

BIOCHEMISTRY (CAS)

Description

The Department of Biochemistry offers studies leading to a bachelor of science (BS) in the College of Arts and Sciences. The training offered is suitable for a professional career in biochemistry, which may lead to employment in various industries involved in the manufacture or processing of chemicals, foods, feeds, and pharmaceuticals or federal agencies such as the Food and Drug Administration, U.S. Department of Agriculture, U.S. Public Health Service, and Environmental Protection Agency. The program is also suitable as preparation for graduate studies leading to academic careers in biochemistry and professional careers in medicine, dentistry, veterinary medicine, pharmacy, and health-related fields. The Department is accredited by the American Society of Biochemistry and Molecular Biology (ASBMB), meaning seniors who sit for the ASBMB certification exam are recognized as earning a certified degree if they receive a qualifying score.

Laboratory Fee and Deposit. Students who enroll in laboratory courses in the Department of Biochemistry may be required to pay a small non-refundable cash fee to defray the cost of materials consumed in the course and a deposit to cover the cost of replacing or repairing equipment the student may damage in the laboratory.

Program Assessment. In order to assist the department in evaluating the effectiveness of its programs, selected courses are assessed and majors are required to participate in a senior exit survey in their senior year. The survey will be administered in the Advanced Topics in Biochemistry (BIOC 435) course and the results of participation in the survey will in no way affect a student's GPA or graduation.

College Admission

The entrance requirements for the College of Arts and Sciences (CAS), including any of the majors or minors offered through the college, are the same as the University of Nebraska–Lincoln General Admission Requirements. In addition to these requirements, the College of Arts and Sciences strongly recommends a third and fourth year of one foreign language in high school. Four years of high school coursework in the same language will fulfill the College of Arts and Sciences' language requirement. It will also allow students to continue language study at a more advanced level at the University of Nebraska–Lincoln and provide more opportunity to study abroad.

Academic and Career Advising

Academic and Career Advising Center

Not sure where to go or who to ask? The Advising Center team in 107 Oldfather Hall can help. The Academic and Career Advising Center is the undergraduate hub for CAS students in all majors. Centrally located and easily accessed, students encounter friendly, knowledgeable people who are eager to help or connect students to partner resources. Students also visit the Advising Center in 107 Oldfather Hall to:

- Choose or change their major, minor, or degree program.
- Check on policies, procedures, and deadlines.
- Get a college approval signature from the Dean's representatives.

CAS Career Coaches are available by appointment (in-person or zoom) and located in the CAS Academic and Career Advising Center, 107

Oldfather Hall. They help students explore majors and minors, gain experience, and develop a plan for life after graduation.

Assigned Academic Advisors

Academic advisors are critical resources dedicated to students' academic, personal, and professional success. Every CAS student is assigned an academic advisor based on their primary major. Since most CAS students have more than just a single major, it is important to get to know the advisor for any minors or additional majors. Academic advisors work closely with the faculty to provide the best overall support and the discipline specific expertise. They are available for appointments (in-person or zoom) and through weekly virtual drop-ins. Assigned advisors are listed in MyRED (<https://its.unl.edu/myunl/>) and their offices may be located in or near the department of the major for which they advise.

Students who have declared a pre-health or pre-law area of interest will also work with advisors in the Exploratory and Pre-Professional Advising Center (Explore Center) in 127 Love South, who are specially trained to guide students preparing to enter a professional school.

For complete and current information on advisors for majors, minors, or pre-professional areas, visit <https://cas.unl.edu/major-advisors> (<https://cas.unl.edu/major-advisors/>), or connect with the Arts and Sciences Academic and Career Advising Center, 107 Oldfather Hall, 402-472-4190, casadvising@unl.edu.

Career Coaching

The College believes that **Academics + Experience = Opportunities** and encourages students to complement their academic preparation with real-world experience, including internships, research, education abroad, service, and leadership. Arts and sciences students have access to a powerful network of faculty, staff, and advisors dedicated to providing information and support for their goals of meaningful employment or advanced education. Arts and sciences graduates have unlimited career possibilities and carry with them important career competencies—communication, critical thinking, creativity, context, and collaboration. They have the skills and adaptability that employers universally value. Graduates are prepared to effectively contribute professionally and personally with a solid foundation to excel in an increasingly global, technological, and interdisciplinary world.

