BIOCHEMISTRY (CASNR)

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 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 to students to carry out and interpret contemporary research.

Graduate Work. Advanced degrees of master of science and doctor of philosophy are available. For details, consult the Graduate Studies Catalog.

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.

College Requirements
College Admission
Requirements for admission into the College of Agricultural Sciences and Natural Resources (CASNR) are consistent with general University admission requirements (one unit equals one high school year): 4 units of English, 4 units of mathematics, 3 units of natural sciences, 3 units of social studies, and 2 units of foreign language. Students must also meet performance requirements (ACT composite of 20 or higher OR combined SAT score of 950 or higher OR rank in the top one-half of graduating class; transfer students must have a 2.0 on the most recent term of attendance. For students entering the PGA Golf Management degree program, a certified golf handicap of 12 or better (e.g., USGA handicap card) or written ability (MS Word file) equivalent to a 12 or better handicap by a PGA professional or high school golf coach is required. For more information, please visit: http://pgm.unl.edu/requirements.

Admission Deficiencies/Removal of Deficiencies
Students who are admitted to CASNR with core course deficiencies must remove these deficiencies within the first 30 credit hours at the University of Nebraska–Lincoln, or within the first calendar year at Nebraska, whichever takes longer, excluding foreign languages. Students have up to 60 credit hours to remove foreign language deficiencies. College-level coursework taken to remove deficiencies may be used to meet degree requirements in CASNR.

Deficiencies in the required entrance subjects can be removed by completion of specified courses in the University or by correspondence.

The Office of Admissions, Alexander Building (south entrance), City Campus, provides information to new students on how deficiencies can be removed.

College Degree Requirements
Curriculum Requirements
The curriculum requirements of the College consist of three areas: ACE (Achievement-Centered Education); College of Agricultural Sciences and Natural Resources Core; and Degree Program requirements and electives. All three areas of the College Curriculum Requirements are incorporated within the description of the Major/Degree Program sections of the catalog. The individual major/degree program listings of classes insures that a student will meet the minimum curriculum requirements of the College.

Foreign Languages/Language Requirement
Two units of a foreign language are required. This requirement is usually met with two years of high school language.

Minimum Hours Required for Graduation
The College grants the bachelors degree in programs associated with agricultural sciences, natural resources and related programs. Students working toward a degree must earn at least 120 semester hours of credit. A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Grade Rules
Removal of C-, D and F Grades
Only the most recent letter grade received in a given course will be used in computing a student's cumulative grade point average if the student has completed the course more than once and previously received a grade or grades below C in that course.

The previous grade (or grades) will not be used in the computation of the cumulative grade point average, but it will remain a part of the academic record and will appear on any transcript.

A student can remove from his/her cumulative average a course grade of C-, D+, D- or F if the student repeats the same course at the University of Nebraska and receives a grade other than P (pass), I (incomplete), N (no pass), W (withdrawn), or NR (no report). If a course is no longer being offered, it is not eligible for the revised grade point average computation process.

For complete procedures and regulations, see the Office of the University Registrar website at http://www.unl.edu/regrec/course-repeats.

Pass/No Pass
Students in CASNR may take any course offered on a Pass/No Pass basis within the 24-hour limitation established by the Faculty Senate. However, a department may specify that the Pass/No Pass status of its courses be limited to non-majors or may choose to offer some courses for letter grades only.
GPA Requirements
A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Transfer Credit Rules
To be considered for admission, a transfer student, Nebraska resident or nonresident, must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who have completed less than 12 credit hours of college study must submit either ACT or SAT scores.

Ordinarily, credits earned at an accredited college are accepted by the University. The College, however, will evaluate all hours submitted on an application for transfer and reserves the right to accept or reject any of them. Sixty (60) is the maximum number of hours the University will accept on transfer from a two-year college. Ninety (90) is the maximum number of hours the University will accept from a four-year college.

Transfer credit in the degree program must be approved by the degree program advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major. At least 9 hours in the major field, including the capstone course, must be completed at the University of Nebraska–Lincoln regardless of the number of hours transferred.

