BIOCHEMISTRY (CAS)

Description
The Department of Biochemistry offers studies leading to either a bachelor of science (BS) or to a combined bachelors and masters degree (BS and MS) in biochemistry. 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.

The combined bachelors and masters degree in biochemistry is especially tailored for highly motivated undergraduate students with superior ability who seek additional training to further their career goals. This research thesis-based program is designed to provide opportunities for students to carry out and interpret contemporary research.

Laboratory Fee and Deposit. Students who enroll in laboratory courses in the Department of Biochemistry may be required to pay a small nonrefundable 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 an exit interview in their senior year. The interview will be conducted in the BIOL 435 Advanced Topics in Biochemistry course and results of participation in the interview 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 UNL 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 UNL and provide more opportunity to study abroad.

ACADEMIC AND CAREER Advising
Academic and Career Advising Center
The Academic and Career Advising Center in 107 Oldfather Hall 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. Students visit the Advising Center in 107 Oldfather Hall to:

• Choose or change their major, minor, or degree program.
• Check in on policies, procedures, and deadlines.

• Get a college approval signature from the Dean’s representative, Sr. Director of Advising and Student Success.

While the assigned academic advisor should be the student’s primary contact, there are daily walk-ins from 12-3 where a general academic advisor can answer a quick question. In addition, the CAS Career Coaches are located here. They help students explore majors and minors, gain experience, and develop a plan for life after graduation. Not sure where to go or who to ask? The Advising Center team can help.

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.

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 or in the Academic and Career Advising Center. 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, contact the Arts and Sciences Academic and Career Advising Center, 107 Oldfather Hall, 402-472-4190, http://cas.unl.edu/advising.

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 not only prepared to effectively contribute professionally in the real world, but they have 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, 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 style.

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.

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**

Select from courses approved for ACE outcome 1.

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

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

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

**CDR: Humanities**

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

**CDR: Social Science**

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

**CDR: Human Diversity in U.S. Communities**

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

**CDR: Language**

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 approved natural/physical science courses in anthropology, geography, and psychology that do not apply as social science.

Language Requirement

UNL and the College of Arts and Sciences place great value on academic exposure and proficiency in a second language. The UNL 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.

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 base credit come from the following College of Arts and Sciences disciplines: actuarial science, anthropology (selected courses), astronomy, biochemistry (excluding BIO 101), biological sciences (excluding BIOS 100 or BIOS 203), chemistry (excluding CHEM 101), computer science (excluding CSCE 10), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology (excluding MBIO 101), and physics.
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 UNL 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 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 UNL 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 contacting the Dean's Office, 1223 Oldfather Hall.

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 UNL.

Residency Requirement
Students must complete at least 30 of the 120 total hours for their degree at UNL. 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 UNL.

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 UNL. 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 UNL 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.

Learning Outcomes
Graduates of biochemistry will be able to:

1. Apply the basic principles of the physical sciences to the study of biological systems to explain how organisms consume and convert energy to enable the processes of life.
2. Attribute the function and regulation of biomolecules to specific macromolecular structures through the use of quantitative and analytical computational techniques.
3. Explain the flow of information through biological systems and predict the impact of environmental or biological variables on system output.
4. Analyze, interpret, critique, and communicate data and ideas concerning topics at the forefront of biochemistry.

Major Requirements
Core Requirements

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 101</td>
<td>Foundational Concepts &amp; Career Opportunities in Biochemistry</td>
<td>1</td>
</tr>
<tr>
<td>BIOC 205</td>
<td>Scientific Analysis and Technical Writing</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 431 / BIOS 431 / CHEM 431</td>
<td>Biochemistry I: Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 432 / BIOS 432 / CHEM 432</td>
<td>Biochemistry II: Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 433 / BIOS 433 / CHEM 433</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 435</td>
<td>Advanced Topics in Biochemistry (ACE 10)</td>
<td>3</td>
</tr>
</tbody>
</table>
Credit Hours Subtotal: 14
Total Credit Hours 14

