PLANT SCIENCES, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Degree Requirements
For the Bachelor of Science degree in Plant Sciences, a minimum of 120 credits are required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Electives</td>
<td>0-13</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>83-102</td>
</tr>
</tbody>
</table>

21-24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses and 3 credits of GWS courses; plus 3 GH in Crop Production.

Requirements for the Major
To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44.

Common Requirements for the Major (All Options)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 110</td>
<td>Biology: Basic Concepts and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 110</td>
<td>Chemical Principles I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>Experimental Chemistry I</td>
<td>1</td>
</tr>
<tr>
<td>ENT 313</td>
<td>Introduction to Entomology</td>
<td>2</td>
</tr>
<tr>
<td>PLANT 200</td>
<td>Introduction to Agricultural Crop Growth, Form, and Function</td>
<td>3</td>
</tr>
</tbody>
</table>

Prescribed Courses: Require a grade of C or better

- AGECO 457 Principles of Integrated Pest Management 3
- PLANT 461 Emerging Issues in Plant Sciences 3
- SOILS 101 Introductory Soil Science 3

Additional Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENT 314</td>
<td>Management of Insect Pests of Ornamentals</td>
<td>1</td>
</tr>
<tr>
<td>or ENT 316</td>
<td>Field Crops Entomology</td>
<td></td>
</tr>
<tr>
<td>Select 3 credits from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGBM 101</td>
<td>Economic Principles of Agribusiness Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>ECON 14</td>
<td>Principles of Economics</td>
<td></td>
</tr>
<tr>
<td>ECON 102</td>
<td>Introductory Microeconomic Analysis and Policy</td>
<td></td>
</tr>
<tr>
<td>ECON 104</td>
<td>Introductory Macroeconomic Analysis and Policy</td>
<td></td>
</tr>
</tbody>
</table>

Select 1 credit from the following:

- AGECO 496 Independent Studies 1

Additional Courses: Require a grade of C or better

- ENGL 202C Effective Writing: Technical Writing 3

Requirements for the Option
Agroecology Option (57-58 credits)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGECO 295</td>
<td>Agroecology Internship</td>
<td>1</td>
</tr>
<tr>
<td>AGECO/AGRO 438</td>
<td>Principles of Weed Management</td>
<td>4</td>
</tr>
<tr>
<td>PPEM 405</td>
<td>Microbe-Plant Interactions: Plant Disease and Biological Control</td>
<td>3</td>
</tr>
<tr>
<td>SOILS 102</td>
<td>Introductory Soil Science Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>SOILS 401</td>
<td>Soil Composition and Physical Properties</td>
<td>3</td>
</tr>
<tr>
<td>SOILS 402</td>
<td>Soil Nutrient Behavior and Management</td>
<td>3</td>
</tr>
</tbody>
</table>

Prescribed Courses: Require a grade of C or better

- AGECO 201 Introductory Agroecology 3

Additional Courses

- BIOL 222 Genetics 3
- or HORT 407 Plant Breeding 3

Select 3 credits from the following:

- AGECO/ METEO 122 Atmospheric Environment: Growing in the Wind 3
- AGECO 134 3
- AGECO 144 Principles and Practices of Organic Agriculture 3
- AGECO 154 Principles of Agronomic Field Operations 3
- AGECO 496 Independent Studies 3

Select 3 credits from the following:

- AG 160 Introduction into Ethics and Issues in Agriculture 3
- GEOG 30N Environment and Society in a Changing World 3
- PHIL 13 Nature and Environment 3
- PHIL 103 Ethics 3
- PHIL 132/ BIOET 100 Bioethics 3

Select 6 credits from the following:

- AGRO 423 Forage Crop Management 3
- AGRO 425 Field Crop Management 3
- or ENGL 202D Effective Writing: Business Writing 3-5

Select 3-5 credits from the following:

- MATH 22 College Algebra With Analytic Geometry and Applications II 3
- MATH 26 Plane Trigonometry and Applications of Trigonometry 3
- MATH 40 Algebra, Trigonometry, and Analytic Geometry 3
- MATH 41 Trigonometry and Analytic Geometry 3
- MATH 110 Techniques of Calculus I 3
- MATH 111 Techniques of Calculus II 3
- MATH 140 Calculus With Analytic Geometry I 3
- MATH 141 Calculus With Analytic Geometry II 3

Select 3-4 credits from the following:

