PLANT BIOLOGY (CASNR)

Description

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

The plant biology degree program provides 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 degree program or 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 the above departments and schools for advising, internships, and research opportunities.

Studying plant biology will allow students to explore their knowledge of plants at the following levels:

1. Molecular. (Biotechnology Option)
2. Cellular and organismal. (biological, biochemical/chemical sciences)
3. Whole plant/applied physiological. (horticulture and agronomy courses)
4. Ecological. (Ecology and Management Option)

Students may select a bachelor of science track through the College of Agricultural Sciences and Natural Resources or a bachelor of science or arts track through the College of Arts and Sciences. Every student must complete a set of core courses that provide breadth in basic sciences. Introduction to plant biology should be taken during the first semester in the program. Students also must complete an emphasis to provide depth in one of the following options: Biotechnology or Ecology and Management.

The plant biology program includes a career experience/internship course (AGRO 295/RNGE 295/SOIL 295; BIOS 395; HORT 395/TLMT 395T; 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. Presentation of this work will be part of the Plant Biology Portfolio and Assessment course.

Students interested in plant biology through the College of Agricultural Sciences and Natural Resources are advised to make an initial appointment with the chief academic advisor, Dr. Don Lee, who will then assign them to a faculty member in the College of Agricultural Sciences and Natural Resources.

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 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 ensures 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, 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 (withdrew), 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 provide transcripts and complete the Application for Degree form via MyRED. Students without MyRED access may apply for graduation in person at Husker Hub in the Canfield Administration Building, or by mail. 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 and a 3+1 program leading to a bachelor of science in Applied Science.

**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 residence.

\(^1\) Includes courses taught by CASNR faculty through interdisciplinary prefixes (e.g., LIFE, MBIO, ENVR, SCIL, EAEF, 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 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 worldwide in plant biology.

**Major Requirements**

The core requirements and one of the options must be completed.

### Core Requirements

**College Integrative Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCIL 101</td>
<td>Science and Decision-Making for a Complex World</td>
<td>3</td>
</tr>
</tbody>
</table>

**Career Experience**

Select one of the following: 1

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

**Independent Study/Current Project**

Select one of the following: 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 496 / RNGE 496 / SOIL 496</td>
<td>Independent Study</td>
<td>1</td>
</tr>
<tr>
<td>BIOS 498</td>
<td>Independent Research in Biological Sciences</td>
<td>1</td>
</tr>
<tr>
<td>HORT 396</td>
<td>Current Projects and Topics in Horticulture</td>
<td>1</td>
</tr>
<tr>
<td>NRES 496</td>
<td>Independent Study</td>
<td>1</td>
</tr>
<tr>
<td>PLPT 496</td>
<td>Independent Study</td>
<td>1</td>
</tr>
<tr>
<td>AGRO 92 / HORT 92 / NRES 92</td>
<td>Plant Biology Portfolio and Assessment</td>
<td>0</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 5

**Mathematical and Statistics (ACE 3)**

<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

**Communications**

**Written Communication (ACE 1)**

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 150</td>
<td>Writing and Inquiry</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 151</td>
<td>Writing and Argument</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 254</td>
<td>Writing and Communities</td>
<td>1</td>
</tr>
<tr>
<td>JGEN 120</td>
<td>Basic Business Communication</td>
<td>1</td>
</tr>
<tr>
<td>JGEN 200</td>
<td>Technical Communication I</td>
<td>1</td>
</tr>
<tr>
<td>JGEN 300</td>
<td>Technical Communication II</td>
<td>1</td>
</tr>
</tbody>
</table>

**Oral Communication (ACE 2)**

Select one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMM 209</td>
<td>Public Speaking</td>
<td>1</td>
</tr>
<tr>
<td>COMM 286</td>
<td>Business and Professional Communication</td>
<td>1</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 6

**Natural Sciences**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 153 / HORT 153 / SOIL 153</td>
<td>Soil Resources</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 401 &amp; BIOL 401L</td>
<td>Elements of Biochemistry and Laboratory for Elements of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I (ACE 4)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 110</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 251 &amp; CHEM 253</td>
<td>Organic Chemistry I and Organic Chemistry I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 141</td>
<td>Elementary General Physics I</td>
<td>5</td>
</tr>
<tr>
<td>or PHYS 151</td>
<td>Elements of Physics</td>
<td>5</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 25

**Biological Sciences**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 215 / HORT 215 / TLMT 215</td>
<td>Genetics</td>
<td>4</td>
</tr>
<tr>
<td>AGRO 278</td>
<td>Botany</td>
<td>4</td>
</tr>
<tr>
<td>AGRO 325</td>
<td>Introductory Plant Physiology</td>
<td>4</td>
</tr>
<tr>
<td>NRES 220 &amp; NRES 222</td>
<td>Principles of Ecology and Ecology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>or BIOS 207</td>
<td>Ecology and Evolution</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>
</tbody>
</table>

Credit Hours Subtotal: 24

**Economics, Humanities and Social Sciences**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 211</td>
<td>Principles of Macroeconomics (ACE 6)</td>
<td>3</td>
</tr>
<tr>
<td>or ECON 212</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one course each from ACE outcomes 5, 7, 8, and 9 | 12 |

Credit Hours Subtotal: 15

**Option Requirements**

Complete requirements | 37 |

Credit Hours Subtotal: 37

Total Credit Hours: 120

**Ecology and Management Option**

Within this option one course must be taken to fulfill the ACE 10 outcome. Suggested courses are:

**ACE 10 Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 403 / HORT 403</td>
<td>Scientific Writing and Communication</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 454 / NRES 454</td>
<td>Ecological Interactions</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 457</td>
<td>Ecosystem Ecology</td>
<td>3</td>
</tr>
<tr>
<td>NRES 438</td>
<td>Grassland Conservation: Planning and Management</td>
<td>3</td>
</tr>
</tbody>
</table>

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 245 / NRES 245</td>
<td>Introduction to Grassland Ecology and Management</td>
<td>3-4</td>
</tr>
</tbody>
</table>
or NRES 310  Introduction to Forest Management  
AGRO 444 / NRES 444 / RNGE 444

Credit Hours Subtotal: 6-7

**Earth Sciences**

**Water/Climate**

Select one of the following: 3-4
- METR 100  Weather and Climate
- NRES 208  Applied Climate Sciences
- NRES 408 / AGRO 408 / GEOG 408 / HORT 408 / METR 408 / WATS 408
- WATS 281 / GEOG 281 / NRES 281

**Geospatial Information Sciences**

Select one of the following: 3-4
- GEOG 412 / NRES 412  Introduction to Geographic Information Systems
- GEOG 418 / NRES 418  Introduction to Remote Sensing
- NRES 312 / GEOG 312  Introduction to Spatial Sciences

Credit Hours Subtotal: 6-8

**Biology**

**Plant Identification**

AGRO 442 / NRES 442 / RNGE 442  Wildland Plants 3

**Plant-Animal-Organismal Interactions**

Select one of the following: 3-4
- AGRO 340 / RNGE 340  Range Management and Improvement
- AGRO 460 / BIOS 460 / NRES 460 / SOIL 460  Soil Microbiology
- BIOS 317  The Biology of Plants
- BIOS 368  Plants in Human Medicine: Biological, Social, and Ethical Dimensions
- BIOS 475  Avian Biology
- BIOS 476 / NRES 476  Mammalogy
- ENTO 115 / BIOS 115 / & ENTO 116 / BIOS 116  Insect Biology and Insect Identification
- NRES 211  Introduction to Conservation Biology
- NRES 311  Wildlife Ecology and Management
- NRES 348  Wildlife Damage Management

Credit Hours Subtotal: 6-7

**Ecology and Management**

Select two of the following: 7-8
- AGRO 204  Resource-Efficient Crop Management
- AGRO 240 / RNGE 240  Forage Crop and Pasture Management
- AGRO 440 / NRES 440 / RNGE 440  Great Plains Ecosystem
- BIOS 454 / NRES 454  Ecological Interactions
- BIOS 457 / Ecosystem Ecology
- BIOS 470  Prairie Ecology
- NRES 310  Introduction to Forest Management
- NRES 417 / HORT 418  Agroforestry Systems in Sustainable Agriculture
- NRES 424  Forest Ecology
- NRES 459 / BIOS 459 / WATS 459  Limnology
- NRES 468 / BIOS 458 / WATS 468  Wetlands

Credit Hours Subtotal: 7-8

**Electives**

Select 7-13 credits 7-13

Credit Hours Subtotal: 7-13

**Total Credit Hours** 32-43

**Biotechnology Option**

Within this option one course must be taken to fulfill the ACE 10 outcome. Suggested courses are:

**ACE 10 Courses**

- AGRO 403 / HORT 403  Scientific Writing and Communication
- BIOS 454 / NRES 454  Ecological Interactions
- BIOS 457  Ecosystem Ecology

**Required Courses**

- BIOS 312  Microbiology 3
- BIOS 478  Plant Anatomy 4

Select one of the following: 3-4
- BIOS 337  Applications of Bioinformatics
- BIOC 442 / STAT 442  Computational Biology
- BIOS 427  Practical Bioinformatics Laboratory

Select at least 3 hours from each of the three categories below for a total of 17 hours or more:

**Biological Sciences**

- AGRO 270 / HORT 270 / NRES 270 / PLPT 270  Biological Invaders
AGRO 434 / BIOC 434 / BIOS 434 / CHEM 434  
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 471  
or BIOS 429  
BIOS 477  

Applied Plant Biology  
AGRO 131 / HORT 131  
& AGRO 132  
or HORT 133  
AGRO 408 / GEOG 408 / HORT 408 / METR 408 / NRES 408 / WATS 408
AGRO 411  
AGRO 412  
BIOS 368  
HORT 221  
NRES 406 / HORT 406 / AGRO 406
PLPT 369 / BIOS 369  

Plant and Food System Management  
AGRO 204  
AGRO 240 / RNGE 240  
or AGRO 227  
HORT 227 / TLMT 227
AGRO 405  
or AGRO 435  
HORT 435 / NRES 435
AGRO 426 / HORT 426 / NRES 426
AGRO 437  
AGRO 438  
ENTO 115 / BIOS 115  
& ENTO 116 / BIOS 116
FDST 205  
HORT 306  
HORT 352  
HORT 355  
HORT 362  

Credit Hours Subtotal: 27-28

Electives  
Select 10-11 credits

Credit Hours Subtotal: 10-11

Total Credit Hours 37-39

Additional Major Requirements  

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

Pass/No Pass  
Students in plant biology may not take any of the core or option courses required for the degree Pass/No Pass except for the Exploring Plant Biology and Career Experience courses.

Program Assessment. To gauge the effectiveness of this program, students will be required to start and maintain an experiential portfolio throughout their program and complete an assessment survey.

