

Horticultural Science (BS): Plant Breeding and Biotechnology in Horticulture Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

The Bachelor of Science in Horticultural Science: Plant Breeding & Biotechnology in Horticulture Concentration is one of the four concentrations offered in by the Department of Horticultural Science. Students are offered a unique look at various aspects of Horticulture.

The Plant Breeding & Biotechnology in Horticulture concentration is a menu driven concentration that allows students to direct their education in either plant breeding or biotechnology. Students are required to take two Biology courses, Soil Science, General Chemistry, Organic Chemistry I and II, Biochemistry, Genetics, and Whole Plant Physiology. The remaining courses for the major are selected from a series of topical menus: Plant Protection Electives, Business Electives, and Advised Electives.

Students can follow paths toward research and biotechnology in academia or industry or pursue a graduate degree.

Coordinator

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Plan Requirements

Code	Title	Hours	Counts towards
Orientation			
ALS 103	Freshman Transitions and Diversity in Agriculture & Life Sciences	1	
or ALS 303	Transfer Transitions and Diversity in Agriculture & Life Sciences		
Communication		3	
COM 110	Public Speaking		
or COM 112	Interpersonal Communication		
or COM 202	Small Group Communication		
Mathematics & Sciences			
MA 121	Elements of Calculus	3	

or MA 131	Calculus for Life and Management Sciences A		
ST 311	Introduction to Statistics	3	
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
CH 101	Chemistry - A Molecular Science	3	
CH 102	General Chemistry Laboratory	1	
CH 221	Organic Chemistry I	3	
CH 222	Organic Chemistry I Lab	1	
CH 223	Organic Chemistry II	3	
CH 224	Organic Chemistry II Lab	1	
Select one of the following:		3	
ARE 201	Introduction to Agricultural & Resource Economics		
Foundational Courses			
BCH 351	General Biochemistry	3-4	
or BCH 451	Principles of Biochemistry		
CS 413	Plant Breeding	3	
GN 311	Principles of Genetics	4	
GN 312	Elementary Genetics Laboratory	1	
HS 201	The World of Horticulture: Principles and Practices	3	
HS 290	Horticulture: Careers and Opportunities	1	
HS 301	Plant Propagation	4	
HS 303	Ornamental Plant Identification I	3	
HS 304	Ornamental Plant Identification II	3	
or PB 403	Systematic Botany		
PB 421	Plant Physiology	3	

PB 480	Introduction to Plant Biotechnology	3
SSC 200	Soil Science	3
SSC 201	Soil Science Laboratory	1
Select one of the following Internship/Research/Teaching courses:		3
HS 492	Horticulture Internship	
HS 493	Research Experience in Horticultural Science	
HS 494	Teaching Experience in Horticultural Science	

Electives

Environmental Elective (p.)	3
Plant Protective Electives (p. 2)	6
Business Elective (p. 2)	3
Broad-Scope Elective (p. 3)	3
Advised Electives (p. 3)	9

GEP Courses

ENG 101	Academic Writing and Research ¹	4
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		6
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		2
GEP US Diversity, Equity, and Inclusion (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/)		3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		2
GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)		

Foreign Language Proficiency (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/>) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) ²	5
Total Hours	120

¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine which courses fill this requirement.

Environmental Electives

Code	Title	Hours	Counts towards
BIT 100	Current Topics in Biotechnology	4	
ES 200	Climate Change and Sustainability	3	
COM 289	Science Communication and Public Engagement	3	
CS 224	Seeds, Biotechnology and Societies	3	

Plant Protective Electives

Code	Title	Hours	Counts towards
CS 414	Weed Science	4	
CS 415	Integrated Pest Management	3	
ENT 425	General Entomology	3	
	or FOR 402 Forest Entomology		
FOR 318	Forest Pathology	3	
	or PP 315 Principles of Plant Pathology		
	or PP 318 Forest Pathology		

Business Electives

Code	Title	Hours	Counts towards
ACC 280	Survey of Financial and Managerial Accounting	3	
ARE 215	Small Business Accounting	3	
ARE 306	Agricultural Law	3	
ARE 309	Environmental Law & Economic Policy	3	
ARE 311	Agricultural Markets	3	
ARE 312	Agribusiness Marketing	3	

ARE 332	Human Resource Management for Agribusiness	3
MIE 310	Introduction to Entrepreneurship	3
MIE 413	New Venture Planning	3

GN 425	Advanced Genetics Laboratory	2
GN 427	Introductory Bioinformatics	3
GN 451	Genome Science	3
GN 461	Advanced Bioinformatics	3

