

Biochemistry

PROGRAM OBJECTIVES

The Biochemistry program degree was created to meet the demand for students who are interested in working at the interface between biology and chemistry. This is a very exciting and rapidly growing field because of its many applications in biotechnology, physiology, genetics, cancer research, and the health sciences in general. The program is designed to prepare students for a broad range of career possibilities in teaching, research, industry, and the health professions.

LEARNING OUTCOMES

Biochemistry graduates will have a foundational knowledge of chemistry comparable to a chemistry degree recipient, as well as an understanding of biological systems at the molecular level. They will be able to apply pertinent chemical/biochemical knowledge to the solution of diverse scientific, environmental, and social problems in the following learning outcomes:

1. **Content Knowledge:** Students will understand the basic chemical/biochemical principles and content in the major specialty areas, which include inorganic, organic, physical, analytical, and biochemistry.
2. **Applied Learning Skills:** Students will acquire safe chemical/biochemical laboratory practices and techniques including the use of instrumentation and computers.
3. **Inquiry and Integrated Learning:** Students will be able to design and conduct chemical/biochemical research with appropriate documentation including literature searches.
4. **Communication and Critical Thinking:** Students will understand the importance of the discipline to modern society and be able to communicate chemical/biochemical information both orally and in writing to their peers and the public.

MEANS OF ASSESSMENT

To assess students learning, the faculty will employ traditional evaluation techniques such as homework assignments, quizzes, examinations, and evaluation of laboratory experiments. The ACS offers standardized exams in every field of chemistry, including biochemistry, and these will be administered to our students upon completion of their coursework to see how they compare to national averages. In addition, a service learning component will be incorporated in selected courses. Finally, students will be required to fulfill a capstone project, typically independent undergraduate research under the supervision of a chemistry faculty member. The project concludes with the student's oral and written presentation to the faculty and to his/her

peers. We anticipate that most biochemistry students will also present their research at national meetings of scientific societies, such as the American Chemical Society.

REQUIREMENTS FOR THE BACHELOR OF ARTS OR THE BACHELOR OF SCIENCE DEGREE IN BIOCHEMISTRY

1. Complete Eastern graduation requirements with at least a "C-" in each listed course required for the Biochemistry degree and have a grade point average of 2.00 or better.
2. Complete a minimum of 55 credit hours in chemistry, of which 40 or more must be 300 or 400 level courses, as required below.
3. Complete a minimum of 33 credit hours in biology, of which 18 or more must be 300 or 400 level courses, as required below.
4. Complete a minimum of 20 credit hours in related mathematics and science areas as required below.
5. The designated capstone courses are CHEM 401 and CHEM 407.
6. A minimum of 15 Chemistry credits must be from EOU.

Chemistry Requirements

CHEM 204, 205, 206 General Chemistry (15)
CHEM 320 Analytical Chemistry (3)
CHEM 321 Analytical Chemistry Laboratory (2)
CHEM 334 Organic Chemistry I (4)
CHEM 335 Organic Chemistry II (4)
CHEM 336 Organic Chemistry III (4)
CHEM 338 Organic Chemistry I Laboratory (1)
CHEM 339 Organic Chemistry II Laboratory (1)
CHEM 340 Physical Chemistry (4)
CHEM 401 Research (1) (Capstone)
CHEM 407 Seminar (1) (Capstone)
CHEM 421 Instrumental Analysis (3)
CHEM 422 Instrumental Analysis Laboratory (2)
CHEM 450 Structural Biochemistry (4)
CHEM 451 Metabolic Biochemistry (4)
CHEM 454 Biochemistry Laboratory (2)

Biology Requirements

BIOL 211, 212, 213 Principles of Biology (15)
BIOL 341, 342 Genetics (8)
BIOL 431 Cell Structure and Function (5)
BIOL 323 General Microbiology (5) or
BIOL 432 Animal Physiology (5) or
BIOL 433 Plant Physiology (5)

Related Area Requirements

PHYS 201, 202, 203 General Physics (12) or

PHYS 221, 222, 223 General Physics with Calculus (15)
MATH 251, 252 Calculus (8)

Strongly Recommended (but not required):

CHEM 285 Chemical Safety (1)

CHEM 437 Organic NMR Spectroscopy (2)

CHEM 442 Chemical Dynamics (4)

CS 161 Foundations of Computer Science I (4)

MATH 321 Differential Equations (5)

Students may not also attain a major or minor in either Chemistry or Biology or a minor in Environmental Chemistry.

TYPICAL FIRST YEAR CURRICULUM

Fall

CHEM 204 General Chemistry (5) [1]

General Education or Elective Courses (10) [3]

Winter

CHEM 205 General Chemistry (5) [1]

General Education or Elective Courses (10) [3]

Spring

CHEM 206 General Chemistry (5)

General Education or Elective Courses (10) [3]

TYPICAL SECOND YEAR CURRICULUM

Fall

CHEM 334 Organic Chemistry I (4)

BIOL 211 Principles of Biology (5)

MATH 251 Calculus (4)

General Education or Elective Courses (3) [3]

Winter

CHEM 335 Organic Chemistry II (4)

CHEM 338 Organic Chemistry I Laboratory (1)

BIOL 212 Principles of Biology (5)

MATH 252 Calculus (4)

Spring

CHEM 336 Organic Chemistry III (4)

CHEM 339 Organic Chemistry II Laboratory (1)

BIOL 213 Principles of Biology (5)

General Education or Elective Courses (5) [3]

TYPICAL THIRD YEAR CURRICULUM

Fall

CHEM 320 Analytical Chemistry (3)

CHEM 321 Analytical Chem Lab (2)

PHYS 201 or **221** General Physics I (4/5)

CHEM 401 Research (1)

General Education or Elective Courses (5) [3]

Winter

BIOL 341 Genetics (4)

PHYS 202 or **222** General Physics II (4/5)

Electives (6)

Spring

BIOL 342 Genetics (4)

PHYS 203 or **223** General Physics III (4/5)

CHEM 340 Physical Chemistry (4)

General Education or Elective Courses (3) [3]

TYPICAL FOURTH YEAR CURRICULUM

Fall

CHEM 407 Seminar (1)

CHEM 450 Structural Biochemistry (4)

CHEM 454 Biochemistry Laboratory (2)

BIOL 431 Cell Structure and Function (5)

Electives (3)

Winter

CHEM 421 Instrumental Analysis (3)

CHEM 422 Instrumental Analysis Laboratory (2)

CHEM 451 Metabolic Biochemistry (4)

BIOL 323 General Microbiology (5) or

BIOL 432 Animal Physiology (5) or

BIOL 433 Plant Physiology (5)

Spring

General Education or Elective Courses (14) [3]

Note:

[1] Students not meeting admission requirements in CHEM 204, 205 should enroll in CHEM 101, 102.

[2] Students may need to enroll in lower level math sequence as determined by an Eastern evaluation.

[3] Selected to meet general education requirements.

Refer to CHEMISTRY and BIOLOGY programs for course descriptions.