Requirement for Minor Offered by Department  
Requirements for the minor include a minimum of 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 131 / HORT 131  
& HORT 133
AGRO 325  
AGRO 278  
Credit Hours Subtotal: 12

Focus  
Select one focus from the following: 7-8

Biotechnology Focus  
AGRO 215 / HORT 215 / TLMT 215

or BIOS 206 General Genetics

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

Ecology and Management Focus

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRES 220</td>
<td>Principles of Ecology</td>
</tr>
<tr>
<td>NRES 222</td>
<td>Ecology Laboratory</td>
</tr>
</tbody>
</table>

Select any 300- or 400-level course listed under the Plant Biology Major—Ecology & Management Option

Credit Hours Subtotal: 7

Total Credit Hours: 19

AGRO 100 Plants, Landscapes, & the Environment
Crosslisted with: HORT 100, TLMT 100
Description: Introduction to a diverse range of plant and landscape systems and management strategies for balancing economic and environmental sustainability. Foundational principles of plant biology, landscape ecology, and environmental science using real-world case studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
ACE: ACE 4 Science

AGRO 102 Internship and Career Preparation
Crosslisted with: HORT 102, TLMT 102
Description: Group and individual activities to help formulate career goals, improve academic success skills, identify beneficial co-curricular activities, and select appropriate internships.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Offered: FALL

AGRO 107 Invasive Plant Species: Impacts on Ecosystems
Crosslisted with: NRES 107
Notes: Online only
Description: The flora of the earth is constantly being re-distributed by natural and human forces. As plant species change locations, they affect ecosystems, but how? In this course, students will learn how invasive plants establish and spread in ecosystems and develop an understanding of the importance of invasive plants and their impacts on ecosystems from local to global scales.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
ACE: ACE 9 Global/Diversity

AGRO 131 Plant Science
Crosslisted with: HORT 131
Description: Biology of plants grown for food, fiber, fun, or fuel. Plant life cycles in managed ecosystems and their role in global carbon and water cycles. Mechanisms plants use to drive and control their growth, propagate, and change to compete with other organisms in their environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 134, HORT 134, TLMT 134; AGRO 204; AGRO 227, HORT 227, TLMT 227; AGRO 228, HORT 228, TLMT 228; AGRO 240, RNGE 240, GRAS 240; AGRO 278, HORT 278; BIOS 369, PLPT 369; HORT 212, NRES 212, LARC 212; HORT 352; HORT 353; HORT 354; HORT 355; HORT 362; NRES 220; NRES 302, HORT 302; NRES 310; PGAM 229
ACE: ACE 4 Science

AGRO 132 Agronomic Plant Science Laboratory
Prerequisites: AGRO 131 or parallel
Description: Growth, development, morphology and staging of annual and perennial monocot and dicot plants produced for grain, forage and grazing. Evaluation of seed, grain and forage quality for plants of agronomic importance.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Prerequisite for: AGRO 278, HORT 278; HORT 306; HORT 307

AGRO 134 Plant Sciences Laboratory
Crosslisted with: HORT 134, TLMT 134
Prerequisites: Prior or concurrent enrollment in AGRO/HORT 131 required.
Notes: Open to all majors and minors, except Agronomy or Horticulture.
Description: An exploration of plant morphology, physiology, and maturation with an emphasis on environmental, biotic, and human interactions within production and landscape systems. Not open to Agronomy or Horticulture majors or minors.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded
Prerequisite for: HORT 306; HORT 307

AGRO 127 Survey of Turfgrass and Landscape Management
Crosslisted with: TLMT 127, HORT 127
Description: Introduction to careers, internships and co-curricular activities in turfgrass and landscape management.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
AGRO 153 Soil Resources
Crosslisted with: HORT 153, SOIL 153
Prerequisites: High school chemistry or one semester college chemistry.
Description: Characteristics of soils in relation to their appropriate uses and protection. Principles and practices using cooperative exercises including discussion, assessment, planning, problem-solving, writing, and presentation involving all aspects of soils.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: AGRO 131 or AGRO/SOIL 153, or equivalents.

AGRO 204 Resource-Efficient Crop Management
Prerequisites: AGRO 131 and AGRO/SOIL 153, or equivalents.
Description: Integration of principles of crop and soil science, plant breeding, climatology and integrated pest management in the development and evaluation of crop management practices. Efficient use of solar radiation, water, nutrients, heat, carbon dioxide, and other resources in field crop management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 131 or AGRO/SOIL 153, or equivalents.

AGRO 215 Genetics
Crosslisted with: HORT 215, TLMT 215
Prerequisites: 3 hrs biological sciences.
Description: Discovery of the biology of genes and the application of genetics principles to understand the control and inheritance of traits in families and populations. Focus is on animals and plants that are important in medicine, agriculture and nature. Learning emphasis is problem solving via online, instant feedback assessments, group discussion, experimental data analysis and context-based exams.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: HORT 215, TLMT 215

AGRO 216 Plant Breeding Principles and Practice
Crosslisted with: HORT 216
Prerequisites: High school biology and chemistry. BIOS 101 and 101L or 102 or equivalent recommended.
Description: Plant breeding theory and technique. Application of genetic principles to plant improvement. Experience with breeding agronomic and horticultural plant species to illustrate plant mating systems and breeding principles.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option

AGRO 227 Introductory Turfgrass Management
Crosslisted with: HORT 227, TLMT 227
Prerequisites: AGRO/HORT 131 or AGRO 278 or either concurrently.
Description: Introduction to turfgrasses, their management and use, and to the turfgrass industry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327; TLMT 295; TLMT 395T

AGRO 228 Introduction to Landscape Management
Crosslisted with: HORT 228, TLMT 228
Prerequisites: AGRO/HORT 131 or AGRO/HORT 278 or either concurrently.
Notes: Uses a team approach to problem solving, discussion, assessment planning, and oral presentations of applied case studies.
Description: An overview of landscape management and landscape design. Principles and practices.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; TLMT 295; TLMT 395L

AGRO 229 Introductory Turfgrass Management Laboratory
Crosslisted with: HORT 229
Description: Laboratory covering turfgrass identification and management. Concurrent enrollment with AGRO/HORT/TLMT 227 preferred. Required for Turfgrass Science majors, other students require instructor consent.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AGRO 240 Forage Crop and Pasture Management
Crosslisted with: RNGE 240, GRAS 240
Prerequisites: AGRO/HORT 131 or BIOS 101 or LIFE 120
Description: Principles basic to the establishment, management, and utilization of forage crops and pastures. Plant identification and selection, seeding, fertilization, irrigation, forage quality and utilization, hay and silage preservation, and grazing management. The role of forages and ranges in developing a sustainable agriculture.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: AGRO 340, RNGE 340, GRAS 340; AGRO 395; AGRO 445, AGRO 845, ASCI 451, ASCI 851, RNGE 445, GRAS 445
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Crosslisted with</th>
<th>Prerequisites</th>
<th>Description</th>
<th>Credit Hours</th>
<th>Notes</th>
<th>Offered</th>
<th>Prerequisite for</th>
<th>Credit Hours</th>
<th>Notes</th>
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<tbody>
<tr>
<td>AGRO 242</td>
<td>North American Wildland Plants</td>
<td>HORT 242, RNGE 242, GRAS 242</td>
<td>Permission.</td>
<td>Identification and description of two-hundred important wildland plants of North America. Characteristics of these plants evaluated in terms of management implications.</td>
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<td>FALL/SPR</td>
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<tr>
<td>AGRO 245</td>
<td>Introduction to Grassland Ecology and Management</td>
<td>NRES 245</td>
<td>AGRO 153</td>
<td>Grassland ecology and management is relevant to students with education and career goals in managing natural resources in Nebraska and the Great Plains. About 50% of the land area in Nebraska is classified as grassland (or rangeland) and is the land type with the most opportunity for enhancing biodiversity and wildlife habitat. Applying ecological principles and social values to managing rangeland resources, students will develop a knowledge and appreciation for the various grassland management uses and techniques available to resource managers.</td>
<td>3</td>
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<td>FALL/SPR</td>
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<tr>
<td>AGRO 269</td>
<td>Principles of Soil Management</td>
<td>SOIL 269</td>
<td>AGRO 153</td>
<td>Principles of soil management under dryland and irrigated conditions. Relationships of soil and climate resources to soil erosion, movement and storage of soil water, soil organic matter, and irrigation practice. Special problem topics such as acidity, alkali, drainage, and soil testing.</td>
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<tr>
<td>AGRO 270</td>
<td>Biological Invaders</td>
<td>HORT 270, NRES 270, PLPT 270</td>
<td>3 hrs biological sciences.</td>
<td>Impact of exotic species and invasive organisms: agricultural and medical emerging disease; predicting biological invasions; biological control; regulatory, monitoring, and control efforts; ecological impact.</td>
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<td>FALL/SPR</td>
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<td>AGRO 275</td>
<td>Agribusiness Entrepreneurial Finance</td>
<td>AECN 275, EAEP 275, ENTR 275, HORT 275</td>
<td>AGRO/RNGE 240 recommended.</td>
<td>Overview of financial issues for agribusiness start-ups. Business funding specific to new enterprises. Case studies on financial practices for start-up firms.</td>
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<tr>
<td>AGRO 278</td>
<td>Botany</td>
<td>HORT 278</td>
<td>AGRO 153</td>
<td>Introduction to the plant kingdom and to plants as biological organisms; structure and function of cells, tissues, and organs with emphasis on seed plants; the important processes and concepts of life cycles, evolution, and physiology.</td>
<td>4</td>
<td></td>
<td>SPRING</td>
<td>AGRO 227, HORT 227, TLMT 227, AGRO 228, HORT 228, TLMT 228, HORT 221</td>
<td>4</td>
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<tr>
<td>AGRO 279</td>
<td>Soil Evaluation</td>
<td>NRES 279, SOIL 279</td>
<td>AGRO 153</td>
<td>Introduction to the plant kingdom and to plants as biological organisms; structure and function of cells, tissues, and organs with emphasis on seed plants; the important processes and concepts of life cycles, evolution, and physiology.</td>
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<td>AGRO 295</td>
<td>Internship</td>
<td>RNGE 295, SOIL 295, HORT 295</td>
<td>Sophomore standing and completion of an internship contract. The internship contract is subject to approval by the department. Internships completed without a signed contract may not qualify for credit.</td>
<td>Professional experience in a plant, landscape or soil interest area. Experience may be with a business, government agency, organization, or a university research, extension, or teaching program.</td>
<td>3</td>
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<td>SPRING</td>
<td>AECN 275, EAEP 275, ENTR 275, HORT 275, TLMT 275, HORT 275, HORT 228, TLMT 228, HORT 221</td>
<td>3</td>
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<tr>
<td>AGRO 325</td>
<td>Introductory Plant Physiology</td>
<td>AGRO 441, AGRO 841, HORT 441, HORT 841, RNGE 441, GRAS 441</td>
<td>AGRO 132 or HORT 132</td>
<td>Introduction to the plant kingdom and to plants as biological organisms; structure and function of cells, tissues, and organs with emphasis on seed plants; the important processes and concepts of life cycles, evolution, and physiology.</td>
<td>1-3</td>
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<td>FALL/SPR</td>
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</table>

