

# EMU Chemistry Department Course Descriptions

## **CHEM101 Science for Elementary**

### **Teachers 3\_hrs**

Designed for students who plan to teach in elementary school. Lectures deal with some basic principles of chemistry while the laboratory work emphasizes the discovery approach as it may be used in an elementary classroom. Simple equipment and easily obtained chemicals are used in the experiments. Does not count toward major or minor. Lecture: two hours per week. Laboratory: two hours per week.

## **CHEM115 Chemistry and Society 3\_hrs**

Examines the relevance of chemistry to the problem of how humans relate to the environment. It is designed for humanities and other nonscience majors. No previous mathematics or chemistry is required. CHEM116 may be taken concurrently to satisfy the laboratory science requirement for general studies. Does not count toward major or minor. Lecture: three hours per

## **CHEM116 Chemistry and Society Laboratory 1\_hr**

Laboratory experiments based on environmental problems such as water and air pollution, drugs and pesticides. The laboratory may be taken concurrently with CHEM115 to satisfy the Area II physical science requirement. Does not count toward major or minor. Laboratory: two hours per week.  
*Prereq or Coreq: CHEM115*

## **CHEM117 Fundamentals of Chemistry- Lecture 3\_hrs**

A rapidly moving introductory study of basic principles in general chemistry. Includes elements, compounds, periodic properties, atomic structure, gas laws and stoichiometry. Does not count toward major or minor. Can be used with CHEM118 to satisfy the chemistry prerequisite for CHEM121. Will satisfy Area II physical science requirement when taken concurrently with CHEM118. Lecture: three hours per week.  
*Prereq: MATH104, MATH105, MATH107, MATH112, MATH118, MATH119, MATH120 or Level 3 math placement; Coreq: CHEM118*

## **CHEM118 Fundamentals of Chemistry Laboratory 1\_hr**

Designed to accompany CHEM117 lecture. Will provide an introduction to scientific discovery through experimentation and observation. Experiments are drawn from topics presented in the chemistry lectures in CHEM117. Does not count toward major or minor. Laboratory: two hours per week.  
*Coreq: CHEM117*

## **CHEM120 Fundamentals of Organic and Biochemistry 4\_hrs**

A survey of organic chemistry and biochemistry; completes the study of chemistry begun in CHEM117/118 and is a terminal course. Does not count toward major or minor. Lecture: three hours per week. Laboratory: two hours per week.

*Prereq: high school chemistry*

## **CHEM121 General Chemistry I 3\_hrs**

The first semester of a two-semester sequence covering the principles of chemistry for science majors and others with an interest and background in science. Lecture: three hours per week.

*Prereq: MATH104 or Level 3 math placement with concurrent registration in MATH104; High school chemistry; Coreq: CHEM122*

## **CHEM122 General Chemistry I Laboratory 1\_hr**

The laboratory class to accompany CHEM121. Students learn basic techniques employed in a chemistry laboratory, including use of analytical balances, quantitative glassware, spectrophotometry, and computers for data acquisition and analysis. Laboratory: three hours per week.

*Coreq: CHEM121*

## **CHEM123 General Chemistry II 3\_hrs**

A continuation of the two-semester sequence covering the general principles of chemistry for science majors and others with an interest and background in science. Lecture: three hours per week. Restriction: C- or better in CHEM121.

*Prereq: CHEM121 and CHEM122; Coreq: CHEM124*

## **CHEM124 General Chemistry II Laboratory 1\_hr**

The techniques learned in CHEM122 are reemphasized and supplemented. Laboratory: three hours per week. Restrictions: C- or better in CHEM122.

*Coreq: CHEM123*

## **CHEM125 Honors General Chemistry II (Lecture) 3\_hrs**

A continuation of CHEM121 General Chemistry for students of superior ability. The sequence of CHEM121, 122, 125 and 126 can constitute the customary year of general chemistry. Lecture: three hours per week.

*Prereq: CHEM121 and CHEM122; and MATH105, MATH112, MATH119, MATH120 or Level 5 math placement; and consent of Honors Committee; Coreq: CHEM126*

**CHEM126 Honors General Chemistry II (lab) 1\_hr**

The laboratory to accompany CHEM125. The techniques learned in CHEM122 are reemphasized and supplemented. Preparation of a laboratory notebook is required. The sequence of CHEM121, CHEM122, CHEM125 and CHEM126 can constitute the customary year of general chemistry. Laboratory: three hours per week.

