

# CHEMISTRY AND BIOCHEMISTRY

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Halenz Hall, Room 225  
(616) 471-3247 or 471-3248  
chemistry@andrews.edu  
<http://www.andrews.edu/CHEM/>

## **Faculty**

G. William Mutch, *Chair*  
David E. Alonso  
Desmond H. Murray  
D. David Nowack  
Steven E. Warren  
Peter A. Wong

Students who plan to major in chemistry or biochemistry are expected to have entrance credit in the preparatory subjects of chemistry and mathematics (including algebra and trigonometry); a background in physics is desirable. Those who do not have entrance credit or equivalent training in these subjects, particularly mathematics, may not fulfill the department graduation requirements in four years.

Students are encouraged to plan early for an on-campus or off-campus research experience required of all students in the Bachelor of Science degree programs in chemistry and strongly recommended for those in the Bachelor of Science degree program in biochemistry. This experience may take the form of a cooperative educational-research experience or research in an academic, industrial, or governmental laboratory setting. Interested students should consult the department chair.

## **AMERICAN CHEMICAL SOCIETY CERTIFICATION**

Students desiring American Chemical Society certification must

- Complete the required courses for the (ACS) Bachelor of Science degree in chemistry as spelled out in this bulletin

# Courses

(Credits)

See inside front cover for symbol code.

**BCHM120** \$ (4)

***Introduction to Biological Chemistry***

A survey of major concepts in biochemistry such as structures of biological molecules, their functions, energy metabolism, regulation of biochemical pathways; for nursing, dietetics, and allied health students. Weekly: 3 lectures, and a 3-hour lab. Not applicable towards a major or minor in chemistry or biochemistry. Prerequisite: CHEM110. *Spring*

**BCHM421** ◆ (4)

***Biochemistry I***

Study of the fundamental principles of enzyme kinetics and mechanisms based on the structure and chemistry of biomolecules including amino acids, carbohydrates, lipids, proteins, nucleotides, nucleic acids, and biological membranes. Weekly: 4 lectures. Prerequisite: CHEM232. *Fall*

**BCHM422** ◆ (3)

***Biochemistry II***

Continuation of BCHM421 including selected topics of hormone and regulatory biochemistry, and the study of the four primary neurotransmitter systems—acetylcholine, catecholamines, serotonin, and gamma-aminobutyric acid. Weekly: 3 lectures. Prerequisite: BCHM421. *Spring*

**BCHM430** ◆ \$ (1)

***Biochemistry Lab***

Introduction to quantitative and qualitative methods for the isolation, purification and identification of biological materials and applications of enzyme kinetics. Weekly: 4 hours of lab. Prerequisite: BCHM421 and registration in BCHM422. *Spring*

**CHEM110** \$ (4)

***Introduction to Inorganic and Organic Chemistry***

An introduction to the principles and applications of inorganic and organic chemistry; for nursing, dietetics, and allied health students. Meets the natural/physical science general education restricted choice requirement. Weekly: 3 lectures, 1 recitation, and a 3-hour lab. *Fall*

**CHEM131** \$ (4)

***General Chemistry I***

This first course in chemistry is for students planning to major in science and engineering. Topics include stoichiometry, atomic and molecular structure, bonding, states of matter, solutions, chemical kinetics, and chemical equilibrium. Weekly: 3 lectures, 2 recitations, and a 3-hour lab. Prerequisite: MPE $\geq$

**CHEM410** ◆ \$ (2)**Forensic Chemistry**

Principles of chemistry as applied to the methods of analysis and identification of drugs. Rules of evidence as they apply to testimony in court. Observation of drug-related court procedures. Weekly: 1 lecture and two 3-hour labs. Participation must be arranged with the instructor at least 2 months prior to beginning of course. Prerequisites: CHEM200, 232. *Spring*

**CHEM411** (5)**Seminar in Chemistry**

First half of semester consists of two meetings per week: one is an introduction to chemical literature and computer searching of Chemical Abstracts and chemical databases, the other meeting is the regular seminar series presented by students, faculty, and invited speakers. During the semester, each student prepares and presents a seminar. This course is required of and open only to senior chemistry and biochemistry majors, and attendance for both semesters is required for one credit. A deferred grade (DG) is assigned Fall Semester and is removed upon successful completion of CHEM412. Weekly: Two meetings during first half of semester, one meeting remainder of semester. Prerequisite: CHEM312. *Fall*

