

HORTICULTURE

To meet the educational needs of a student population with interests ranging from the biology of plants to 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. Greenhouse Plant Production
2. Horticultural Food Crop Production and Management
3. Landscape Design, Installation, and Management
4. Public Horticulture
5. Horticulture Research
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 practices 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.

Minors

The Department of Horticulture offers two minors: 1) Horticulture and 2) Landscape Management. Both minors are 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.

The Horticulture minor is a broad-based minor that does not focus within a specific area of horticulture. The 12 additional credits for this minor can be selected from the full list of Horticulture courses.

The Landscape Management minor focuses on landscape management including plant selection, landscape installation and management, and turfgrass management. The 12 additional credits for this minor can be selected from the following courses: HORT 240 Trees, Shrubs, and Woody Vines for Landscaping, HORT 281 Landscape Graphics, HORT 330 Herbaceous Ornamental Plants, 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 or HORT 444 Landscape Construction Management.

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 Options.

The Department of Horticulture offers two minors: 1) Horticulture and 2) Landscape Management. The requirements appear under Undergraduate Minors.

Total Degree Requirement: 129 credits (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.

Biological Sciences: 18 cr.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
And complete fourteen credit hours from the following:		14
AGRON 217	Weed Identification	
AGRON 282	Soil Conservation and Land Use	
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 212	Principles of Biology II	
BIOL 212L	Principles of Biology Laboratory II	
BIOL 312	Ecology	
BIOL 313	Principles of Genetics	
& 313L	and Genetics Laboratory	
or GEN 320	Genetics, Agriculture and Biotechnology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 355	Plants and People	
BIOL 366	Plant Systematics	
BIOL 430	Principles of Plant Physiology	
BIOL 454	Plant Anatomy	
BIOL 474	Plant Ecology	

ENT 201	Introduction to Insects	
ENT 211	Insects and Society	
ENT 370	Insect Biology	
ENT 375	Plant Protection Using Natural Enemies	
ENT 376	Fundamentals of Entomology and Pest Management	
FOR 416	Forest Insects and Diseases	
FOR 416L	Forest Insects and Diseases Laboratory	
PL P 408	Principles of Plant Pathology	
Total Credits		18

Communications Proficiency (with a grade of C or better)

6 credits of English composition (see approved courses below)

3 credits of speech fundamentals (see approved courses below)

Communication/Library: 13 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Information Literacy	1
ENGL 302	Business Communication	3
or ENGL 314	Technical Communication	
One of the following:		3
SP CM 212	Fundamentals of Public Speaking	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
COMST 214	Professional Communication	
Total Credits		13

Ethics: 3 cr.

3 cr. from approved list

Humanities and Social Sciences: 6 cr.

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

International Perspective: 3 cr.

3 cr. from approved list

Total Credits 3

U.S. Diversity: 3 cr.

3 cr. from approved list	3
Total Credits	3

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 301	Intermediate Statistical Concepts and Methods	

Total Credits 6

Physical Sciences: 11 cr.

Complete one of the following: 5

CHEM 163	College Chemistry	
& 163L	and Laboratory in College Chemistry	
or CHEM 177	General Chemistry I	
& 177L	and Laboratory in General Chemistry I	

AND complete one course from the following: 3-4

AGRON 259	Organic Compounds in Plants and Soils	
BBMB 221	Structure and Reactions in Biochemical Processes	
CHEM 178	General Chemistry II	
& 178L	and Laboratory in College Chemistry II	
CHEM 231	Elementary Organic Chemistry	
& 231L	and Laboratory in Elementary Organic Chemistry	
CHEM 331	Organic Chemistry I	
& 331L	and Laboratory in Organic Chemistry I	
PHYS 101	Physics for the Nonscientist	
PHYS 111	General Physics	
PHYS 115	Physics for the Life Sciences	

AND complete one course from the following: 3-5

BBMB 221	Structure and Reactions in Biochemical Processes	
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CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I	
Total Credits		11-14

Horticultural Sciences: Minimum of 30 cr.

HORT 110	Professional and Educational Development in Horticulture.	1
HORT 221	Principles of Horticulture Science	3
HORT 321	Horticulture Physiology	3
HORT 445	Horticulture Management and Administration	2
Select 21 cr. hours from courses within selected option.		21
Total Credits	Minimum of	30

Soil Sciences: 3 cr.

AGRON 182	Introduction to Soil Science	3
Total Credits		3

Electives

No more than 4 cr. of Hort 490 may count toward graduation.