The College will accept no more than 10 semester hours of C, D+, D and D- grades from other schools. The C, D+, D and D- grades can only be applied to free electives. This policy does not apply to the transfer of grades from UNO or UNK to the University of Nebraska–Lincoln.

Joint Academic Transfer Programs
The College of Agricultural Sciences and Natural Resources has agreements with many institutions to support joint academic programs. The transfer programs include dual degree programs and cooperative degree programs. Dual degree programs offer students the opportunity to receive a degree from a participating institution and also to complete requirements for a bachelor of science degree in CASNR. Cooperative programs result in a single degree from either the University of Nebraska–Lincoln or the cooperating institution.

Dual Degree Programs
A to B Programs
The A to B Program, a joint academic program offered by the CASNR and participating community colleges, allows students to complete the first two years of a degree program at the participating community college and continue their education and study in a degree program leading toward a bachelor of science degree.

The A to B Program provides a basic knowledge plus specialized coursework. Students transfer into CASNR with junior standing.

Depending on the community college, students enrolled in the A to B Program may complete the requirements for an associate of science at the community college, transfer to the University of Nebraska–Lincoln, and work toward a bachelor of science degree.

Participating community colleges include:
- Central Community College
- Metropolitan Community College
- Mid-Plains Community College
- Nebraska College of Technical Agriculture
- Northeast Community College
- Southeast Community College
- Western Nebraska Community College

3+2 Programs
Two specialized degree programs in animal science and veterinary science are offered jointly with an accredited college or school of veterinary medicine. These two programs permit CASNR animal science or veterinary science students to receive a bachelor of science degree from the University of Nebraska–Lincoln with a degree in animal science or veterinary science after successfully completing two years of the professional curriculum in veterinary medicine at an accredited veterinary school. Students who successfully complete the 3+2 Program, must complete the Application for Degree form and provide transcripts to the Credentials Clerk, Office of the University Registrar, 107 Canfield Administration Building. Students should discuss these degree programs with their academic advisor.

Cooperative Degree Programs
Academic credit from the University and a cooperating institution is applied towards a four-year degree from either the University of Nebraska–Lincoln (University degree-granting program) or the cooperating institution (non University degree-granting program). All have approved programs of study.

UNL Degree-Granting Programs
A University of Nebraska–Lincoln degree-granting program is designed to provide students the opportunity to complete a two-year program of study at one of the four-year institutions listed below, transfer to CASNR and complete the requirements for a bachelor of science degree.

Chadron State College. Chadron State College offers a 2+2 program leading to a grassland ecology and management degree program and a transfer program leading to a bachelor of science in agricultural education in the teaching option.

Wayne State College. Wayne State College offers a 3+1 program leading to a bachelor of science in plant biology in the ecology and management option.

University of Nebraska at Kearney. Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.

University of Nebraska at Omaha. The University of Nebraska at Omaha (UNO) cooperates with CASNR in providing four-semester pre-agricultural sciences, pre-natural resources, pre-food science and technology, pre-horticulture and pre-turfgrass and landscape management transfer programs.

A student enrolled in these programs may transfer all satisfactorily completed academic credits identified in the suggested program of study, and enter CASNR to study toward a degree program leading to a bachelor of science degree. The total program would require a minimum of four years or eight semesters (16 credit hours/semester or 120 credit hours).

Nebraska CASNR faculty teach horticulture and food science and technology courses at UNO to assist an urban population in better understanding the food processing, horticulture, and landscape horticulture industries.
For more information, contact the CASNR Dean’s Office, 800-472-8800, ext. 2541.

**Non University of Nebraska–Lincoln Degree-Granting Programs**

CASNR cooperates with other institutions to provide coursework that is applied towards a degree at the cooperating institution. Pre-professional programs offered by CASNR allow students to complete the first two or three years of a degree program at the University prior to transferring and completing a degree at the cooperating institution.