AGRO/RNGE 240 recommended.
AGRO 326 Landscape Solutions
Crosslisted with: HORT 326, TLMT 326
Prerequisites: TLMT/AGRO/HORT 227 or 228
Description: Using processes and problem-solving approach to identify and analyze common landscape management situations in commercial, public, and residential landscapes. Integrate design, environment, function, pest and disease, and existing management practices to produce recommendations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 470, HORT 470, TLMT 470

AGRO 327 Turfgrass Science and Management
Crosslisted with: HORT 327, TLMT 327
Prerequisites: AGRO/HORT/SOIL 153; CHEM 105 or 109; and TLMT 227
Description: Scientific principles of turf species adaptation, turf and/or soil relationships, establishment, fertility, mowing, irrigation, and pest control of turf species.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 330 Pruning Ornamentals
Crosslisted with: HORT 330, TLMT 330
Description: Why, when and how to prune ornamental landscape plants. Demonstrations and field opportunities on how to choose and how to use pruning tools correctly.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AGRO 340 Range Management and Improvement
Crosslisted with: RNGE 340, GRAS 340
Prerequisites: AGRO 240.
Description: The principles of range management within the ecosystem framework. Range improvement practices and grazing systems; plant control using biological, chemical and mechanical factors; prescribed burning; range seeding; range fertilization; and the integration of range with other forage resources.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
Prerequisite for: AGRO 445, AGRO 845, ASCI 451, ASCI 851, RNGE 445, GRAS 445

AGRO 361 Soils, Environment and Water Quality
Crosslisted with: GEOL 361, NRES 361, SOIL 361, WATS 361
Prerequisites: AGRO/HORT/SOIL 153; MATH 102 or 103; two semesters chemistry (CHEM 105, 106 or CHEM 109,110) and WATS/GEOL/NRES 281
Description: Chemical and physical processes that influence the fate and transport of contaminants (inorganic, organic, microbial) in soil-water environments. Extent, fate, mitigation and impact of various sources of pollution. Remedial technologies used for environmental restoration of contaminated environments.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 458, AGRO 858, NRES 458, NRES 858, SOIL 458

AGRO 366 Soil Nutrient Relationships
Crosslisted with: SOIL 366
Prerequisites: AGRO 153.
Description: Use of fertilizers as plant nutrient sources to produce healthy and nutritious plants, improve profit, insure enterprise sustainability, fulfill legal requirements, and protect soil and water quality. Addresses issues from production agriculture, natural resource utilization and preservation, and ornamental plant culture.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

AGRO 375 Innovations for Agriculture
Crosslisted with: HORT 375, AGRI 375, EAEP 375, TLMT 375
Description: Explore sustainability challenges in plant and animal agricultural systems, assess current solutions, and identify opportunities for innovation. Research, develop, prototype, test, and pitch an innovative product, service, or technology for agriculture.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

AGRO 388 Business Systems in Entrepreneurship
Crosslisted with: HORT 388, ENTR 388, EAEP 388, ABUS 388
Description: Introductory models for a startup business. Ideation, customer segments, value proposition, minimal viable product and market fit.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: HORT 301
AGRO 395 Internship in Agronomy
Prerequisites: Junior standing; AGRO 204 or 240 or 269; and completion of an internship contract. Internships completed without a signed contract not may qualify for credit.
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Advanced internship in an agronomic enterprise. Must be a business, government agency, organization or university research, teaching, or extension program in which the student does not have previous internship credit.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR
AGRO 403 Scientific Writing and Communication
Crosslisted with: AGRO 803, HORT 403, HORT 803
Prerequisites: Senior standing or higher, an ACE 1 written communication course, an ACE 2 oral communication course, and permission of instructor.
Description: Reading and critiquing, writing, and presenting scientific information. Use research data to compose a manuscript in standard scientific format, and prepare and present a poster to a general audience. Ethical issues in research and writing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
ACE: ACE 10 Integrated Product
AGRO 405 Crop Management Strategies
Prerequisites: Senior standing; AGRO 204, AGRO/SOIL 269; and permission.
Notes: JGEN 200 and/or JGEN 300, and AECN 201 recommended
Description: Application, expansion, and integration of principles from agricultural, biological, and physical sciences into the development and management of cropping systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
ACE: ACE 10 Integrated Product
AGRO 406 Plant Ecophysiology: Theory and Practice
Crosslisted with: AGRO 806, HORT 406, HORT 806, NRES 406, NRES 806
Prerequisites: Junior standing; 4 hrs ecology, and 4 hrs botany or plant physiology.
Description: Principles of plant physiology which underlie the relationship between plants and their physical, chemical and biotic environments. An introduction to the ecological niche, limiting factors and adaptation. An overview of the seed germination and ecology, plant and soil water relations, nutrients, plant energy budgets, photosynthesis, carbon balance and plant-animal interactions. An introduction to various field equipment used in ecophysiological studies.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
AGRO 408 Microclimate: The Biological Environment
Crosslisted with: GEOG 408, HORT 408, METR 408, NRES 408, WATS 408, AGRO 808, GEOG 808, HORT 808, METR 808, NRES 808
Prerequisites: Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering.
Description: Physical factors that create the biological environment. Radiation and energy balances of earth’s surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 907, HORT 907, METR 907, NRES 907; BSEN 954, NRES 954
Groups: Physical Geography
AGRO 409A Case studies in plant breeding: Breeding for Disease Resistance
Crosslisted with: AGRO 809A, HORT 409A, HORT 809A
Description: The application of fundamental genetics principles in inheritance, gene mapping and DNA analysis to decision making by plant breeders with the goal of improving disease resistance in crop cultivars. Learning is structured by the genetics discovery story told in published research articles and the thinking process of plant breeders who will use these discoveries in their work.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded
AGRO 409B Case Studies in plant breeding: Transgenic strategies for disease resistance
Crosslisted with: AGRO 809B, HORT 409B, HORT 809B
Description: The application of basic science and technology by plant genetic engineering experts with the goal of teaming with plant breeders to improve disease resistance in crop cultivars. Learning is structured by the genetics discovery story told in published research articles and the thinking process of genetic engineers and plant breeders who will use these discoveries in their work.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded
AGRO 411 Crop Genetic Engineering
Crosslisted with: AGRO 811
Description: Basic steps required to produce genetically engineered crops. Genetic engineering procedures used to develop current crops and innovations that will lead to future products. Genetic engineering process and predicting how changes in different steps of the process influence the final crop. Application of genetic engineering technology to plan the development of new genetically engineered crops.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
AGRO 412 Crop and Weed Genetics
Crosslisted with: AGRO 812
Notes: A previous class in Genetics is highly recommended.
Description: Application of classical and molecular genetic principles to the explanation of variation observed in plant families and populations. Interpretation of information gathered from whole plant trait observation and from molecular analysis. Relationships between crops and weeds. Examples from genetic studies on both crop and weed species are the basis of course.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

AGRO 414 Turfgrass Disease Management
Crosslisted with: AGRO 814, HORT 414, HORT 814, PLPT 414, PLPT 814, TLMT 414, TLMT 814
Prerequisites: BIOS/PLPT 369 or one semester of introductory plant pathology.
Description: Pathogens, epidemiology, and control of diseases specific to turfgrass.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AGRO 419 Applications of Remote Sensing in Agriculture and Natural Resources
Crosslisted with: GEOG 419, GEOL 419, NRES 420, AGRO 819, GEOG 819, GEOL 819, NRES 820
Notes: GEOG 418/NRES 418 recommended
Description: Introduction to the practical uses of remote electromagnetic sensing in dealing with agricultural and water-resources issues.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Groups: Techniques

AGRO 420 Bioinformatics Applications in Agriculture
Crosslisted with: AGRO 820
Prerequisites: AGRO 215 Genetics or equivalent. Undergraduate students must be at the senior class level standing.
Description: Introduction to applied computational methods to analyze biological data, efficiently manipulate large data sets, and automate workflows using Perl and Shell scripting. Learn strategies for assembling and analyzing data generated by modern high throughput sequencing platforms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

AGRO 426 Invasive Plants
Crosslisted with: AGRO 826, HORT 426, HORT 826, NRES 426, NRES 826
Prerequisites: AGRO/HORT/SOIL 153; AGRO/HORT 131
Description: Identification, biology and ecology of weedy and invasive plants. Principles of invasive plant management by preventative, cultural, biological, mechanical and chemical means using an adaptive management framework. Herbicide terminology and classification, plant-herbicide and soil-herbicide interactions, equipment calibration and dosage calculations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 427 Turfgrass Systems Management
Crosslisted with: HORT 427, TLMT 427, AGRO 827, HORT 827, TLMT 827
Prerequisites: TLMT 227 and TLMT 327
Description: Critical evaluation of turfgrass settings to create economical and environmentally friendly management systems for professionally managed turf areas.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

AGRO 429 Plant Biotechnology Applications
Crosslisted with: AGRO 829
Prerequisites: Faculty Permission
Description: Application of plant biotechnology to answer biological questions. Development of writing and thinking skills with a working knowledge of plant biology and biotechnology. Learning in a lab focused setting to solidify skills used in molecular biology, biochemistry, cell biology, and computational biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

AGRO 429A Food Security: A Global Perspective
Prerequisites: Junior standing
Description: Overview of the technical and sociocultural dimensions of global food insecurity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

AGRO 431 Site-specific Crop Management
Crosslisted with: AGEN 431, MSYM 431
Prerequisites: Senior standing; AGRO/SOIL 153; AGRO 204.
Description: Principles and concepts of site-specific management. Evaluation of geographic information systems for crop production practices. Practical experience with hardware and software necessary for successful application of information affecting crop management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
AGRO 434 Plant Biochemistry
Crosslisted with: BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834
Prerequisites: BIOC/BIOS/Chemistry 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

