HORTICULTURE

Description
Horticulture requires a broad education including knowledge of production, management, improvement, distribution, processing, and utilization of fruits, vegetables, ornamentals, and turf. Horticulture relies on an understanding of the basic sciences and involves competence in communication, aesthetic appreciation, and an awareness of consumer needs.

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 the University of Nebraska–Lincoln, or within the first calendar year at Nebraska, whichever takes longer, excluding foreign languages. Students have up to 60 credit hours to remove foreign language deficiencies. College-level coursework taken to remove deficiencies may be used to meet degree requirements in CASNR.

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

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

College Degree Requirements

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

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

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

Grade Rules

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

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

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

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

Pass/No Pass
Students in CASNR may take any course offered on a Pass/No Pass basis within the 24-hour limitation established by the Faculty Senate. However, a department may specify that the Pass/No Pass status of its courses be limited to non-majors or may choose to offer some courses for letter grades only.

GPA Requirements
A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. 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 degree at the community college, transfer to the University of Nebraska–Lincoln, and work toward a bachelor of science degree.

Participating community colleges include:

- Central Community College
- Metropolitan Community College
- Mid-Plains Community College
- Nebraska College of Technical Agriculture
- Northeast Community College
- Southeast Community College
- Western Nebraska Community College

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

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

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

- **Chadron State College.** Chadron State College offers a 2+2 program leading to a grassland ecology and management degree program and a transfer program leading to a bachelor of science in agricultural education in the teaching option.
- **Wayne State College.** Wayne State College offers a 3+1 program leading to a bachelor of science in plant biology in the ecology and management option.
- **University of Nebraska at Kearney.** Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.
- **University of Nebraska at Omaha.** The University of Nebraska at Omaha (UNO) cooperates with CASNR in providing four-semester pre-agricultural sciences, pre-natural resources, pre-food science and technology, pre-horticulture and pre-turfgrass and landscape management transfer programs.

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

Nebraska CASNR faculty teach horticulture and food science and technology courses at UNO to assist an urban population in better understanding the food processing, horticulture, and landscape horticulture industries.

For more information, contact the CASNR Dean's Office, 800-472-8800, ext. 2541.

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

- **Chadron State College–Range Science.** The 3+1 Program in range science allows Chadron State College students to pursue a range science degree through Chadron State College. Students complete three years of coursework at Chadron State College and one year of specialized range science coursework (32 credit hours) at CASNR.
- **Dordt College (Iowa)–Agricultural Education: Teaching Option.** This program allows students to pursue an Agricultural Education Teaching Option degree leading toward a bachelor of science in agricultural education. Students at Dordt College will complete 90 credit hours in the Agricultural Education: Teaching Option Transfer Program.

**Residency**
Students must complete at least 30 of the total hours for their degree using University of Nebraska–Lincoln credits. At least 18 of the 30 credit hours must be in courses offered through CASNR1 (>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.

Includes courses taught by CASNR faculty through interdisciplinary prefixes (e.g., LIFE, MBIO, ENVr, SCIL, EAEP, HRTM, ENSC) and CASNR cross listed 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 at 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 horticulture will be able to:

1. Search for, filter, synthesize, and interpret evidence-based information to solve complex plant and landscape system problems.
2. Access and use state-of-the-art software, Web, and mobile applications (apps), instruments, and sensors to help solve complex plant and landscape system problems.
3. Apply classroom experiences and knowledge to real-world internship and career experiences in plant and landscape systems.
5. Educate and persuade stakeholders (e.g., consumers, policy-makers, growers, etc.) to action using evidence-based and technically sound oral, written, and multimedia communications.
6. Lead and contribute to diverse teams and integrate knowledge across disciplines to solve complex plant and landscape system problems.
7. Integrate biological, physical, and chemical sciences to improve management of plant and landscape systems.
8. Identify, propagate, grow, and manage a diversity of plant species in controlled and increasingly stressful field environments.
10. Design climate-resilient and resource-efficient landscape systems to achieve ecological, aesthetic, recreational, and production functions.
11. Identify opportunities to increase efficiency of plant and landscape systems, and add value to plant and landscape products.
12. Anticipate challenges in plant and landscape systems, and develop and test innovative solutions to those challenges.
13. Apply plant and landscape knowledge to a range of systems and scales including field, controlled environment, urban, rural, global, and local.

Major Requirements
Horticulture Core
The following basic core courses are required for the horticulture degree program. In addition, students in horticulture must select and meet the requirements of one of the options, depending upon their basic needs and interests.

College Integrative Course

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

Credit Hours Subtotal: 3

Horticulture Integrative Course
Horticulture

HORT 100 / TLMT 100 / AGRO 100

Plants, Landscapes, & the Environment 3

Credit Hours Subtotal: 3

Communications

Written Communication (ACE 1)

Select one of the following: 3

ENGL 150 Writing and Inquiry
ENGL 151 Writing and Argument
JGEN 120 Basic Business Communication
JGEN 200 Technical Communication I
JGEN 300 Technical Communication II

Oral Communication (ACE 2)

Select one of the following: 3

ALEC 102 Interpersonal Skills for Leadership
COMM 209 Public Speaking
COMM 215 Visual Communication
COMM 283 Interpersonal Communication
COMM 286 Business and Professional Communication
MRKT 257 Sales Communication
NRES 301 Environmental Communication Skills

