

Horticulture

Undergraduate Study

To meet the educational needs of a student population with interests ranging from landscape design/installation to fruit and vegetable production to golf course construction and management, considerable flexibility is built into the horticulture curriculum. The diversity of interests and need for flexibility are reflected in the impressive array of horticulture courses.

The Department of Horticulture offers six options within the horticulture major:

1. Landscape Design, Installation, and Management
2. Horticulture Food Crop Production and Management
3. Ornamental Plant Production and Garden Center Management
4. Public Horticulture
5. Science
6. Turfgrass Management

Graduates possess the technical knowledge and skills to become professional horticulturists. They understand principles of life science, plant growth and development, and are familiar with cultural and management principles for a wide assortment of horticultural crops. They are able to work and communicate effectively with fellow horticultural professionals and other citizens who share an interest in horticulture. Graduates also understand the ethical and environmental dimensions of problems and issues facing horticultural professionals.

A degree in horticulture opens the door to employment opportunities with production nurseries, seed companies, interior landscaping firms, greenhouses, garden centers, conservatories, landscape design/installation firms, public gardens and arboreta, orchards and vineyards, food processing companies, vegetable farms, golf courses, sports fields, sod production companies, and lawn care businesses. Several allied plant-science industries also provide employment opportunities in the areas of sales, management, and communication. Opportunities exist for careers in research, teaching, extension, and business after obtaining advanced training in graduate school.

Minor

The Department of Horticulture offers a minor in horticulture that is earned by taking HORT 221 Principles of Horticulture Science plus 12 additional credits with a maximum of 3 credits at the 200-level and a minimum of 9 credits at the 300-level or above.

Visit our departmental website at www.hort.iastate.edu.

Graduate Study

The graduate major in horticulture leads to the M.S. (thesis required) and Ph.D. A nonthesis master's degree is offered through the master of agriculture program. Some faculty members of the department serve as major professors for students in interdepartmental graduate majors in plant biology; genetics; molecular, cellular, and developmental biology; ecology and evolutionary biology; sustainable agriculture; and environmental science.

Graduates possess a broad understanding of horticulture and the allied plant sciences. They are able to communicate effectively with members of the scientific community, industry groups, and other interested citizens. They are experienced in conducting research and communicating the results from that research. They are capable of addressing and solving complex problems that confront the many horticultural, agricultural, and plant science professions. They also understand the ethical, legal, social, and environmental issues associated with modern agricultural/horticultural practices.

Curriculum in Horticulture

Students majoring in horticulture will select an option in which to specialize before reaching junior standing and will fulfill the requirements described below under Specialization Options.

A horticulture minor is available. The requirements appear under Horticulture, Courses and Programs.

Total Degree Requirement: 129 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

International Perspective: 3 cr.

3 cr. from approved list

U.S. Diversity: 3 cr.

3 cr. from approved list

Communications Proficiency (with a C or better): 9 cr.

English composition	6
Speech fundamentals	3
Total Credits	9

Communication/Library: 13 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
ENGL 302	Business Communication	3
or ENGL 314	Technical Communication	
LIB 160	Information Literacy	1
Total Credits		13

Humanities and Social Sciences: 6 cr.

Approved Humanities course	3
Approved Social Science course	3
Total Credits	6

Ethics: 3 cr.

3 cr. from approved list.

Life Sciences: 6 cr.

BIOL 211	Principles of Biology I	3
Approved Life Sciences course		3
Total Credits		6

Mathematical Sciences: 6 cr.

Select one course from the following:	3	
MATH 140	College Algebra	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 165	Calculus I	
MATH 181	Calculus and Mathematical Modeling for the Life Sciences I	

AND select one of the following:	3	
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
STAT 226	Introduction to Business Statistics I	
STAT 401	Statistical Methods for Research Workers	
Total Credits		6

Physical Sciences: Minimum of 10 cr.

Select one complete course from the following:	3-5	
CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	
CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
AND one complete course from the following:	3-5	
CHEM 178 & 178L	General Chemistry II and Laboratory in College Chemistry II	
Agron 259X - Organic Compounds in Plant and Soil Environments		3
PHYS 111	General Physics	5
PHYS 115	Physics for the Life Sciences	3-4
or PHYS 101	Physics for the Nonscientist	
And ONE complete course from the following group:	4	
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I	

BBMB 221	Structure and Reactions in Biochemical Processes	
Total Credits		10-14

Biological Sciences: 18 cr.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
Select eleven credit hours from the following:		11
AGRON 260	Soils and Environmental Quality	
AGRON 316	Crop Structure-Function Relationships	
AGRON 317	Principles of Weed Science	
AGRON 354	Soils and Plant Growth	
AGRON 354L	Soils and Plant Growth Laboratory	
BIOL 312	Ecology	
BIOL 313 & 313L	Principles of Genetics and Genetics Laboratory	
or GEN 320	Genetics, Agriculture and Biotechnology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 330	Principles of Plant Physiology	
BIOL 355	Plants and People	
BIOL 366	Plant Systematics	
BIOL 454	Plant Anatomy	
BIOL 474	Plant Ecology	
ENT 370	Insect Biology	
ENT 375	Plant Protection Using Natural Enemies	
ENT 376	Fundamentals of Entomology and Pest Management	
FOR 416	Forest Insect and Disease Ecology	
PL P 391	Practical Plant Health	
PL P 408	Principles of Plant Pathology	
Total Credits		18

Horticultural Sciences: Minimum of 30 cr.