### Specific Major Requirements

#### Mathematics and Statistics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
<td>5</td>
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<tr>
<td>MATH 107</td>
<td>Calculus II</td>
<td>4</td>
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</table>

Credit Hours Subtotal: 9

#### Biological/Life Sciences

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 120L</td>
<td>Fundamentals of Biology I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 121</td>
<td>Fundamentals of Biology II</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 121L</td>
<td>Fundamentals of Biology II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 206</td>
<td>General Genetics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or AGRO 215 / HORT 215 / TLMT 215</td>
<td></td>
</tr>
<tr>
<td>BIOS 312</td>
<td>Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 314</td>
<td>Microbiology Laboratory</td>
<td>1</td>
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</table>

Credit Hours Subtotal: 16

#### Chemistry

Select one sequence of the following: 11-12

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I</td>
<td>11</td>
</tr>
<tr>
<td>&amp; CHEM 110</td>
<td>and General Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 221</td>
<td>and Elementary Quantitative Analysis</td>
<td></td>
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<tr>
<td>CHEM 113</td>
<td>Fundamental Chemistry I</td>
<td>12</td>
</tr>
<tr>
<td>&amp; CHEM 114</td>
<td>and Fundamental Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 221</td>
<td>and Elementary Quantitative Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Select one sequence of the following: 8-10

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CHEM 251</td>
<td>Organic Chemistry I</td>
<td>8</td>
</tr>
<tr>
<td>&amp; CHEM 253</td>
<td>and Organic Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 252</td>
<td>and Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 254</td>
<td>and Organic Chemistry II Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 261</td>
<td>Organic Chemistry</td>
<td>10</td>
</tr>
<tr>
<td>&amp; CHEM 263</td>
<td>and Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 262</td>
<td>and Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 264</td>
<td>and Organic Chemistry Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Select one course of the following: 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 471</td>
<td>Physical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 481</td>
<td>Physical Chemistry I</td>
<td></td>
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</tbody>
</table>

Credit Hours Subtotal: 23-26

#### Physics

Select one sequence of the following: 10

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 141</td>
<td>General Physics I</td>
<td>10</td>
</tr>
<tr>
<td>&amp; PHYS 142</td>
<td>and General Physics II</td>
<td></td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics I</td>
<td>10</td>
</tr>
<tr>
<td>&amp; PHYS 212</td>
<td>and General Physics II</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 221</td>
<td>and General Physics Laboratory I</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 222</td>
<td>and General Physics Laboratory II</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 10

Total Credit Hours 58-61

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

NOTE: Within the same subject matter area, students may request a more advanced course be substituted for a required course.

### 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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 431</td>
<td>Biochemistry I: Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 432</td>
<td>Biochemistry II: Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 206</td>
<td>General Genetics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or AGRO 215 / HORT 215 / TLMT 215</td>
<td></td>
</tr>
<tr>
<td>BIOS 312</td>
<td>Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 314</td>
<td>Microbiology Laboratory</td>
<td>1</td>
</tr>
</tbody>
</table>

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.

Grading Option: Pass No Pass
**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 109 or CHEM 113

**Notes:** BIOC 101 and CHEM 110 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

**Offered:** SPRING

**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 401 Elements of Biochemistry**

**Crosslisted with:** BIOC 801

**Prerequisites:** CHEM 255 (preferred) or CHEM 251; BIOS 101 and CHEM 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:** NUTR 450; NUTR 455; VBMS 410

**BIOC 401L Laboratory for Elements of Biochemistry**

**Prerequisites:** Parallel BIOC 321

**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

**BIOC 431 Biochemistry I: Structure and Metabolism**

**Crosslisted with:** BIOC 831, BIOS 831, CHEM 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 AGRO 215 is recommended.