**CHEM412** (5)**Seminar in Chemistry**

Continuation of CHEM411. During the semester, each student prepares and presents a seminar. This course is required of and open only to seniors. Prerequisite: CHEM411. *Spring*

**CHEM415** ◆ (4)**Advanced Inorganic Chemistry**

Atomic and molecular structure, symmetry, group theory, solid state, acids and bases; structure, bonding, spectra, and reaction mechanisms of d-metal complexes, systematic chemistry of non-metals; organometallic chemistry and catalysis. Weekly: 4 lectures. Prerequisites: CHEM232, 431. *Spring*

**CHEM431** ◆ (3)**Physical Chemistry I**

Fundamental concepts in chemical thermodynamics, free energy, chemical equilibria, phase changes, solutions, molecular transport, chemical dynamics, and electrochemistry. Weekly: 3 lectures. Prerequisites: CHEM200, MATH142, PHYS142 (or 242, 272). *Fall*

**CHEM432** ◆ (3)**Physical Chemistry II**

Wave mechanics, atomic and molecular structure, chemical bonding, atomic and molecular spectroscopies, and applications to chemical dynamics and statistical thermodynamics. Weekly: 3 lectures. Prerequisites: CHEM431, MATH286; MATH240 strongly recommended. *Spring*

**CHEM440** ◆ \$ (4)**Instrumental Analysis**

Theory and practice of analytical separations and chemical analyses by chromatographic, optical and electrochemical methods. Introduction to interface of instruments with micro-computers. Instruments used include emission and absorption spectrometers, lasers, mass spectrometer, chromatographs, micro-computers, analog and digital devices. Weekly: 2 lectures and two 4-hour labs. Prerequisites: CHEM200, MATH142. *Fall*

**CHEM441** ◆ \$ (1)**Physical Chemistry Laboratory I**

Experiments related to the course content of CHEM431. Weekly:

one 4-hour laboratory. Prerequisite: concurrent enrollment in CHEM431. *Fall*

**CHEM442** ◆ \$ (1)**Physical Chemistry Laboratory II**

Experiments related to the course content of CHEM432. Weekly one 4-hour laboratory. Prerequisite: concurrent enrollment in CHEM 432. *Spring*

**CHEM470** ◆ \$ (2)**Modern Synthetic Techniques**

An advanced laboratory course designed to incorporate a wide variety of modern synthetic techniques of organic, organometallic, and inorganic chemistry. Weekly: two 4-hour labs. Prerequisites: CHEM474,415 or concurrent enrollment in CHEM415. *Spring*

**CHEM474** (2)**Advanced Topics in Organic Chemistry**

Study of the principles of modern synthetic organic chemistry with applications from one or more of the following areas: natural product, medicinal, or polymer chemistry. Weekly: 2 lectures. Prerequisite: CHEM232. *Fall*

**CHEM475** ◆ (2)**Advanced Topics in Physical Chemistry**

Advanced study of molecular spectroscopy, statistical thermodynamics, chemical dynamics, or the application of quantum mechanics. Prerequisites: CHEM432 or CHEM431 and permission of the instructor.

**CHEM495** ◆ (1-4)**Independent Research**

An opportunity for chemistry and biochemistry majors to gain research experience by joining with a faculty member in study of an area of special interest.

**GRADUATE****CHEM530** (2-4)**Topics in Teaching Chemistry**

Each time the course is offered, it treats one of the following areas:

- Concepts in Chemistry  
Fundamental ideas of chemistry
- Demonstrations  
Simple experiments which illustrate chemical principles
- Problem-Solving Strategies  
Exploration into the mental processes and logic behind problem solving.

None of the above areas are to occur twice in one student's program. Prerequisite: CHEM232. Repeatable to 6 credits.

**CHEM540** (2-4)**Topics in Chemistry**

Independent readings to be chosen in consultation with the instructor. A written report and an oral presentation covering the materials read are required. A minimum of 60 hours of work is required for each credit. Prerequisites: CHEM431. Repeatable to 6 credits.