Credit Hours Subtotal: 6

Communications Elective

Select any additional course from the previous lists. 3

Credit Hours Subtotal: 3

Mathematics

Select 5 credits from the following (ACE 3-see option) 5

MATH 102 Trigonometry
MATH 104 Applied Calculus
MATH 106 Calculus I
STAT 218 Introduction to Statistics

Credit Hours Subtotal: 5

Natural Sciences (ACE 4)

Select one of the following (see option): 4

CHEM 105 Chemistry in Context I
or CHEM 109 General Chemistry I
HORT 153 / AGRO 153 / SOIL 153 Soil Resources

Select one of the following: 4

HORT 131 / AGRO 131 & HORT 133 Plant Science and Horticultural Plant Science Laboratory
LIFE 120 & LIFE 120L Fundamentals of Biology I and Fundamentals of Biology I laboratory
HORT 278 / AGRO 278 Botany

Select one of the following: 3

HORT 212 Landscape Plants I
or HORT 213 Landscape Plants II
HORT 214 Herbaceous Landscape Plants
HORT 221 Plant Propagation

Credit Hours Subtotal: 25

Economics, Humanities and Social Sciences

Select one of the following (see option, ACE 6): 3

AECN 141 Introduction to the Economics of Agriculture
ECON 200 Economic Essentials and Issues
ECON 211 Principles of Macroeconomics
ECON 212 Principles of Microeconomics

Select one course each from ACE outcomes 5, 7, 8 and 9 (recommend HORT 200 in either 7 or 9) 12

Credit Hours Subtotal: 15

Career Experience (2 separate experiences)

HORT 395 Career Experience 2

Credit Hours Subtotal: 2

Total Credit Hours 62

Plant and Landscape Systems Option

This option emphasizes a diversified approach to the student education by relying on a core knowledge of the major areas of the horticulture industry. Through this option, students can sample the sub-fields of food, trees, ornamentals design, turf, entrepreneurship, and production, providing students with a broad knowledge base for many possible career paths.

Plant Production and Management

Select 6-7 credits from the following: 6-7

HORT 352 Production and Physiology of Horticultural Crops
HORT 353 Vegetable Crop Production Laboratory
HORT 354 Fruit Production Laboratory
HORT 355 Perennial, Pot and Bedding Plant Production Laboratory
HORT 356 Organic Farming and Food Systems
HORT 462 Nursery Management and Crop Production (if not taken as capstone)

Credit Hours Subtotal: 6-7

Landscape Design and Management

Select 9 credits from the following: 9

HORT 212 Landscape Plants I (whichever is not taken in core)
HORT 213 Landscape Plants II
HORT 227 Introductory Turfgrass Management
HORT 228 Introduction to Landscape Management
HORT 265 Visual Communication for Landscape Design
HORT 267 Introduction to Landscape Design Studio
HORT 326 Landscape Solutions
HORT 327 Turfgrass Science and Management

Credit Hours Subtotal: 9

Plant Science

AGRO 215 Genetics 4

Credit Hours Subtotal: 4

Entrepreneurship

Select 3 credits from the following: 3

HORT 275 Agribusiness Entrepreneurial Finance
### Horticulture Entrepreneurship Option

Entrepreneurship is the courageous pursuit of your purpose through business development. Students actively engage in their business ideas, develop their networks, and engage with entrepreneurs from many different industries. Students develop the mindset of an entrepreneur, provide personalized experiences, and focus on customer discovery, financial resources, and business plan writing.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>HORT 275</td>
<td>Agribusiness Entrepreneurial Finance</td>
<td>3</td>
</tr>
<tr>
<td>HORT 388</td>
<td>Business Systems in Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>HORT 375</td>
<td>Innovations for Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>HORT 378</td>
<td>Business Systems in Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>HORT 403</td>
<td>Management of Horticultural Crop Insects</td>
<td>3</td>
</tr>
<tr>
<td>HORT 427</td>
<td>Turfgrass Systems Management</td>
<td>3</td>
</tr>
</tbody>
</table>

### Mathematics (1 credit beyond core minimum)

Select from core requirements:

- MATH 104: Applied Calculus
- & STAT 218: Introduction to Statistics

Credit Hours Subtotal: 1

### Economics

Select 3 credits from the following (not taken in core requirements):

- ECON 211: Principles of Macroeconomics
- ECON 212: Principles of Microeconomics

Credit Hours Subtotal: 3

### Business

Select 9 credits from the following:

- ACCT 201: Introductory Accounting I
- ACCT 202: Introductory Accounting II
- BLAW 371: Legal Environment
- MRKT 341: Marketing
- MNGT 361: Human Resource Management

Credit Hours Subtotal: 9

### Pest Management

Select 6-7 credits from the following:

- ENTO 115: Insect Biology
- ENTO 116: Insect Identification
- ENTO 403: Management of Horticultural Crop Insects
- PLPT 369: Introductory Plant Pathology
- AGRO 426: Invasive Plants
- NRES 348: Wildlife Damage Management

Credit Hours Subtotal: 6-7
## Plant and Landscape Systems

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 352</td>
<td>Production and Physiology of Horticultural Crops</td>
<td>2</td>
</tr>
</tbody>
</table>

Select one lab from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 353</td>
<td>Vegetable Crop Production Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>HORT 354</td>
<td>Fruit Production Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>HORT 355</td>
<td>Perennial, Pot and Bedding Plant Production Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>HORT 462</td>
<td>Nursery Management and Crop Production</td>
<td>4</td>
</tr>
</tbody>
</table>

Select 9 credits from the following:

- Any courses required for “& Science” emphasis (added to option)
- Any HORT course 200-level or above (not taken above in core or option)