Students should contact the career coaches in the Arts and Sciences Academic and Career Advising Center in 107 Oldfather Hall, or their assigned advisor, for more information. The CAS career coaches help students explore career options, identify ways to build experience and prepare to apply for internships, jobs, or graduate school, including help with resumes, applications, and interviewing.

ACE Requirements

Students must complete one course for each of the ACE Student Learning Outcomes below. Certified course choices are published in the degree audit, or visit the ACE website (<http://ace.unl.edu>) for the most current list of certified courses.

ACE Student Learning Outcomes

ACE 1: Write texts, in various forms, with an identified purpose, that respond to specific audience needs, integrate research or existing knowledge, and use applicable documentation and appropriate conventions of format and structure.

ACE 2: Demonstrate competence in communication skills.

ACE 3: Use mathematical, computational, statistical, logical, or other formal reasoning to solve problems, draw inferences, justify conclusions, and determine reasonableness.

ACE 4: Use scientific methods and knowledge to pose questions, frame hypotheses, interpret data, and evaluate whether conclusions about the natural and physical world are reasonable.

ACE 5: Use knowledge, historical perspectives, analysis, interpretation, critical evaluation, and the standards of evidence appropriate to the humanities to address problems and issues.

ACE 6: Use knowledge, theories, and research perspectives such as statistical methods or observational accounts appropriate to the social sciences to understand and evaluate social systems or human behaviors.

ACE 7: Use knowledge, theories, or methods appropriate to the arts to understand their context and significance.

ACE 8: Use knowledge, theories, and analysis to explain ethical principles and their importance in society.

ACE 9: Exhibit global awareness or knowledge of human diversity through analysis of an issue.

ACE 10: Generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection.

Some courses from geography and anthropology may also be used to satisfy the lab requirement above.¹

CDR: Humanities 3

Select from classics, English, film studies, history, modern languages and literatures, philosophy, and religious studies.²

CDR: Social Science 3

Select from anthropology, communication studies, geography, national security studies, political science, psychology, or sociology.³

CDR: Human Diversity in U.S. Communities 0-3

Select from a set of approved courses as listed in the degree audit.

CDR: Language 0-16

Fulfilled by the completion of the 6-credit-hour second-year sequence in a single foreign language in one of the following departments: Classics and religious studies or modern languages and literatures. Instruction is currently available in Arabic, Chinese, Czech, French, German, Greek, Japanese, Latin, Russian, and Spanish.

A student who has completed the fourth-year level of one foreign language in high school is exempt from the languages requirement, but encouraged to continue on in their language study.

Credit Hours Subtotal: 13-32

¹ See Degree Audit or a College of Arts and Sciences advisor for approved geography and anthropology courses that apply as natural science.

² Language courses numbered 220 and below do not fulfill the CDR Humanities.

³ See Degree Audit or College of Arts and Sciences advisor for list of natural/physical science courses in anthropology, geography, and psychology that do not apply as social science.

College Degree Requirements

College Distribution Requirements – BA and BS

The College of Arts and Sciences distribution requirements are common to both the bachelor of arts and bachelor of science degrees and are designed to ensure a range of courses. By engaging in study in several different areas within the College, students develop the ability to learn in a variety of ways and apply their knowledge from a variety of perspectives. All requirements are in addition to University ACE requirements, and no course can be used to fulfill both an ACE outcome and a College Distribution Requirement.

- A student may not use a single course to satisfy more than one College Distribution Requirement, with the exception of CDR Diversity. Courses used to meet CDR Diversity may also meet CDR Writing, CDR Humanities, or CDR Social Science.
- Independent study or reading courses and internships cannot be used to satisfy distribution requirements.
- Courses from interdisciplinary programs will be applied in the same area as courses from the home/cross-listed department.

College Distribution Requirements

CDR: Written Communication 3

Select from courses approved for ACE outcome 1.

CDR: Natural, Physical, and Mathematical Sciences with Lab 4

Select from biochemistry, biological sciences, chemistry, computer science, geology, meteorology, mathematics, and physics. Must include one lab in the natural or physical sciences. Lab courses may be selected from biochemistry, biological sciences, chemistry, geology, meteorology, and physics.

Language Requirement

The University of Nebraska–Lincoln and the College of Arts and Sciences place great value on academic exposure and proficiency in a second language. The University of Nebraska–Lincoln entrance requirement of two years of the same foreign language or the College's language distribution requirement (CDR: Language) will rarely be waived and only with relevant documentation. See the main College of Arts and Sciences page for more details.