AGRO 435 Agroecology
Crosslisted with: AGRO 835, HORT 435, NRES 435, NRES 835
Prerequisites: For AGRO/HORT/NRES 435: Senior standing. For AGRO/NRES 835: 12 hrs biological or agricultural sciences.
Description: Integration of principles of ecology, plant and animal sciences, crop protection, and rural landscape planning and management for sustainable agriculture. Includes natural and cultivated ecosystems, population and community ecology, nutrient cycling, pest management, hydrologic cycles, cropping and grazing systems, landscape ecology, biodiversity, and socioeconomic evaluation of systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 436 Agroecosystems Analysis
Crosslisted with: AGRO 836, HORT 436, HORT 836
Prerequisites: Senior standing.
Notes: Cost of travel required. Summer travel course with multi-state faculty. Farm visits to Iowa, Minnesota and Nebraska.
Description: Analysis of production, economics, environmental impacts, and social integration aspects of farms and farming systems
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 437 Animal, Food and Industrial Uses of Grain
Crosslisted with: AGRO 837
Prerequisites: CHEM 105 or 109, and one of the following: AGRO 204 or ASCI 250.
Description: Identification and comparison of grain quality characteristics desired by livestock feeders, human food processors and industrial users, and methods used to measure these characteristics.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option

AGRO 438 Producing Grain for Animal, Food and Industrial Uses
Crosslisted with: AGRO 838
Prerequisites: CHEM 109 and one of the following: AGRO 204 or ASCI 250.
Notes: AGRO 215 and 437/837 recommended.
Description: Genetic development, production practices, and grain handling and storage procedures to deliver quality grain to livestock feeders, human food processors and industrial uses.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AGRO 439 Organic Farming and Food Systems
Crosslisted with: AGRO 839, HORT 439, HORT 839
Prerequisites: 12 credits of agricultural or biological science, economics, or natural resources
Description: History of organic farming and horticultural systems, organic certification, nutrient and pest management in organic systems, planning organic enterprises including production and marketing, resilience of organic systems in ecological, economic, and social terms; future issues and potentials of organic food systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 440 Great Plains Ecosystem
Crosslisted with: AGRO 840, NRES 840, RNGE 440, NRES 440, GRAS 440
Prerequisites: Junior standing.
Notes: BIS 101 and 101L, or equivalent, recommended.
Description: Characteristics of Great Plains ecosystems, interrelationships of ecological factors and processes, and their application in the management of grasslands. Interactions of fire, vegetation, grazing animals and wildlife.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING

AGRO 441 Perennial Plant Function, Growth, and Development
Crosslisted with: AGRO 841, HORT 441, HORT 841, RNGE 441, GRAS 441
Prerequisites: AGRO 325 or equivalent.
Description: Principles of crop physiology and developmental morphology in relation to function, growth, development, and survival of perennial forage, range, and turf plants. The relationship of physiology and morphological development on plant use and management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
AGRO 442 Wildland Plants
Crosslisted with: AGRO 842, NRES 842, RNGE 442, NRES 442, GRAS 442
Prerequisites: Junior standing.
Notes: BIOS 101 and 101L, or equivalent, recommended.
Description: Wildland plants that are important to grassland and shrubland ecosystem management and production. Distribution, utilization, classification, identification (including identification by vegetative parts), uses by Native Americans, and recognition of grasses, forbs, shrubs, exotic and wetland plants.
Credit Hours: 3
Max credits per semester: 3
Grading Option: Graded with Option
Offered: FALL

AGRO 444 Ecosystem Monitoring and Assessment
Crosslisted with: AGRO 844, NRES 844, RNGE 444, NRES 444, GRAS 444
Prerequisites: Junior standing.
Notes: NRES 220 or equivalent, recommended.
Description: Measurement and monitoring of the important vegetation and environmental factors used to develop management guidelines in grasslands, savannas, woodlands, and wetlands. Emphasis on using ecosystem monitoring protocols for assessment of wildlife habitat, fuels management for wild-land fire, livestock production, and watershed function. Requires field sampling and travel to local field sites.
Credit Hours: 3
Max credits per semester: 3
Grading Option: Graded with Option
Offered: FALL

AGRO 445 Livestock Management on Range and Pasture
Crosslisted with: AGRO 845, ASCI 451, ASCI 851, RNGE 445, GRAS 445
Prerequisites: ASCI 250 and AGRO 240 or 340; AECN 201 recommended.
Notes: AECN 201 recommended. Capstone course. All students required to participate in a one-week field trip in central or western Nebraska prior to beginning of fall semester. Therefore, students must notify instructor at time of early registration (Dates are given in class schedule.)
Description: Analyzing the plant and animal resources and economic aspects of pasturage. Management of pasture and range for continued high production emphasized.
Credit Hours: 3
Max credits per semester: 3
Grading Option: Graded with Option
Offered: FALL

AGRO 450 Climate and Society
Crosslisted with: GEOG 450, METR 450, NRES 452, AGRO 850, GEOG 850, METR 850, NRES 852
Prerequisites: Junior standing or above.
Notes: Offered spring semester of even-numbered calendar years.
Description: Impact of climate and extreme climatic events on society and societal responses to those events. Global in scope and interdisciplinary.
Credit Hours: 3
Max credits per semester: 3
Grading Option: Graded with Option
Offered: SPRING
Groups: Physical Geography

AGRO 452 Irrigation Systems Management
Crosslisted with: MSYM 452, MSYM 852, WATS 452
Prerequisites: MSYM 109 or PHYS 141 or PHYS 151 or PHYS 211
Notes: AGRO/SOIL 153 recommended.
Description: Irrigation management and the selection, evaluation, and improvement of irrigation systems. Includes soil-water measurement, crop water use, irrigation scheduling, irrigation efficiency, measurement of water flow, irrigation systems, groundwater and wells, pumping systems, applying chemicals with irrigation systems, and environmental and water resource considerations.
Credit Hours: 3
Max credits per semester: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: AGEN 854, MSYM 854; AGEN 955, AGRO 955, CIVE 955, GEOL 985; MSYM 855

AGRO 453 Urban Soil Properties and Management
Crosslisted with: HORT 453, LARC 453, SOIL 453
Prerequisites: AGRO/HORT/SOIL 153.
Description: Characteristics of soils in urban settings. Evaluation of soils intended for intensive human uses. Manipulation and remediation of soils subject to construction and other stresses.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 455 Soil Chemistry and Mineralogy
Crosslisted with: AGRO 855, NRES 455, NRES 855, SOIL 455
Prerequisites: AGRO/HORT/SOIL 153 or GEOL 101; CHEM 109 and 110; CHEM 221 or 251; or equivalent.
Description: Chemical and mineralogical properties of soil components. Inorganic colloidal fraction. Structures of soil minerals as a means of understanding properties, such as ion exchange and equilibria; release and supply of nutrient and toxic materials; and soil acidity and alkalinity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 458 Soil Physical Determinations
Crosslisted with: AGRO 858, NRES 458, NRES 858, SOIL 458
Prerequisites: SOIL/AGRO/GEOL/WATS 361; PHYS 141 or equivalent; MATH 102 or 103.
Description: Survey of measurement techniques and principles used in characterizing the physical properties of soils. Includes analysis of experimental design and sources of experimental error. Techniques include: particle size analysis, soil water content, pore size analysis, field sampling techniques, soil strength, and saturated hydraulic conductivity.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
AGRO 460 Soil Microbiology
Crosslisted with: BIOS 460, NRES 460, SOIL 460, AGRO 860, BIOS 860, NRES 860
Prerequisites: One semester microbiology; one semester biochemistry or organic chemistry.
Description: Soil from a microbe's perspective-growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S, and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil microorganisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered:
AGRO 461 Soil Physics
Crosslisted with: GEOL 461, NRES 461, SOIL 461, WATS 461, AGRO 861, GEOL 861, NRES 861
Prerequisites: AGRO/SOIL 153; PHYS 141 or equivalent, one semester of calculus.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGEN 955, AGRO 955, CIVE 955, GEOL 985
AGRO 469 Bio-Atmospheric Instrumentation
Crosslisted with: GEOG 469, HORT 407, METR 469, MSYM 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, MSYM 869, NRES 869
Prerequisites: Junior standing; MATH 106; 4 hrs physics; physical or biological science major.
Description: Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO/HORT/SOIL 153 or equivalent; MATH 104 or MATH 106 or equivalent.
Description: Emphasis on applied soil physics. Discussion of theoretical principles followed by field and laboratory exercises and applications. Fluxes of water, solutes, air, and heat through the soil. Emphasis on water infiltration, water retention, other soil hydraulic properties. Components of soil water balance. Management of soil water.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
AGRO 475 Water Quality Strategy
Crosslisted with: NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 875, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, MSYM 475, MSYM 875, POLS 475, POLS 875
Prerequisites: Senior standing.
Notes: Capstone course.
Description: Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Groups: American Government&Public Pol
AGRO 477 Great Plains Field Pedology
Crosslisted with: GEOG 467, NRES 477, SOIL 477, GEOG 867, NRES 877
Prerequisites: AGRO/SOIL 153.
Description: Spatial relationship of soil properties on various parts of landscape typical of the Plains, causal factors, and predictions of such relationships on other landscapes. Grouping these properties into classes, naming the classes, and the taxonomy that results from this grouping. Application of a taxonomy to a real situation through making a field soil survey in a region representative of the Plains border; predicting land use response of various mapped units as it affects the ecosystem, and evaluating the effectiveness of the taxonomic system used in the region surveyed.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: BIOS 879
AGRO 478 Plant Anatomy
Crosslisted with: BIOS 878, AGRO 878, HORT 878
Prerequisites: 8 hrs biological sciences
Notes: BIOS 109 recommended.
Description: Development, structure, and function of tissues and organs of the higher plants. Relationships of structure to physiology and ecology of plants.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: BIOS 879
AGRO 480 Modified Rootzones
Crosslisted with: HORT 480, TLMT 480, TLMT 880, AGRO 880, HORT 880
Notes: Offered as a five-week course.
Description: Modified rootzones and their applications in the turfgrass and landscape management industry. Correct applications and construction techniques.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AGRO 484 Water Resources Seminar
Crosslisted with: GEOG 484, GEOL 484, NRES 484, WATS 484, NRES 884, AGRO 884, GEOG 884, GEOL 884, WATS 884
Prerequisites: Junior or above standing
Description: Seminar on current water resources research and issues in Nebraska and the region.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

AGRO 488 Entrepreneurship and Enterprise Development
Crosslisted with: HORT 488, HORT 888, EAEP 488, ENTR 488, EAEP 888, AGRO 888, ENTR 888, ABUS 488
Description: The process of starting your own enterprise. Competitive environment, risk management, finance for business startups, funding, and business plan writing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
ACE: ACE 10 Integrated Product

AGRO 489 Urbanization of Rural Landscapes
Crosslisted with: AGRO 889, CRPL 489, HORT 489, HORT 889, CRPL 889
Prerequisites: Senior standing or graduate standing.
Description: Development converts rural landscapes into housing, roads, malls, parks, and commercial uses. This process fragments landscapes and changes ecosystem functions, drives up land prices, and pushes agriculture into more marginal areas. This multi-disciplinary, experiential course guides students in learning about the urbanization process, the impacts on landscapes, people, and the community, and the choices that are available to informed citizens.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 496 Independent Study
Crosslisted with: AGRO 896, RNGE 496, SOIL 496
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Grading Option: Graded with Option

