PLANT BIOLOGY (CAS)

Description
Website: http://agronomy.unl.edu/plant-biology

The plant biology major is designed to provide a flexible entry for undergraduate students that have an interest in the plant sciences. Once enrolled in the program, students will take a core of classes that will allow them to continue in the plant biology major or would also allow them to easily transfer to other Life Sciences programs. Students will have the opportunity to interact with the faculty of the Center for Plant Science Innovation as well as other departments and schools for advising and research opportunities.

The goal of the plant biology program is to offer a field of study to students who are interested and talented in the basic sciences and mathematics and who:

1. may never have considered applying this knowledge to plants,
2. have always dreamed of this field of study, and/or
3. have always had an interest in plants but are uncertain that this field of study is right for them.

Studying plant biology will allow students to explore and understand plants at molecular, cellular, physiological, organismal, population, and community levels and by taking ecological, evolutionary, agricultural, and horticultural perspectives. This is accomplished through required courses in different scientific fields (e.g., biology, biochemistry, chemistry, agronomy, horticulture) and through different options in the major (ecology and management option and biotechnology option).

The plant biology program includes a career experience/internship course (AGRO 295/RNGE 295/SOIL 295, BIOS 395, HORT 395, NRES 497) which provides the opportunity to gain work experience in an off-campus setting related to a student’s academic and career objectives.

A research project initiated by the beginning of the junior year is required.

Admission
College Admission
The entrance requirements for the College of Arts and Sciences are the same as the UNL General Admission Requirements. Students who are admitted through the Admission by Review process may have certain conditions attached to their enrollment at UNL. These conditions are explained under “Removal of Deficiencies.”

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.

Advising
Academic and Career Advising
The Academic and Career Advising Center in 107 Oldfather is a centrally located and easily accessed resource for students in all majors in the College of Arts and Sciences. The professional academic advisors and career coaches offer 1-1 meetings on a walk-in and appointment basis weekdays. Advisors will provide assistance choosing majors and minors, understanding degree requirements and academic policies, completing paperwork, meeting deadlines, adding/dropping courses, and planning for graduation. In addition, career coaches can help students identify career options related to their interests and connect them with experiences like internships, research, and more that will prepare them for those career options. These specially trained advisors and coaches also serve as first point of contact in the College for all incoming freshmen and transfer students during New Student Enrollment.

Students in the College who have declared a major will be assigned an academic advisor who is their first point of contact for a variety of questions. Academic advisors help students be successful in adjusting to UNL overall as well as making progress toward degree completion. The assigned advisor may be located within the department of their primary major, or in the Advising Center. Students can identify their assigned advisor in MyRED on the academics tab. In addition, faculty advisors are experts in their discipline, including advanced coursework and requirements, opportunities for research, student organizations, and considering graduate school in the discipline. 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 Library 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.

College Degree Requirements
College Distribution Requirements
Bachelor of Arts or Bachelor of Science (16 hours + Language)
The College of Arts and Sciences distribution requirements are designed to ensure a breadth of courses within the liberal arts degree. 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.

- A student may not use a single course to satisfy 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.
- A student may not use a course from their primary major to satisfy the Breadth Requirement (F), but may apply an ancillary requirement of the primary major or a course from their second major toward this requirement.
- Independent study, directed readings, or internship courses cannot be used to satisfy a College Distribution Requirement.
- Cross-listed courses from interdisciplinary programs will be applied in the same area as courses from the home/cross-listed department.

College Distribution Requirements

<table>
<thead>
<tr>
<th>CDR A - Written Communication</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select from courses approved for ACE outcome 1.</td>
<td></td>
</tr>
<tr>
<td>CDR B and BL - Natural, Physical, and Mathematical Sciences with Lab</td>
<td>4</td>
</tr>
</tbody>
</table>
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 C - Humanities | 3  |

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

| CDR D - Social Science | 3  |

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

| CDR E - Language | 0-16 |

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

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

| CDR F - Additional Breadth | 3  |

Select from natural, physical and mathematical sciences (Area B), humanities (Area C), or social sciences (Area D). Cannot be a course from the primary major.