**Chadron State College—Range Science.** The 3+1 Program in range science allows Chadron State College students to pursue a range science degree through Chadron State College. Students complete three years of coursework at Chadron State College and one year of specialized range science coursework (32 credit hours) at CASNR.

**Dordt College (Iowa)—Agricultural Education: Teaching Option.** This program allows students to pursue an Agricultural Education Teaching Option degree leading toward a bachelor of science in agricultural education. Students at Dordt College will complete 90 credit hours in the Agricultural Education: Teaching Option Transfer Program.

**Residency**

Students must complete at least 30 of the total hours for their degree using University of Nebraska–Lincoln credits. At least 18 of the 30 credit hours must be in courses offered through CASNR\(^1\) (>299) including the appropriate ACE 10 degree requirement or an approved ACE 10 substitution offered through another Nebraska college and excluding independent study regardless of the number of hours transferred. Credit earned during education abroad may be used toward the residency requirement if students register through UNL and participate in prior-approved education abroad programs. University of Nebraska–Lincoln open enrollment and summer independent study courses count toward residency.

\(^1\) Includes courses taught by CASNR faculty through interdisciplinary prefixes (e.g., LIFE, MBIO, ENVR, SCIL, EAAEP, HRTM, ENSC) and CASNR crosslisted courses taught by non-CASNR faculty.

**Online and Distance Education**

There are many opportunities to earn college credit online through the University of Nebraska–Lincoln. Some of these credits may be applicable not only as elective credits, but also toward the fulfillment of the College’s education requirements. Credits earned online may count toward residency. However, certain offerings may not be counted toward scholarship requirements or academic recognition criteria.

**For further information, contact:**

Office of Online and Distance Education
University of Nebraska–Lincoln
305 Brace Labs
Lincoln, NE 68588-0109
402-472-4681
http://online.unl.edu/

**Independent Study Rules**

Students wishing to take part in independent studies must obtain permission; complete and sign a contract form; and furnish copies of the contract to the instructor, advisor, departmental office, and the Dean’s Office. The contract should be completed before registration. Forms are available in 103 Agricultural Hall or online at the CASNR website.

Independent study projects include research, literature review or extension of coursework under supervision and evaluation of a departmental faculty member.

Students may only count 12 hours of independent study toward their degrees and no more than 6 hours can be counted during their last 36 hours earned, excluding senior thesis, internships, and courses taught under an independent study number.

**Other College Degree Requirements**

**Capstone Course Requirement**

A capstone course is required for each CASNR degree program. A capstone course is defined as a course in which students are required to integrate diverse bodies of knowledge to solve a problem or formulate a policy of societal importance.

**ACE Requirements**

All students must fulfill the Achievement Centered Education (ACE) requirements. Information about the ACE program may be viewed at ace.unl.edu (https://ace.unl.edu).

The minimum requirements of CASNR reflect the common core of courses that apply to students pursuing degrees in the college. Students should work with an advisor to satisfy ACE outcomes 1, 2, 3, 4, 6 and 10 with the college requirements.

**Catalog Rule**

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to the University of Nebraska–Lincoln or when they were first admitted to a Joint Academic Transfer Program. 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 Nebraska in the College of Agricultural Sciences and Natural Resources. Students must complete all degree requirements from a single catalog year. 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**

**Specific Major Requirements**

**Biochemistry Core**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCIL 101</td>
<td>Science and Decision-Making for a Complex World</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 101</td>
<td>Career Opportunities in Biochemistry</td>
<td>1</td>
</tr>
</tbody>
</table>

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</tr>
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<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>BIOC 205</td>
<td>Scientific Analysis and Technical Writing</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 431 /</td>
<td>Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 431 /</td>
<td>Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 431</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 432 /</td>
<td>Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 432 /</td>
<td>Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 432</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 433 /</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOS 433 /</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>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>
<tr>
<td>BIOL 205</td>
<td>Scientific Analysis and Technical Writing</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 431 /</td>
<td>Structure and Metabolism</td>
<td>3</td>
</tr>
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<td>BIOS 431 /</td>
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<tr>
<td>CHEM 431</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
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<td>BIOL 432 /</td>
<td>Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 432 /</td>
<td>Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 432</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 433 /</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOS 433 /</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
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<tr>
<td>CHEM 433</td>
<td>Biochemistry Laboratory</td>
<td>2</td>
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<tr>
<td>BIOL 435</td>
<td>Advanced Topics in Biochemistry (ACE 10)</td>
<td>3</td>
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**Credit Hours Subtotal:** 17