<table>
<thead>
<tr>
<th>Suggested Courses:</th>
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</thead>
<tbody>
<tr>
<td>HORT 227 Introductory Turfgrass Management</td>
</tr>
<tr>
<td>HORT 228 Introduction to Landscape Management</td>
</tr>
<tr>
<td>HORT 325</td>
</tr>
<tr>
<td>HORT 327 Turfgrass Science and Management</td>
</tr>
<tr>
<td>HORT 261 Floral Design I</td>
</tr>
<tr>
<td>HORT 262 Floral Design II</td>
</tr>
<tr>
<td>HORT 353 Vegetable Crop Production Laboratory</td>
</tr>
<tr>
<td>HORT 354 Fruit Production Laboratory</td>
</tr>
<tr>
<td>HORT 355 Perennial, Pot and Bedding Plant Production Laboratory (if not taken above)</td>
</tr>
<tr>
<td>HORT 435 Agroecology</td>
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<tr>
<td>HORT 439 Organic Farming and Food Systems</td>
</tr>
<tr>
<td>HORT 470 Critical Thinking in Landscape Management</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 17

### Capstone

<table>
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<tr>
<th>Course Code</th>
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<th>Credit Hours</th>
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<tbody>
<tr>
<td>HORT 488</td>
<td>Entrepreneurship and Enterprise Development</td>
<td>3</td>
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</tbody>
</table>

Credit Hours Subtotal: 3

### Free Electives

Select 9-10 credits.  
Credit Hours Subtotal: 9-10

### Core Credit Hours:

- 62

### Option Credit Hours:

- 58

Total Credit Hours Needed: 120

## Landscape Design and Management Option

Landscape designers and managers understand the complex and interesting relationships between all aspects of landscape systems, including soils, plants, insects and diseases, and human actions from design to implementation. Students actively engage in landscape design and management projects on campus and in communities and create comprehensive, fact-based recommendations.

### Landscape Management

Select 6 credits from the following:

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 228</td>
<td>Introduction to Landscape Management</td>
<td>6</td>
</tr>
<tr>
<td>HORT 326</td>
<td>Landscape Solutions</td>
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</tbody>
</table>

### HORT 453 Urban Soil Properties and Management

Credit Hours Subtotal: 6

### Landscape Design

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>HORT 265</td>
<td>Visual Communication for Landscape Design</td>
<td>3</td>
</tr>
<tr>
<td>HORT 267</td>
<td>Introduction to Landscape Design Studio</td>
<td>3</td>
</tr>
<tr>
<td>HORT 467</td>
<td>Planting Design</td>
<td>4</td>
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</tbody>
</table>

Credit Hours Subtotal: 10

### Landscape Installation

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>MSYM 109</td>
<td>Physical Principles in Agriculture and Life Sciences</td>
<td>4</td>
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</table>

Select 10 credits from the following:

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>HORT 300</td>
<td>Introduction to Landscape Construction</td>
<td>3</td>
</tr>
<tr>
<td>HORT 301</td>
<td>Introduction to Landscape Contracting</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 10

### Pest Management

Select 9-10 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
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<td>ENTO 115</td>
<td>Insect Biology</td>
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<td>ENTO 116</td>
<td>Insect Identification</td>
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<td>PLPT 369</td>
<td>Introductory Plant Pathology</td>
<td></td>
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<tr>
<td>PLPT 369L</td>
<td>Introductory Plant Pathology Lab</td>
<td></td>
</tr>
<tr>
<td>AGRO 426</td>
<td>Invasive Plants</td>
<td></td>
</tr>
<tr>
<td>NRES 348</td>
<td>Wildlife Damage Management</td>
<td></td>
</tr>
<tr>
<td>HORT 414</td>
<td>Turfgrass Disease Management</td>
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</tbody>
</table>

Credit Hours Subtotal: 9-10

### Ecology

Select 6 credits from the following:

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>NRES 220</td>
<td>Principles of Ecology</td>
<td></td>
</tr>
<tr>
<td>HORT 435</td>
<td>Agroecology</td>
<td></td>
</tr>
<tr>
<td>NRES 245</td>
<td>Introduction to Grassland Ecology and Management</td>
<td></td>
</tr>
<tr>
<td>NRES 424</td>
<td>Forest Ecology</td>
<td></td>
</tr>
<tr>
<td>LARC 487</td>
<td>Introduction to Landscape Ecology</td>
<td></td>
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</tbody>
</table>

Credit Hours Subtotal: 6

### Business and Marketing

Select 3 credits from the following:

<table>
<thead>
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<td>HORT 388</td>
<td>Business Systems in Entrepreneurship</td>
<td></td>
</tr>
<tr>
<td>HORT 488</td>
<td>Entrepreneurship and Enterprise Development</td>
<td></td>
</tr>
<tr>
<td>MRKT</td>
<td>300 level or above</td>
<td></td>
</tr>
<tr>
<td>MNGT</td>
<td>300 level or above</td>
<td></td>
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</tbody>
</table>

Credit Hours Subtotal: 3

### Capstone

Select 3 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 469</td>
<td>Senior Landscape Design</td>
<td>3</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 3

### Free Electives

Select 10-11 credits.  
Credit Hours Subtotal: 10-11
### Specialty Crop Production Option

With increasing consumer interest in local foods and the environment, specialty crop production in Nebraska is on the rise. Horticultural specialty crops include fruits, tree nuts, vegetables, culinary herbs and spices, medicinal plants, as well as nursery and floriculture plants. Students in this option will explore the science and practice of growing specialty crops in controlled greenhouse and field environments, and learn to make complex management decisions at the individual plant and landscape level.