Advised Electives Categories

Code	Title	Hours	Counts towards
Broad-Scope Electives			
BIO 414	Cell Biology	3	
BIT 402	Biotechnology Networking and Professional Development	1	
CS 411	Crop Ecology	3	
HS 403	Plant Micropropagation and Tissue Culture	3	
HS 451	Plant Nutrition	3	
HS 462	Postharvest Physiology	3	
HS 476	Crop Physiology and Production in Controlled Environments	3	
HS 491	Sustainable Agriculture Entrepreneurship Study Abroad	3	
PB 413	Plant Anatomy	2	
Breeding Elective			
BCH 453	Biochemistry of Gene Expression	3	
BIT 465	Real-time PCR Techniques	2	
BIT 467	PCR and DNA Fingerprinting	2	
BIT 471	RNA Interference and Model Organisms	2	
BIT 474	Plant Genetic Engineering	2	
BIT 481	Plant Tissue Culture and Transformation	2	
BIT 476	Applied Bioinformatics	2	
BIT 501	Ethical Issues in Biotechnology	1	
GN 423	Population, Quantitative and Evolutionary Genetics	3	

Biotechnology Electives		
BIT 410	Manipulation of Recombinant DNA	4
BIT 471	RNA Interference and Model Organisms	2
BIT 474	Plant Genetic Engineering	2
FS 402	Chemistry of Food and Bioprocessed Materials	4
GN 421	Molecular Genetics	3

Semester Sequence

This is a sample.

First Year		Hours
Fall Semester		
ALS 103 or ALS 303	Freshman Transitions and Diversity in Agriculture & Life Sciences or Transfer Transitions and Diversity in Agriculture & Life Sciences	1
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
ENG 101	Academic Writing and Research	4
HS 201	The World of Horticulture: Principles and Practices	3
HS 290	Horticulture: Careers and Opportunities	1
MA 121 or MA 131	Elements of Calculus or Calculus for Life and Management Sciences A	3
Hours		16
Spring Semester		
BIO 183	Introductory Biology: Cellular and Molecular Biology	4
CH 101	Chemistry - A Molecular Science	3
CH 102	General Chemistry Laboratory	1
COM 110 or COM 112 or COM 202	Public Speaking or Interpersonal Communication or Small Group Communication	3
ST 311	Introduction to Statistics	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
Hours		15

Second Year**Fall Semester**

ARE 201 or EC 201 or EC 205	Introduction to Agricultural & Resource Economics or Principles of Microeconomics or Fundamentals of Economics	3
CH 221	Organic Chemistry I	3
CH 222	Organic Chemistry I Lab	1
HS 303	Ornamental Plant Identification I	3
GN 311	Principles of Genetics	4
GN 312	Elementary Genetics Laboratory	1
Hours		15

Spring Semester

Advised Elective (p. 3)		3
CH 223	Organic Chemistry II	3
CH 224	Organic Chemistry II Lab	1
Environmental Elective (p.)		3
HS 304 or PB 403	Ornamental Plant Identification II or Systematic Botany	3
SSC 200	Soil Science	3
SSC 201	Soil Science Laboratory	1
Hours		17

Third Year**Fall Semester**

Advised Elective (p. 3)		3
BCH 351 or BCH 451	General Biochemistry or Principles of Biochemistry	3
CS 413	Plant Breeding	3
Select one of the following:		3
HS 492	Horticulture Internship	
HS 493	Research Experience in Horticultural Science	
HS 494	Teaching Experience in Horticultural Science	
Plant Protection Elective (p. 2)		3
Hours		15

Spring Semester

Advised Elective (p. 3)		3
Free Elective		3
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		2
HS 301	Plant Propagation	4
Hours		15

Fourth Year**Fall Semester**

GEP US Diversity, Equity, and Inclusion (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/)		3
PB 421	Plant Physiology	3
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		3
PB 480	Introduction to Plant Biotechnology	3

GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	1
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Hours	13
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Spring Semester

Advised Elective (p. 3)	3
Business Elective (p. 2)	3
Free Elective	2
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	3
Plant Protection Elective (p. 2)	3

Hours	14
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Total Hours	120
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Career Opportunities

Horticulture graduates fill positions in production, processing, sales, service, and outreach. Among these are:

- County extension agents
- Vocational agriculture teachers
- Plant breeders
- Landscape designers and landscape contractors
- Floral crop grower or floral designer
- Fruit and vegetable growers
- Business owners
- Orchard, nursery, greenhouse, and garden center managers
- Research, production, and promotional specialists with commercial seed, fertilizer chemical, and food companies
- Urban horticulture specialists
- Garden writers
- Quality control technologists
- USDA specialists
- County and state government planners
- Leaders in other phases of agricultural and industrial developments
- Students also prepare for careers in research, teaching or extension in horticulture