### Natural Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; LIFE 120L</td>
<td>Fundamentals of Biology I laboratory (ACE 4)</td>
<td></td>
</tr>
<tr>
<td>LIFE 121</td>
<td>Fundamentals of Biology II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; LIFE 121L</td>
<td>Fundamentals of Biology II laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOS 206</td>
<td>General Genetics</td>
<td>4</td>
</tr>
<tr>
<td>or AGRO 215</td>
<td>Genetics</td>
<td></td>
</tr>
<tr>
<td>or HORT 215</td>
<td>Genetics</td>
<td></td>
</tr>
<tr>
<td>or TLMT 215</td>
<td>Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOS 312</td>
<td>Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 313</td>
<td>Molecular Microbiology Laboratory</td>
<td>1-2</td>
</tr>
<tr>
<td>or BIOS 314</td>
<td>Microbiology Laboratory</td>
<td></td>
</tr>
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Select one sequence of the following: 11-12

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 110</td>
<td>General Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 221</td>
<td>and Elementary Quantitative Analysis</td>
<td></td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Fundamental Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 114</td>
<td>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: 4-5
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 251</td>
<td>Organic Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 253</td>
<td>Organic Chemistry I Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 261</td>
<td>Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 263</td>
<td>Organic Chemistry Laboratory</td>
<td></td>
</tr>
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</table>

Select one sequence of the following: 4-5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 252</td>
<td>Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 254</td>
<td>Organic Chemistry II Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 262</td>
<td>Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 264</td>
<td>Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 471</td>
<td>Physical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM 481</td>
<td>Physical Chemistry I</td>
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</tr>
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</table>

Select one sequence of the following: 10

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHYS 141</td>
<td>General Physics I</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 142</td>
<td>General Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics I</td>
<td></td>
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<tr>
<td>&amp; PHYS 212</td>
<td>General Physics I</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 221</td>
<td>General Physics Laboratory I</td>
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</tr>
<tr>
<td>&amp; PHYS 222</td>
<td>General Physics Laboratory I</td>
<td></td>
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</table>

Credit Hours Subtotal: 49

### Communications

#### Written Communication (ACE 1)

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 150</td>
<td>Writing and Inquiry</td>
<td></td>
</tr>
<tr>
<td>ENGL 151</td>
<td>Writing and Argument</td>
<td></td>
</tr>
<tr>
<td>ENGL 254</td>
<td>Writing and Communities</td>
<td></td>
</tr>
<tr>
<td>JGEN 120</td>
<td>Basic Business Communication</td>
<td></td>
</tr>
<tr>
<td>JGEN 200</td>
<td>Technical Communication I</td>
<td></td>
</tr>
<tr>
<td>JGEN 300</td>
<td>Technical Communication II</td>
<td></td>
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### Communication and Interpersonal Skills (ACE 2)

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALEC 102</td>
<td>Interpersonal Skills for Leadership</td>
<td></td>
</tr>
<tr>
<td>COMM 101</td>
<td>Communication in the 21st Century</td>
<td></td>
</tr>
<tr>
<td>COMM 209</td>
<td>Public Speaking</td>
<td></td>
</tr>
<tr>
<td>COMM 210</td>
<td>Communicating in Small Groups</td>
<td></td>
</tr>
<tr>
<td>COMM 215</td>
<td>Visual Communication</td>
<td></td>
</tr>
<tr>
<td>COMM 286</td>
<td>Business and Professional Communication</td>
<td></td>
</tr>
<tr>
<td>JGEN 300</td>
<td>Technical Communication II</td>
<td></td>
</tr>
<tr>
<td>MRKT 257</td>
<td>Sales Communication</td>
<td></td>
</tr>
<tr>
<td>NRES 301</td>
<td>Environmental Communication Skills</td>
<td></td>
</tr>
<tr>
<td>TMFD 121</td>
<td>Visual Communication and Presentation</td>
<td></td>
</tr>
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Credit Hours Subtotal: 6