Options**Greenhouse Plant Production**

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 322	Plant Propagation	3
HORT 330	Herbaceous Ornamental Plants	3
HORT 331	Hydroponic Food Crop Production	3
HORT 332	Greenhouse Operation and Management	4
HORT 434	Fall Greenhouse Crop Production	3
HORT 435	Spring Greenhouse Crop Production	3

Other recommended courses are:

HORT 391	Horticultural Management Experience	
HORT 424	Sustainable and Environmental Horticulture Systems	
HORT 442	Nursery Production and Garden Center Management	

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

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	
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 and Safety	

Horticultural Food Crop Production and Management

The following courses are required to meet the Horticulture requirement:

HORT 276	Understanding Grape and Wine Science	3
HORT 376	Fundamentals of Field Production of Horticultural Food Crops	3
HORT 461	Fruit Crop Production and Management	3
HORT 471	Vegetable Production and Management	2
HORT 471L	Vegetable Production and Management Lab	1

Other recommended courses:

HORT 322	Plant Propagation	
HORT 331	Hydroponic Food Crop Production	
HORT 332	Greenhouse Operation and Management	
HORT 338	Seed Science and Technology	
HORT 391	Horticultural Management Experience	
HORT 484	Organic Agricultural Theory and Practice	

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

ACCT 215	Legal Environment of Business	
ACCT 285	Managerial Accounting	
ACCT 316	Business Law	

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
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 and Regulations
FS HN 405	Food Quality Assurance
FS HN 471	Food Processing
FS HN 472	Food Processing Laboratory
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 and Safety
TSM 324	Soil and Water Conservation Management

Horticulture Research

The following courses are required for this option:

AGEDS 312	Science With Practice	3
HORT 322	Plant Propagation	3

Biological Sciences:

BIOL 430	Principles of Plant Physiology	3
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Other recommended courses:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping
HORT 330	Herbaceous Ornamental Plants
HORT 331	Hydroponic Food Crop Production
HORT 332	Greenhouse Operation and Management
HORT 342	Landscape Plant Installation, Establishment, and Maintenance
HORT 391	Horticultural Management Experience

Mathematical Sciences Requirement: 8

MATH 165	Calculus I
	or MATH 181 Calculus and Mathematical Modeling for the Life Sciences I

MATH 166 Calculus II

Physical Sciences Requirement:

BBMB 301 Survey of Biochemistry

or BBMB 404 Biochemistry I

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 General Physics

& PHYS 112 and General Physics

And select 5 cr. hours from the following:

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 107 Applied Computer Programming

or COM S 20 Fundamentals of Computer Programming

GEN 409 Molecular Genetics

GEN 410 Analytical Genetics

Landscape Design, Installation and Management

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	
HORT 391	Horticultural Management Experience	
HORT 442	Nursery Production and Garden Center Management	

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

ACCT 215	Legal Environment of Business	
ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
COM S 103	Computer Applications	
ECON 234	Small Business Management	
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	

Public Horticulture

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 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	
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HORT 342	Landscape Plant Installation, Establishment, and Maintenance	
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HORT 351	Turfgrass Establishment and Management	
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HORT 351L	Turfgrass Establishment and Management Laboratory	
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HORT 376	Fundamentals of Field Production of Horticultural Food Crops	
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HORT 380	Principles of Garden Composition	
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HORT 381	Beginning Garden Composition Studio	
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HORT 391	Horticultural Management Experience	
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Required for option

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

ACCT 215	Legal Environment of Business	
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 101	Principles of Microeconomics	
ECON 234	Small Business Management	
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	Proposal and Report 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 310	Fundamentals of Photojournalism	
MGMT 370	Management of Organizations	
MGMT 371	Organizational Behavior	

MGMT 471	Personnel and Human Resource Management	
P R 220	Principles of Public Relations	
SP CM 312	Business and Professional Speaking	
SP CM 313	Communication in Classrooms and Workshops	

Turfgrass Management

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 courses:

HORT 330	Herbaceous Ornamental Plants	
HORT 322	Plant Propagation	
HORT 424	Sustainable and Environmental Horticulture Systems	
HORT 391	Horticultural Management Experience	

