

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

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 Elective (http:// catalog.ncsu.edu/undergraduate/ gep-category-requirements/)		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)		
World Language Proficiency (http:// catalog.ncsu.edu/undergraduate/ gep-category-requirements/world- 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
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Advised Electives Categories

Code	Title	Hours	Counts towards
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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
GN 425	Advanced Genetics Laboratory	2
GN 427	Introductory Bioinformatics	3
GN 451	Genome Science	3

GN 461	Advanced Bioinformatics	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

Fall Semester	Hours	
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
COM 110	Public Speaking	3
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		15

Spring Semester

BIO 183	Introductory Biology: Cellular and Molecular Biology	4
ENG 101	Academic Writing and Research	4
CH 101	Chemistry - A Molecular Science	3
CH 102	General Chemistry Laboratory	1
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		16

Second Year

Fall Semester	Hours	
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 Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		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
Hours		13

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
Total Hours		120

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

Career Titles

- Agricultural Engineer
- Agricultural Inspector
- Agricultural Sciences Professor
- Agricultural Technician
- Botanist
- Crop Workers Supervisor
- Farm and Ranch Manager
- Farm Management Advisor
- Farm Products Purchasing Agent
- Farmers and Ranchers
- Food & Drug Inspector
- Food Science Technicians
- Golf Course Manager
- Greenhouse and Nursery Manager
- Horticultural Worker Supervisor
- Horticulture Therapist
- Horticulturist
- Irrigation Engineer
- Landscape Architect
- Landscape Contractor
- Plant Breeder
- Sales Representative (Agricultural Products)
- Winemaker / Vinter

Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)

This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.