HORT 110	Orientation in Horticulture	1
HORT 221	Principles of Horticulture Science	3
HORT 321	Horticulture Physiology	3
HORT 445	Horticulture Management and Administration	2
Select 21 credit hours from approved list.		21
Total Credits		Minimum of 30

Soil Sciences: 3 cr.

AGRON 154	Fundamentals of Soil Science	3
or AGRON 155	Soils for Horticultural Scientists	
Total Credits		3

Electives

No more than 4 cr. of ECON 297 Internship may count toward graduation.

Options

Public Horticulture option

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 282	Educating Youth Through Horticulture	3
HORT 283	Pesticide Application Certification	2
HORT 322	Plant Propagation	3
HORT 330	Herbaceous Ornamental Plants	3

Other recommended courses:

HORT 281	Landscape Graphics	
HORT 332	Greenhouse Operation and Management	
HORT 341	Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs	
HORT 342	Landscape Plant Installation, Establishment, and Maintenance	

HORT 351	Turfgrass Establishment and Management	
HORT 351L	Turfgrass Establishment and Management Laboratory	
HORT 380	Principles of Garden Composition	
HORT 381	Beginning Garden Composition Studio	
And select 12 credit hours from the following:		12
ACCT 215	Legal Environment of Business	
ACCT 284	Financial Accounting	
ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
AGEDS 310	Foundations of Agricultural Education Programs	
AGEDS 401	Planning Agriculture and Life Sciences Education Programs	
COMST 102	Introduction to Interpersonal Communication	
COMST 214	Professional Communication	
COMST 317	Small Group Communication	
ECON 334	Entrepreneurship in Agriculture	
ENGL 220	Descriptive English Grammar	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 305	Creative Writing--Nonfiction	
ENGL 309	Report and Proposal Writing	
ENGL 313	Rhetorical Website Design	
ENGL 415	Business and Technical Editing	
ENGL 416	Visual Aspects of Business and Technical Communication	
ENSCI 446	Integrating GPS and GIS for Natural Resource Management	
ENSCI 461I	Introduction to GIS	
FIN 301	Principles of Finance	
JL MC 201	Reporting and Writing for the Mass Media	
JL MC 220	Principles of Public Relations	
JL MC 310	Fundamentals of Photojournalism	
JL MC 341	Contemporary Magazine Publishing	
MGMT 370	Management of Organizations	
MGMT 371	Organizational Behavior	
MGMT 471	Personnel and Human Resource Management	
SP CM 312	Business and Professional Speaking	
SP CM 313	Communication in Classrooms and Workshops	

Horticultural Food Crop Production and Management option

The following courses are required to meet the Horticulture requirement:

HORT 422	Postharvest Technology	4
HORT 461	Fruit Crop Production and Management	3
HORT 471	Vegetable Production and Management	3

Required for option:

ACCT 284	Financial Accounting	3
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And select nine credits hours from the following: 9

ACCT 215	Legal Environment of Business	
ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
AGRON 260	Soils and Environmental Quality	
COM S 103	Computer Applications	
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
ECON 230	Farm Business Management	
ECON 234	Small Business Management	3

ECON 334	Entrepreneurship in Agriculture	
ENV S 293	Environmental Planning	
ENV S 324	Energy and the Environment	
ENV S 382	Environmental Sociology	
ENV S 491	Environmental Law and Planning	
FS HN 403	Food Laws, Regulations, and the Regulatory Process	

FS HN 405	Food Quality Assurance
FS HN 471	Food Processing I
FS HN 472	Food Processing II
MGMT 310	Entrepreneurship and Innovation
MGMT 313	Feasibility Analysis and Business Planning
MGMT 370	Management of Organizations
MGMT 371	Organizational Behavior
MKT 340	Principles of Marketing
MKT 442	Sales Management
MKT 446	Retailing
MKT 447	Consumer Behavior
TSM 270	Principles of Injury Prevention
TSM 324	Soil and Water Conservation Management

Science option

Biological Sciences Requirement:	3
BIOL 330	Principles of Plant Physiology
Mathematical Sciences Requirement:	4
MATH 165	Calculus I
or MATH 181	Calculus and Mathematical Modeling for the Life Sciences I
Physical Sciences Requirement:	
CHEM 177	General Chemistry I
CHEM 177L	Laboratory in General Chemistry I
CHEM 178	General Chemistry II
CHEM 178L	Laboratory in College Chemistry II
CHEM 331	Organic Chemistry I
CHEM 331L	Laboratory in Organic Chemistry I
CHEM 332	Organic Chemistry II
CHEM 332L	Laboratory in Organic Chemistry II
PHYS 111 & PHYS 112	General Physics and General Physics
BBMB 301	Survey of Biochemistry
or BBMB 404	Biochemistry I
MATH 166	Calculus II
or MATH 182	Calculus and Mathematical Modeling for the Life Sciences II
And select five credit hours from the following	5
BBMB 404	Biochemistry I
BBMB 405	Biochemistry II
BBMB 411	Techniques in Biochemical Research
BIOL 313	Principles of Genetics
BIOL 313L	Genetics Laboratory
BIOL 314	Principles of Molecular Cell Biology
BIOL 315	Biological Evolution
CHEM 211	Quantitative and Environmental Analysis
CHEM 211L	Quantitative and Environmental Analysis Laboratory
CHEM 316	Instrumental Methods of Chemical Analysis
CHEM 316L	Instrumental Analysis Laboratory
CHEM 321L	Laboratory in Physical Chemistry
CHEM 322L	Laboratory in Physical Chemistry
CHEM 324	Introductory Quantum Mechanics
COM S 103	Computer Applications
COM S 207	Fundamentals of Computer Programming
GEN 409	Molecular Genetics
GEN 410	Analytical Genetics