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

ACCT 285	Managerial Accounting	
ACCT 316	Business Law	
AGRON 206	Introduction to Weather and Climate	
AGRON 360	Environmental Soil Science	
AGRON 459	Environmental Soil and Water Chemistry	
COM S 103	Computer Applications	
ECON 234	Small Business Management	
ECON 334	Entrepreneurship in Agriculture	
ENSCI 4611	Introduction to GIS	
ENV S 201	Introduction to Environmental Issues	
ENV S 324	Energy and the Environment	
HSP M 101	Introduction to the Hospitality Industry	
HSP M 289	Contemporary Club Management	
MGMT 370	Management of Organizations	
MGMT 371	Organizational Behavior	
TSM 270	Principles of Injury Prevention and Safety	

TSM 324	Soil and Water Conservation Management	
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Horticulture, B.S. Greenhouse Plant Production Option

Freshman

Fall	Credits Spring	Credits
CHEM 163	4 AGRON 182	3
CHEM 163L	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
HORT 110	1 ENGL 250	3
HORT 121	2 HORT 221	3
LIB 160	1 STAT 104	3
PSYCH or SOC or ECON	3	
	15	16

Sophomore

Fall	Credits Spring	Credits
ACCT 284	3 Biol Science (see list)	3
Biol Science (see list)	3 Biol Science (see list)	3
Elective	2 Elective	3
HORT 240	3 HORT 332	4
Intl Perspectives	3 US Diversity	3
MATH 140	3	
	17	16

Junior

Fall	Credits Spring	Credits
Biol Science (see list)	3 Biol Science (see list)	3
Select from the following:	3-4 HORT 322	3
CHEM 231	HORT 435	3
CHEM 231L	PHYS 101 OR 111 OR 115	3-5
OR	SP CM 212 or AGEDS 311	3
BBMB 221		
HORT 321	3	
HORT 434	3	
Hort Recommended (see list)	3	
	15-16	15-17

Senior

Fall	Credits Spring	Credits
Elective	3 Elective	3
HORT 330	3 ENGL 302 or 314	3
HORT 331	3 Ethics	3
HORT 391	1 Humanities	3
HORT 445	2 Option Class (see list)	3

Hort Recommended (see list)	2 Option Class (see list)	3
Option Class	3	
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	17	18

Horticulture, B.S. - Horticulture Food Crop Production and Management Option

Freshman

Fall	Credits Spring	Credits
CHEM 163	4 AGRON 182	3
CHEM 163L	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
HORT 110	1 ENGL 250	3
HORT 121	2 HORT 221	3
LIB 160	1 STAT 104	3
PSYCH OR SOC OR ECON	3	
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	15	16

Sophomore

Fall	Credits Spring	Credits
Biol Science (see list)	3 Biol Science (see list)	3
Biol Science (see list)	3 HORT 276	3
Elective	2 HORT 322	3
HORT 376	3 Humanities	3
Intl Perspectives	3 PHYS 101 or 111 or 115	3-5
Option Class (see list)	3	
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	17	15-17

Junior

Fall	Credits Spring	Credits
Select from the following:	3-4 ACCT 284	3
CHEM 231	Biol Science (see list)	3
CHEM 231L	Elective	3
OR	Hort Recommended (see list)	3
BBMB 221	HORT 471	2
HORT 321	3 HORT 471L	1
HORT 391	1 SP CM 212 or AGEDS 311	3
Hort Recommended (see list)	2	
MATH 140	3	
US Diversity	3	
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	15-16	18

Senior

Fall	Credits Spring	Credits
Biol Science (see list)	2-3 Elective	3
Elective	2 Ethics	3
ENGL 302 or 314	3 HORT 461	3
HORT 391	1 Hort Recommended (see list)	3
HORT 445	2 Option Class	3
Hort Recommended (see list)	3	
Option Class (see list)	3	
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	16-17	15

Horticulture, B.S. - Landscape Design, Installation, and Management

Freshman

Fall	Credits Spring	Credits
CHEM 163	4 AGRON 182	3
CHEM 163L	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
HORT 110	1 ENGL 250	3
HORT 121	2 HORT 221	3
LIB 160	1 STAT 104	3
PSYCH or SOC or ECON	3	
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	15	16

Sophomore

Fall	Credits Spring	Credits
ACCT 284	3 Biol Science (see list)	3
Biol Science (see list)	3 Biol Science (see list)	3
HORT 281	2 Elective	3
HORT 330	3 HORT 380	2
HORT 444	3 HORT 381	2
MATH 140	3 PHYS 101 OR 111 OR 115 OR AGRON 259	3-5
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	17	16-18