#### Natural Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I (Choose instead of CHEM 105 in core)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 110</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td><strong>Credit Hours Subtotal:</strong></td>
<td></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

#### Plant Production and Management

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 352</td>
<td>Production and Physiology of Horticultural Crops</td>
<td>2</td>
</tr>
<tr>
<td>HORT 325</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Select 4 credits from the following:</td>
<td></td>
<td><strong>4</strong></td>
</tr>
<tr>
<td>HORT 353</td>
<td>Vegetable Crop Production Laboratory</td>
<td></td>
</tr>
<tr>
<td>HORT 354</td>
<td>Fruit Production Laboratory</td>
<td></td>
</tr>
<tr>
<td>HORT 355</td>
<td>Perennial, Pot and Bedding Plant Production Laboratory</td>
<td></td>
</tr>
<tr>
<td>Select 2-3 credits from the following:</td>
<td></td>
<td><strong>2-3</strong></td>
</tr>
<tr>
<td>HORT 353</td>
<td>Vegetable Crop Production Laboratory (if not taken above)</td>
<td></td>
</tr>
<tr>
<td>HORT 354</td>
<td>Fruit Production Laboratory (if not taken above)</td>
<td></td>
</tr>
<tr>
<td>HORT 355</td>
<td>Perennial, Pot and Bedding Plant Production Laboratory (if not taken above)</td>
<td></td>
</tr>
<tr>
<td>HORT 439</td>
<td>Organic Farming and Food Systems</td>
<td></td>
</tr>
<tr>
<td><strong>Credit Hours Subtotal:</strong></td>
<td></td>
<td><strong>12-13</strong></td>
</tr>
</tbody>
</table>

#### Plant Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 215</td>
<td>Genetics</td>
<td>4</td>
</tr>
<tr>
<td><strong>Credit Hours Subtotal:</strong></td>
<td></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

#### Soil Management

Select 3-4 credits from the following: 3-4
- AGRO 269 Principles of Soil Management
- AGRO 366 Soil Nutrient Relationships

| **Credit Hours Subtotal:** | **3-4** |

#### Pest Management

Select 12 credits from the following: 12
- ENTO 115 Insect Biology
- ENTO 116 Insect Identification
- ENTO 403 Management of Horticultural Crop Insects
- PLPT 369 Introductory Plant Pathology
- PLPT 369L Introductory Plant Pathology Lab

### Capstone

Select 3-4 credits from the following, if not taken above: 3-4
- HORT 462 Nursery Management and Crop Production
- HORT 488 Entrepreneurship and Enterprise Development

| **Credit Hours Subtotal:** | **3-4** |

#### Free Electives

Select 6-9 credits.

| **Credit Hours Subtotal:** | **6-9** |

### Total Credit Hours Needed:

120
create an individualized and interdisciplinary program of study. Specific option requirements and courses are defined, then approved by the student’s faculty advisory committee and then sent to the Department of Agronomy and Horticulture Curriculum Committee for final approval.

**Option Requirements**

1. 120 credit hour minimum requirement (30 hours must be at the 300 level or above).
2. Must complete 62 hours of core requirements in the horticulture major, which includes the general education requirements (ACE) and CASNR college core.
3. Students should include an Independent Study (HORT 399) in their program of study (up to 6 credit hours). The independent study provides students with the opportunity to integrate what they have learned in their degree program and demonstrate their ability to formulate an original interdisciplinary project appropriate to their program of study and career goals.
4. Students must complete at least two internship experiences (HORT 395) as part of the horticulture major core requirements, but Customized Horticulture Studies Option students can receive approval for up to 5 hours of off-campus study and/or experiential learning.
5. Achieve a grade of C or better in all courses.

**Process for Student**

1. Explore and articulate your interests, strengths, and abilities. Establish career goals. Research the types of career opportunities and employers of interest.
2. Consult with a faculty member and/or professional advisor to determine if an existing degree program satisfies your personal and professional interests.
3. Think about the academic skills and background needed for your career choice. Consider future education plans, including graduate school and professional programs.
4. Identify a faculty member to help you design your program of study and develop an advisory committee. The advisory committee will be comprised of three faculty members with one of the faculty members designated as the major advisor. The major advisor must be a faculty member in the horticulture degree program. One of the advisory committee members can be an industry professional.
5. Develop a proposal that includes the degree program focus, what you hope to accomplish by completing this program, how your individualized program of study connects different disciplines, and the relationship between your career goals and your program of study. Also include a list of all courses taken as part of your degree along with a semester-by-semester plan of study. The selection of courses must be consistent with your personal, academic and professional interests and goals.
6. Schedule a meeting with your faculty advisory committee to present your proposal. Once the faculty advisory committee approves the core concentration areas and program of study, the Advisory Committee Approval (ACA) form should be completed. The ACA form is available through the CASNR Dean’s Office.
7. Submit the proposal and accompanying ACA form to the Department of Agronomy and Horticulture Curriculum Committee. The committee must approve the degree program before the student completes 60 of the 120 applicable hours of the degree.
8. Students pursuing this degree option are required to have a meeting with their faculty advisor at the start of each semester (must be completed by the first week of the semester). The purpose of this meeting is to review the program of study and progress towards degree completion, along with discussing the student’s professional development and career plans.

Any changes to the approved program of study must be recommended by the faculty advisory committee and approved by the departmental curriculum committee.