Experiential Learning Requirement

All undergraduates in the College of Arts and Sciences must complete an Experiential Learning (EL) designated course. This may include 0-credit courses designed to document co-curricular activities recognized as Experiential Learning.

Scientific Base - BS Only

The bachelor of science degree requires students to complete 60 hours in mathematical, physical, and natural sciences. Approved courses for scientific-based credit come from the following College of Arts and Sciences disciplines: actuarial science, anthropology (selected courses), astronomy, biochemistry (excluding BIOC 101), biological sciences (excluding BIOS 100 or BIOS 203), chemistry (excluding CHEM 101), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology (excluding MBI0 101), and physics (excluding PHYS 201.)

See your Degree Audit or your assigned academic advisor for a complete list, including individual classes that fall outside of the disciplines listed above. Up to 12 hours of scientific and technical courses offered by other colleges may be accepted toward this requirement with approval of the College of Arts and Sciences. See your assigned academic advisor to start the approval process.

Minimum Hours Required for Graduation

A minimum of 120 semester hours of credit is required for graduation from the College of Arts and Sciences. A cumulative grade point average of at least 2.0 is required.

Grade Rules

Restrictions on C- and D Grades

The College will accept no more than 15 semester hours of C- and D grades from other domestic institutions except for UNO and UNK. All courses taken at UNO and UNK impact the UNL transcript. No transfer of C- and D grades can be applied toward requirements in a major or a minor. No University of Nebraska–Lincoln C- and D grades can be applied toward requirements in a major or a minor. International coursework (including education abroad) with a final grade equivalent to a C- or lower will not be validated by the College of Arts and Sciences departments to be degree applicable.

Pass/No Pass Privilege

The College of Arts and Sciences adheres to the University regulations for the Pass/No Pass (P/N) privilege with the following additional regulations:

- Pass/No Pass hours can count toward fulfillment of University ACE requirements and college distribution requirements up to the 24-hour maximum.
- Most arts and sciences departments and programs do not allow courses graded Pass/No Pass to apply to the major or minor. Students should refer to the department's or program's section of the catalog for clarification. By college rule, departments can allow up to 6 hours of Pass/No Pass in the major or minor.
- Departments may specify that certain courses of theirs can be taken only on a P/N basis.
- The college will permit no more than a total of 24 semester hours of P/N grades to be applied toward degree requirements. This total includes all Pass grades earned at the University of Nebraska–Lincoln and other U.S. schools. **NOTE:** This 24-hour limit is more restrictive than the University regulation.

Grading Appeals

A student who feels that he/she has been unfairly graded must ordinarily take the following sequential steps in a timely manner, usually by initiating the appeal in the semester following the awarding of the grade:

1. Talk with the instructor concerned. Most problems are resolved at this point.
2. Talk to the instructor's department chairperson.
3. Take the case to the Grading Appeal Committee of the department concerned. The Committee should be contacted through the department chairperson.
4. Take the case to the College Grading Appeals Committee by contacting the Dean's Office, 1223 Oldfather Hall.

Course Level Requirements

Courses Numbered at the 300 or 400 Level

Thirty (30) of the 120 semester hours of credit must be in courses numbered at the 300 or 400 level. Of those 30 hours, 15 hours (1/2) must be completed in residence at the University of Nebraska–Lincoln.

Residency Requirement

Students must complete at least 30 of the 120 total hours for their degree at the University of Nebraska–Lincoln. Students must complete at least 1/2 of their major coursework, including 6 hours at the 300 or 400 level in their major and 15 of the 30 hours required at the 300 or 400 level, in residence. Credit earned during education abroad may be used toward the residency requirement only if students register through the University of Nebraska–Lincoln.

Catalog to Use

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to and enrolled as a degree-seeking student at the University of Nebraska–Lincoln. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at the University of Nebraska–Lincoln in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991, the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Transfer Students: Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with academic advisors, provided the student a) was enrolled in a community college during the catalog year they are utilizing, b) maintained continuous enrollment at the previous institution for 1 academic year or more, and c) continued enrollment at the University of Nebraska-Lincoln within 1 calendar year from their last term at the previous institution. Students must complete all degree requirements from a single catalog year and within the time frame allowable for that catalog year.