Junior

Fall	Credits Spring	Credits
Elective	3 Biol Science	3
HORT 240	3 Elective	3
HORT 321	3 Select from the following:	3-4
HORT 391	1 CHEM 231	
HORT 481	2 CHEM 231L	
SP CM 212 or AGEDS 311	3 OR BBMB 221	

	HORT 341	2
	Intl Perspective	3
	US Diversity	3
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	15	17-18

Senior

Fall	Credits Spring	Credits
HORT 342	3 Biol Science (see list)	3
HORT 351	3 Elective	1
HORT 391	1 ENGL 302 or 314	3
HORT 445	2 Ethics	3
Humanities	3 Hort Recommended (see list)	3
Option Class	3 Option Class	3
Option Class	3	
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	18	16

Horticulture, B.S. - Public Horticulture Option

Freshman

Fall	Credits Spring	Credits
CHEM 163	4 AGRON 182	3
CHEM 163L	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
HORT 110	1 ENGL 250	3
HORT 121	2 HORT 221	3
LIB 160	1 STAT 104	3
SOC OR PSYCH OR ECON	3	
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	15	16

Sophomore

Fall	Credits Spring	Credits
ACCT 284	3 Biol Science (see list)	3
Biol Science (see list)	3 Biol Science (see list)	3
Elective	2 HORT 282	3
HORT 240	3 HORT 322	3
Intl Perspective	3 PHYS 101 OR 111 OR 115 OR AGRON 259	3-5
MATH 140	3	
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	17	15-17

Junior

Fall	Credits Spring	Credits
Elective	3 Biol Science (see list)	3
Elective	1 Select from the following:	3-4
HORT 321	3 CHEM 231	
HORT 330	3 CHEM 231L	

HORT 391	1 OR	
Option Class (see list)	3 BBMB 221	
SP CM 212 or AGEDS 311	3 Elective	1
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	Hort Recommended (see list)	3
	Option Class (see list)	3
	US Diversity	3
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	17	16-17

Senior

Fall	Credits Spring	Credits
Biol Science (see list)	3 Elective	1
Elective	2 ENGL 302 or 314	3
HORT 391	1 Ethics	3
HORT 445	2 Hort Recommended (see list)	3
Hort Recommended (see list)	3 Hort Recommended (see list)	3
Hort Recommended (see list)	3 Humanities	3
Option Class (see list)	3	
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	17	16

Horticulture, B.S. - Horticulture Research Option

Freshman

Fall	Credits Spring	Credits
CHEM 177	4 AGRON 182	3
CHEM 177L	1 BIOL 211	3
Elective	1 BIOL 211L	1
ENGL 150	3 ENGL 250	3
HORT 110	1 HORT 221	3
HORT 121	2 STAT 104	3
LIB 160	1	
PSYCH OR SOC OR ECON	3	
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	16	16

Sophomore

Fall	Credits Spring	Credits
BIOL 212	3 Hort Recommended (see list)	3-4
BIOL 212L	1 Hort Recommended (see list)	3
CHEM 178	3 MATH 166	4
CHEM 178L	1 PHYS 111	5

Hort Recommended (see list)	3 US Diversity	3
Hort Recommended (see list)	3	
MATH 165 or 181	4	
	18	18-19

Junior		
Fall	Credits Spring	Credits
AGEDS 312	3 Biol Science (see list)	3
Biol Science (see list)	3 CHEM 331	3
HORT 321	3 CHEM 331L	1
HORT 391	1 HORT 322	3
Hort Recommended (see list)	3 Intl Perspectives	3
PHYS 112	5 Option Class	3-4
	18	16-17

Senior		
Fall	Credits Spring	Credits
BBMB 301 or 404	3 BIOL 430	3
CHEM 332	3 Elective	1
CHEM 332L	1 Ethics	3
ENGL 302 or 314	3 Hort Recommended (see list)	3
HORT 391	1 Humanities	3
HORT 445	2 Option Class	3
SP CM 212 or AGEDS 311	3	
	16	16

Horticulture, B.S. - Turfgrass Management Option

Freshman		
Fall	Credits Spring	Credits
CHEM 163	4 AGRON 182	3
CHEM 163L	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
HORT 110	1 ENGL 250	3
HORT 121	2 HORT 221	3
LIB 160	1 STAT 104	3
PSYCH OR SOC OR ECON	3	
	15	16

Sophomore		
Fall	Credits Spring	Credits
ACCT 284	3 Biol Science (see list)	3
Biol Science (see list)	3 HORT 451	2

