

Crop and Soil Sciences (BS): Crop Biotechnology

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 *Crop and Soil Sciences* with a concentration in *Crop Biotechnology* is a program that trains the next generation of plant scientists primarily focused on crop improvement. Through hands-on classes, students will learn how crops develop and improve as a result of biotechnology through increased food quality and quantity once introduced into agricultural production systems. Plant breeders graduating from this program will develop the seeds used by the next generation of food producers.

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		
Mathematics & Natural Sciences			
MA 131	Calculus for Life and Management Sciences A	3	
MA 231	Calculus for Life and Management Sciences B	3	
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
PY 131	Conceptual Physics	4
BCH 351	General Biochemistry	3

Communication/Advanced Writing

COM 110	Public Speaking	3
or COM 112	Interpersonal Communication	
Select one of the following:		3
AEE 311	Communication Methods and Media	
ENG 331	Communication for Engineering and Technology	
ENG 332	Communication for Business and Management	
ENG 333	Communication for Science and Research	

Required Courses within Major

ARE 201	Introduction to Agricultural & Resource Economics	3
BIT 410	Manipulation of Recombinant DNA	4
CSSC 290	Professional Development in Crop & Soil Sciences	1
CS 213	Crop Science ¹	3
CS 214	Crop Science Laboratory ¹	1
CS 413	Plant Breeding	3
CS 211	Plant Genetics	3
PB 421	Plant Physiology	3
PB 480	Introduction to Plant Biotechnology	3
SSC 200	Soil Science ¹	3
SSC 201	Soil Science Laboratory ¹	1

Concentration Electives

Foundation Elective (select one):		3
ANT 261	Technology in Society and Culture	
CS 224	Seeds, Biotechnology and Societies	

SOC 261	Technology in Society and Culture	
STS 302	Contemporary Science, Technology and Human Values	
Biotechnology Elective (p. 2)		4
Experiential Learning (select one):		3
CSSC 492	Professional Internship Experience in Crop and Soil Sciences	
CSSC 493	Research Experience in Crop and Soil Sciences	
Restricted Electives (p. 3)		13

General Education Program**(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 Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)		3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		2
GEP U.S. Diversity (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/) (verify requirement)		
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	6
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.

Biotechnology Elective

Code	Title	Hours	Counts towards
BEC 463/563	Fermentation of Recombinant Microorganisms	2	
BIO 572	Proteomics	3	
BIT 100	Current Topics in Biotechnology	4	
BIT 200	Early Research in Biotechnology	4	
BIT 210	Phage Hunters	3	
BIT 211	Phage Genomics	2	
BIT 295	Special Topics in Biotechnology	1-3	
BIT 462/562	Gene Expression Analysis: Microarrays	2	
BIT 463/563	Fermentation of Recombinant Microorganisms	2	
BIT 464/564	Protein Purification	2	
BIT 465/565	Real-time PCR Techniques	2	
BIT 466/566	Animal Cell Culture Techniques	2	
BIT 467/567	PCR and DNA Fingerprinting	2	
BIT 468/568	Genome Mapping	2	
BIT 471/571	RNA Interference and Model Organisms	2	
BIT 473/573	Protein Interactions	2	
BIT 474/574	Plant Genetic Engineering	2	
BIT 476	Applied Bioinformatics	2	
BIT 477	Metagenomics	2	
BIT 478/578	Mapping the Brain	2	

BIT 479/579	High-Throughput Discovery	2
BIT 480/580	Yeast Metabolic Engineering	2
BIT 481/581	Plant Tissue Culture and Transformation	2
BIT 492	External Learning Experience	1-6
BIT 493	Special Problems in Biotechnology	1-6
BIT 495	Special Topics in Biotechnology	1-3
BIT 501	Ethical Issues in Biotechnology	1
BIT 502	Biotechnology Networking and Professional Development	1
BIT 510	Core Technologies in Molecular and Cellular Biology	4
BIT 569		2
BIT 590	Independent Study in Biotechnology	1-3
BIT 595	Special Topics	1-6
CH 572	Proteomics	3
CHE 463	Fermentation of Recombinant Microorganisms	2
CHE 563	Fermentation of Recombinant Microorganisms	2
MB 210	Phage Hunters	3
MB 211	Phage Genomics	2
PB 481	Plant Tissue Culture and Transformation	2
PO 466/566	Animal Cell Culture Techniques	2

Restricted Electives

Code	Title	Hours	Counts towards
AEC 360	Ecology	4	
BIO 330	Evolutionary Biology	3	
BIO 414	Cell Biology	3	
BIT 476	Applied Bioinformatics	2	
BIT 481/581	Plant Tissue Culture and Transformation	2	
CS 211	Plant Genetics	3	

