classical as well as instrumental
Pre / Co requisites: CRL 232 requires co-requisite of CRL 232.
Typically offered in Fall & Spring.

CRL 321. Analytical Chemistry I Lab. 2 Credits.
Practical experience in modern techniques of chemical analysis with emphasis on volumetric
and gravimetric methods.
Pre / Co requisites: CRL 321 requires co-requisite of CRL 321.
Typically offered in Fall & Spring.

CRL 341. Experimental Physical Chemistry Lab. 2 Credits.
Laboratory course in physical chemistry including computer applications, thermodynamics,
chemical kinetics, structure, and spectroscopy.
Pre / Co requisites: CRL 341 requires prerequisites of CHE 103 and CHE 104 and MAT 161 and
MAT 162 and PHY 170 and co-requisites of CHE 341 and PHY 180.
Typically offered in Fall.

CRL 342. Experimental Physical Chemistry II Lab. 2 Credits.
Experiments and projects in advanced physical chemistry.
Pre / Co requisites: CRL 342 requires prerequisite of CRL 341 and co-requisite of CRL 342.
Typically offered in Fall.

CRL 371. Forensic Chemistry Lab. 2 Credits.
Principles of microscopy, screening methods, and instrumental methods of chemical analysis
applied to criminalistics and toxicological samples.
Pre / Co requisites: CRL 371 requires co-requisite of CRL 371.
Typically offered in Fall.

CRL 411. Inorganic Syntheses. 2 Credits.
A four-hour laboratory course in the synthesis and characterization of inorganic compounds of
the main group and the transition elements.
Pre / Co requisites: CRL 411 requires prerequisite of CHE 409 or CHE 411 and co-requisite of
CHE 341.
Typically offered in Spring.

CRL 424. Analytical Chemistry II Lab. 2 Credits.
Practical experience in the choice and application of instrumental methods of analysis to
chemical systems.
Pre / Co requisites: CRL 424 requires prerequisite or co-requisite of CHE 424.
Typically offered in Spring.

CRL 436. Polymer Chemistry Lab. 2 Credits.
Synthesis of polymers; molecular, physical, and thermal characterization of polymers.
Instrumental methods include X-rays, IR, electron microscopy, and thermal analysis.
Pre / Co requisites: CRL 436 requires co-requisite of CHE 436.

CRL 476. Experimental Biochemistry I Lab. 2 Credits.
Laboratory exercises in the fundamentals of biochemistry.
Pre / Co requisites: CRL 476 requires co-requisite of CHE 476.
Typically offered in Fall & Spring.

CRL 477. Experimental Biochemistry II Lab. 2 Credits.
A second-semester laboratory course in biochemistry that stresses the use of advanced
analytical instruments to characterize biologically important molecules and to elucidate their
mechanism of action.
Pre / Co requisites: CRL 477 requires prerequisites of CHE 476 and CRL 476.
Typically offered in Spring.

SCI

SCI 102. Electricity With Physical And Bio Applic. 3 Credits.
An exploration of the physics of electrical circuits, the chemical basis of electricity as the flow
of electrons, acid-base and oxidation-reduction reactions in chemical and in chemical and in
living systems, the electrical activity in the human nervous system, and connections between
electricity and sensation and locomotion in humans.
Pre / Co requisites: SCI 102 requirement - Education majors only.
Typically offered in Fall & Spring.