HORT 240	3 HORT 452	3
HORT 351	3 Humanities	3
HORT 351L	1 PHYS 101 OR 111 OR 115	3-5
MATH 140	3 SP CM 212 or AGEDS 311	3
	16	17-19

Junior		
Fall	Credits Spring	Credits
Biol Science (see list)	3 Biol Science (see list)	3
HORT 321	3 Select from the following:	3-4
HORT 391	1 CHEM 231	
HORT 453	3 CHEM 231L	
Intl Perspective	3 OR	
US Diversity	3 BBMB 221	
	Elective	2
	HORT 354	3
	HORT 551	2
	Hort Recommended (see list)	3
	16	16-17

Senior		
Fall	Credits Spring	Credits
Biol Science (see list)	3 Elective	1
Elective	2 ENGL 302 or 314	3
HORT 391	1 Ethics	3
HORT 342	3 Hort Recommended (see list)	3
HORT 445	2 Option Class	3
HORT 454	3 Option Class	3
Option Class	3	
	17	16

Graduate Study

The graduate major in horticulture leads to the M.S. (thesis and non-thesis option) and Ph.D. Some faculty members of the department serve as major professors for students in interdepartmental graduate majors in plant biology; genetics and genomics; 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.

Courses primarily for undergraduates:

HORT 110: Professional and Educational Development in Horticulture.

(1-0) Cr. 1. F.

Intended for first-year students and others new to the horticulture curriculum. Introduction to professional and educational development within horticulture. Focus is on university and career acclimation. Assessed service-learning component.

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 floral and landscape design, plant identification, propagation, selection, and management for indoor and outdoor gardens.

HORT 131: Floral Design

(0-2) Cr. 1. S.

Introduces basic geometric design of fresh arrangements, corsages, and holiday arrangements. Includes use of tools and supplies.

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.

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

(2-2) Cr. 3. F.

Identification of trees, shrubs, and woody vines. Factors influencing the horticultural use of woody plants. Field trips outside of regular class time may be required.

HORT 276: Understanding Grape and Wine Science

(Cross-listed with FS HN). (3-0) Cr. 3. Alt. S., offered even-numbered years.

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 and elevation graphics. Intensive studio and computer based instruction.

HORT 282: Educating Youth Through Horticulture

(2-3) Cr. 3. Alt. S., offered even-numbered years.

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. Assessed service-learning component.

HORT 283: Pesticide Application Certification

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

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, cuttings, layering, grafting and budding and tissue culture.

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 331: Hydroponic Food Crop Production

(2-2) Cr. 3. F.

Prereq: HORT 221 or AGRON 181 or 3 credits in biological sciences

Principles and practices of hydroponic systems, crop production and culture, aquaponic systems, and new food crops for hydroponic systems will be discussed. Laboratories will focus on demonstration and participation in practices and procedures used in hydroponic food crop production. Assessed service-learning component.

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 analysis project required.

HORT 338: Seed Science and Technology

(Cross-listed with AGRON). (2-3) Cr. 3. F.

Prereq: AGRON 181 (or equivalent) or HORT 221; BIOL 212

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 181 (or equivalent) 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.

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.

HORT 354: Soils and Plant Growth

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

Prereq: AGRON 182 or equivalent and BIOL 101

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

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 376: Fundamentals of Field Production of Horticultural Food Crops

(3-0) Cr. 3. F.

Prereq: HORT 221 or AGRON 181

An introduction to field production of fruit and vegetable crops and the theoretical and practical knowledge required for successfully producing them. Topics will include basic principles and practices of fruit and vegetable production, site selection, soil techniques, irrigation management, equipment and tools, integrated pest management, season extension strategies, postharvest handling and food safety, marketing, and basic business planning for fruit and vegetable enterprises. Additionally, this course will prepare students for HORT 461 and HORT 471, that are advanced level courses focusing on fruit and vegetable production.

HORT 380: Principles of Garden Composition

(2-0) Cr. 2. S.

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

HORT 381: Beginning Garden Composition Studio

(0-4) Cr. 2. S.

Prereq: HORT 281 and HORT 240 or HORT 330, concurrent enrollment in HORT 380

Introduction to landscape design process. Intensive studio-based projects implementing principles of landscape design, concept development, and graphic communication.

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

Fundamental principles of plant breeding and cultivar development, breeding methods for self-pollinated, cross-pollinated and clonal crops.