Ornamental Plant Production and Garden Center Management

The following core courses must be taken to meet Horticulture requirements:

HORT 322	Plant Propagation	3
HORT 330	Herbaceous Ornamental Plants	3

HORT 332	Greenhouse Operation and Management	4
HORT 442	Nursery Production and Garden Center Management	2
Additional required Greenhouse Specialization courses:		
HORT 422	Postharvest Technology	
HORT 434	Greenhouse Crop Production I	
HORT 435	Greenhouse Crop Production II	
Additional Nursery and Garden Center Specialization courses:		
HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	
HORT 341	Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs	
HORT 342	Landscape Plant Installation, Establishment, and Maintenance	

Required for option:

ACCT 284	Financial Accounting	3
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And select nine credit hours from the following:

ACCT 215	Legal Environment of Business	
ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
AGRON 206	Introduction to Weather and Climate	
COM S 103	Computer Applications	
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
ECON 230	Farm Business Management	
ECON 234	Small Business Management	3
ECON 334	Entrepreneurship in Agriculture	
ENV S 461I	Introduction to GIS	
MGMT 310	Entrepreneurship and Innovation	
MGMT 313	Feasibility Analysis and Business Planning	
MGMT 370	Management of Organizations	
MGMT 371	Organizational Behavior	
MKT 340	Principles of Marketing	
MKT 442	Sales Management	
MKT 446	Retailing	
MKT 447	Consumer Behavior	
TSM 270	Principles of Injury Prevention	

Turfgrass Management option

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 351	Turfgrass Establishment and Management	3
HORT 351L	Turfgrass Establishment and Management Laboratory	1
HORT 451	Professional Turfgrass Management	2
HORT 452	Integrated Management of Diseases and Insect Pests of Turfgrasses	3
HORT 453	Sports Turf Management	3
HORT 454	Turf & Landscape Irrigation	3
HORT 551	Growth and Development of Perennial Grasses	2

Other recommended course is:

HORT 330	Herbaceous Ornamental Plants	
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Required for option:

ACCT 284	Financial Accounting	3
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And select nine credit hours from the following:

ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
AGRON 206	Introduction to Weather and Climate	
AGRON 260	Soils and Environmental Quality	
AGRON 317	Principles of Weed Science	
AGRON 338	Seed Science and Technology	
AGRON 356	Site-Specific Crop and Soil Management	
AGRON 360	Environmental Soil Science	
AGRON 459	Environmental Soil and Water Chemistry	
COM S 103	Computer Applications	

ECON 234	Small Business Management	3
ECON 334	Entrepreneurship in Agriculture	
ENSCI 4611	Introduction to GIS	
ENT 375	Plant Protection Using Natural Enemies	
ENV S 201	Introduction to Environmental Issues	
ENV S 324	Energy and the Environment	
HRI 289	Contemporary Club Operations	
MGMT 370	Management of Organizations	
MGMT 371	Organizational Behavior	
PL P 391	Practical Plant Health	
TSM 270	Principles of Injury Prevention	
TSM 324	Soil and Water Conservation Management	

Landscape Design, Installation and Management option

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 281	Landscape Graphics	2
HORT 330	Herbaceous Ornamental Plants	3
HORT 341	Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs	2
HORT 342	Landscape Plant Installation, Establishment, and Maintenance	3
HORT 351	Turfgrass Establishment and Management	3
HORT 380	Principles of Garden Composition	2
HORT 381	Beginning Garden Composition Studio	2
HORT 444	Landscape Construction Management	3
HORT 481	Advanced Garden Composition	2

Other recommended courses are:

HORT 322	Plant Propagation	
HORT 332	Greenhouse Operation and Management	

Required for option:

ACCT 284	Financial Accounting	3
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And select nine credit hours from the following:

ACCT 215	Legal Environment of Business	
ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
COM S 103	Computer Applications	
ECON 234	Small Business Management	3
ECON 334	Entrepreneurship in Agriculture	
MGMT 310	Entrepreneurship and Innovation	
MGMT 313	Feasibility Analysis and Business Planning	
MGMT 370	Management of Organizations	
MGMT 371	Organizational Behavior	
MKT 340	Principles of Marketing	
MKT 343	Personal Sales	
MKT 442	Sales Management	
MKT 447	Consumer Behavior	
TSM 324	Soil and Water Conservation Management	

Courses primarily for undergraduates:

HORT 110. Orientation in Horticulture.

(1-0) Cr. 1. F.

Introduction to the field of horticulture.

HORT 112. Orientation to Learning and Productive Team Membership.

(Cross-listed with AER E, CON E, FS HN, NREM). (2-0) Cr. 2. F.

Introduction to developing intentional learners and worthy team members. Learning as the foundation of human enterprise; intellectual curiosity; ethics as a personal responsibility; everyday leadership; effective team and community interactions including team learning and the effects on individuals; and growth through understanding self, demonstrating ownership of own learning, and internalizing commitment to helping others. Intentional mental processing as a means of enhancing learning. Interconnectedness of the individual, the community, and the world.