*Coreq: CHEM125*

**CHEM177/178/179 Special Topics 1/2/3\_hrs**

Covers specific chemistry topics not discussed in any regular, introductory chemistry course.

*Prereq: department permission*

**CHEM270 Survey of Organic Chemistry 4\_hrs**

A comprehensive one-semester survey course in organic chemistry. Includes aliphatic and aromatic compounds plus functional group chemistry. Chemistry majors and other students requiring a full-year sequence of organic chemistry should enroll in CHEM371 and CHEM372. Lecture: four hours per week.

*Prereq: CHEM121/122*

**CHEM271 Organic Chemistry Laboratory 1\_hr**

Instruction in the basic manipulative techniques of experimental organic chemistry and experience with organic chemicals. Laboratory: three hours per week.

*Prereq or coreq: CHEM270*

**CHEM277/278/279 Special Topics 1/2/3\_hrs**

Covers specific chemistry topics not discussed in any regular chemistry course at this level.

*Prereq: one 100-level chemistry course and department permission*

**CHEM281 Quantitative Analysis 4\_hrs**

A lecture and laboratory course treating instrumental, gravimetric, and volumetric analysis, and equilibrium. Lecture: two hours per week. Laboratory: six hours per week.

*Prereq: CHEM123/124 or CHEM125/126*

**CHEM282 Honors Quantitative Analysis 4\_hrs**

A lecture and laboratory course treating instrumental, trace, separation and characterization techniques. Lecture: two hours per week. Laboratory: six hours per week.

*Prereq: CHEM123/124 or CHEM125/126; and consent of honors committee*

**CHEM287/288/289 Cooperative Education in Chemistry 1/2/3\_hrs**

Full- or part-time employment at an industrial, federal or state agency chemistry laboratory providing an applied experience in chemistry. Amount of credit granted determined by the nature of job responsibilities and/or duration of placement. Graded on a credit/nocredit basis. No credit granted toward chemistry degree programs, except with departmental permission.

*Prereq: CHEM123/124 or CHEM125/126; admission by application only; sophomore standing*

**CHEM297 Undergraduate Research in Chemistry 1\_hr**

An independent, original endeavor involving laboratory and/or library study under the guidance of a chemistry faculty member. A formal written report is required at the end of the semester.

*Prereq: department permission*

**CHEM332 Inorganic Chemistry 2 hrs**

This course will discuss the fundamental themes of bonding, structure, and reactivity, primarily in the context of inorganic chemistry. In addition, the course will give students an introduction to some of the newer and more exciting areas of interest to inorganic chemists, such as catalytic cycles and bioinorganic chemistry.

*Prereq: CHEM123/124 or CHEM125/126*

**CHEM340 Introduction to Industrial Chemistry 3\_hrs**

Discussion of the important aspects of the manufacture and chemistry of the major organic and inorganic chemicals and their use through commercially available products such as polymers. Includes environmental and economic aspects of industry. Lecture: three hours per week.

*Prereq: CHEM123/124 or CHEM125/126; CHEM270 or CHEM371/372; and PHY221 or PHY223*

**CHEM341 Fundamentals of Material Science 3\_hrs**

A general overview of the fundamental principles of materials science. Addresses the relationship of atomic/molecular structure to physical properties for metals, ceramics, glasses, polymers, semiconductors, and composite materials. Lecture: three hours per week.

*Prereq: CHEM123/124 or CHEM125/126; CHEM270 or CHEM372*

**CHEM351 Foundations of Biochemistry 4 hrs**

Deals with biological structures and the interactions that confer activity upon biological molecules. Metabolism and synthesis of biological molecules, and the controls that integrate the various process at the molecular and cellular level are presented. Bioenergetics, including equilibria, catalysis, and the production/ utilization of biological forms of energy, are discussed. *Not open to freshmen and graduate students.*

*Prereq: CHEM270 or CHEM372*

**CHEM361 Fundamentals of Physical Chemistry 3\_hrs**

Calculus-based introduction to quantum mechanics, thermodynamics and kinetics. Serves as survey course for general curricula and major. Lecture: three hours per week.