CS 216	Southern Row Crop Production - Cotton, Peanuts, and Tobacco	3
CS 218	Southern Row Crop Production - Corn, Small Grains and Soybeans	3
CS 224	Seeds, Biotechnology and Societies	3
CS 230	Introduction to Agroecology	3
CS 251	Production of Forage Crops	3
CS 411	Crop Ecology	3
CS 414	Weed Science	4
CS 415	Integrated Pest Management	3
CS 418/518	Introduction to Regulatory Science in Agriculture	3
CS 428/528	Advanced Regulatory Science in Agriculture	3
CS 424/524	Seed Physiology	3
CS 430/530	Advanced Agroecology	4
CS 480	Sustainable Food Production (capstone)	1
CSSC 490	Senior Seminar in Crop Science and Soil Science	1
CSSC 495	Special Topics in Crop and Soil Sciences	1-6
ENT 425	General Entomology	3
GN 311	Principles of Genetics	4
GN 312	Elementary Genetics Laboratory	1
GN 421/521	Molecular Genetics	3
GN 423	Population, Quantitative and Evolutionary Genetics	3
MB 200	The Fourth Horseman: Plagues that Changed the World	3

MB 351	General Microbiology	3
MB 575	Introduction to Mycology	4
PB 200	Plant Life	4
PB 250	Plant Biology	4
PB 295	Special Topics in Botany	1-4
PB 345	Economic Botany	3
PB 346	Economic Botany Lab	1
PB 360	Ecology	4
PB 400	Plant Diversity and Evolution	4
PB 403	Systematic Botany	4
PB 413	Plant Anatomy	2
PB 481	Plant Tissue Culture and Transformation	2
PB 495	Special Topics in Plant Biology	1-6
PB 503	Systematic Botany	4
PB 513	Plant Anatomy	2
PB 570	Plant Functional Ecology	3
PB 575	Introduction to Mycology	4
PP 315	Principles of Plant Pathology	4
PP 495	Special Topics in Plant Pathology	1-3
PP 575	Introduction to Mycology	4
SSC 185	Land and Life	3
SSC 332	Environmental Soil Microbiology	3
SSC 341	Soil Fertility and Nutrient Management	3
SSC 342	Soil and Plant Nutrient Analysis	1
SSC 421	Role of Soils in Environmental Management	3
SSC 427	Biological Approaches to Sustainable Soil Systems	3
SSC 440/540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3

SSC 442	Soil and Environmental Biogeochemistry	3
SSC 452	Soil Classification	4
SSC 455	Soils, Environmental Quality and Global Challenges	3
SSC 461	Soil Physical Properties and Plant Growth	3
SSC 462	Soil-Crop Management Systems	3
SSC 470/570	Wetland Soils	3
ST 371	Introduction to Probability and Distribution Theory	3
STS 302	Contemporary Science, Technology and Human Values	3
STS 323	World Population and Food Prospects	3

Semester Sequence

This is a sample.

First Year

		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
ENG 101	Academic Writing and Research	4
MA 131	Calculus for Life and Management Sciences A	3
	Foundation Elective (p. 1)	3
CSSC 290	Professional Development in Crop & Soil Sciences	1

Hours 16

Spring Semester

BIO 183 or PB 200	Introductory Biology: Cellular and Molecular Biology or Plant Life	4
CH 101	Chemistry - A Molecular Science	3
CH 102	General Chemistry Laboratory	1
MA 231	Calculus for Life and Management Sciences B	3
	GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	1

GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	3
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Hours	15
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Second Year**Fall Semester**

CH 221	Organic Chemistry I	3
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CH 222	Organic Chemistry I Lab	1
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CS 213	Crop Science	3
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CS 214	Crop Science Laboratory	1
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SSC 200	Soil Science	3
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SSC 201	Soil Science Laboratory	1
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GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	1
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Restrictive Electives (p. 3)	3
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Hours	16
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Spring Semester

CH 223	Organic Chemistry II	3
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CH 224	Organic Chemistry II Lab	1
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COM 110	Public Speaking	3
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CS 211	Plant Genetics	3
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Restricted Electives (p. 3)	3
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GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	2
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Hours	15
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Third Year**Fall Semester**

ARE 201	Introduction to Agricultural & Resource Economics	3
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PY 131	Conceptual Physics	4
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PB 421	Plant Physiology	3
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ST 311	Introduction to Statistics	3
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GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3
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Hours	16
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Spring Semester

BCH 351	General Biochemistry	3
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BIT 410	Manipulation of Recombinant DNA	4
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GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	3
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Restrictive Elective (p.)	3
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Hours	13
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Fourth Year**Fall Semester**

Biotechnology Elective (p. 1)	4
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PB 480	Introduction to Plant Biotechnology	3
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GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
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Experiential Learning Elective (p. 1)	3
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Hours	13
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Spring Semester

CS 413	Plant Breeding	3
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Select one of the following:	3
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ENG 331	Communication for Engineering and Technology	3
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ENG 332	Communication for Business and Management	3
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ENG 333	Communication for Science and Research	3
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Restrictive Elective (p.)	4
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Free Elective	6
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Hours	16
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Total Hours	120
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Career Opportunities

The breadth and depth of education and experiences you will gain from our department will set you on a path toward a rewarding career in one of the following specialties:

- Crop Geneticist
- Crops Systems Specialist
- Plant Breeder
- Plant Protection Specialist
- Regulatory Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at go.ncsu.edu/careers (<http://go.ncsu.edu/careers/>)