Credit Hours Subtotal: 16-32

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 210 and below do not fulfill the CDR C.

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

Scientific Base

Bachelor of Science Only (60 hours)

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, anthropology (selected courses), astronomy, biochemistry (excluding BIOL 101), biological sciences (excluding BIOL 100 or BIOL 203), chemistry (excluding CHEM 101), computer science (excluding CSCE 10), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology, physics and statistics.

See your degree audit or a College of Arts and Sciences 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 a college advisor.

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 E) will rarely be waived and only with relevant documentation. See the main College of Arts and Sciences page for more details.

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 total 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 initiating the appeal in the semester following the awarding of the grade:

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

Course Level Requirements

Courses Numbered at the 300 or 400 Level

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

ACE Requirements

Consistent with the mission and values of the University, ACE is based on a shared set of four institutional objectives and ten student learning outcomes. The ACE program was approved by faculty in all eight undergraduate colleges and endorsed by the Faculty Senate, the student government, and the Academic Planning Committee in January 2008 for implementation in the fall 2009. ACE aligns with current national initiatives in general education.

To meet the ACE Program requirement, a student will complete a minimum of 3 credit hours for each of the ten ACE Student Learning Outcomes (a total of 30 ACE credit hours). See the ACE website at: http://ace.unl.edu for the most current information and the most recently certified courses.

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 plant biology will be able to:

1. Be confident in explaining how various plants grow and reproduce and predict how they will respond to their growing environment.
2. Plan and conduct experiments that are designed to test hypotheses and then communicate their discoveries in formats designed for other scientists or for the public.
3. Use the principles of ecology to analyze and interpret the interactions of the plant, animal, environmental, and economic aspects of grassland ecosystems. (Ecology and Management Option)
4. Identify management strategies for grasslands that ensure sustained productivity and resilience. (Ecology and Management Option)
5. Envision and design genetic and production improvements in plants to better meet the needs of people or changes in plant production environments (Biotechnology Option)
6. Be competitive applicants for graduate programs world wide in plant biology.

Major Requirements

Core Requirements

Mathematics and Statistics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 106</td>
<td>Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>STAT 218</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 8

Life Sciences

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</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></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></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 8

Physics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 141</td>
<td>Elementary General Physics I</td>
<td>4-5</td>
</tr>
<tr>
<td>or PHYS 151</td>
<td>Elements of Physics</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 4-5

Chemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 110</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 255</td>
<td>Biological Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 257</td>
<td>and Biological Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>or CHEM 251</td>
<td>Organic Chemistry I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 253</td>
<td>and Organic Chemistry I Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 12

Biochemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 401</td>
<td>Elements of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>&amp; BIOC 401L</td>
<td>and Laboratory for Elements of Biochemistry</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 4

Plant Biology Core

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRES 220</td>
<td>Principles of Ecology</td>
<td>4</td>
</tr>
<tr>
<td>&amp; NRES 222</td>
<td>and Ecology Laboratory</td>
<td></td>
</tr>
<tr>
<td>or BIOS 207</td>
<td>Ecology and Evolution</td>
<td></td>
</tr>
<tr>
<td>AGRO 153</td>
<td>Soil Resources</td>
<td>4</td>
</tr>
<tr>
<td>/ HORT 153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/ SOIL 153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGRO 215</td>
<td>Genetics</td>
<td>4</td>
</tr>
<tr>
<td>/ HORT 215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/ TLMT 215</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or BIOS 206</td>
<td>General Genetics</td>
<td></td>
</tr>
<tr>
<td>AGRO 278</td>
<td>Botany</td>
<td>4</td>
</tr>
<tr>
<td>/ HORT 278</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGRO 325</td>
<td>Introductory Plant Physiology</td>
<td>4</td>
</tr>
<tr>
<td>AGRO 92</td>
<td>Plant Biology Portfolio and Assessment</td>
<td>0</td>
</tr>
<tr>
<td>/ NRES 92</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 20