**“& Science” Emphasis (4-17 credits)**

To be added to any of the above options, but with additional requirements in basic sciences and research experiences to prepare students for graduate school and careers in research. Completion of the “& Science” emphasis results in horticulture options that read: Plant and Landscape Systems & Science; Specialty Crop Production & Science; Landscape Design, Management & Science; Entrepreneurship & Plant Science.

**Mathematics**

Select one of the following:

- MATH 104 Applied Calculus
- MATH 106 Calculus I

Credit Hours Subtotal: 0

**Physics**

Select 0-5 credits from the following:

- PHYS 141 Elementary General Physics I
- PHYS 151 Elements of Physics
- PHYS 211 General Physics I
- MSYM 109 Physical Principles in Agriculture and Life Sciences (if not already taken as part of the Landscape Design and Management option)

Credit Hours Subtotal: 0-5

**Chemistry**

Select 4-8 credits from the following:

- CHEM 109 General Chemistry I (choose in core instead of CHEM 105)
- CHEM 110 General Chemistry II (for students not in Specialty Crop Production option)

Select one series from the following:

- CHEM 251 Organic Chemistry I & CHEM 253 and Organic Chemistry I Laboratory
- CHEM 255 Biological Organic Chemistry & CHEM 257 and Biological Organic Chemistry Laboratory

Credit Hours Subtotal: 8-12

**Plant Science**

Select 0-4 credits from the following:

- AGRO 215 Genetics
- AGRO 325 Introductory Plant Physiology
- HORT 478 Plant Anatomy

Credit Hours Subtotal: 0-4

**Career Experience**

Select a research-based experience for at least one of the two experiences required in the core.

Credit Hours Subtotal: 0

**Total Credit Hours** 8-21
Requirements for Minor Offered by Department

Horticulture Minor – 18 hours

A minor in horticulture consists of a minimum of 18 credit hours of horticulture including 6-8 hours at the 300 level or above. Advisors for the horticulture minor will be assigned by the head of the Department of Agronomy and Horticulture. Requirements are as follows:

Core
Select 10-12 credits of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 131 / AGRO 131</td>
<td>Plant Science</td>
</tr>
<tr>
<td>HORT 133</td>
<td>Horticultural Plant Science Laboratory</td>
</tr>
<tr>
<td>HORT 200 / GEOG 200 / LARC 200</td>
<td>Landscape and Environmental Appreciation</td>
</tr>
<tr>
<td>or HORT 261 Floral Design I</td>
<td></td>
</tr>
<tr>
<td>or HORT 355 Perennial, Pot and Bedding Plant Production Laboratory</td>
<td></td>
</tr>
<tr>
<td>HORT 212 / LARC 212 / NRES 212</td>
<td>Landscape Plants I</td>
</tr>
<tr>
<td>HORT 221</td>
<td>Plant Propagation</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 11

Electives
Select 6-8 credits of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 325</td>
<td></td>
</tr>
<tr>
<td>HORT 352</td>
<td>Production and Physiology of Horticultural Crops</td>
</tr>
<tr>
<td>HORT 353</td>
<td>Vegetable Crop Production Laboratory</td>
</tr>
<tr>
<td>HORT 354</td>
<td>Fruit Production Laboratory</td>
</tr>
<tr>
<td>HORT 355</td>
<td>Perennial, Pot and Bedding Plant Production Laboratory (if not taken above)</td>
</tr>
<tr>
<td>HORT 462</td>
<td>Nursery Management and Crop Production</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 7

Total Credit Hours: 18

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
Format: LEC
Offered: FALL/SPR
ACE: ACE 4 Science

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
Format: LEC
ACE: ACE 9 Global/Diversity

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
Format: LEC

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
Format: LEC
Prerequisite for: AGRO 134, HORT 134, TLMT 134; AGRO 204; AGRO 227, HORT 227, PGAM 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 462; 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
Format: LAB
Prerequisite for: AGRO 278, HORT 278; HORT 306; HORT 307
ACE: ACE 4 Science
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
Format: LAB
Prerequisite for: HORT 306; HORT 307

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
Format: LEC
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

AGRO 201 Agronomic Internship and Career Preparation
Description: Group activities to help formulate career goals, improve academic success skills, develop a resume and select an appropriate internship.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC
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

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
Format: LEC
Prerequisite for: AGEN 431, AGRO 431, MSYM 431; AGRO 405

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
Format: LEC
Prerequisite for: ASCI 330; ASCI 486

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

AGRO 227 Introductory Turfgrass Management
Crosslisted with: HORT 227, PGAM 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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327; TLMT 295; TLMT 395

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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; TLMT 295; TLMT 395
AGRO 229 Introductory Turfgrass Management Laboratory
Crosslisted with: TLMT 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
Format: LAB

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
Format: LEC
Offered: FALL/SPR
Prerequisite for: AGRO 340, RNGE 340, GRAS 340; AGRO 445, AGRO 845, ASCI 451, ASCI 851, RNGE 445

AGRO 242 North American Wildland Plants
Crosslisted with: HORT 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
Format: LEC
Offered: FALL/SPR

AGRO 245 Introduction to Grassland Ecology and Management
Crosslisted with: NRES 245
Prerequisites: AGRO 153
Description: 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.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

AGRO 249 Principles of Soil Management
Crosslisted with: SOIL 269
Prerequisites: AGRO 153.
Description: 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.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGRO 405

AGRO 270 Biological Invaders
Crosslisted with: HORT 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
Format: LEC