HORT 114. Developing Responsible Learners and Effective Leaders.

(Cross-listed with CON E, FS HN, NREM). (2-0) Cr. 2. S. Prereq: Hort 112 or NREM 112

Focus on team and community. Application of fundamentals of human learning; evidence of development as a responsible learner; intentional mental processing as a habit of mind; planning and facilitating learning opportunities for others; responsibility of the individual to the community and the world; leading from within; holding self and others accountable for growth and development as learners and leaders.

HORT 121. Home Horticulture.

(2-0) Cr. 2. F.S.

Growing plants in and around the home including requirements for growing house plants; plant propagation; designing and maintaining flower, fruit, and vegetable gardens; lawn, tree, and shrub maintenance.

HORT 122. Hands-On Home Horticulture.

(1-0) Cr. 1. F.S.

Demonstration and activities that illustrate principles of growing plants for the home garden. Topics include plant identification, propagation, selection, and management for indoor and outdoor gardens.

HORT 193. Topics in Horticulture.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193A. Topics in Horticulture: Greenhouse Crops.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193B. Topics in Horticulture: Nursery Crops.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193C. Topics in Horticulture: Turfgrass.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193D. Topics in Horticulture: Fruit Crops.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193E. Topics in Horticulture: Vegetable Crops.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193F. Topics in Horticulture: Cross-Commodity.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 193G. Topics in Horticulture: Landscape Horticulture.

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

HORT 221. Principles of Horticulture Science.

(2-2) Cr. 3. F.S. Prereq: Biol 211 or concurrent enrollment

Biological principles of growing horticultural crops including anatomy, reproduction, light, temperature, water, nutrition, and growth and development. Laboratory exercises emphasize environmental factors and permit detailed observation of plant growth.

HORT 225. Spanish for Horticulture.

(3-0) Cr. 3. S.

This course provides an introduction to basic conversation and communication skills in Spanish, and cross-cultural skills for working with Spanish speakers in the Horticulture industry, emphasizing the use of vocabulary and expressions common in the workplace.

HORT 240. Trees, Shrubs, and Woody Vines for Landscaping.

(3-0) Cr. 3. F.

Students will learn to identify trees, shrubs, and woody vines. Factors influencing the horticultural use of woody plants also will be taught.

HORT 276. Understanding Grape and Wine Science.(3-0) Cr. 3. S. *Prereq: High school biology and chemistry.*

A scientific introduction to viticulture (grape-growing) and enology (wine-making). Topics include grape species and varieties, viticulture practices, fruit quality, geography, history, principles of fermentation and aging, wine classification, appreciation, evaluation, storage and service, regulations, wine as food. No wine tasting.

HORT 281. Landscape Graphics.

(0-4) Cr. 2. F.

Introduction to computer and hand rendering techniques of landscape graphics. Students will gain proficiency in plan view, section and elevation graphics. Intensive studio and computer based instruction.

HORT 282. Educating Youth Through Horticulture.

(2-3) Cr. 3. Alt. S., offered 2012.

Planning, developing, and implementing science-based educational programs in a garden setting. Through hands-on experiences students will learn about horticulture, learning theory, and the application of science principles as they pertain to educating youth.

HORT 283. Pesticide Application Certification.

(Cross-listed with AGRON, FOR, ENT). (2-0) Cr. 2. S.

Holscher. Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

HORT 321. Horticulture Physiology.(3-0) Cr. 3. F. *Prereq: HORT 221 or BIOL 211*

Principles of plant physiology relating to growth and development of horticultural plants including plant water relations, membrane transport, photosynthesis, photomorphogenesis, respiration, and phytohormones. Emphasis on plant's responses to environmental factors (temperature, water, and light) including cellular and whole-plant physiology under stressful environments.

HORT 322. Plant Propagation.(2-2) Cr. 3. S. *Prereq: HORT 221 or BIOL 211*

Fundamental principles underlying sexual and asexual propagation of plants; practice in reproducing plants by use of seeds, leaves, stems, and roots.

HORT 330. Herbaceous Ornamental Plants.(2-2) Cr. 3. F. *Prereq: HORT 221 or by permission of instructor*

Identification, botanical characteristics, origins, propagation, uses and general culture of herbaceous annual and perennial plants for Midwestern gardens and landscapes.

HORT 332. Greenhouse Operation and Management.(3-3) Cr. 4. S. *Prereq: Hort 221*

Operation and management of greenhouses and other controlled environment agriculture structures. Methods of monitoring and manipulating environmental, cultural, and management factors such as light, temperature, fertility, substrate, etc., to maximize production efficiency. Emphasis placed on the production of ornamental and food crops. Greenhouse design and specification project required. Field trips outside scheduled class time required. Nonmajor graduate credit.

HORT 338. Seed Science and Technology.(Cross-listed with AGRON). (2-3) Cr. 3. F. *Prereq: AGRON 114 or HORT 221, BIOL 211*

Goggi. Seed production, maturation, dormancy, vigor, deterioration, and related aspects of enhancement, conditioning, storage, and quality evaluation. Aspects of the seed industry and regulation of seed marketing.

HORT 341. Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs.(2-0) Cr. 2. S. *Prereq: Hort 240 or L A 221 or L A 222*

Cultivars of the most prevalent and economically important woody landscape plants will be taught. The importance of cultivars to the nursery and landscaping professions and suggestions for their proper usage will be discussed.