Plant Biology Internship/Career Experience

Select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 395</td>
<td>Internship</td>
<td>1</td>
</tr>
<tr>
<td>HORT 395</td>
<td>Career Experience</td>
<td></td>
</tr>
<tr>
<td>AGRO 295</td>
<td>Internship in Agronomy</td>
<td></td>
</tr>
<tr>
<td>/ RNGE 295</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/ SOIL 295</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRES 497</td>
<td>Career Experiences in Natural Resource</td>
<td></td>
</tr>
<tr>
<td>Sciences</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 1

Plant Biology Independent Study/Current Project

Select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS 395</td>
<td>Internship</td>
<td>1</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 1
Specific Major Requirements
Select either the Ecology and Management Option or the Biotechnology Option as described below.

Ecology and Management Option

Required Courses
AGRO 245 / NRES 245
or NRES 310
Introduction to Grassland Ecology and Management
AGRO 444 / NRES 444
Ecosystem Monitoring and Assessment

Credit Hours Subtotal: 6-7

Additional Ecology and Management Option Courses
Select at least 3 hours from each of the following five areas:

Water/Climate
Select at least 3 hours from the following:

METR 100 Weather and Climate
NRES 208 Applied Climate Sciences
NRES 408 / AGRO 408 / GEOG 408
Microclimate: The Biological Environment
HORT 408
WATS 408
WATS 281 / GEOG 281 / NRES 281
Introduction to Water Science

Geospatial Information Sciences
Select at least 3 hours from the following:

GEOG 412 / NRES 412
Introduction to Geographic Information Systems
GEOG 418 / NRES 418
Introduction to Remote Sensing
NRES 312 / GEOG 312
Introduction to Geospatial Information Sciences

Plant Identification
AGRO 442 / NRES 442
Wildland Plants
AGRO 340 / NRES 442 / RNGE 442
Range Management and Improvement

Plant-Animal-Organismal Interactions
Select at least 3 hours from the following:

AGRO 340 / RNGE 340

Credit Hours Subtotal: 15

Total Credit Hours: 21-22

Biotechnology Option

Required Courses
BIOS 312
Microbiology
Select one of the following:
BIOS 337
Applications of Bioinformatics
BIOS 442
Computational Biology
STAT 442

BIOS 427
Practical Bioinformatics Laboratory

Credit Hours Subtotal: 6-7

Additional Biotechnology Courses
Select at least 17 hours from the following three areas with at least 3 hours in each area:
### Biological Sciences
Select at least 3 hours from the following: 3-6

- **AGRO 270** / Biological Invaders
- **HORT 270** / NRES 270 / PLPT 270
- **AGRO 460** / BIOS 460 / NRES 460 / SOIL 460
- **BIOS 205**
- **BIOS 302**
- **BIOS 317**
- **BIOS 407**
- **BIOS 418**
- **BIOS 420** / MBIO 420
- **BIOS 425**
- **BIOS 434**
- **BIOS 471**
- **BIOS 477**

### Applied Plant Biology
Select at least 3 hours from the following: 3-6

- **AGRO 131** / HORT 131 & AGRO 132
- **AGRO 278**
- **AGRO 325**
- **BIOS 368**
- **HORT 221**
- **NRES 406** / AGRO 406 / HORT 406
- **PLL 369** / BIOS 369

### Plant and Food System Management
Select at least 3 hours from the following: 3-6

- **AGRO 204**
- **AGRO 240** / RNGE 240
  - or **AGRO 227**
- **AGRO 405**

---

### Additional Major Requirements

#### Grade Rules

- **C- and D Grades**
  A grade of C or better is required in all courses in the major or minor.

