

# Chemistry

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*Chair: Dr. John Harris*

The Chemistry major follows a curriculum that provides a solid foundation in the facts and principles of the science. Mathematics and physics are emphasized since these areas are essential to the understanding of chemistry. There is a high degree of flexibility in the general plan of study and concentration in order to meet the demands of the following students: those who plan to supplement the bachelor's degree by attending graduate school or by enrolling in a professional program, like medical school; those who plan to complete their formal education with the bachelor's degree and obtain positions in industry or with the government; and those who plan careers in teaching.

Careers open to the chemist are any medical field, analytical chemistry, bio-chemistry, clinical chemistry, geochemistry, inorganic chemistry, organic chemistry, physical chemistry, spectroscopy, radio and nuclear chemistry, applied or basic research, chemical literature abstracting, technical writing, market research, sales, advertising, technical services, waste disposal, sanitary engineering, environmental science, forensic science, public health, and teaching.

## **BACHELOR OF SCIENCE IN CHEMISTRY**

### **MAJOR REQUIREMENTS**

Chemistry 101, 102, 192, 201, 202, 251, 292, 301, 302, 303, 304, 392, 492 and 499 or 398/399; nine credits from the following: Chemistry 205, 401, 404, 405, 410-415, and 501; Biology 111; Physics 121, 122; Mathematics 121, 122, and 221 or 306.

**Minor Requirements** — Chemistry 101, 102, 201, 202, 301 (including laboratories).

## **BACHELOR OF SCIENCE IN CHEMISTRY**

### **PRE-PROFESSIONAL CONCENTRATION**

(Pre-Dental, Pre-Medical, Pre-Optometry, Pre-Podiatry, Pre-Veterinary, Pre-Chiropractic)

### **MAJOR REQUIREMENTS**

Chemistry 101, 102, 192, 201, 202, 251, 292, 301, 302, 303, 304, 392, 404, 405, 492; three credits from the following: Chemistry 205, 398/399, 401, 410-415, 499 and 501; Biology 111 and two 200 or above Biology courses selected with approval of the Pre-professional coordinator; Physics 121, 122; Mathematics 121, 122, and 221 or 306. Pre-medical students are encouraged to participate in an undergraduate research project.

## **BACHELOR OF SCIENCE IN CHEMISTRY**

### **SECONDARY EDUCATION CHEMISTRY CERTIFICATION**

#### **MAJOR REQUIREMENTS**

Chemistry 101, 102, 192, 201, 202, 251, 292, 301, 302 or 303, 304, 392, and 492; Physics 121, 122; Mathematics 121, 122, and 221 or 306; plus Education courses prescribed under the Secondary Education program.

**BACHELOR OF SCIENCE IN CHEMISTRY  
FORENSIC CONCENTRATION**

**MAJOR REQUIREMENTS**

Chemistry 101, 102, 192, 201, 202, 251, 292, 301, 303, 304, 308, 309, 392, 398-9 or 499, 405, and 492; Biology 111, and 301 or 401; Physics 121, 122, 308; Mathematics 121, 122, and 304. Sociology 101, 204, and 306. Three elective credits from the following: CHEM 398-9, 401, 404, 499 or SOC 208, 335, 337, and 340.

**FORENSIC SCIENCE MINOR REQUIREMENTS (21-22 credits)**

Chemistry 208, 209; Sociology 204; Biology 111; and Chemistry 101 or 103. Natural Science Electives (3-4 credits) Chemistry 102 or 104, 251, 303, 398-9, 401, 404, 410, 499; Biology 301, 302, 401, 405, 430. Social Science Elective (3 credits) Sociology 105, 306, 335, 337, 340; Psychology 205. Only two courses can overlap between the major and the forensics minor. If courses required for the minor are taken instead to satisfy requirements for the major, another course from the Natural Science electives should be substituted to fulfill the 21 semester hours.

**BACHELOR OF SCIENCE IN CHEMISTRY  
BIOCHEMISTRY CONCENTRATION**

**MAJOR REQUIREMENTS**

Chemistry 101, 102, 192, 201, 202, 251, 292, 301, 302, 303, 304, 392, 404, 405, 492 and three credits from Chemistry two hundred level or greater courses. Biology 111, 301, 401; Physics 121, 122; Mathematics 121, 122, and 221 or 306.