Learning Outcomes

Graduates with a major in biochemistry, regardless of option will be able to:

1. Explain how biological systems consume and convert energy for life's metabolic processes using the principles of the physical and chemical sciences.
2. Relate the structure of macromolecules to their function in order to illustrate how the physical properties of macromolecules enable the dynamic assembly of biological systems.
3. Predict how the flow of information in biological systems allows organisms to respond and adapt to environmental stimuli.
4. Articulate the process of science, integrating hypothesis generation, experimental design, quantitative analysis, and data interpretation.

Graduates with a major in biochemistry, biochemistry analysis option will also be able to:

- Quantitatively describe biochemical reactions and equilibria.

Graduates with a major in biochemistry, cellular biochemistry option will also be able to:

- Use the combination of molecular genetics and cellular biology to explain disruptions in cellular systems.

Graduates with a major in biochemistry, computational biochemistry option will also be able to:

- Use computational tools to analyze and interpret biological datasets.

Major Requirements

Complete the Core Requirements, Ancillary Requirements, and one of the following Options: Biochemical Analysis, Cellular Biochemistry, or Computational Biochemistry.

Core Requirements

Required Courses

BIOC 101	Foundational Concepts & Career Opportunities in Biochemistry	1
BIOC 205	Scientific Analysis and Technical Writing	2
BIOC 431 / BIOS 431 / CHEM 431	Biochemistry I: Structure and Metabolism	3
BIOC 432 / BIOS 432 / CHEM 432	Biochemistry II: Metabolism and Biological Information	3
BIOC 433 / BIOS 433 / CHEM 433	Biochemistry Laboratory	2
BIOC 435	Advanced Topics in Biochemistry (ACE 10)	3
Credit Hours Subtotal:		14
Total Credit Hours		14

Ancillary Requirements

Mathematics

MATH 106	Calculus I	5
Credit Hours Subtotal:		5

Biological Sciences

LIFE 120 & LIFE 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory	4
LIFE 121 & LIFE 121L	Fundamentals of Biology II and Fundamentals of Biology II Laboratory	4
BIOS 206	General Genetics	4
Credit Hours Subtotal:		12
Total Credit Hours		17

Specific Major Requirements

Biochemical Analysis Option

Math

Chemistry

MATH 107	Calculus II	4
CHEM 113A & CHEM 113L	Fundamental Chemistry I and Fundamental Chemistry I Laboratory	4
CHEM 114	Fundamental Chemistry II	3

CHEM 221A & CHEM 221L	Elementary Quantitative Analysis and Elementary Quantitative Analysis Laboratory	5
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CHEM 261 & CHEM 263	Organic Chemistry and Mechanistic Organic Chemistry I Laboratory	5
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CHEM 262 & CHEM 264	Organic Chemistry and Mechanistic Organic Chemistry II Laboratory	5
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Select one course of the following: 3-4

BIOC 440	Structural Biology and Biophysical Chemistry	
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CHEM 471	Physical Chemistry	
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CHEM 481	Physical Chemistry I	
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Credit Hours Subtotal: 29-30

Physics

PHYS 211 & PHYS 221	General Physics I and General Physics Laboratory I	5
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PHYS 212 & PHYS 222	General Physics II and General Physics Laboratory II	5
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Credit Hours Subtotal: 10

Microbiology

BIOS 312	Microbiology	3
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BIOS 314	Microbiology Laboratory	1
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Credit Hours Subtotal: 4

Total Credit Hours 43-44

Cellular Biochemistry Option

Math

MATH 107	Calculus II	4
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Credit Hours Subtotal: 4

Chemistry¹

CHEM 109A	General Chemistry I	3
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or CHEM 113A Fundamental Chemistry I

CHEM 109L	General Chemistry I Laboratory	1
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or CHEM 113L Fundamental Chemistry I Laboratory

CHEM 110A	General Chemistry II	3-4
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& CHEM 110L and General Chemistry II Laboratory

or CHEM 114 Fundamental Chemistry II

Select one sequence of the following: 8-10

CHEM 251 & CHEM 253 & CHEM 252 & CHEM 254	Organic Chemistry I and Organic Chemistry I Laboratory and Organic Chemistry II and Organic Chemistry II Laboratory	
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Or