AGRO 498 Senior Project
Crosslisted with: SOIL 498
Prerequisites: Senior standing.
Notes: A two-semester sequence. Students should select one credit hour the first semester and three credits the second semester. The first semester will be used for planning, topic selection, and identifying a project adviser. The second semester will be used to carry out the research project, prepare a written report, and possibly an oral presentation.
Description: Carry out and report on a research project.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

AGRO 499H Honors Thesis
Crosslisted with: RNGE 499H, SOIL 499H
Prerequisites: Admission to the University Honors Program and permission.
Notes: AGRI 299H recommended.
Description: Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.
Credit Hours: 3-6
Min credits per semester: 3
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded

HORT 100 Plants, Landscapes, & the Environment
Crosslisted with: AGRO 100, TLMT 100
Description: Introduction to a diverse range of plant and landscape systems and management strategies for balancing economic and environmental sustainability. Foundational principles of plant biology, landscape ecology, and environmental science using real-world case studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
ACE: ACE 4 Science

HORT 102 Internship and Career Preparation
Crosslisted with: AGRO 102, TLMT 102
Description: Group and individual activities to help formulate career goals, improve academic success skills, identify beneficial co-curricular activities, and select appropriate internships.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Offered: FALL
HORT 127 Survey of Turfgrass and Landscape Management  
Crosslisted with: TLMT 127, AGRO 127  
Description: Introduction to careers, internships and co-curricular activities in turfgrass and landscape management.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Grading Option: Graded with Option  

HORT 131 Plant Science  
Crosslisted with: AGRO 131  
Description: Biology of plants grown for food, fiber, fun, or fuel. Plant life cycles in managed ecosystems and their role in global carbon and water cycles. Mechanisms plants use to drive and control their growth, propagate, and change to compete with other organisms in their environment.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Prerequisite for: AGRO 134, HORT 134, TLMT 134; AGRO 204; AGRO 227, HORT 227, TLMT 227; AGRO 228, HORT 228, TLMT 228; AGRO 240, RNGE 240, GRAS 240; AGRO 278, HORT 278; BIOS 369, PLPT 369; HORT 212, NRES 212, LARC 212; HORT 352; HORT 353; HORT 354; HORT 355; HORT 362; NRES 302, HORT 302; NRES 310; PGAM 229  
ACE: ACE 4 Science  

HORT 133 Horticultural Plant Science Laboratory  
Prerequisites: AGRO 131 or parallel  
Description: Growth, anatomy, morphology and physiology of fruits, vegetables, woody plants, ornamentals and turf. Emphasis on both field and greenhouse grown horticultural plants.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Grading Option: Graded with Option  
Prerequisite for: AGRO 278, HORT 278; HORT 306; HORT 307; HORT 355  

HORT 134 Plant Sciences Laboratory  
Crosslisted with: AGRO 134, TLMT 134  
Prerequisites: Prior or concurrent enrollment in AGRO/HORT 131 required  
Notes: Open to all majors and minors, except Agronomy or Horticulture.  
Description: An exploration of plant morphology, physiology, and maturation with an emphasis on environmental, biotic, and human interactions within production and landscape systems. Not open to Agronomy or Horticulture majors or minors.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Grading Option: Graded  
Prerequisite for: HORT 306; HORT 307  

HORT 153 Soil Resources  
Crosslisted with: AGRO 153, SOIL 153  
Prerequisites: High school chemistry or one semester college chemistry.  
Description: Characteristics of soils in relation to their appropriate uses and protection. Principles and practices using cooperative exercises including discussion, assessment, planning, problem-solving, writing, and presentation involving all aspects of soils.  
Credit Hours: 4  
Max credits per semester: 4  
Max credits per degree: 4  
Grading Option: Graded with Option  
Prerequisite for: AGEN 431, AGRO 431, MSYM 431; AGRO 204; AGRO 269, SOIL 269; AGRO 327, HORT 327, TLMT 327; AGRO 361, GEOL 361, NRES 361, SOIL 361, WATS 361; AGRO 366, SOIL 366; AGRO 453, HORT 453, LARC 453, SOIL 453; AGRO 455, AGRO 855, NRES 455, NRES 855, SOIL 455; AGRO 472, AGRO 872, NRES 472, NRES 872, SOIL 472, WATS 472; LARC 487, NRES 487; MSYM 354, SOIL 354, WATS 354; NRES 245, AGRO 245, NRES 319  

HORT 170 Residential Landscape Design  
Description: Introductory course in home landscaping focusing on basic design elements and processes. Students prepare a program, analyze a dwelling and site, determine a phased budget, conceptualize a layout, and select detailed elements and techniques to implement a design for an actual residence.  
Credit Hours: 2  
Max credits per semester: 2  
Max credits per degree: 2  
Grading Option: Graded with Option  

HORT 200 Landscape and Environmental Appreciation  
Crosslisted with: GEOG 200, LARC 200  
Description: Values and processes in human landscapes and natural environments. Concepts and tools to understand the context of local and global environments and significant historical landscapes. Landscape as an indicator of aesthetic quality, design principles and processes as integrators of humans and nature, and the garden as a model for creating sustainable landscapes.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Prerequisite for: HORT 265, HORT 267  
ACE: ACE 9 Global/Diversity ACE 7 Arts  
Groups: Human-Economic Geography  

HORT 201 Dendrology: Study and Identification of Trees and Shrubs  
Crosslisted with: NRES 201, LARC 201  
Description: An introduction to the naming, identification, and natural history of woody trees and shrubs in North American with emphasis on trees common to Nebraska. Covers morphology, natural site conditions, wildlife and human uses of woody trees and shrubs.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Offered: FALL
HORT 212 Landscape Plants I
Crosslisted with: NRES 212, LARC 212
Prerequisites: HORT 131
Notes: Requires Saturday off-campus field trips.
Description: Identification using botanical and common names for
herbaceous annuals, perennials, grasses, ground covers, vines, trees, and
shrubs commonly found in Great Plains gardens, parks, and landscapes
is stressed through field visits.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: ARCH 467, ARCH 567, ARCH 867, LARC 467, HORT 467;
HORT 213, NRES 213, LARC 213

HORT 213 Landscape Plants II
Crosslisted with: NRES 213, LARC 213
Prerequisites: HORT/LARC/NRES 212.
Notes: Continuation of HORT/LARC/NRES 212.
Description: Site requirements, landscape use, natural history, and
specific needs of herbaceous ornamentals, grasses, ground covers, vines,
trees, and shrubs commonly found in Great Plains gardens, parks, and
landscapes. Common cultivars and additional species not covered in
HORT/LARC/NRES 212.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 214 Herbaceous Landscape Plants
Crosslisted with: NRES 214
Description: Identification of herbaceous plants with ornamental value
in the landscape including native and introduced annuals, perennials,
grasses and cultivars. Typical ecological associations, environmental
tolerances and/or intolerance, cultural requirements, and design
characteristics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 215 Genetics
Crosslisted with: AGRO 215, TLMT 215
Prerequisites: 3 hrs biological sciences
Description: Discovery of the biology of genes and the application of
genetics principles to understand the control and inheritance of traits
in families and populations. Focus is on animals and plants that are
important in medicine, agriculture and nature. Learning emphasis
is problem solving via online, instant feedback assessments, group
discussion, experimental data analysis and context-based exams.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: ASCI 330; ASCI 486

HORT 216 Plant Breeding Principles and Practice
Crosslisted with: AGRO 216
Prerequisites: High school biology and chemistry. BIOS 101 and 101L or
102 or equivalent recommended.
Description: Plant breeding theory and technique. Application of genetic
principles to plant improvement. Experience with breeding agronomic
and horticultural plant species to illustrate plant mating systems and
breeding principles.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option

HORT 221 Plant Propagation
Prerequisites: AGRO/HORT 278 taken previously or concurrently
Description: Principles and practices involved in sexual and asexual
propagation of herbaceous and woody plants. Laboratory work includes
actual practice to gain skill and experience on the different methods of
propagating plants.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
Prerequisite for: HORT 362; HORT 395

HORT 222 Introductory Turfgrass Management
Crosslisted with: AGRO 227, TLMT 227
Prerequisites: AGRO/HORT 131 or AGRO 278 or either concurrently.
Description: Introduction to turfgrasses, their management and use, and
to the turfgrass industry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327,
TLMT 327; TLMT 295; TLMT 395T

HORT 223 Introductory Turfgrass Management Laboratory
Crosslisted with: AGRO 228, TLMT 228
Prerequisites: AGRO/HORT 131 or AGRO/HORT 278 or either concurrently.
Notes: Uses a team approach to problem solving, discussion,
assessment planning, and oral presentations of applied case studies.
Description: An overview of landscape management and landscape
design. Principles and practices.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327,
TLMT 327; TLMT 295; TLMT 395T

HORT 224 Introductory Turfgrass Management Laboratory
Crosslisted with: AGRO 228, TLMT 228
Prerequisites: AGRO/HORT 131 or AGRO/HORT 278 or either concurrently.
Notes: Requires SAT/ACT field trips.
Description: Laboratory covering turfgrass identification and
management. Concurrent enrollment with AGRO/HORT/TLMT 227
preferred. Required for Turfgrass Science majors, other students require
instructor consent.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
HORT 242 North American Wildland Plants
Crosslisted with: AGRO 242, RNGE 242, GRAS 242
Prerequisites: Permission.
Notes: AGRO/RNGE 240 recommended.
Description: Identification and description of two-hundred important wildland plants of North America. Characteristics of these plants evaluated in terms of management implications.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 4
Grading Option: Graded with Option
Offered: FALL/SPR

HORT 261 Floral Design I
Description: Principles of floral design and retail florist shop management, while offering practical experience in all aspects of flower arranging. Includes identification, care and handling, marketing and critiquing of floral designs.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: HORT 262
ACE: ACE 7 Arts

HORT 262 Floral Design II
Prerequisites: HORT 261 or permission.
Description: Advanced styles of floral design, foliage plant care and retail shop layout, as well as practical business knowledge in managing a small business. Topics include personnel, advertising, sales and floral marketing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 265 Visual Communication for Landscape Design
Prerequisites: HORT 200.
Description: Graphic and oral presentation techniques for landscape design; sketching; introduction to use of various media and computers for visual communication and landscape analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: HORT 267

HORT 267 Introduction to Landscape Design Studio
Prerequisites: HORT 200, HORT 265 or permission
Notes: Requires individual and team projects, studio critiques, presentations, and may require off-campus site visits outside of scheduled class time.
Description: Introduction to the process and elements of landscape design.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: HORT 300; HORT 301; TLMT 395L
Groups: Techniques