HORT 424: Sustainable and Environmental Horticulture Systems

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

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: Fall Greenhouse Crop Production

(2-3) Cr. 3. Alt. F., offered odd-numbered years.

Prereq: HORT 332

Principles and practices of flowering and ornamental greenhouse crop production. Emphasis is placed on production of flowering potted plants, cut flowers, and foliage crops produced in greenhouses and other controlled environments. An overnight class field trip outside scheduled class time is required.

HORT 435: Spring Greenhouse Crop Production

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: HORT 330 and HORT 332

Principles and practices of containerized greenhouse production of crops for gardens and outdoor use. Emphasis is placed on the production of seedling plugs and rooted cuttings, annual and perennial bedding plants, and native plants. An overnight class field trip outside scheduled class time is required.

HORT 442: Nursery Production and Garden Center Management

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

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.

HORT 444: Landscape Construction Management

(2-3) Cr. 3. F.

Principles and practices of residential landscape construction.

Encompasses project management, landscape estimating and overview of common landscape materials. Laboratory work involves field trips and project 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 odd-numbered years.

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.

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 even-numbered years.

Prereq: HORT 351

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 even-numbered years.

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.

HORT 454: Turf & Landscape Irrigation

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

Irrigation systems and principles for turf and landscape environments. Topics include design, installation, equipment, management, and troubleshooting 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 odd-numbered years.

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.

HORT 471: Vegetable Production and Management

(2-0) Cr. 2. Alt. S., offered even-numbered years.

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.

HORT 471L: Vegetable Production and Management Lab

(0-3) Cr. 1. Alt. S., offered even-numbered years.

Prereq: Junior or Senior status and concurrent enrollment in Hort 471 is required.

Hands-on training in the area of vegetable crop production. Students will have an opportunity to grow a variety of vegetables in a heated greenhouse and also conduct greenhouse and lab experiments. The lab also involves visits to vegetable production sites in Iowa to observe/experience and learn from growers and other agricultural professionals.

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).

HORT 481: Advanced Garden Composition

(0-4) Cr. 2. F.

Prereq: HORT 240 and HORT 330 and HORT 380 and HORT 381

Priority given 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 odd-numbered years.

Prereq: 9 cr. in biological or physical sciences

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 129 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 129 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 129 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 129 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 129 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 129 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 129 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 129 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 129 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 129 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 129 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.

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. Assessed service-learning component.

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. Assessed service-learning component.

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. Assessed service-learning component.

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 506: Crop Genetics

(Cross-listed with AGRON). Cr. 3. F.

Introduction to genetics of reproductive systems, recombination, segregation and linkage analysis, inbreeding, quantitative inheritance, fertility regulation, and polyploidy to prepare students for subsequent courses in crop improvement. Enrollment is restricted to off-campus MS in Plant Breeding students.

HORT 511: Integrated Management of Tropical Crops

(Cross-listed with ENT, PL P). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221

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 524: Sustainable and Environmental Horticulture Systems

(Dual-listed with HORT 424). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

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 530: Research Orientation

(1-3) Cr. 2. F.

Instruction in scientific methods and communication skills.

HORT 538: Seed Physiology and the Environment

(Cross-listed with AGRON). (2-0) Cr. 2. Alt. F., offered even-numbered years.

Prereq: AGRON 316; CHEM 231 or CHEM 331

Physiological aspects of seed development, maturation, longevity, dormancy, and germination of agronomic and horticultural crops and their interactions with field and storage environments. Emphasis on current literature and advanced methodology.

HORT 542: Introduction to Molecular Biology Techniques

(Cross-listed with B M S, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

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

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

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, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, VDPAM). 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 Techniques

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

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, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

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: Introduction to Molecular Biology Techniques: Proteomics

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

HORT 542F: Introduction to Molecular Biology Techniques: Metabolomics

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

HORT 542G: Introduction to Molecular Biology Techniques: Genomic

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

HORT 543: Seed Physiology

(Cross-listed with STB). (2-0) Cr. 2. Alt. F., offered even-numbered years.

Prereq: Admission to the Seed Technology and Business Master's Degree 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 Farming Systems

(Cross-listed with AGRON, SUSAG). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

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 even-numbered years.

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 even-numbered years.

Prereq: HORT 351

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, SUSAG). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Prereq: 9 cr. in biological or physical sciences

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, FOR, GDCB, PLBIO). Cr. 1. Repeatable.

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.