CHEM 261 & CHEM 263 & CHEM 262 & CHEM 264	Organic Chemistry and Mechanistic Organic Chemistry I Laboratory and Organic Chemistry and Mechanistic Organic Chemistry II Laboratory	
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BIOC 440	Structural Biology and Biophysical Chemistry	3
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Credit Hours Subtotal: 18-21

Physics

Select one sequence of the following: 10

PHYS 141 & PHYS 142	Elementary General Physics I and Elementary General Physics II	
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Or

PHYS 211 & PHYS 212 & PHYS 221 & PHYS 222	General Physics I and General Physics II and General Physics Laboratory I and General Physics Laboratory II	
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Credit Hours Subtotal: 10

Additional Courses

BIOS 312 & BIOS 314	Microbiology and Microbiology Laboratory	4
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Select one of the following: 2-4

BIOS 205	Genetics, Molecular and Cellular Biology Laboratory	
BIOS 213 & BIOS 213L	Human Physiology and Human Physiology Laboratory	
BIOS 427	Practical Bioinformatics Laboratory	
BIOS 478	Plant Anatomy	
PLAS 325	Introductory Plant Physiology	
PLAS 429	Plant Biotechnology Applications	

Select one of the following: 3

BIOS 302	Cell Biology	
BIOS 402	Cancer Biology	
BIOS 442	Endocrinology	
BIOS 443	Immunology	
BIOS 434	Plant Biochemistry	

Credit Hours Subtotal: 9-11

Total Credit Hours 41-46

¹ **AP and IB Credit.** Students who earned AP or IB credit for general chemistry in high school are still required to complete a general chemistry sequence at an accredited post-secondary institution. These students are encouraged, but not required, to take CHEM 113A/CHEM 113L and CHEM 114 rather than CHEM 109A/CHEM 109L and CHEM 110A/CHEM 110L. High school dual enrollment credit is not included in this policy.

Computational Biochemistry Option

Statistics

STAT 218	Introduction to Statistics	3
Credit Hours Subtotal:		3

Chemistry¹

CHEM 109A	General Chemistry I	3
or CHEM 113A	Fundamental Chemistry I	
CHEM 109L	General Chemistry I Laboratory	1
or CHEM 113L	Fundamental Chemistry I Laboratory	
CHEM 110A & CHEM 110L	General Chemistry II and General Chemistry II Laboratory	3-4
or CHEM 114	Fundamental Chemistry II	

Select one sequence of the following: 8-10

CHEM 251 & CHEM 253 & CHEM 252 & CHEM 254	Organic Chemistry I and Organic Chemistry I Laboratory and Organic Chemistry II and Organic Chemistry II Laboratory	
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Or

CHEM 261 & CHEM 263 & CHEM 262 & CHEM 264	Organic Chemistry and Mechanistic Organic Chemistry I Laboratory and Organic Chemistry and Mechanistic Organic Chemistry II Laboratory	
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Credit Hours Subtotal: 15-18

Physics

PHYS 141	Elementary General Physics I	5
PHYS 142	Elementary General Physics II	5
Credit Hours Subtotal:		10

Computational Biochemistry

CSCE 155T	Computer Science I: Informatics Focus	3
CSCE 311	Data Structures and Algorithms for Informatics	3
BIOS 337	Applications of Bioinformatics	4
CSCE 413	Database Systems	3
Credit Hours Subtotal:		13

Internship (Two Semesters)

BIOS 95	Biochemistry Internship	0
Credit Hours Subtotal:		0

Total Credit Hours 41-44

¹ **AP and IB Credit.** Students who earned AP or IB credit for general chemistry in high school are still required to complete a general chemistry sequence at an accredited post-secondary institution. These students are encouraged, but not required, to take CHEM 113A/CHEM 113L and CHEM 114 rather than CHEM 109A/CHEM 109L and CHEM 110A/CHEM 110L. High school dual enrollment credit is not included in this policy.

Additional Major Requirements

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major or minor.

Pass/No Pass

Courses taken Pass/No Pass will not count toward the major or minor.

Requirements for Minor Offered by Department

Eighteen (18) credit hours of graded coursework as follows.

BIOS 431	Biochemistry I: Structure and Metabolism	3
BIOS 432	Biochemistry II: Metabolism and Biological Information	3
BIOS 206 or PLAS 215	General Genetics Genetics	4
BIOS 312	Microbiology	3
BIOS 314	Microbiology Laboratory	1
CHEM 252 or CHEM 262	Organic Chemistry II Organic Chemistry	3
CHEM 254	Organic Chemistry II Laboratory	1-2

or CHEM 264 Mechanistic Organic Chemistry II Laboratory

Total Credit Hours

18

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major or minor.