HORT 342. Landscape Plant Installation, Establishment, and Maintenance.(2-3) Cr. 3. F. *Prereq: Hort 240 or L A 221 or L A 222*

Principles and practices involved with establishment and maintenance of managed landscapes. Laboratory work involves site evaluation, installation techniques, postplant care, and maintenance of established landscape plants.

HORT 351. Turfgrass Establishment and Management.(Cross-listed with AGRON). (3-0) Cr. 3. F. *Prereq: HORT 221 or AGRON 114 or BIOL 211*

Principles and practices of turfgrass propagation, establishment, and management. Specialized practices relative to professional lawn care, golf courses, athletic fields, highway roadsides, and seed and sod production. The biology and control of turfgrass pests. Nonmajor graduate credit.

HORT 351L. Turfgrass Establishment and Management Laboratory.(Cross-listed with AGRON). (0-3) Cr. 1. F. *Prereq: Credit or enrollment in HORT 351*

Those enrolled in the horticulture curriculum are required to take 351L in conjunction with 351 except by permission of the instructor. Nonmajor graduate credit.

HORT 354. Soils and Plant Growth.(Cross-listed with AGRON). (3-0) Cr. 3. F.S. *Prereq: AGRON 154 and BIOL 101 or BIOL 211*

Loynachan. Effects of chemical, physical, and biological properties of soils on plant growth, with emphasis on nutritive elements, pH, organic matter maintenance, and rooting development. Nonmajor graduate credit.

HORT 354L. Soils and Plant Growth Laboratory.(Cross-listed with AGRON). (0-3) Cr. 1. F.S. *Prereq: Agron or Hort major with credit or enrollment in AGRON 354*

Laboratory exercises in soil testing that assess a soil's ability to support nutritive requirements for plant growth.

HORT 380. Principles of Garden Composition.(2-0) Cr. 2. S. *Prereq: HORT 240*

Functional and aesthetic aspects of landscape planning as a basis for design decisions; emphasis on plant selection. Includes site analysis, development process, and design principles.

HORT 381. Beginning Garden Composition Studio.(0-4) Cr. 2. S. *Prereq: HORT 240, HORT 281, HORT 330*

To be taken concurrently with 380. Development of landscape graphic techniques. Studio-based projects implementing principles of landscape design. Not available as credit for L A majors.

HORT 391. Horticultural Management Experience.Cr. 1. Repeatable. F.S.SS. *Prereq: HORT 221 or permission of instructor*

A structured work experience for the student to gain insight into management operations associated with production and management of horticultural crops. A report of 10 or more pages describing the student's experience is required. One credit is given for each term the student is enrolled in the course. A maximum of two credits may be used toward the horticultural sciences course requirements, and two additional credits may be used toward the 128 credits required for graduation.

HORT 398. Cooperative Education.Cr. R. Repeatable. F.S.SS. *Prereq: Permission of department resource and career center coordinator*

Students must register for this course before commencing each work period.

HORT 421. Introduction to Plant Breeding.(Cross-listed with AGRON). (3-0) Cr. 3. F. *Prereq: GEN 320 or BIOL 313*

Breeding methods used in the genetic improvement of self-pollinated, cross-pollinated and asexually reproducing agronomic and horticultural crops. Applications of biotechnology techniques in the development of improved cultivars. Nonmajor graduate credit.

HORT 422. Postharvest Technology.(3-3) Cr. 4. Alt. F., offered 2013. *Prereq: HORT 221 and junior or senior classification*

Principles, methods, and techniques related to postharvest maintenance of quality of horticultural commodities. Emphasis on the effects of handling, storage facilities and techniques, and quality evaluation. Field trips outside scheduled class time required. Nonmajor graduate credit.

HORT 424. Sustainable and Environmental Horticulture Systems.

(Dual-listed with HORT 524). (Cross-listed with ENV S). (3-0) Cr. 3. Alt. S., offered 2013.

Inquiry into ethical issues and environmental consequences of horticultural cropping systems, production practices and managed landscapes. Emphasis on systems that are resource efficient, environmentally sound, socially acceptable, and profitable.

HORT 434. Greenhouse Crop Production I.

(3-3) Cr. 4. Alt. F., offered 2013. *Prereq: HORT 332*

Principles and practices of greenhouse floricultural and food crop production. Emphasis is placed on production of foliage, containerized flowering species, and food crops produced in greenhouses and other controlled environments. Field trips outside scheduled class time required. Greenhouse scheduling and costs of production projects are required. Nonmajor graduate credit.

HORT 435. Greenhouse Crop Production II.

(3-3) Cr. 4. Alt. S., offered 2014. *Prereq: HORT 330 and HORT 332*

Principles and practices of greenhouse production of ornamental and food crops for the spring garden market. Emphasis placed on the production of several ornamental and food crops, along with the complete palate of spring garden crops. Greenhouse scheduling and costs of production projects are required. Field trips outside scheduled class time required. Nonmajor graduate credit.

HORT 442. Nursery Production and Garden Center Management.

(2-0) Cr. 2. Alt. F., offered 2013. *Prereq: HORT 221*

Nursery layout, design, and cultural practices important for growing and shipping field and container-grown nursery crops. Overview of garden center design and retailing and marketing strategies. Field trip(s) outside scheduled class time may be required. Nonmajor graduate credit.

