COMPUTATIONAL BIOLOGY 
& BIOINFORMATICS MINOR 
(CASNR)

Description
This interdisciplinary minor prepares students to understand, use, and 
develop advanced computational methods and tools for processing, 
visualizing, and analyzing biological data and for modeling biological 
processes. Studies in computational biology and bioinformatics involve 
biosciences, computer science, engineering, mathematics, and statistics. 
Students will be prepared for careers in biomedical, biotechnology, 
agricultural, pharmaceutical, and engineering fields and for related 
graduate studies.

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 a 4.0 scale) cumulative 
grade point average and 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 UNL, or 
within the first calendar year at UNL, whichever takes longer, excluding 
foreign languages. Students have up to 60 credit hours to remove 
foreign language deficiencies. College-level course work 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 bachelor's 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.

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, 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 (withdraw), 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.

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 is the maximum number of hours UNL will accept on 
transfer from a two-year college. Ninety is the maximum number of hours 
UNL 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 
UNL 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 UNL.

**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 UNL 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 course work. 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 UNL, 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 UNL 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, UNL. Students should discuss these degree programs with their academic advisor.

**Cooperative Degree Programs**

Academic credit from UNL and a cooperating institution is applied towards a four-year degree from either UNL (UNL degree-granting program) or the cooperating institution (non UNL degree-granting program). All have approved programs of study.

**UNL Degree-Granting Programs**

A UNL 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).

UNL 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 UNL Degree-Granting Programs**

The CASNR cooperates with other institutions to provide course work 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 UNL 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 course work at Chadron State College and one year of specialized range science course work (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 UNL credits. At least 18 of the 30 credit hours must be in courses offered through CASNR (299) including the appropriate ACE 10 degree requirement or an approved ACE 10 substitution offered through another UNL 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. UNL
open enrollment and summer independent study courses count toward residence.

1 Includes courses taught by CASNR faculty through interdisciplinary prefixes (e.g., LIFE, Mbio, Envr, sol, eae, hrtm, ens) 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 course work 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 www.ace.unl.

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 UNL 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 UNL 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.

Requirements for Minor Offered by Department
Eighteen (18) hours (not including prerequisites) of core courses and additional courses.

**Prerequisite Courses**

<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 (or equivalent)</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 120 &amp; LIFE 120L</td>
<td>Fundamentals of Biology I and Fundamentals of Biology I laboratory</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 121 &amp; LIFE 121L</td>
<td>Fundamentals of Biology II and Fundamentals of Biology II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>MATH 106</td>
<td>Calculus I (or equivalent)</td>
<td>5</td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 17

**Core Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCE 155T</td>
<td>Computer Science I: Informatics Focus</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 311</td>
<td>Data Structures and Algorithms for Informatics</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 237</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>STAT 218</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 380 &amp; MATH 380</td>
<td>Statistics and Applications</td>
<td></td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 13

**Life Science Course**

Select a course from either LS 1 or LS 2 choices, depending on your major.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 427</td>
<td>Practical Bioinformatics Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOS 428</td>
<td>Perl Programming for Biological Applications</td>
<td></td>
</tr>
<tr>
<td>BIOS 456 / NRES 456</td>
<td>Mathematical Models in Biology</td>
<td></td>
</tr>
<tr>
<td>BIOS 477</td>
<td>Bioinformatics and Molecular Evolution</td>
<td></td>
</tr>
<tr>
<td>STAT 442 / BIOS 442</td>
<td>Computational Biology</td>
<td></td>
</tr>
</tbody>
</table>

**LS 1: for students in life science majors.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 452 / BIOS 451 / CHEM 431</td>
<td>Structure and Metabolism</td>
<td></td>
</tr>
<tr>
<td>BIOS 432 / BIOS 432 / CHEM 432</td>
<td>Metabolism and Biological Information</td>
<td></td>
</tr>
<tr>
<td>BIOC 434 / AGRO 434 / BIOS 434 / CHEM 434</td>
<td>Plant Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BIOS 420 / MBIO 420</td>
<td>Molecular Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOS 425</td>
<td>Plant Biotechnology</td>
<td></td>
</tr>
<tr>
<td>BIOS 429</td>
<td>Phylogenetic Biology</td>
<td></td>
</tr>
<tr>
<td>BIOS 472</td>
<td>Evolution</td>
<td>3-4</td>
</tr>
</tbody>
</table>

**Credit Hours Subtotal:** 3-4
### Computer Science/Math/Statistics/Engineering (CMSE)

#### Course 

Select a course from either CMSE 1 or CMSE 2 choices, depending on your major.

**CMSE 1 - For students in computer science, math, engineering and related majors.**

- CSCE 471  Introduction to Bioinformatics

**CMSE 2**

- BSEN 414  Medical Imaging Systems
- CHME 473  Biochemical Engineering
- CHME 474  Advanced Biochemical Engineering
- CSCE 410  Information Retrieval Systems
- CSCE 413  Database Systems
- CSCE 421  Foundations of Constraint Processing
- CSCE 423  Design and Analysis of Algorithms
- CSCE 435  Cluster and Grid Computing
- CSCE 456  Parallel Programming
- CSCE 472  Digital Image Processing
- CSCE 474  Introduction to Data Mining
- CSCE 476  Introduction to Artificial Intelligence
- CSCE 478  Introduction to Machine Learning
- CSCE 479  Introduction to Neural Networks
- ECEN 450  Bioinformatics
- MATH 439  Mathematical Models in Biology
- MATH 452  Graph Theory
- STAT 412  Introduction to Experimental Design
- STAT 450  Introduction to Regression Analysis

<table>
<thead>
<tr>
<th>Credit Hours Subtotal:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Credit Hours</td>
<td>19-20</td>
</tr>
</tbody>
</table>

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1. *These requirements can be replaced with equivalent courses upon approval except for BIOS 237, which cannot be replaced.*

2. *Students are strongly encouraged to take STAT 218 or STAT 380. However, ECEN 305 can be used to satisfy this requirement, subject to approval.*

3. *For life science major students, those courses listed as LS Elective 2 cannot be used for CBB requirements.*

4. *For students in computer science, mathematics, engineering, and related majors, those courses listed as CMSE Elective 2 cannot be used for CBB requirements.*

### Grade Rules

#### C- and D Grades

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

#### Pass/No Pass

No course taken Pass/No Pass will be counted toward the minor.