Pass/No Pass

Courses taken Pass/No Pass will not count toward the major or minor.

BIOC 95 Biochemistry Internship

Prerequisites: Biochemistry Major; Junior or Senior standing; Permission

Notes: Permission to enroll will be granted upon review of the proposed internship by the supervising UNL faculty.

Description: Provides an opportunity for a practical experience and career exploration/development in a selected business, industry, agency or educational institution. Activities must include a significant biochemistry and/or computational/systems biology component.

Credit Hours: 0

Max credits per semester:

Max credits per degree:

Grading Option: Pass No Pass

BIOC 98 Biochemistry Research Experience

Prerequisites: Permission

Notes: This course may be repeated four times; research students should enroll in BIOC 498 in subsequent semesters. Permission to enroll will be granted upon review of the Request for Research Experience application by supervising UNL faculty.

Description: An introduction to laboratory or field methods in preparation for independent research.

Credit Hours: 0

Max credits per semester:

Max credits per degree:

Grading Option: Pass No Pass

Experiential Learning: Research

BIOC 101 Foundational Concepts & Career Opportunities in Biochemistry

Notes: Interest in becoming a biochemistry major.

Description: Introduction to the field of biochemistry and exploration of biochemistry related careers.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Grading Option: Graded with Option

Offered: FALL/SPR

BIOC 205 Scientific Analysis and Technical Writing

Prerequisites: Biochemistry major or minor. LIFE 120 and CHEM 109A and 109L or CHEM 113A and 113L

Notes: BIOC 101 and CHEM 110A/CHEM 110L suggested to be taken prior to this course or concurrent enrollment.

Description: Data analysis and presentation, hypothesis-driven research execution and various types of scientific writing with detailed examination of high impact biochemistry research literature.

Credit Hours: 2

Max credits per semester: 2

Max credits per degree: 2

Grading Option: Graded with Option

BIOC 305 Reflective Approach to Graduate/Professional School Application

Prerequisites: Biochemistry major; junior standing or senior standing; BIOC 431. Biochemistry minor, with permission.

Notes: Letter grade only.

Description: Focuses on preparing students for graduate/professional school application through reflective writing and application specific activities.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Grading Option: Graded

Offered: SPRING

BIOC 390 Seminars in the Life Sciences

Prerequisites: BIOC 431 or concurrent

Description: Seminars by UNL faculty, graduate students, and external guests provide a picture of research in biochemistry and the related life sciences

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 3

Grading Option: Pass No Pass

Offered: FALL/SPR

BIOC 401 Elements of Biochemistry

Crosslisted with: BIOC 801

Prerequisites: CHEM 255 (preferred) or CHEM 251; BIOS 101 and BIOS 101L or LIFE 120 and LIFE 120L

Notes: Will not count towards a biochemistry major.

Description: Structure and function of proteins, carbohydrates, lipids and nucleic acids; enzymes; principal metabolic pathways; and biochemical expression of genetic information.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Grading Option: Graded with Option

Prerequisite for: FDST 867; NUTR 450; NUTR 455; VBMS 410

BIOC 401L Laboratory for Elements of Biochemistry

Prerequisites: Parallel BIOC 401

Description: Laboratory exercises and experiments that complement material covered in BIOC 401.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Grading Option: Graded with Option