- **Pass/No Pass**
  No course taken Pass/No Pass will count toward the major or minor, except for the Career Experience courses.

#### Requirements for the minor Offered by Department

Requirements for the minor include 19 hours of coursework, with a minimum of 7 hours at the 300 level or above.

### Requirements
Select one of the following: 4

- **AGRO 131** / HORT 131 & AGRO 132
- **AGRO 278**
- **AGRO 325**
- **AGRO 405**

Credit Hours Subtotal: 17

Total Credit Hours 23-24

---

1. Students considering graduate school should also take BIOS 478.
AGRO 215 / Genetics
HORT 215 /
TLMT 215
or BIOS 206 General Genetics

Any 300- or 400-level course listed under the Plant Biology
Major—Biotechnology Option

Ecology and Management Focus
NRES 220 Principles of Ecology
NRES 222 Ecology Laboratory

Any 300- or 400-level course listed under the Plant Biology
Major—Ecology and Management Option

Credit Hours Subtotal: 7-8

Total Credit Hours 19-20

Grade Rules
C- and D Grades
A grade of C or better is required in all courses in the major or minor.

Pass/No Pass
No course taken Pass/No Pass will count toward the major or minor,
except for the Career Experience courses.

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.

Plant Biology - Ecology and Management
(B.S.)

Plant Biology - Biotechnology (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
- Communicate results of scientific experiments to scientific and non-
  scientific audiences
- Apply mathematical and scientific skills to solve real-world problems
- Make predictions using mathematical, statistical, and scientific
  modeling methods
- Define problems and identifying causes
- Understand and use proper laboratory and technical skills and
  instruments
- Collaborate with a team to develop solutions
- Confidently navigate complex, ambiguous projects and environments
- Design and implement research experiments
- Document and replicate processes and procedures

Jobs of Recent Graduates
- Associate Sales Manager, Theisen Seed LLC - Atkinson NE
- Distance Education Instructor, University of Nebraska - Lincoln NE
- Site Manager, Sustainable Agriculture Education - Berkeley CA
- Groundskeeper, Burr Oak Lodge - Eagle NE
- Graduate Research assistant, university of nebraska lincoln - Lincoln NE
- Student of Doctor of Health Program, UNL - Lincoln NE

Internships
- Intern, DuPont Pioneer - Johnston IA
- Research Assistant, UNL Plant Pathology - Lincoln NE
- Cover Crop Research Intern, UNL Agronomy and Horticulture - Lincoln NE
- Research Intern, Nebraska Forest Service - Lincoln NE
- Intern, Grassland Ecology - Wood River NE
- Pioneer Sales Associate Intern, Theisen Seed LLC - Atkinson NE
- Crop Production Intern, UNL Agronomy and Horticulture - Lincoln NE
- Research Intern, UNL Molecular Plant Physiology - Lincoln NE

Graduate & Professional Schools
- Ph.D., Genetics, Iowa State University - Ames IA
- Ph.D., Evolutionary Ecology, Colorado State University - Fort Collins CO
- Ph.D., Plant Breeding and Genetics, Purdue University - Lafayette IN
- Ph.D., Entomology, University of Arkansas - Fayetteville AR
- Ph.D., Agronomy and Horticulture, University of Nebraska-Lincoln - Lincoln NE
- Master’s Degree, Agronomy, University of Nebraska-Lincoln - Lincoln NE
- Master’s Degree, Plant Breeding and Genetics, University of Nebraska-Lincoln - Lincoln NE
- Master’s Degree, Biological Sciences, University of Nebraska-Lincoln - Lincoln NE
- Master’s Degree, Entomology and Plant Pathology, Colorado State University - Fort Collins CO
- Master’s Degree, Horticulture, University of Nebraska-Lincoln - Lincoln NE
- Ph.D., Horticulture, University of Nebraska Lincoln - Lincoln NE

...