AGRO 275 Agribusiness Entrepreneurial Finance
Crosslisted with: AECN 275, EAEP 275, ENTR 275, HORT 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
Format: LEC

AGRO 278 Botany
Crosslisted with: HORT 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
Format: LEC
Offered: SPRING
Prerequisite for: AGRO 227, HORT 227, PGAM 227, TLMT 227; AGRO 228, HORT 228, TLMT 228; HORT 221

AGRO 279 Soil Evaluation
Crosslisted with: NRES 279, SOIL 279
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 3
Format: LEC
AGRO 295 Internship in Agronomy
Crosslisted with: RNGE 295, SOIL 295
Prerequisites: Sophomore standing and completion of internship approval form. The internship proposal is subject to approval by the department.
Description: Participation in agronomic applications and in agronomy-related areas of agribusiness; agronomic research in lab, greenhouse, or field; participation in farming practices other than those in which the student has had previous experience; or preparation of teaching materials.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 5
Format: FLD

AGRO 325 Introductory Plant Physiology
Prerequisites: Chemistry through organic or higher-level course in cell biology.
Notes: Botany recommended.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: AGRO 441, AGRO 841, HORT 441, HORT 841, RNGE 441, GRAS 441

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
Format: LEC
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
Format: LEC

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
Format: LEC

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
Format: LEC
Offered: SPRING
Prerequisite for: AGRO 445, AGRO 845, ASCI 451, ASCI 851, RNGE 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/GEOG/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
Format: LEC
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
Format: LEC

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
Format: LEC
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
Format: LEC
Offered: FALL/SPR
Prerequisite for: HORT 301
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
Format: LEC
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
Format: LEC
ACE: ACE 10 Integrated Product
AGRO 406 Crop Genetic Engineering
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
Format: LEC
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
Format: LEC
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
Format: LEC
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
Format: LEC
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
Format: LEC
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: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC
Offered: SPRING

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
Format: LEC

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
Format: LEC
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
Format: LEC
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
Format: LEC

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
Format: LEC
ACE: ACE 10 Integrated Product

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
Format: LEC

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
Format: LEC

AGRO 434 Plant Biochemistry
Crosslisted with: BIOC 434, BIOS 434, CHEM 434, AGRO 834, BIOC 834, BIOS 834, CHEM 834
Prerequisites: BIOC/BIOS/CHEM 431/831.
Description: Biochemical metabolism unique to plants. Relationships of topics previously acquired in general biochemistry to biochemical processes unique to plants. Biochemical mechanisms behind physiological processes discussed in plant or crop physiology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
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
Format: LEC
ACE: ACE 10 Integrated Product

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
Format: FLD

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
Format: LEC

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
Format: LEC

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
Format: LEC

AGRO 440 Great Plains Ecosystem
Crosslisted with: AGRO 840, NRES 840, RNGE 440, NRES 440, GRAS 440
Prerequisites: Junior standing.
Notes: BIOS 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
Format: LEC
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
Format: LEC
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
Max credits per degree: 3
Format: LEC
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
Max credits per degree: 3
Format: LEC
Offered: FALL

AGRO 445 Livestock Management on Range and Pasture
Crosslisted with: AGRO 845, ASCI 451, ASCI 851, RNGE 445
Prerequisites: ASCI 250 and AGRO 240 or 340; AECN 201 recommended.
Notes: AECN 201 recommended.
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
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

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
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

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
Format: LEC

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
Format: LEC

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
Format: LAB

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
Format: LEC
Offered: SPRING
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Crosslisted with</th>
<th>Prerequisites</th>
<th>Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 461</td>
<td>Soil Physics</td>
<td>GEOI 461, NRES 461, SOIL 461, WATS 461, AGRO 461, GEOI 861, NRES 861</td>
<td>AGRO/SOIL 153; PHYS 141 or equivalent, one semester of calculus.</td>
<td>Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.</td>
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<tr>
<td>AGRO 467</td>
<td>Great Plains Field Pedology</td>
<td>GEOG 467, NRES 477, SOIL 477, GEOI 867, NRES 877</td>
<td>AGRO/SOIL 153.</td>
<td>Spatial relationship of soil properties on various parts of landscape typical of the Plains, causal factors, and predictions of such relationships on other landscapes.</td>
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<tr>
<td>AGRO 475</td>
<td>Water Quality Strategy</td>
<td>NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOI 475, GEOI 875, MSYM 475, MSYM 875, POLS 475, POLS 875</td>
<td>Senior standing.</td>
<td>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.</td>
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<td>AGRO 477</td>
<td>Bio-Atmospheric Instrumentation</td>
<td>GEOG 469, HORT 407, METR 469, MSYM 469, NRES 469, AGRO 869, GEOI 869, HORT 807, METR 869, MSYM 869, NRES 869</td>
<td>Junior standing; MATH 106; 4 hrs physics; physical or biological science major.</td>
<td>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.</td>
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<td>AGRO 478</td>
<td>Plant Anatomy</td>
<td>AGRO/HORT/PGMP/TLMT 326.</td>
<td>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.</td>
<td>Development, structure, and function of tissues and organs of the higher plants. Relationships of structure to physiology and ecology of plants.</td>
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<td>AGRO 479</td>
<td>Critical Thinking in Landscape Management</td>
<td>HORT 470, TLMT 470</td>
<td>AGRO/HORT/PGMP/TLMT 326.</td>
<td>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.</td>
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<tr>
<td>AGRO 480</td>
<td>Modified Rootzones</td>
<td>AGRO 872, NRES 472, NRES 872, SOIL 472, WATS 472</td>
<td>AGRO/HORT/SOIL 153 or equivalent; MATH 104 or MATH 106 or equivalent.</td>
<td>Emphasis on soil water balance. Management of soil water.</td>
<td>3</td>
</tr>
</tbody>
</table>