**BACHELOR OF ARTS IN CHEMISTRY  
MAJOR REQUIREMENTS**

Chemistry 101, 102, 192, 201, 202, 205, 251, 292, 301, 304, 392, 492; Biology 111; Physics 121, 122; Mathematics 121, 122 and minor of student's choice, or pre-law concentration, or double major.

**Other Exciting Special Degree Options** also available to those interested in Chemistry: See Pre-Professional Studies for specifics.

“3+4” Accelerated Program in Primary Care

Lake Erie College of Osteopathic Medicine

“3+3” (B.S./PHARM.D.) Program in Pharmacy

Lake Erie College of Osteopathic Medicine

“2+3” Accelerated Program in PHARMAC

Lake Erie College of Osteopathic Medicine

“3+4” Accelerated Program Leading to Baccalaureate and Doctor of Dental  
Medicine Degrees Temple University School of Dentistry

“3+4” Accelerated Program in Optometry

Pennsylvania College of Optometry

## CHEMISTRY — COURSE DESCRIPTIONS

### 101-102. Chemical Principles I, II (4 credits each)

Introduction to the entire discipline of chemistry with an emphasis on physical (inorganic) and analytical chemistry; theoretical principles, chemistry of inorganic compounds, problem solving, quantitative measurements, and an interpretation of experimental data. *Three lecture-recitation periods and one four-hour laboratory. Prerequisite: high school chemistry. Chemistry 101 is a prerequisite for Chemistry 102. Fall, Spring.*

### 103-104. Human Chemistry I, II (4 credits each)

Introduction to Chemistry. Chemistry of inorganic compounds, problem solving, quantitative measurements and an interpretation of experimental data. Special emphasis on movement of inorganic substances in biological systems. Theories of organic molecular structures and reaction mechanisms in biological systems. Metabolic pathways. This sequence is intended to be terminal. Science majors and students interested in a minor should take the Chemistry 101-102 sequence instead. *Three lectures and one, two-hour laboratory. Chemistry 103 is a prerequisite for Chemistry 104. Fall, Spring.*

### 103R. Human Chemistry Recitation (1 credit)

Students will develop and practice problem solving skills directly related to the Human Chemistry course, CHEM103, Human Chemistry I. As advised after placement assessment. (P/F) (1 credit) *Fall.*

### 105. Contemporary Chemistry (3 credits)

This course is intended to be part of the General Education Program. It is designed not only to give students an understanding of chemistry and its impact on all aspects of life, but also to demonstrate how chemistry can enrich their lives through a better understanding of their bodies, minds, environments, and the world in which they live. Present global issues will be addressed from a chemical viewpoint. *As needed.*

### 192. Chemistry Freshman Seminar (0 credits)

Topics that will introduce the use of university resources, time management, study habits, and participation in college life. *Fall.*

### 201-202. Organic Chemistry I, II (4 credits each)

General principles and theories of organic chemistry, preparation and properties of aliphatic and aromatic compounds, the study of some natural products. *Three lecture-recitation periods and one four-hour laboratory. Prerequisite: Chemistry 102. Chemistry 201 is a prerequisite for Chemistry 202. Fall, Spring.*

### 203-204. Organic and Biological Chemistry I, II (4 credits each)

For medical technologists and biology majors in secondary education, with emphasis on biological rather than physical applications. Theories of organic molecular structures and reaction mechanisms in relationship to biologically important substances and metabolic pathways. *Three lecture-recitation periods and one four-hour laboratory. Prerequisite: Chemistry 102. Chemistry 203 is a prerequisite for Chemistry 204. Chem 203/204 is offered as needed.*

### 205. Environmental Chemistry (4 credits)

For students with a strong interest in the environment. An introduction to the chemical aspects of the environment including concentration measurements, toxicity of chemicals, and remediation methods. *Three lecture-recitation periods and one two-hour laboratory. Prerequisite: Chemistry 104, 201, or 203.*

### 208. Forensics (3 credits)

An introduction to basic forensic science and criminalistics developed for all majors. *Three lecture-recitation periods. No Prerequisite: Fall, odd numbered years.*

### 209. Forensics Laboratory (1 credit)

Crime scene processing and introduction to techniques of analysis. *One two-hour laboratory. Co-requisite or Prerequisite, CHEM 208, Fall, odd-numbered years*