Offered: FALL/SPR

Course and Laboratory Fee: \$35

BIOC 431 Biochemistry I: Structure and Metabolism**Crosslisted with:** BIOC 831, BIOS 431, BIOS 831, CHEM 431, CHEM 831**Prerequisites:** LIFE 120 with a grade of C or better; CHEM 252 or CHEM 262 with a grade of C or better.**Notes:** BIOS 206 or PLAS 215 is recommended. First course of a two-semester, comprehensive biochemistry course sequence.**Description:** Structure and function of proteins, nucleic acids, carbohydrates and lipids; nature of enzymes; major metabolic pathways of catabolism; and biochemical energy production.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL/SPR**Prerequisite for:** AGRO 810, BIOC 810, HORT 810; ASCI 820; ASCI 917; ASCI 925, NUTR 925; ASCI 926, NUTR 926; ASCI 927, NUTR 927; BIOC 305; BIOC 390; BIOC 432, BIOC 832, BIOS 432, CHEM 432, CHEM 832, BIOS 832; BIOC 433, BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833; BIOC 440; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820, NUTR 420; NUTR 821; PLAS 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834; VBMS 410; VBMS 805; VBMS 950**BIOC 432 Biochemistry II: Metabolism and Biological Information****Crosslisted with:** BIOC 832, BIOS 432, CHEM 432, CHEM 832, BIOS 832**Prerequisites:** BIOC 431/831 with a grade of C or better; BIOS 206 or PLAS 215 with a grade of C or better.**Notes:** Continuation of BIOC 431/831.**Description:** Major metabolic pathways of anabolism, structural and biochemical aspects of biological information flow and use in biotechnology.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL/SPR**Prerequisite for:** ASCI 949, BIOC 949, NUTR 949; BIOC 435; BIOC 932, BIOS 932, CHEM 932; BIOC 933, BIOS 933, CHEM 933; BIOC 934, BIOS 934, CHEM 934; BIOC 935, BIOS 935, CHEM 935; BIOC 998; VBMS 919; VBMS 950; VBMS 951**BIOC 433 Biochemistry Laboratory****Crosslisted with:** BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833**Prerequisites:** BIOC 431/831 or parallel; or CHEM 435/835.**Description:** Introduction to techniques used in biochemical and biotechnology research, including measurement of pH, spectroscopy, analysis of enzymes, chromatography, fractionation of macromolecules, electrophoresis, and centrifugation.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Graded with Option**Offered:** FALL/SPR**Prerequisite for:** BIOC 437, BIOC 837, BIOS 437, BIOS 837; BIOC 898**Course and Laboratory Fee:** \$50**BIOC 433H Honors: Inquiry-based Biochemistry Laboratory****Prerequisites:** BIOS 206, Parallel BIOC 431**Description:** A course-based research experience. Hypothesis-driven design of experiments. Data collection and analysis employing techniques used in spectroscopy, bioinformatics, mutagenesis, recombinant DNA, chromatography, enzyme analysis**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL**BIOC 434 Plant Biochemistry****Crosslisted with:** PLAS 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834**Prerequisites:** BIOC/BIOS/CHEM 431/831.**Description:** Biochemical metabolism unique to plants. Relationships of topics previously acquired in general biochemistry to biochemical processes unique to plants. Biochemical mechanisms behind physiological processes discussed in plant or crop physiology.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**BIOC 435 Advanced Topics in Biochemistry****Prerequisites:** BIOC/BIOS/CHEM 432/832 with a grade of C or better**Description:** Application of general biochemistry knowledge to current topics in the life sciences; literature research and seminar.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**ACE:** ACE 10 Integrated Product**BIOC 437 Research Techniques in Biochemistry****Crosslisted with:** BIOC 837, BIOS 437, BIOS 837**Prerequisites:** BIOC/BIOS/CHEM 433/833.**Description:** Methods approach to systems biology analysis. Molecular identification and quantification employing techniques such as mass spectrometry, chromatography, electrophoretic fractionation, transcriptomics, proteomics and metabolomics. Data and pathway analysis with computational methods.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**Prerequisite for:** VBMS 919**Course and Laboratory Fee:** \$65**BIOC 439 Dynamics of Biochemical and Biological Networks****Crosslisted with:** BIOC 839, BIOS 439, BIOS 839**Prerequisites:** BIOS 206 or PLAS 215; BIOC 401 or BIOC 431**Notes:** Letter grade only.**Description:** To introduce and integrate, students in biochemistry and other life sciences, to the field of computational modeling of biochemical and biological network systems into a seamless curriculum.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** SPRING**Prerequisite for:** ASCI 949, BIOC 949, NUTR 949; BIOC 932, BIOS 932, CHEM 932; BIOC 933, BIOS 933, CHEM 933; BIOC 998