**Notes:**
- BIOS 109 recommended.
- AGRO/HORT/PGMP/TLMT 326.
- AGRO/SOIL 153.
- Senior standing.
- Capstone course.
- BIOS 109 recommended.
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  
Format: LEC

AGRO 488 Entrepreneurship and Enterprise Development  
Crosslisted with: HORT 488, HORT 888, EAEP 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  
Format: LEC

AGRO 489 Urbanization of Rural Landscapes  
Crosslisted with: 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  
Format: LEC

AGRO 495 Grasslands Seminar  
Crosslisted with: ENTO 495, GRAS 495, HORT 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  
Format: LEC

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  
Format: IND

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  
Format: IND

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  
Format: IND

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  
Format: LEC

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  
Format: LEC
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
Format: LEC
Prerequisite for: AGRO 134, HORT 134, TLMT 134; AGRO 204; AGRO 227, HORT 227, PGAM 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 462; NRES 220; 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
Format: LAB
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
Format: LEC
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
Format: LEC
Prerequisite for: AGEO 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
Format: LEC

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 gardens.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
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
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
Format: LEC
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
Format: LEC
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
Format: LEC

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
Format: LEC

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
Format: LEC
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
Format: LEC

HORT 217 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
Format: LEC
Offered: SPRING
Prerequisite for: HORT 462

HORT 218 Introductory Turfgrass Management Laboratory
Crosslisted with: AGRO 227, PGAM 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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327; TLMT 295; TLMT 395

HORT 221 Plant Propagation
Crosslisted with: 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
Format: LEC
Offered: SPRING
Prerequisite for: HORT 462

HORT 222 Introductory Turfgrass Management
Crosslisted with: AGRO 227, PGAM 227, TLMT 227
Prerequisites: AGRO/HORT 131 or AGRO/HORT 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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327; TLMT 295; TLMT 395

HORT 223 Introductory Turfgrass Management Laboratory
Crosslisted with: AGRO 227, PGAM 227, TLMT 227
Prerequisites: AGRO/HORT 131 or AGRO/HORT 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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327; TLMT 295; TLMT 395

HORT 224 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: 1
Format: LAB
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
Format: LEC
Prerequisite for: HORT 262

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
Format: LEC

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
Format: LAB
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
Format: SDO
Prerequisite for: HORT 300; HORT 301
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
Format: LEC

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
Format: LEC

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
Format: LEC
Offered: SPRING
Prerequisite for: AGRO 227, HORT 227, PGAM 227, TLMT 227; AGRO 228, HORT 228, TLMT 228; HORT 221

HORT 300 Introduction to Landscape Construction
Prerequisites: HORT 267 or concurrent
Notes: Offered Spring Semester of odd years and alternate with HORT 301. Requires field trips to landscape installation sites.
Description: Materials, systems, and methods for constructing landscapes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

HORT 301 Introduction to Landscape Contracting
Prerequisites: HORT 267 and HORT 388 or concurrent
Notes: Offered Spring of even years and alternate with HORT 300.
Description: Overview of the landscape contracting business and administration of contracts, cost estimation and bidding.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

HORT 302 Tree Biology
Crosslisted with: NRES 302
Prerequisites: BIOS 101, LIFE 120, HORT 131
Description: The study of the structure and function of woody plants, with a focus on trees growing in temperate climates. Covers the basics of wood physiology in terms of the biological, physical, and chemical processes utilized by tree to function. The anatomy and morphology of trees with a focus on the impacts of tree maintenance to the structure and function of landscape trees.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL
HORT 306 Greenhouse Practices and Management
Prerequisites: AGRO 132 or HORT 133 or AGRO/HORT 134 or LIFE 120
Description: Principles and practices involved in operation and use of greenhouses and other controlled plant growth environments.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

HORT 307 Hydroponics for Growing Populations
Prerequisites: AGRO 132 or AGRO 134 or HORT 133 or LIFE 120
Description: 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.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LAB
Offered: FALL/SPR
ACE: ACE 9 Global/Diversity

HORT 321 Arboriculture: Maintenance & Selection of Landscape Trees
Crosslisted with: NRES 321
Prerequisites: Junior standing
Description: 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.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: SPRING
Groups: Laboratory and Field Training

HORT 326 Landscape Solutions
Crosslisted with: AGRO 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
Format: LEC
Prerequisite for: AGRO 470, HORT 470, TLMT 470

HORT 327 Turfgrass Science and Management
Crosslisted with: AGRO 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
Format: LEC

HORT 330 Pruning Ornamentals
Crosslisted with: AGRO 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
Format: LEC

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
Format: LEC
Offered: FALL

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
Format: LAB

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
Format: LAB
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
Format: LAB
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  
**Format:** LEC  
**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  
**Format:** LEC  
**Offered:** FALL/SPR  
**Prerequisite for:** HORT 301  

HORT 395 Career Experience  
**Prerequisites:** Sophomore standing; HORT major.  
**Notes:** Requires advanced permission before registering for the course.  
**Description:** Participation in a horticulture enterprise (other than in one of those in which the student has had previous experience).  
**Credit Hours:** 1-5  
**Min credits per semester:** 1  
**Max credits per semester:** 5  
**Max credits per degree:** 5  
**Format:** FLD  