HORT 444. Landscape Construction Management.

(2-3) Cr. 3. F.

Principles and practices of residential landscape construction. Encompasses business and project management, and landscape estimating and contracting including estimating procedures. Laboratory work involves construction project management and installation.

HORT 445. Horticulture Management and Administration.

(2-0) Cr. 2. F. *Prereq: HORT 221 and junior or senior classification*

In-depth presentation and discussion of skills and strategies needed to manage a horticultural enterprise. Topics include motivating employees, managing meetings, conducting performance appraisals, dealing with conflict, and managing an increasingly diverse work force.

HORT 451. Professional Turfgrass Management.

(2-0) Cr. 2. Alt. S., offered 2013. *Prereq: HORT 351*

Turfgrass science including the study of (1) specific information on soil chemistry and soil modification as they relate to the development and maintenance of turfgrass areas, (2) specialized management practices used in athletic field care, professional lawn care, and golf course industries, and (3) construction methods for golf courses and sports fields. Nonmajor graduate credit.

HORT 452. Integrated Management of Diseases and Insect Pests of Turfgrasses.

(Dual-listed with HORT 552). (Cross-listed with ENT, PL P). (3-0) Cr. 3. Alt. S., offered 2014. *Prereq: HORT 351*

Gleason, D. Lewis. Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

HORT 453. Sports Turf Management.

(3-0) Cr. 3. Alt. F., offered 2012. *Prereq: HORT 351*

Management techniques for today's specialized athletic fields. The horticultural and budgetary aspects of football, soccer, baseball, and softball fields will be presented. Field trips and laboratory exercises will develop a practical understanding of actual principles in field development, construction, and management. Nonmajor graduate credit.

HORT 454. Turf & Landscape Irrigation.

(3-0) Cr. 3. Alt. F., offered 2013.

Irrigation systems and principles for turf and landscape environments. Topics include design, installation, equipment, management, and trouble shooting of irrigation systems for golf, athletic fields, residential lawns and landscapes. Participation in practical exercises and local field trips to irrigation sites is required.

HORT 461. Fruit Crop Production and Management.

(2-2) Cr. 3. Alt. S., offered 2013. *Prereq: HORT 221*

Principles and practices of small fruit, tree fruit, and nut culture and production. Morphology, physiology of growth and development, plant establishment, pest management, pruning, training, harvesting, storage, and marketing of commercial temperate fruit and nut crops. Emphasis on sustainable practices. Participation in practical exercises and local field trips is required. Nonmajor graduate credit.

HORT 465. Horticulture Enterprise Management.

(Cross-listed with AGEDS). (1-6) Cr. 3. F. *Prereq: Econ 230, 6 credits of horticulture, and jr classification*

Participation in the management and operation of fruit and vegetable enterprises for local markets. The class is responsible for the plans, records, and decision for planting, operating, harvesting, and marketing fruit and vegetables. Nonmajor graduate credit.

HORT 465A. Horticulture Enterprise Management - Planting.

(Cross-listed with AGEDS). (1-6) Cr. 3. S. *Prereq: Econ 230, 6 credits of horticulture, and jr classification*

Participation in the management and operation of fruit and vegetable enterprises for local markets. The class is responsible for the plans, records, and decision for planting, operating, harvesting, and marketing fruit and vegetables. Nonmajor graduate credit.

HORT 465B. Horticulture Enterprise Management: Harvesting.

(Cross-listed with AGEDS). (1-6) Cr. 3. SS. *Prereq: Econ 230, 6 credits of horticulture, and jr classification.*

Participation in the management and operation of fruit and vegetable enterprises for local markets. The class is responsible for the plans, records, and decision for planting, operating, harvesting, and marketing fruit and vegetables. Nonmajor graduate credit.

HORT 465C. Horticulture Enterprise Management: Marketing.

(Cross-listed with AGEDS). (1-6) Cr. 3. F. *Prereq: Econ 230, 6 credits of horticulture, and jr classification.*

Participation in the management and operation of fruit and vegetable enterprises for local markets. The class is responsible for the plans, records, and decision for planting, operating, harvesting, and marketing fruit and vegetables. Nonmajor graduate credit.

HORT 471. Vegetable Production and Management.

(2-2) Cr. 3. Alt. S., offered 2014. *Prereq: HORT 221*

Principles of vegetable production with emphasis on sustainable production practices, market outlets, business aspects, and risk management. Topics will include crop classification and rotation; planting methods; crop climatic conditions, physiological growth & development; soil, water, and pest management; cover cropping; season extension strategies; harvest and postharvest management and marketing. Course involves visits to growers fields to observe/experience their production enterprise. Laboratory portion of the class will provide an opportunity to grow a variety of vegetables in a heated greenhouse; conduct experiments; observe and/or operate equipment for field production. Nonmajor graduate credit.

HORT 475. Urban Forestry.

(Cross-listed with FOR). (2-3) Cr. 3. F. *Prereq: Junior or senior classification, 3 credits in biology*

Discussion of establishment and management of woody perennials in community-owned urban greenspaces, consideration of urban site and soil characteristics, plant physiology, plant culture, urban forest valuation, inventory methods, species selection, and urban forest maintenance (health care and pest management). Nonmajor graduate credit.

HORT 481. Advanced Garden Composition.