*Prereq: MATH120, CHEM281 or CHEM282; Prereq/Coreq: PHY222 or PHY224*

**CHEM371 Organic Chemistry I 3\_hrs**

The first semester of a two-semester sequence covering the general principles of organic chemistry for students specializing in science and those preparing for dentistry or medicine. Lecture: three hours per week. Credit cannot be earned in both CHEM270 and CHEM371.  
*Prereq: CHEM123/124 or CHEM125/126*

**CHEM372 Organic Chemistry II 3\_hrs**

A continuation of CHEM371. CHEM371 and CHEM372 constitute the customary year of foundation/lecture work in organic chemistry. Lecture: three hours per week. Restriction: Cor better in CHEM371.  
*Prereq: CHEM371*

**CHEM373 Organic Chemistry Laboratory 2\_hrs**

Covers the basic techniques involved in organic chemistry. Laboratory: six hours per week.  
*Prereq or coreq: CHEM372*

**CHEM376 Honors Organic Chemistry Laboratory 2\_hrs**

Covers the basic techniques involved in organic chemistry for students of superior ability. The sequence of CHEM371, CHEM372, and CHEM376 can constitute the customary year of organic chemistry. Laboratory: six hours per week.  
*Prereq or coreq: CHEM372 and consent of Honors Committee*

**CHEM377/378/379 Special Topics 1/2/3\_hrs**

Covers specific chemical topics not discussed in any regular chemistry course at this level.  
*Prereq: department permission*

**CHEM381 Instrumentation for Chemical Technology 2\_hrs**

A lecture and laboratory course that surveys various types of analytical instrumentation and their uses in chemical industry. Lecture: one hour per week. Laboratory: three hours per week.  
*Prereq: CHEM281, CHEM270 or CHEM372; and CHEM271, CHEM373 or equivalent*

**CHEM387/388/389 Cooperative Education in Chemistry 1/2/3\_hrs**

Full- or part-time employment at an industrial, federal or state agency chemistry laboratory providing an applied experience in chemistry. Amount of credit granted determined by the nature of job responsibilities and/or duration of placement. *Graded on a credit/nocredit basis. For junior-level students. No credit granted toward chemistry degree programs, except with department permission.*  
*Prereq: junior standing*

**CHEM397 Undergraduate Research in Chemistry 1\_hr**

An independent, original endeavor involving laboratory and/or library study, under the guidance of a chemistry faculty member. A formal written report is required at the end of the semester.  
*Prereq: department permission*

**CHEM411 Toxicology I 2\_hrs**

An introduction to the principles and methods of toxicology. Special cases of toxic response including carcinogenesis, teratogenesis and mutagenesis, and the effects of radiation are discussed. Lecture: two hours per week.  
*Prereq: CHEM270 or CHEM372*

**CHEM412 Toxicology II 2\_hrs**

Discussion of the metabolism of toxicants and their effect on specific organ systems; specific classes of toxicants and legal aspects of toxicology. Lecture: two hours per week.  
*Prereq: CHEM411; biochemistry recommended*

**CHEM413 Toxicology Laboratory 2\_hrs**

A lecture and laboratory covering the techniques employed in a toxicology laboratory including methods of calculation, interpretation and presentation of experimental data. The theory and practical aspects of toxicological procedures will be discussed. Lecture: one hour per week. Laboratory: three hours per week.  
*Prereq: CHEM411; CHEM281 recommended*

**CHEM414 Regulatory Toxicology 2\_hrs**

This lecture course reviews the major environmental laws, building a framework for understanding their intent and application. Lecture: two hours per week.  
*Prereq: CHEM270 or CHEM372*

**CHEM415 Environmental Chemistry 3\_hrs**

A survey of environmental and energy-related problems and the ways in which chemistry may be applied to them. Important topics include air and water pollution, energy and other resources, solid wastes and recycling, and toxic chemicals. Lecture: three hours per week.  
*Prereq: CHEM123/124 or CHEM125/126; CHEM270 or CHEM372 and CHEM281 recommended.*

**CHEM432 Advanced Inorganic Chemistry 3\_hrs**

An advanced-level treatment of the newer inorganic chemical developments, with emphasis on theoretical advances in the interpretation of bonding and reactivity of inorganic compounds. Lecture: three hours per week.  
*Prereq: CHEM465 or department permission; CHEM332 recommended*

**CHEM433 Inorganic-Organic Synthesis  
Laboratory 2\_hrs**

Covers advanced preparative and analytical techniques of inorganic and organic chemistry including extensive use of IR, NMR, UV-visible and other instruments. Laboratory: six hours per week.