**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 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834; 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 432, BIOC 832, BIOS 432, CHEM 432, CHEM 832, BIOC 832, BIOC 433, BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833; BIOC 440, BIOC 840, BIOC 850, VBMS 850; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; VBMS 410; VBMS 805

**BIOC 432 Biochemistry II: Metabolism and Biological Information**

**Crosslisted with:** BIOC 832, BIOS 832, CHEM 832, CHEM 832, CHEM 832

**Prerequisites:** BIOC 431/831 with a grade of C or better; BIOS 206 or AGRO 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:** AGRO 434, BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834; 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 432, BIOC 832, BIOS 432, CHEM 432, CHEM 832, BIOC 832, BIOC 433, BIOC 833, BIOS 433, BIOS 833, CHEM 433, CHEM 833; BIOC 440, BIOC 840, BIOC 850, VBMS 850; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; VBMS 410; VBMS 805

**BIOC 433 Biochemistry Laboratory**

**Crosslisted with:** BIOC 833, BIOS 833, CHEM 833, CHEM 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, BIOC 837; BIOC 898; CHEM 498
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: AGRO 434, BIOS 434, CHEM 434, AGRO 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  

BIOC 439 Dynamics of Biochemical and Biological Networks  
Crosslisted with: BIOC 839, BIOS 439, BIOS 839  
Prerequisites: BIOS 206 or AGRO 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, BIOS 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, BIOS 486, BIOS 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 499H Honors Thesis  
Prerequisites: Good standing in the University Honors Program or by invitation. AGRI 299H recommended.  
Description: Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.  
Credit Hours: 1-6  
Min credits per semester: 1  
Max credits per semester: 6  
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 (B.S.)

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

• Application Scientist, Advanced Analytical Technologies - Ankeny IA
• Science Writer, LI-COR Biosciences - Lincoln NE
• Neuromonitoring Technologist, Biotronic Neuronetwork - Columbia MO
• Lab Technician II, GeneSeek - Lincoln NE
• Research Assistant, University of Nebraska-Lincoln - Lincoln NE
• Lab Technician I, GeneSeek/Neogen Corporation - Lincoln NE
• Researcher, University of Nebraska Medical Center - Omaha NE
• Research Scientist, Vajra Instruments - Lincoln NE
• Scientist I, Aerotek - Chicago IL
• Chemical Engineer I, Black & Veatch - Kansas City KS
• Chemist, Archer Daniels Midland - Lincoln NE
• Manufacturing Development Chemist, Ash Grove Cement Company - Louisville NE
• Associate Attorney, Baird Holm, LLP - Omaha NE
• Embedded Software Developer, a defense start-up - Herndon VA
• Plant Research Biologist, Midwest Research Inc. - York NE

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

• College of Medicine, University of Nebraska Medical Center - Omaha NE
• Doctor of Dentistry, University of Nebraska Medical Center - Lincoln NE
• Ph.D. in Biochemistry, University of Nebraska-Lincoln - Lincoln NE
• Doctor of Pharmacy, University of Missouri-Kansas City - Kansas City MO
• Master of Clinical Perfusion, University of Nebraska Medical Center - Omaha NE
• Ph.D. in Molecular and Cell Biology, University of California-Berkeley - Berkeley CA
• Ph.D. in Genetics, University of California-San Diego - San Diego CA
• Juris Doctorate, Texas Wesleyan University School of Law - Fort Worth TX
• Doctor of Optometry, Southern College of Optometry - Memphis TN
• Ph.D. Biomedical Science, University of Iowa - Iowa City IA
• Cancer Research Graduate Program, UNMC - Omaha NE
• Masters in Genetic Counseling, Northwestern University - Chicago IL
• Postdoctoral Professional Masters, Keck Graduate Institute - Claremont CA
• Doctor of Osteopathic Medicine/DO, A.T. Still University - Kirksville MO
• Master of Physician Assistant Studies, University of Nebraska Medical Center - Omaha NE
• Master of Agronomy, University of Nebraska-Lincoln - Lincoln NE
• Medicine, Washington University in St. Louis School of Medicine - St. Louis MO
• Masters of Science in Natural Resources, University of Nebraska-Lincoln - Lincoln NE