(0-4) Cr. 2. F. *Prereq: HORT 240 and HORT 330 and HORT 380 and HORT 381*

Limited to Landscape Design Installation and Management option students. Development of residential landscapes using design principles and the design process. Projects encompass site analysis, concept development, preliminary design, final design, and graphic presentation techniques. Techniques will include hand and computer rendering.

HORT 484. Organic Agricultural Theory and Practice.

(Dual-listed with HORT 584). (Cross-listed with AGRON). (3-0) Cr. 3. Alt. S., offered 2014. *Prereq: 9 cr. in biological or physical sciences*

Delate. Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

HORT 490. Independent Study.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490A. Independent Study: Greenhouse Crops.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490B. Independent Study: Nursery Crops.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490C. Independent Study: Turfgrass.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490D. Independent Study: Fruit Crops.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490E. Independent Study: Vegetable Crops.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490F. Independent Study: Cross-Commodity.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490G. Independent Study: Landscape Horticulture.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490H. Independent Study: Honors.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490I. Independent Study: International Study.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 490J. Independent Study: Entrepreneurship.

Cr. arr. Repeatable. *Prereq: Junior or Senior classification in horticulture or permission of instructor*

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of Hort 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 128 credits required for graduation.

HORT 491. Seed Science Internship Experience.

(Cross-listed with AGRON). Cr. 1-2. Repeatable, maximum of 1 times. F.S.SS. *Prereq: Agron 338, advanced approval and participation of employer and instructor*

A professional work experience and creative project for seed science secondary majors. The project requires the prior approval and participation of the employer and instructor. The student must submit a written report.

HORT 493. Workshop in Horticulture.

Cr. arr. Repeatable.

Off campus. Offered as demand warrants. Workshops in horticulture. Nonmajor graduate credit.

HORT 494. Service Learning.

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS. *Prereq: Permission of instructor*

Selected projects that result in outcomes benefiting a non-Iowa State University entity while instilling professional ethics and accomplishing student learning goals. Course expenses paid by student. A maximum of 4 credits of 494 may be used toward the Horticulture credits required for graduation.

HORT 494A. Service Learning: International.

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS. *Prereq: Permission of instructor*

Selected projects that result in outcomes benefiting a non-Iowa State University entity while instilling professional ethics and accomplishing student learning goals. Course expenses paid by student. A maximum of 4 credits of 494 may be used toward the Horticulture credits required for graduation.

HORT 494B. Service Learning: Domestic.

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS. *Prereq: Permission of instructor*

Selected projects that result in outcomes benefiting a non-Iowa State University entity while instilling professional ethics and accomplishing student learning goals. Course expenses paid by student. A maximum of 4 credits of 494 may be used toward the Horticulture credits required for graduation.

HORT 495. Horticulture Travel Course Preparation.

Cr. R. Repeatable. F.S.SS. *Prereq: Permission of instructor*

Limited enrollment. Students enrolled in this course also intend to register for Hort 496 the following term. Topics include preparation for safe international travel, the horticultural/agricultural industries, climate, crops, economics, geography, history, marketing, soils, culture, traditions, and horticultural/agricultural development of the country to be visited. Students enroll in this course the term immediately before travel to the foreign country.

HORT 496. Horticulture Travel Course.

Cr. 1-4. Repeatable. F.S.SS. *Prereq: Permission of instructor*

Limited enrollment. Study and tour of production methods in major horticultural regions of the world. Influence of climate, economics, geography, soils, landscapes, markets, cultures, and history of horticultural crops. Location and duration of tours will vary. Tour expenses paid by students. Meets International Perspectives Requirement.

Courses primarily for graduate students, open to qualified undergraduates:

HORT 511. Integrated Management of Tropical Crops.

(Cross-listed with ENT, PL P). (3-0) Cr. 3. Alt. S., offered 2013. *Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Gleason, Lewis. Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects.

Meets International Perspectives Requirement.

HORT 523. Plant Tissue, Cell, and Protoplast Culture.

(2-0) Cr. 2. Alt. F., offered 2013. *Prereq: BIOL 313 or HORT 321 or senior classification in a College of Agriculture and Life Sciences major*

Theory and techniques of plant tissue culture, including organogenesis, somatic embryogenesis, micropropagation, anther and embryo culture, protoplast isolation and culture, and transformation. Applications to agriculture.

HORT 524. Sustainable and Environmental Horticulture Systems.

(Dual-listed with HORT 424). (Cross-listed with ENV S). (3-0) Cr. 3. Alt. S., offered 2013.

Inquiry into ethical issues and environmental consequences of horticultural cropping systems, production practices and managed landscapes. Emphasis on systems that are resource efficient, environmentally sound, socially acceptable, and profitable.

HORT 529. Publishing in Biological Sciences Journals.

(Cross-listed with AGRON, NREM). (3-0) Cr. 3. S. *Prereq:* *Permission of instructor; evidence of a publishable unit of the student's research data*
Process of preparing a manuscript for submission to a refereed journal in the biological sciences. Emphasis on publishing self-generated data from thesis or dissertation research.

HORT 530. Research Orientation.

(1-3) Cr. 2. F.

Instruction in scientific methods and communication skills.

HORT 542. Introduction to Molecular Biology Techniques.

(Cross-listed with B M S, EEOB, FS HN, GDCB, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. *Prereq:* *Graduate classification*
Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

HORT 542A. Introduction to Molecular Biology Techniques: DNA.