### Economics, Humanities, and Social Sciences

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 200</td>
<td>Economic Essentials and Issues</td>
<td></td>
</tr>
<tr>
<td>ECON 211</td>
<td>Principles of Macroeconomics</td>
<td></td>
</tr>
<tr>
<td>ECON 212</td>
<td>Principles of Microeconomics (ACE 8)</td>
<td></td>
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</table>

Select one course each from ACE outcomes 5, 6, 7, and 9: 12

Credit Hours Subtotal: 15

### Free Electives

Select 20-24 credits: 20-24

Credit Hours Subtotal: 24

### Total Credit Hours

120

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

### Advanced Placement and International Baccalaureate 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 Fundamental Chemistry I / CHEM 114 Fundamental Chemistry II rather than CHEM 109 General Chemistry I / CHEM 110 General Chemistry II. High school dual enrollment credit is not included in this policy.

### Additional Major Requirements

#### Grade Rules

**C- and D Grades**

No C- or D grades can be applied toward the biochemistry minor or biochemistry degree requirements in any of the courses listed under the following sections of **Specific Major Requirements**: Biochemistry Core, Natural Sciences, and Mathematics and Statistics.
Pass/No Pass

Students in biochemistry must take the courses listed under Specific Major Requirements as graded only. Pass/No Pass is not allowed in: Biochemistry Core, Natural Sciences, and Mathematics and Statistics.

Requirements for Minor Offered By Department

Select a minimum of 18 credit hours of graded coursework to include the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 431 / BIOS 431 / CHEM 431</td>
<td>Structure and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 432 / BIOS 432 / CHEM 432</td>
<td>Metabolism and Biological Information</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 206 or AGRO 215 / HORT 215 / TLMT 215</td>
<td>General Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOS 312</td>
<td>Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 313 or BIOS 314</td>
<td>Molecular Microbiology Laboratory / Microbiology Laboratory</td>
<td>1-2</td>
</tr>
<tr>
<td>CHEM 252 or CHEM 262</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 254 or CHEM 264</td>
<td>Organic Chemistry II Laboratory / Organic Chemistry Laboratory</td>
<td>1-2</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 minor or major.

BIOC 101 Career Opportunities in Biochemistry

Prerequisites: Interest in becoming a biochemistry major.

Description: Introduction to the field of biochemistry and faculty research interests in the Center for Biochemistry. Exploration of careers in biochemistry.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LEC

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

Format: LEC

Offered: SPRING

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

Format: LEC

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

Format: LAB

Offered: FALL/SPR

BIOC 431 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 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: 1

Format: LEC

Offered: FALL/SPR

Prerequisite for: AGRO 434, BIOC 434, BIOS 434, CHEM 434, AGRO 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, BIOS 832; BIOS 433, BIOS 833, BIOS 833, CHEM 433, CHEM 833; BIOS 879; BIOS 950, VBMS 950; FDST 470, FDST 870; NUTR 450; NUTR 455; NUTR 820; NUTR 821; VBMS 410; VBMS 805
BIOC 432 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 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  
Format: LEC  
Offered: FALL/SPR  
Prerequisite for: BIOC 433H, BIOS 433H, CHEM 433H, CHEM 833H  
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  
Format: LAB  
Offered: FALL/SPR  
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  
Format: LEC  
Offered: FALL/SPR  
Prerequisite for: BIOC 437, BIOC 837, BIOS 437, BIOS 837, CHEM 498  
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  
Format: LEC  
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  
Format: LEC  
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 992K, CHEM 992K; BIOC 998  
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  
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  
Format: LEC
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  
**Format:** IND

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  
**Format:** IND

**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.