HORT 270 Biological Invaders
Crosslisted with: AGRO 270, NRES 270, PLPT 270
Prerequisites: 3 hrs biological sciences.
Description: Impact of exotic species and invasive organisms: agricultural and medical emerging disease; predicting biological invasions; biological control; regulatory, monitoring, and control efforts; ecological impact.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 275 Agribusiness Entrepreneurial Finance
Crosslisted with: AECN 275, EAEP 275, ENTR 275, AGRO 275
Description: Overview of financial issues for agribusiness start-ups. Business funding specific to new enterprises. Case studies on financial practices for start-up firms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 278 Botany
Crosslisted with: AGRO 278
Prerequisites: BIOS 101 and 101L or LIFE 120 and LIFE 120L or AGRO/HORT 131 and AGRO 132 or HORT 133.
Description: Introduction to the plant kingdom and to plants as biological organisms; structure and function of cells, tissues, and organs with emphasis on seed plants; the important processes and concepts of life cycles, evolution, and physiology.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Offered: SPRING
Prerequisite for: AGRO 227, HORT 227, TLMT 227; AGRO 228, HORT 228, TLMT 228; HORT 221

HORT 295 Internship
Crosslisted with: AGRO 295, RNGE 295, SOIL 295
Prerequisites: Sophomore standing and completion of an internship contract. The internship contract is subject to approval by the department. Internships completed without a signed contract may not qualify for credit.
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Professional experience in a plant, landscape or soil interest area. Experience may be with a business, government agency, organization, or a university research, extension, or teaching program.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR
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<thead>
<tr>
<th>Course</th>
<th>Prerequisites</th>
<th>Description</th>
<th>Credit Hours</th>
<th>Max credits per semester</th>
<th>Max credits per degree</th>
<th>Grading Option</th>
<th>Offered</th>
<th>ACE</th>
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<tbody>
<tr>
<td>HORT 300 Introduction to Landscape Construction</td>
<td>HORT 267 or concurrent</td>
<td>Uses landscape contracting business and administration of contracts, cost estimation and bidding.</td>
<td>3</td>
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<td>Graded with Option</td>
<td>SPRING</td>
<td>ACE 9 Global/Diversity</td>
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<tr>
<td>HORT 301 Introduction to Landscape Contracting</td>
<td>HORT 267 and HORT 388 or concurrent</td>
<td>Provides field trips to landscape installation sites.</td>
<td>3</td>
<td>3</td>
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<td>Graded</td>
<td>SPRING</td>
<td>ACE</td>
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<tr>
<td>HORT 302 Tree Biology</td>
<td>BIOS 101 or LIFE 120 or HORT 131</td>
<td>Studies the structure and function of woody plants, with a focus on trees growing in temperate climates.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Graded with Option</td>
<td>FALL</td>
<td>ACE</td>
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<tr>
<td>HORT 306 Greenhouse Practices and Management</td>
<td>AGRO 132 or HORT 133 or AGRO/HORT 134 or LIFE 120</td>
<td>Principles and practices involved in operation and use of greenhouses and other controlled plant growth environments.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Graded with Option</td>
<td>FALL</td>
<td>ACE</td>
</tr>
<tr>
<td>HORT 307 Hydroponics for Growing Populations</td>
<td>AGRO 132 or AGRO 134 or HORT 133 or LIFE 120</td>
<td>Globally diverse peoples are explored through culture, diets, food production systems, and environment with emphasis on the application of hydroponic plant production systems to address food needs that are culturally conscious. Hydroponic methodologies are investigated and prototypes are designed, built, and tested for proof of concept.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Graded</td>
<td>FALL/SPRING</td>
<td>ACE</td>
</tr>
<tr>
<td>HORT 319 Edible Landscapes</td>
<td>Junior Standing or permission</td>
<td>Identification, environmental requirements, and sustainable care and management of herbaceous perennial and woody plants with both edible and aesthetic landscape value. Historical and human cultural ties or ethnobotanical traditions associated with the plants will be utilized for appropriate plant selection and use.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Graded with Option</td>
<td>SPRING</td>
<td>ACE</td>
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<tr>
<td>HORT 321 Arboriculture: Maintenance &amp; Selection of Landscape Trees</td>
<td>HORT 267 and HORT 388 or concurrent</td>
<td>Covers practical application of the science of tree growth, development, and management in human dominated landscapes. Tree selection for varying landscapes and objectives, proper planting and pruning, identification and correction of tree defects, and working with tree pest issues.</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>Graded with Option</td>
<td>SPRING</td>
<td>ACE</td>
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<tr>
<td>HORT 326 Landscape Solutions</td>
<td>AGRO 326, TLMT 326</td>
<td>Uses processes and problem-solving approach to identify and analyze common landscape management situations in commercial, public, and residential landscapes. Integrate design, environment, function, pest and disease, and existing management practices to produce recommendations.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Graded with Option</td>
<td>SPRING</td>
<td>ACE</td>
</tr>
<tr>
<td>HORT 327 Turfgrass Science and Management</td>
<td>AGRO 327, TLMT 327</td>
<td>Scientific principles of turf species adaptation, turf and/or soil relationships, establishment, fertility, mowing, irrigation, and pest control of turf species.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>Graded with Option</td>
<td>SPRING</td>
<td>ACE</td>
</tr>
<tr>
<td>HORT 330 Pruning Ornamentals</td>
<td>AGRO 330, TLMT 330</td>
<td>Why, when and how to prune ornamental landscape plants. Demonstrations and field opportunities on how to choose and how to use pruning tools correctly.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Graded with Option</td>
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</tbody>
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Notes: ACE: ACE 9 Global/Diversity
HORT 352 Production and Physiology of Horticultural Crops
Prerequisites: AGRO/HORT 131
Notes: HORT 353 or HORT 354 or HORT 355 parallel enrollment suggested
Description: Principles underlying the management and production of floricultural, fruit and vegetable crops.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: HORT 395

HORT 353 Vegetable Crop Production Laboratory
Prerequisites: AGRO/HORT 131.
Notes: HORT 133 suggested.
Description: Vegetable crop production principles and practices, both locally and from a global perspective. Experience with seeding, transplant production, and growing of vegetables in field and greenhouse.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option

HORT 354 Fruit Production Laboratory
Prerequisites: AGRO/HORT 131
Description: Fruit crop production principles and practices, both locally and from a global perspective. Experience with planting, pruning and layout of orchard, vineyard and small fruit crops, greenhouse propagation, and production practices.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Offered: FALL

HORT 355 Perennial, Pot and Bedding Plant Production Laboratory
Prerequisites: AGRO/HORT 131 and HORT 133
Notes: HORT 352 recommended.
Description: Growing conditions of specific perennial, annual, pot plants, cut flowers. How to schedule and cost account plant production. Care of post-production plants. Experience propagating and growing perennial, pot and bedding plants and cut flowers in the greenhouse.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option

HORT 356 Nursery Crop Production
Prerequisites: AGRO/HORT 131; HORT 221
Notes: Offered spring semester of even-numbered calendar years. Requires a culminating group project creating one of four types of nursery landscape businesses.
Description: Principles underlying the production of nursery crops. Propagation, crop scheduling, transplanting, handling, and transportation of nursery crops. Cultural considerations such as media, fertilizers, irrigation, and pest control.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Grading Option: Graded with Option
Offered: SPRING

HORT 375 Innovations for Agriculture
Crosslisted with: AGRI 375, AGRO 375, EAEP 375, TLMT 375
Description: Explore sustainability challenges in plant and animal agricultural systems, assess current solutions, and identify opportunities for innovation. Research, develop, prototype, test, and pitch an innovative product, service, or technology for agriculture.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL

HORT 388 Business Systems in Entrepreneurship
Crosslisted with: AGRO 388, ENTR 388, EAEP 388, ABUS 388
Description: Introductory models for a startup business. Ideation, customer segments, value proposition, minimal viable product and market fit.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: HORT 301

HORT 395 Internship in Horticulture
Prerequisites: Junior Standing; HORT 221 or HORT 352 and completion of an internship contract. Internships completed without a signed contract may not qualify for credit
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Advanced internship experience in a horticulture enterprise. Must be a business, government agency, organization or university research, teaching, or extension program in which the student does not have previous internship credit.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR

HORT 396 Current Projects and Topics in Horticulture
Prerequisites: Sophomore standing; 12 hours in subject areas dealing with plant sciences; and permission.
Notes: A completed and approved study plan contract is required.
Description: Independent or group projects, readings, or research focusing on current aspects of horticulture.
Credit Hours: 1-5
Min credits per semester: 1
Max credits per semester: 5
Max credits per degree: 5
Grading Option: Graded with Option
HORT 399 Independent Study
**Prerequisites:** Junior standing; 12 hrs plant science; and permission.
**Notes:** Requires advance approval of plan of work and is to be under the supervision and evaluation of a Horticulture departmental faculty member. Oral and written reports are mandatory at the completion of this Independent Study.
**Description:** Individual or group projects in research, literature review, or extension of course work.
**Credit Hours:** 1-5
**Min credits per semester:** 1
**Max credits per semester:** 5
**Max credits per degree:** 12
**Grading Option:** Graded with Option

HORT 403 Scientific Writing and Communication
**Crosslisted with:** AGRO 403, AGRO 803, HORT 803
**Prerequisites:** Senior standing or higher, an ACE 1 written communication course, an ACE 2 oral communication course, and permission of instructor.
**Description:** Reading and critiquing, writing, and presenting scientific information. Use research data to compose a manuscript in standard scientific format, and prepare and present a poster to a general audience. Ethical issues in research and writing.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Grading Option:** Graded
**ACE:** ACE 10 Integrated Product

HORT 406 Plant Ecophysiology: Theory and Practice
**Crosslisted with:** AGRO 806, HORT 806, NRES 406, NRES 806, AGRO 406
**Prerequisites:** Junior standing; 4 hrs ecology; and 4 hrs botany or plant physiology.
**Description:** Principles of plant physiology which underlie the relationship between plants and their physical, chemical and biotic environments. An introduction to the ecological niche, limiting factors and adaptation. An overview of the seed germination and ecology, plant and soil water relations, nutrients, plant energy budgets, photosynthesis, carbon balance and plant-animal interactions. An introduction to various field equipment used in ecophysiological studies.
**Credit Hours:** 4
**Max credits per semester:** 4
**Max credits per degree:** 4
**Grading Option:** Graded with Option

HORT 407 Bio-Atmospheric Instrumentation
**Crosslisted with:** AGRO 469, GEOG 469, METR 469, MSYM 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, MSYM 869, NRES 869
**Prerequisites:** Junior standing; MATH 106; 4 hrs physics; physical or biological science major.
**Description:** Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Grading Option:** Graded with Option
**Groups:** Physical Geography