(Cross-listed with B M S, EEOB, FS HN, GDCB, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. *Prereq:* *Graduate classification*
Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

HORT 542B. Introduction to Molecular Biology Techniques: Protein.

(Cross-listed with B M S, GDCB, EEOB, FS HN, GDCB, NREM, NUTRS). Cr. 1. Repeatable. S.SS. *Prereq:* *Graduate classification*
Techniques. Includes fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

HORT 542C. Introduction to Molecular Biology Techniques: Cell.

(Cross-listed with B M S, EEOB, FS HN, GDCB, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S. *Prereq:* *Graduate classification*
Includes immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

HORT 542D. Introduction to Molecular Biology Techniques: Plant Transformation.

(Cross-listed with B M S, EEOB, FS HN, GDCB, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S. *Prereq:* *Graduate classification*
Includes *Agrobacterium* and particle gun-mediated transformation of tobacco, *Arabidopsis*, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

HORT 542E. Proteomics. Includes two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. (F.).

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. *Prereq:* *Graduate classification*
Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

HORT 542F. Techniques in Metabolomics. metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects.

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS. *Prereq:* *Graduate classification*
Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

HORT 542G. Introduction to Molecular Biology Techniques: Genomic.

(Cross-listed with B M S, EEOB, FS HN, GDCB, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S. *Prereq:* *Graduate classification*
Offered on a satisfactory-fail basis only.

HORT 543. Seed Physiology.

(Cross-listed with STB). (2-0) Cr. 2. Alt. F., offered 2012. *Prereq:* *Admission to the Graduate Seed Technology and Business Program or approval of the instructor*
Brief introduction to plant physiology. Physiological aspects of seed development, maturation, longevity, dormancy and germination. Links between physiology and seed quality.

HORT 546. Strategies for Diversified Food and Farming Systems.

(Cross-listed with AGRON, SUSAG). (3-0) Cr. 3. Alt. S., offered 2013. *Prereq:* *SUSAG 509*

Project-focused engagement in food and farming systems using tools and perspectives drawn from multiple disciplines. Includes a field component.

HORT 551. Growth and Development of Perennial Grasses.

(Cross-listed with AGRON). (2-0) Cr. 2. Alt. S., offered 2014. *Prereq:* *Junior or senior or graduate classification or permission of instructor*
Selected topics on anatomy, morphology, and physiology relative to growth and development of perennial grasses. Emphasis on growth and development characteristics peculiar to grasses and variations of such characteristics under natural and managed conditions.

HORT 552. Integrated Management of Diseases and Insect Pests of Turfgrasses.

(Dual-listed with HORT 452). (Cross-listed with ENT, PL P). (3-0) Cr. 3. Alt. S., offered 2014. *Prereq:* *HORT 351*

Gleason, D. Lewis. Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

HORT 584. Organic Agricultural Theory and Practice.

(Dual-listed with HORT 484). (Cross-listed with AGRON). (3-0) Cr. 3. Alt. S., offered 2014. *Prereq:* *9 cr. in biological or physical sciences*
Delate. Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

HORT 590. Special Topics.

Cr. arr. Repeatable. *Prereq:* *a major or minor in horticulture*

HORT 593. Workshop in Horticulture.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593A. Workshop in Horticulture: Greenhouse Crops.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593B. Workshop in Horticulture: Nursery Crops.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593C. Workshop in Horticulture: Turfgrass.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593D. Workshop in Horticulture: Fruit Crops.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593E. Workshop in Horticulture: Vegetable Crops.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593F. Workshop in Horticulture: Cross-Commodity.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 593G. Workshop in Horticulture: Landscape Horticulture.

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

HORT 599. Creative Component.

Cr. arr. Repeatable.

Courses for graduate students:**HORT 610. Graduate Seminar.**

Cr. 1. Repeatable. F.S.

Offered on a satisfactory-fail basis only.

HORT 690. Advanced Topics.

Cr. arr. Repeatable.

HORT 696. Research Seminar.

(Cross-listed with AGRON, BBMB, GDCB, PLBIO, FOR). Cr. 1. Repeatable. F.S.
Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

HORT 698. Horticulture Teaching Practicum.

(1-0) Cr. 1. S. *Prereq: Graduate student classification*

Discussions are intended to foster the development of graduate students as teaching assistants and future horticulture/plant science teachers. Topics include establishing a classroom presence, improving lectures, motivating students, dealing with difficult or disruptive students, and developing a teaching philosophy. Offered on a satisfactory-fail basis only.

HORT 699. Thesis and Dissertation Research.

Cr. arr. Repeatable.

HORT 699A. Thesis and Dissertation Research: Greenhouse Crops.

Cr. arr. Repeatable.

HORT 699B. Thesis and Dissertation Research: Nursery Crops.

Cr. arr. Repeatable.

HORT 699C. Thesis and Dissertation Research: Turfgrass.

Cr. arr. Repeatable.

HORT 699D. Thesis and Dissertation Research: Fruit Crops.

Cr. arr. Repeatable.

HORT 699E. Thesis and Dissertation Research: Vegetable Crops.

Cr. arr. Repeatable.

HORT 699F. Thesis and Dissertation Research: Cross-Commodity.

Cr. arr. Repeatable.

HORT 699G. Thesis and Dissertation Research: Landscape Horticulture.

Cr. arr. Repeatable.

HORT 699I. Thesis and Dissertation Research: Biotechnology.

Cr. arr. Repeatable.