*Prereq: CHEM281 or CHEM282; and CHEM373 or CHEM376*

**CHEM451 Biochemistry I 3\_hrs**

Chemistry of biologically significant compounds such as proteins, nucleic acids, carbohydrates and lipids. Enzymes are introduced, bioenergetics is discussed and the most central topics of metabolism are outlined. This course is intended as a one-semester survey of biochemistry for health science students and as the first semester of a two-semester sequence for chemistry, biology and toxicology students. Lecture: three hours per week.

*Prereq: CHEM123/124 or CHEM125/126; and CHEM270, CHEM372 or equivalent*

**CHEM452 Biochemistry II 3\_hrs**

Continues the survey of biochemistry begun in CHEM451. Membranes and transport, enzyme kinetics, further topics in metabolism, replication, transcription, translation and regulation of cell processes are discussed. Lecture: three hours per week. Restrictions: C- or better in CHEM451.

*Prereq: CHEM451*

**CHEM453 Biochemistry Laboratory 2\_hrs**

Theory and application of preparative and analytical techniques in the investigation of the biochemical and biophysical properties of proteins and nucleic acids. Emphasis is placed on communication of experimental results in the form of scientific manuscripts. Laboratory: six hours per week.

*Prereq: CHEM451 or CHEM351; CHEM271, CHEM373 or CHEM376; and CHEM281 strongly recommended*

**CHEM461 Chemical Thermodynamics and Kinetics 3 hrs**

The study of the principles of thermodynamics, the equilibrium properties of systems, and the rates of chemical reactions. Lecture: three hours per week.

*Prereq: PHY224 and CHEM281 or CHEM282; Prereq/Coreq: MATH223*

**CHEM463 Physical Chemistry  
Laboratory 2\_hrs**

Determination of the physical properties of substances, rate studies and measurement of the thermochemical properties. Emphasis on scientific report writing and oral presentation of work. Laboratory: six hours per week. Restrictions: C- or better in CHEM361.

*Prereq: MATH121 and CHEM361 or CHEM461*

**CHEM465 Quantum and Statistical  
Mechanics 3\_hrs**

The study of quantum mechanics and its application to atomic structure, molecular bonding and spectroscopy. An introduction to statistical mechanics and modern theories of the rate constant. Lecture: three hours per week.

*Prereq: CHEM461*

**CHEM475 Introduction to Polymer  
Chemistry 3\_hrs**

An emphasis on the organic chemistry involved in the preparation of synthetic high polymers. Topics include: chain-growth vinyl polymers, step-growth polymerization, copolymerization, cationic and anionic polymerization, and complex coordination catalysts.

Lecture: three hours per week.

*Prereq: CHEM270 or CHEM372*

**CHEM477/478/479 Special Topics 1/2/3\_hrs**

Covers specific chemistry topics not discussed in any regular chemistry courses at this level.

*Prereq: department permission*

**CHEM481 Instrumental Analysis 4\_hrs**

Theory and practice of chemical analysis and measurements and data processing by instrumental methods. Lecture: two hours per week.

Laboratory: six hours per week.

*Prereq: CHEM281 or CHEM282; and CHEM463; Pre/coreq: CHEM465*

**CHEM485 Introduction to Radiotracer  
Techniques 2\_hrs**

Measurement of radiation and principles of radiation safety; experiments with emphasis on beta and gamma-ray counting and handling radioactivity. Lecture: one hour per week. Laboratory: three hours per week.

*Prereq: CHEM123/124 or CHEM125/126; and either CHEM281, one science laboratory course above the 200-level or department permission*

**CHEM487/488/489 Cooperative Education  
in Chemistry 1/2/3\_hrs**

Full- or part-time employment at an industrial, federal or state agency chemistry laboratory providing an applied experience in chemistry. Amount of credit granted determined by the nature of job responsibilities and/or duration of placement. *Graded on a credit/nocredit basis. For senior-level students.*

**CHEM497/498/499 Undergraduate  
Research in Chemistry 1/2/3\_hrs**

Independent, original endeavors involving extensive library and/or laboratory study, under the guidance of a chemistry faculty member. A formal written report is required at the end of the semester.

*Prereq: department permission*