HORT 408 Microclimate: The Biological Environment
**Crosslisted with:** AGRO 408, GEOG 408, METR 408, NRES 408, WATS 408, AGRO 808, GEOG 808, HORT 808, METR 808, NRES 808
**Prerequisites:** Senior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering.
**Description:** Physical factors that create the biological environment. Radiation and energy balances of earth's surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.
**Credit Hours:** 3
**Max credits per semester:** 3
**Max credits per degree:** 3
**Grading Option:** Graded with Option
**Prerequisite for:** AGRO 907, HORT 907, METR 907, NRES 907; BSEN 954, NRES 954
**Groups:** Physical Geography

HORT 409A Case studies in plant breeding: Breeding for Disease Resistance
**Crosslisted with:** AGRO 409A, AGRO 809A, HORT 809A
**Description:** The application of fundamental genetics principles in inheritance, gene mapping and DNA analysis to decision making by plant breeders with the goal of improving disease resistance in crop cultivars. Learning is structured by the genetics discovery story told in published research articles and the thinking process of plant breeders who will use these discoveries in their work.
**Credit Hours:** 1
**Max credits per semester:** 1
**Max credits per degree:** 1
**Grading Option:** Graded

HORT 409B Case Studies in plant breeding: Transgenic strategies for disease resistance
**Crosslisted with:** AGRO 409B, AGRO 809B, HORT 809B
**Description:** The application of basic science and technology by plant genetic engineering experts with the goal of teaming with plant breeders to improve disease resistance in crop cultivars. Learning is structured by the genetics discovery story told in published research articles and the thinking process of genetic engineers and plant breeders who will use these discoveries in their work.
**Credit Hours:** 1
**Max credits per semester:** 1
**Max credits per degree:** 1
**Grading Option:** Graded

HORT 414 Turfgrass Disease Management
**Crosslisted with:** AGRO 414, AGRO 814, HORT 814, PLPT 414, PLPT 814, TLMT 414, TLMT 814
**Prerequisites:** BIOS/PLPT 369 or one semester of introductory plant pathology.
**Description:** Pathogens, epidemiology, and control of diseases specific to turfgrass.
**Credit Hours:** 1
**Max credits per semester:** 1
**Max credits per degree:** 1
**Grading Option:** Graded with Option
HORT 418 Agroforestry Systems in Sustainable Agriculture  
Crosslisted with: HORT 818, NRES 417, NRES 817  
Prerequisites: 12 hours biological or agricultural sciences.  
Description: The roles of woody plants in sustainable agricultural systems of temperate regions. Emphasis on the ecological and economic benefits of trees and shrubs in the agricultural landscape. Topics include: habitat diversity and biological control; shelterbelts structure, function, benefits and design; intercropping systems; silvopastoral systems; riparian systems; and production of timber and specialty crops. Comparison of temperate agroforestry systems to those of tropical areas.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

HORT 426 Invasive Plants  
Crosslisted with: AGRO 426, AGRO 826, HORT 826, NRES 426, NRES 826  
Prerequisites: AGRO/HORT/SOIL 153; AGRO/HORT 131  
Description: Identification, biology and ecology of weedy and invasive plants. Principles of invasive plant management by preventative, cultural, biological, mechanical and chemical means using an adaptive management framework. Herbicide terminology and classification, plant-herbicide and soil-herbicide interactions, equipment calibration and dosage calculations.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Offered: SPRING  

HORT 427 Turfgrass Systems Management  
Crosslisted with: AGRO 427, TLMT 427, AGRO 827, HORT 827, TLMT 827  
Prerequisites: TLMT 227 and TLMT 327  
Description: Critical evaluation of turfgrass settings to create economical and environmentally friendly management systems for professionally managed turf areas.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

HORT 429A Food Security: A Global Perspective  
Prerequisites: Junior standing  
Description: Overview of the technical and sociocultural dimensions of global food insecurity.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

HORT 435 Agroecology  
Crosslisted with: AGRO 435, AGRO 835, NRES 435, NRES 835  
Prerequisites: For AGRO/HORT/NRES 435: Senior standing. For AGRO/NRES 835: 12 hrs biological or agricultural sciences.  
Description: Integration of principles of ecology, plant and animal sciences, crop protection, and rural landscape planning and management for sustainable agriculture. Includes natural and cultivated ecosystems, population and community ecology, nutrient cycling, pest management, hydrologic cycles, cropping and grazing systems, landscape ecology, biodiversity, and socioeconomic evaluation of systems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
ACE: ACE 10 Integrated Product  

HORT 436 Agroecosystems Analysis  
Crosslisted with: AGRO 436, AGRO 836, HORT 836  
Prerequisites: Senior standing.  
Notes: Cost of travel required. Summer travel course with multi-state faculty. Farm visits to Iowa, Minnesota and Nebraska.  
Description: Analysis of production, economics, environmental impacts, and social integration aspects of farms and farming systems  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

HORT 439 Organic Farming and Food Systems  
Crosslisted with: AGRO 839, AGRO 439, HORT 839  
Prerequisites: 12 credits of agricultural or biological science, economics, or natural resources  
Description: History of organic farming and horticultural systems, organic certification, nutrient and pest management in organic systems, planning organic enterprises including production and marketing, resilience of organic systems in ecological, economic, and social terms; future issues and potentials of organic food systems.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

HORT 441 Perennial Plant Function, Growth, and Development  
Crosslisted with: AGRO 441, AGRO 841, HORT 841, RNGE 441, GRAS 441  
Prerequisites: AGRO 325 or equivalent.  
Description: Principles of crop physiology and developmental morphology in relation to function, growth, development, and survival of perennial forage, range, and turf plants. The relationship of physiology and morphological development on plant use and management.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Offered: SPRING
HORT 453 Urban Soil Properties and Management
Crosslisted with: AGRO 453, LARC 453, SOIL 453
Prerequisites: AGRO/HORT/SOIL 153.
Description: Characteristics of soils in urban settings. Evaluation of soils intended for intensive human uses. Manipulation and remediation of soils subject to construction and other stresses.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 457 Green Space and Urban Forestry Management
Crosslisted with: NRES 457, NRES 857
Prerequisites: Junior or senior standing. Graduate student.
Description: A focus on the management of trees, parks, and green infrastructure in rural and urban communities. Perspectives from community planning, landscape architecture, urban forestry, natural resources, horticulture, and environmental policy. Development and implementation of green space and forest management plans encompassing societal needs and biological limitations in rural and urban communities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
ACE: ACE 10 Integrated Product

HORT 467 Planting Design
Crosslisted with: ARCH 467, ARCH 567, ARCH 867, LARC 467
Prerequisites: HORT/LARC/NRES 212; ARCH 210 or HORT/LARC 266.
Description: Design processes, principles, and elements as applied to the use of native and ornamental plant materials. Aesthetic, functional, and micro-climatic arrangements of plant material in parks, on commercial property, on home grounds, along roadways, and in urban open spaces. Develop a palette of plants and graphics for designs.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded

HORT 469 Senior Landscape Design
Crosslisted with: ARCH 469
Prerequisites: HORT 341 and/or permission.
Description: Capstone course for the landscape option. Students work individually on real-world projects with actual clients. They select the project location and scope in consultation with the instructor prior to the semester this course is taken. The project must reflect evidence of a design process, design articulation and communication understandable to the client and provide in depth drawings, details needed to carry out the implementation of the design.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

HORT 470 Critical Thinking in Landscape Management
Crosslisted with: AGRO 470, TLMT 470
Prerequisites: AGRO/HORT/PGMP/TLMT 326.
Description: Using processes and strategies to identify and compare issues, make recommendations, demonstrate proficiency in field application as skills and techniques, and prepare cost estimates in the development of landscape management plans.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

HORT 471 Vines, Wines and You
Crosslisted with: HORT 871, NUTR 471, NUTR 871, HRTM 471, HRTM 871
Prerequisites: 6 hrs science or equivalent experience; 21 years of age or older
Notes: Proof of age is required.
Description: Origin, botany, historical and cultural significance of the grapevine and related species. Principles and practices of vineyard establishment, management and processing of grape products, importance and/or scope of grape and wine industry; global and local significance. Culinary applications, health, environmental and safety-related issues, business and industry relations and experience.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

HORT 478 Plant Anatomy
Crosslisted with: BIOS 478, BIOS 878, AGRO 478, AGRO 878, HORT 878
Prerequisites: 8 hrs biological sciences
Notes: BIOS 109 recommended.
Description: Development, structure, and function of tissues and organs of the higher plants. Relationships of structure to physiology and ecology of plants.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

HORT 480 Modified Rootzones
Crosslisted with: AGRO 480, TLMT 480, TLMT 880, AGRO 880, HORT 880
Notes: Offered as a five-week course.
Description: Modified rootzones and their applications in the turfgrass and landscape management industry. Correct applications and construction techniques.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
HORT 488 Entrepreneurship and Enterprise Development  
Crosslisted with: HORT 888, EAE 488, AGRO 488, ENTR 488, EAEP 888, AGRO 888, ENTR 888, ABUS 488  
Description: The process of starting your own enterprise. Competitive environment, risk management, finance for business startups, funding, and business plan writing.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  
Offered: FALL/SPR  
ACE: ACE 10 Integrated Product  

HORT 489 Urbanization of Rural Landscapes  
Crosslisted with: AGRO 489, AGRO 889, CRPL 489, HORT 889, CRPL 889  
Prerequisites: Senior standing or graduate standing.  
Description: Development converts rural landscapes into housing, roads, malls, parks, and commercial uses. This process fragments landscapes and changes ecosystem functions, drives up land prices, and pushes agriculture into more marginal areas. This multi-disciplinary, experiential course guides students in learning about the urbanization process, the impacts on landscapes, people, and the community, and the choices that are available to informed citizens.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

HORT 495 Grasslands Seminar  
Crosslisted with: AGRO 495, ENTO 495, GRAS 495, NRES 495, RNGE 495, SOIL 495  
Prerequisites: Junior standing.  
Description: Topic varies and deals with different aspects of forage and/or range and/or livestock, turf and/or landscape grasses, natural habitats, and wetlands.  
Credit Hours: 1-2  
Min credits per semester: 1  
Max credits per semester: 2  
Max credits per degree: 4  
Grading Option: Graded with Option  

HORT 499H Honors Thesis  
Prerequisites: Admission to the University Honors Program and permission.  
Notes: AGRI 299H recommended.  
Description: Conduct a scholarly research project and write a University Honors Program undergraduate thesis.  
Credit Hours: 3-6  
Min credits per semester: 3  
Max credits per semester: 6  
Max credits per degree: 6  
Grading Option: Graded  