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  
**Format:** IND  

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  
**Format:** IND  

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  
**Format:** LEC  
**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  
**Format:** LEC  

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  
**Format:** LEC  
**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: 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
Format: LEC
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
Format: LEC

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
Format: LEC

HORT 410B 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
Format: LEC

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
Format: LEC

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
Format: LEC

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
Format: LEC

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
Format: LEC
ACE: ACE 10 Integrated Product

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
Format: LEC
HORT 435 Agroecology
Crosslisted with: AGRO 435, AGRO 835, NRES 435, NRES 835
Prerequisites: For AGRO/HORT/NRES 435: Senior standing. For AGRO/HORT/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
Format: LEC
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
Format: FLD

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
Format: LEC

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
Format: LEC
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
Format: LEC

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
Format: LEC
Offered: SPRING
ACE: ACE 10 Integrated Product

HORT 462 Nursery Management and 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 and the profitable management of a nursery. Propagation, crop scheduling, transplanting, handling, and transportation of nursery crops. Cultural considerations such as media, fertilizers, irrigation, and pest control. Economic aspects of running a business include creating income and balance sheets.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
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
Format: LEC
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  
Format: SDO  
ACE: ACE 10 Integrated Product

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  
Format: LEC  
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  
Format: LEC  
ACE: ACE 10 Integrated Product

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  
Format: LEC  
Prerequisite for: BIOS 879

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  
Format: LEC

HORT 488 Entrepreneurship and Enterprise Development  
Crosslisted with: HORT 888, EAEP 488, AGRO 488, ENTR 888, 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  
Format: LEC  
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  
Format: LEC

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  
Format: LEC

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  
Format: IND
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
Format: LEC
Offered: FALL/SPR
ACE: ACE 4 Science

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
Format: LEC

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
Format: LAB
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
Format: LEC
Prerequisite for: ASCI 330; ASCI 486

TLMT 227 Introductory Turfgrass Management
Crosslisted with: AGRO 227, HORT 227, PGAM 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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; AGRO 327, HORT 327, TLMT 327; TLMT 295; TLMT 395

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
Format: LEC
Offered: FALL
Prerequisite for: AGRO 326, HORT 326, TLMT 326; TLMT 295; TLMT 395

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
Format: LAB

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
Format: FLD

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
Format: LEC
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
Format: LEC
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
Format: LEC
TLMT 375 Innovations for Agriculture
Crosslisted with: HORT 375, AGRI 375, AGRO 375, EAP 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
Format: LEC
TLMT 395 Career Experience
Prerequisites: Sophomore standing and TLMT 227 or TLMT 228; advance approval required.
Notes: Pass/No Pass only
Description: Participation in a turfgrass or landscape management enterprise other than one in which the student has had previous experience. Written and oral reports are required at the completion of the career experience.
Credit Hours: 1-5
Min credits per semester: 1
Max credits per semester: 5
Max credits per degree: 5
Format: FLF
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
Format: LEC
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
Format: LEC
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
Format: LEC
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
Format: LEC
Please Note
This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

Horticulture - Horticulture Entrepreneurship
Horticulture - Landscape Design and Management
Horticulture - Plant and Landscape Systems
Specialty Crop Production
Customized Horticulture Studies
Career Information
The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.
Jobs of Recent Graduates

- Owner, Landscape Design Business - Arlington NE
- Landscape Designer, Campbell's Nursery - Lincoln NE
- Greenhouse Manager, Faller Landscape & Nursery - York NE
- Propagation Manager, Heritage Nursery - Roca NE
- Production Manager, KM Landscaping - Yutan NE
- Horticulturist, Lincoln Parks and Recreation - Lincoln NE
- Research Technologist, University of Nebraska-Lincoln - Lincoln NE
- Tree and Shrub Specialist, Finke Gardens and Nursery - Lincoln NE
- Head Floral Designer, Blooms - Omaha NE
- Extension 4-H Agent, Kansas State University Research & Extension - Dodge City KS

Internships

- Plant Science Professional Intern, Walt Disney World - Orlando FL
- UNL Cooperative Extension Intern, Fillmore County Extension - Geneva NE
- Marketing Intern, Nebraska 4-H Foundation - Lincoln NE
- Design Intern, Sunken Gardens - Lincoln NE
- Nursery Production Intern, Spruce Point Tree Farm - Hotchkiss CO
- Greenhouse Assistant, UNL Dept of Agronomy & Horticulture - Lincoln NE
- Horticulture Intern, Midwest Hop Producers - Plattsmouth NE
- Public Gardening Intern, Downtown Lincoln Association - Lincoln NE
- Assistant Vineyard Manager, Oak Creek Vineyard - Raymond NE
- Plant Production and Landscaping Intern, Campbell's Nursery - Lincoln NE

Graduate & Professional Schools

- Longwood Graduate Program, University of Delaware - Newark DE
- Ph.D. in Agronomy and Horticulture, University of Nebraska-Lincoln - Lincoln NE
- Entomology Masters, University of Nebraska-Lincoln - Lincoln NE
- Masters in Environmental Science, University of Nebraska-Lincoln - Lincoln NE
- Masters in Landscape Architecture, Iowa State University - Ames IA
- Masters in Plant Pathology, University of Nebraska Lincoln - Lincoln NE
- Masters in Horticulture, University of Nebraska-Lincoln - Lincoln NE
- Masters in Agronomy, University of Nebraska-Lincoln - Lincoln NE
- Masters in Entomology, Washington State University - Pullman WA
- Masters in Horticulture, Kansas State University - KS