BIOC 440 Structural Biology and Biophysical Chemistry**Prerequisites:** BIOC/BIOS/CHEM 431; MATH 107; PHYS 142 or PHYS 212.**Description:** Introduction and development of structural and physical ideas for students interested in addressing biological and biochemical questions through quantitative, analytical, and structure-based approaches.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL/SPR**BIOC 442 Computational Biology****Crosslisted with:** BIOC 842, STAT 842, STAT 442**Prerequisites:** Any introductory course in biology, or genetics, or statistics.**Description:** Databases, high-throughput biology, literature mining, gene expression, next-generation sequencing, proteomics, metabolomics, system biology and biological networks.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**BIOC 486 Advanced Topics in Biophysical Chemistry****Crosslisted with:** BIOC 886, CHEM 486, CHEM 886**Prerequisites:** CHEM 471/871 or CHEM 481/881.**Description:** Applications of thermodynamics to biochemical phenomena, optical properties of proteins and polynucleotides, and kinetics of rapid reactions.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**BIOC 498 Undergraduate Research****Prerequisites:** Permission.**Description:** Research on a specific biochemical project under the supervision of a biochemistry faculty member.**Credit Hours:** 1-6**Min credits per semester:** 1**Max credits per semester:** 6**Max credits per degree:** 6**Grading Option:** Graded with Option**BIOC 499 Undergraduate Thesis****Prerequisites:** Permission.**Description:** Conduct a scholarly research project and write an undergraduate thesis.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 6**Grading Option:** Graded**BIOC 499H Honors Undergraduate Thesis****Prerequisites:** Permission.**Description:** Conduct a scholarly research project and write a University Honors Program undergraduate thesis.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 6**Grading Option:** Graded**PLEASE NOTE**

This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

Biochemistry - Biochemical Analysis

Biochemistry - Cellular Biochemistry

Biochemistry - Computational Biochemistry

Career Information

The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.

Transferable Skills

- Read, understand, and critically review scientific information
- Understand and use proper laboratory and technical skills and instruments
- Design and implement research experiments
- Document and replicate processes and procedures
- Understand fundamental life processes
- Define problems and identifying causes
- Demonstrate ethical conduct in research activities
- Develop and defend evidence based arguments

Jobs of Recent Graduates

- Engineering Technician, Invitae – San Francisco, CA
- Ophthalmology Clinical Researcher, Ocular Imaging Research and Reading Center – Sunnyvale, CA
- Research Assistant, University of Nebraska-Lincoln – Lincoln, NE
- Patient Care Technician, Dermatologist Specialist of Omaha – Omaha, NE
- Clinical Services Technician, Celerion – Lincoln, NE
- Medication Aide, Lexington Assisted Living – Lincoln, NE
- Research Assistant, University of Texas – Houston, TX
- Lab Technician, University of Nebraska-Lincoln – Lincoln, NE
- Neuromonitoring Technologist, Biotronic Neuronetwork – Columbia, MO
- Chemical Engineer, Black & Veatch – Kansas City, KS

Internships

- Advanced Research Intern, Li-COR Biosciences - Lincoln NE
- Facilities Coordinator, UNL CBA Information Tech Services - Lincoln NE
- R&D Summer Intern, Estee Lauder Companies - Melville NY
- Anatomy/Physiology Internship, University of Nebraska-Lincoln - Lincoln NE
- Associate Management Intern, Cargill - Kansas City, MO

- Undergrad Student Research Intern, UNL Mid-America Transportation Center - Lincoln NE
- Intern, Monsanto - Gothenburg NE
- Construction Management Intern, Nemaha Landscape Construction - Lincoln NE
- Project Manager Assistant/Engineering Assistant, LI-COR Biosciences - Lincoln NE
- Undergrad Student Research Intern, UNL Mid America Transportation Center - Lincoln NE

Graduate & Professional Schools

- Master's Degree, Public Health and Epidemiology, University of Pittsburg – Pittsburg, PA
- Master's Degree, Physician's Assistant, Union College – Lincoln, NE
- Master's Degree, Medical Science, University of Texas – Austin, TX
- Master's Degree, Biostatistics, University of Michigan – Ann Arbor, MI
- Master's Degree, Conservation of Archeological and Museum Objects, Durham University – Durham, England
- Master's Degree, Genetic Counseling, Northwestern University – Chicago, IL
- Doctoral Degree, Optometry, Midwestern University – Glendale, AZ
- Doctoral Degree, Dentistry, University of Nebraska Medical Center – Lincoln, NE
- Doctoral Degree, Plant Biology, Iowa State University – Ames, IA
- Doctoral Degree, Neuroscience, University of North Carolina-Chapel Hill – Chapel Hill, NC