PLPT 110 Molds and Man  
Prerequisites: Non-science major.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

PLPT 270 Biological Invaders  
Crosslisted with: AGRO 270, HORT 270, NRES 270  
Prerequisites: 3 hrs biological sciences.  
Description: Impact of exotic species and invasive organisms: agricultural and medical emerging disease; predicting biological invasions; biological control; regulatory, monitoring, and control efforts; ecological impact.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

PLPT 369 Introductory Plant Pathology  
Crosslisted with: BIOS 369  
Prerequisites: AGRO 131/HORT 131, or LIFE 120 and 120L, or BIOS 109.  
Description: Relation of plant disease to crop production, the environment, and society. Organisms that cause disease and their interactions with plants. Strategies for plant disease management.  
Credit Hours: 3  
Max credits per semester: 3  
Max credits per degree: 3  
Grading Option: Graded with Option  

PLPT 369L Introductory Plant Pathology Lab  
Prerequisites: Must enroll in both PLPT 369 (lecture) and PLPT 369L (lab)  
Description: Optional lab for PLPT 369.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Grading Option: Graded with Option  

PLPT 414 Turfgrass Disease Management  
Crosslisted with: AGRO 414, AGRO 814, HORT 414, HORT 814, PLPT 814, TLMT 414, TLMT 814  
Prerequisites: BIOS/PLPT 369 or one semester of introductory plant pathology.  
Description: Pathogens, epidemiology, and control of diseases specific to turfgrass.  
Credit Hours: 1  
Max credits per semester: 1  
Max credits per degree: 1  
Grading Option: Graded with Option  

PLPT 495 Internship in Plant Pathology  
Prerequisites: Junior standing.  
Description: Experience in a work place setting that is directly related to Plant Pathology.  
Credit Hours: 1-3  
Min credits per semester: 1  
Max credits per semester: 3  
Max credits per degree: 5  
Grading Option: Pass No Pass  

PLPT 496 Independent Study  
Prerequisites: Advanced approval of the plan of study and permission.  
Description: Research, literature review, extension of course work, or preparation of teaching materials.  
Credit Hours: 1-5  
Min credits per semester: 1  
Max credits per semester: 5  
Max credits per degree: 5  
Grading Option: Graded with Option
PLPT 498 Independent Research
Prerequisites: Permission.
Description: Independent research in areas of plant pathology.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

PLPT 499H Honors Thesis
Prerequisites: Admission to the University Honors Program and permission, AGRI 299H recommended.
Description: Conduct a scholarly research project and write a University Honors Program or undergraduate thesis.
Credit Hours: 3-6
Min credits per semester: 3
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded

TLMT 100 Plants, Landscapes, & the Environment
Crosslisted with: HORT 100, AGRO 100
Description: Introduction to a diverse range of plant and landscape systems and management strategies for balancing economic and environmental sustainability. Foundational principles of plant biology, landscape ecology, and environmental science using real-world case studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL/SPR
ACE: ACE 4 Science

TLMT 102 Internship and Career Preparation
Crosslisted with: AGRO 102, HORT 102
Description: Group and individual activities to help formulate career goals, improve academic success skills, identify beneficial co-curricular activities, and select appropriate internships.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
Offered: FALL

TLMT 127 Survey of Turfgrass and Landscape Management
Crosslisted with: AGRO 127, HORT 127
Description: Introduction to careers, internships and co-curricular activities in turfgrass and landscape management.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

TLMT 134 Plant Sciences Laboratory
Crosslisted with: AGRO 134, HORT 134
Prerequisites: Prior or concurrent enrollment in AGRO/HORT 131 required
Notes: Open to all majors and minors, except Agronomy or Horticulture.
Description: An exploration of plant morphology, physiology, and maturation with an emphasis on environmental, biotic, and human interactions within production and landscape systems. Not open to Agronomy or Horticulture majors or minors.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded

Prerequisite for: HORT 306; HORT 307

TLMT 215 Genetics
Crosslisted with: AGRO 215, HORT 215
Prerequisites: 3 hrs biological sciences
Description: Discovery of the biology of genes and the application of genetics principles to understand the control and inheritance of traits in families and populations. Focus is on animals and plants that are important in medicine, agriculture and nature. Learning emphasis is problem solving via online, instant feedback assessments, group discussion, experimental data analysis and context-based exams.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

Prerequisite for: ASCI 330; ASCI 486

TLMT 227 Introductory Turfgrass Management
Crosslisted with: AGRO 227, HORT 227
Prerequisites: AGRO/HORT 131 or AGRO 278 or either concurrently.
Description: Introduction to turfgrasses, their management and use, and to the turfgrass industry.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327, TLMT 295; TLMT 395T

TLMT 228 Introduction to Landscape Management
Crosslisted with: AGRO 228, HORT 228
Prerequisites: AGRO/HORT 131 or AGRO/HORT 278 or either concurrently.
Notes: Uses a team approach to problem solving, discussion, assessment planning, and oral presentations of applied case studies.
Description: An overview of landscape management and landscape design. Principles and practices.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL

Prerequisite for: AGRO 326, HORT 326, TLMT 326; TLMT 295; TLMT 395L
TLMT 229 Introductory Turfgrass Management Laboratory
Crosslisted with: AGRO 229, HORT 229
Description: Laboratory covering turfgrass identification and management. Concurrent enrollment with AGRO/HORT/TLMT 227 preferred. Required for Turfgrass Science majors, other students require instructor consent.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

TLMT 295 Turfgrass and Landscape Management Extended Internship
Prerequisites: Sophomore standing; TLMT/AGRO/HORT/PGAM 227 or 228.
Notes: Requires advanced permission before registering for the course. Written and oral reports are required at the completion of the internship. Pass/No Pass only.
Description: Participation in a turfgrass or landscape management enterprise other than one in which the student has had previous experience.
Credit Hours: 1-12
Min credits per semester: 1
Max credits per semester: 12
Max credits per degree: 12
Grading Option: Pass No Pass

TLMT 326 Landscape Solutions
Crosslisted with: AGRO 326, HORT 326
Prerequisites: TLMT/AGRO/HORT 227 or 228
Description: Using processes and problem-solving approach to identify and analyze common landscape management situations in commercial, public, and residential landscapes. Integrate design, environment, function, pest and disease, and existing management practices to produce recommendations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 470, HORT 470, TLMT 470

TLMT 327 Turfgrass Science and Management
Crosslisted with: AGRO 327, HORT 327
Prerequisites: AGRO/HORT/SOIL 153; CHEM 105 or 109; and TLMT 227
Description: Scientific principles of turf species adaptation, turf and/or soil relationships, establishment, fertility, mowing, irrigation, and pest control of turf species.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGRO 470, HORT 470, TLMT 470

TLMT 330 Pruning Ornamentals
Crosslisted with: AGRO 330, HORT 330
Description: Why, when and how to prune ornamental landscape plants. Demonstrations and field opportunities on how to choose and how to use pruning tools correctly.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

TLMT 375 Innovations for Agriculture
Crosslisted with: HORT 375, AGRI 375, AGRO 375, EAEP 375
Description: Explore sustainability challenges in plant and animal agricultural systems, assess current solutions, and identify opportunities for innovation. Research, develop, prototype, test, and pitch an innovative product, service, or technology for agriculture.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

TLMT 395L Internship in Landscape Design and Management
Prerequisites: Junior standing; TLMT 228 or HORT 267; and completion of an internship contract. Internships completed without a signed contract not may qualify for credit.
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Advanced professional experience in a landscape design and/or management enterprise. Experience must be with a business, government agency, organization, or a university research, extension, or teaching program in which the student does not have previous internship credit.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR

TLMT 395T Internship in Turfgrass Science and Management
Prerequisites: Junior standing; TLMT 227 and completion of an internship contract. Internships completed without a signed contract may not qualify for credit.
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Advanced internship experience in a turfgrass enterprise. Must be a business, government agency, organization, or university research, teaching or extension program in which the student does not have previous internship credit.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR

TLMT 375 Innovations for Agriculture
Crosslisted with: HORT 375, AGRI 375, AGRO 375, EAEP 375
Description: Explore sustainability challenges in plant and animal agricultural systems, assess current solutions, and identify opportunities for innovation. Research, develop, prototype, test, and pitch an innovative product, service, or technology for agriculture.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

TLMT 395L Internship in Landscape Design and Management
Prerequisites: Junior standing; TLMT 228 or HORT 267; and completion of an internship contract. Internships completed without a signed contract not may qualify for credit.
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Advanced professional experience in a landscape design and/or management enterprise. Experience must be with a business, government agency, organization, or a university research, extension, or teaching program in which the student does not have previous internship credit.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR

TLMT 395T Internship in Turfgrass Science and Management
Prerequisites: Junior standing; TLMT 227 and completion of an internship contract. Internships completed without a signed contract may not qualify for credit.
Notes: Pass/No Pass only; requires advanced permission before registering for the course.
Description: Advanced internship experience in a turfgrass enterprise. Must be a business, government agency, organization, or university research, teaching or extension program in which the student does not have previous internship credit.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Pass No Pass
Offered: FALL/SPR

TLMT 414 Turfgrass Disease Management
Crosslisted with: AGRO 414, AGRO 814, HORT 414, HORT 814, PLPT 414, PLPT 814, TLMT 814
Prerequisites: BIOS/PLPT 369 or one semester of introductory plant pathology.
Description: Pathogens, epidemiology, and control of diseases specific to turfgrass.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
TLMT 427 Turfgrass Systems Management
Crosslisted with: AGRO 427, HORT 427, AGRO 827, HORT 827, TLMT 827
Prerequisites: TLMT 227 and TLMT 327
Description: Critical evaluation of turfgrass settings to create economical and environmentally friendly management systems for professionally managed turf areas.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

TLMT 470 Critical Thinking in Landscape Management
Crosslisted with: AGRO 470, HORT 470
Prerequisites: AGRO/HORT/PGMP/TLMT 326.
Description: Using processes and strategies to identify and compare issues, make recommendations, demonstrate proficiency in field application as skills and techniques, and prepare cost estimates in the development of landscape management plans.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product

TLMT 480 Modified Rootzones
Crosslisted with: AGRO 480, HORT 480, TLMT 880, AGRO 880, HORT 880
Notes: Offered as a five-week course.
Description: Modified rootzones and their applications in the turfgrass and landscape management industry. Correct applications and construction techniques.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option

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 can also 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 - Biotechnology

Plant Biology - Ecology & Management

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
- North American Trait Integration Breeder, Monsanto - Chesterfield MO
- Plant Protection Technician, USDA - Lincoln NE
- Data Analyst, Zoex Corporation - Houston TX
- 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, univeristy 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