**251. Quantitative Chemical Analysis  
(3 credits)**

Theory of gravimetric and volumetric analysis, sampling, sample preparation, lab safety, and basic instrumental techniques. *Two lecture-recitation periods and one four-hour laboratory. Prerequisite: Chemistry 102 concurrent. Spring.*

**292. Chemistry Sophomore Seminar  
(0 credits)**

Session will address the possible resources for internships and summer research. Instructor(s) will oversee the application process. *Fall.*

**301-302. Physical Chemistry I, II  
(4 credits each)**

Thermodynamics, kinetics, theory of solutions, and an introduction to quantitative treatment of molecular structure. *Three lecture-recitation periods and one four-hour laboratory. Prerequisites: Chemistry 102, Physics 105 or 122, and Mathematics 122. Chemistry 301 is a prerequisite for Chemistry 302. Chemistry 301 is offered in the Fall and Chemistry 302 in the Spring.*

**CHEM 301 Physical Chemistry I** cross listed as **PHYS 301 Thermodynamics.**

**CHEM 302 Physical Chemistry II** cross listed as **PHYS 302 Dynamics and Quantum Mechanics.**

**303. Instrumental Analysis  
(3 credits)**

Theory and application of modern analytical instrumentation and techniques. *Two lecture-recitation periods and one four-hour laboratory. Prerequisite: Chemistry 202, 251. Spring, odd-numbered years.*

**304. Inorganic Chemistry  
(4 credits)**

The chemistry of the elements with an emphasis on chemical bonding, structure and correlation with positions of elements in the periodic table. *Three lecture-recitation periods and one four-hour laboratory. Fall, even-numbered years.*

**308. Forensic Chemistry  
(3 credits)**

Forensic chemistry utilizes theories and techniques of modern instrumental analysis applied to solving crimes. *Three lecture-recitation periods. Prerequisites, CHEM 251, CHEM 202. Fall, odd numbered years.*

**309. Forensic Chemistry Laboratory  
(1 credit)**

Sampling, sample preparation and basic instrumental techniques used in forensic science. *Prerequisite, CHEM 251. One four-hour laboratory. Fall, odd-numbered years.*

**392. Chemistry Junior Seminar  
(0 credits)**

The seminar will provide instruction on preparation for graduate/professional school entrance exams, resume writing, job search, and interviewing. *Fall.*

**398-399. Chemistry Internship  
(3-15 credits)**

The integration of classroom theory with practical work experience under which students have specific periods of attendance at college and specific periods of employment, either full- or part-time, with or without pay. *Credit may vary from three to 15 credits, but no more than four credits may be counted toward major requirements, with additional credits counted as free electives. Open only to Chemistry majors with approval of the department chair and the Provost. Fall, Spring, Summer.*

**401. Principles of Spectroscopy  
(3 credits)**

Spectroscopic analysis of organic compounds and mixtures using chemical and instrumental methods. Emphasis on theoretical and practical considerations, and problem solving. *Two lecture recitation periods and one three-hour laboratory. Prerequisites: Chemistry 202. As needed.*

**404. Bioorganic Chemistry  
(3 credits)**

Advanced study of the chemistry of nature's most relevant bioorganic molecules. Special emphasis on their importance, structure, syntheses, and reactions. *Three lecture-recitation periods. Prerequisites: Chemistry 202. Fall, alternate years.*

**405. Biochemistry  
(same as Biology 405)  
(3 credits)**

Basic chemical processes of living organisms, from single cells to humans, emphasizing the use and production of energy and macromolecules; metabolic regulation; and structure-function relationships. *Three lectures. Prerequisites: Chemistry 202. Spring.*

**410-415. Special Topics in Chemistry  
(3-4 credits)**

A specialized area of chemistry is selected for study. Course may include lectures, laboratory, and examinations of the primary literature. As needed or requested.

**492. Chemistry Seminar  
(1 credit)**

Selection of an acceptable chemistry topic, research, and presentation of the research findings in written and oral form. *Prerequisite: Chemistry 202. Fall.*

**499. Undergraduate Research  
(1-4 credits)**

Original research in selected chemical problems. *A report is required. Open to qualified students with the consent of the chair of the department. Recommended for those who are planning graduate study. No more than six credits applicable to minimum requirements for major. Fall, Spring, Summer as needed.*

**501. Independent Study in Chemistry  
(1-8 credits)**

*Saint Francis University students speak to a potential employer at the annual career fair.*