- STAT 200 Elementary Statistics 3
- STAT 240 Introduction to Biometry 3
- STAT 250 Introduction to Biostatistics 3
Select 3-4 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGECO/ANSC/</td>
<td>Nutrient Management in Agricultural Systems</td>
<td>3-4</td>
</tr>
<tr>
<td>SOILS 418</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANSC 201</td>
<td>Animal Science</td>
<td></td>
</tr>
<tr>
<td>GEOG 160</td>
<td>Mapping Our Changing World</td>
<td></td>
</tr>
<tr>
<td>SOILS 450</td>
<td>Environmental Geographic Information Systems</td>
<td></td>
</tr>
</tbody>
</table>

Select 3-4 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 410W</td>
<td>Physiology of Agricultural Crops</td>
<td></td>
</tr>
<tr>
<td>HORT 412W</td>
<td>Post-Harvest Physiology</td>
<td></td>
</tr>
<tr>
<td>SOILS 412W</td>
<td>Soil Ecology</td>
<td></td>
</tr>
</tbody>
</table>

Select 3 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 28</td>
<td>Principles of Crop Management</td>
<td>3</td>
</tr>
<tr>
<td>or HORT 101</td>
<td>Horticultural Science</td>
<td></td>
</tr>
</tbody>
</table>

Select 9 credits of supporting courses in consultation with adviser

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG 301</td>
<td>Interpersonal Skills for Tomorrow's Leaders</td>
<td></td>
</tr>
<tr>
<td>AGBM 200</td>
<td>Introduction to Agricultural Business Management</td>
<td></td>
</tr>
<tr>
<td>AGBM 407</td>
<td>Farm Planning and Financial Management</td>
<td></td>
</tr>
</tbody>
</table>

Select 6-7 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 402W</td>
<td>Plant Nutrition</td>
<td></td>
</tr>
<tr>
<td>HORT 407</td>
<td>Plant Breeding</td>
<td></td>
</tr>
<tr>
<td>HORT 445</td>
<td>Plant Ecology</td>
<td></td>
</tr>
<tr>
<td>HORT 455</td>
<td>Retail Horticulture Business Management</td>
<td></td>
</tr>
<tr>
<td>or HORT 101</td>
<td>Horticultural Science</td>
<td></td>
</tr>
</tbody>
</table>

Select 9-10 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG 160</td>
<td>Introduction into Ethics and Issues in Agriculture</td>
<td></td>
</tr>
<tr>
<td>PHIL 13</td>
<td>Nature and Environment</td>
<td></td>
</tr>
<tr>
<td>PHIL 103</td>
<td>Ethics</td>
<td></td>
</tr>
<tr>
<td>PHIL 132/</td>
<td>Bioethics</td>
<td></td>
</tr>
<tr>
<td>BIOET 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select 3 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG 301</td>
<td>Interpersonal Skills for Tomorrow's Leaders</td>
<td></td>
</tr>
<tr>
<td>AGBM 200</td>
<td>Introduction to Agricultural Business Management</td>
<td></td>
</tr>
<tr>
<td>AGBM 407</td>
<td>Farm Planning and Financial Management</td>
<td></td>
</tr>
</tbody>
</table>
### Plant Sciences, B.S.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA 303</td>
<td>Marketing</td>
<td></td>
</tr>
<tr>
<td>BLAW 243</td>
<td>Legal Environment of Business</td>
<td></td>
</tr>
<tr>
<td>SPAN 1</td>
<td>Elementary Spanish I</td>
<td></td>
</tr>
<tr>
<td>SPAN 2</td>
<td>Elementary Spanish II</td>
<td></td>
</tr>
<tr>
<td>SPAN 3</td>
<td>Intermediate Spanish</td>
<td></td>
</tr>
<tr>
<td>SPAN 105</td>
<td>Elementary Spanish I for Students in the Agricultural Sciences</td>
<td></td>
</tr>
</tbody>
</table>

1. Students cannot use the same course more than once as an additional course.

---

### Plant Genetics and Biotechnology Option (56-63 credits)

**Prescribed Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 410W</td>
<td>Physiology of Agricultural Crops</td>
<td>4</td>
</tr>
<tr>
<td>AGRO/BIOC 460</td>
<td>Advances and Applications of Plant Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 222</td>
<td>Genetics</td>
<td></td>
</tr>
<tr>
<td>BMB 400</td>
<td>Molecular Biology of the Gene</td>
<td>2-3</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>Chemical Principles II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 212</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>HORT 407</td>
<td>Plant Breeding</td>
<td>3</td>
</tr>
<tr>
<td>HORT/BIO/BIOTC 459</td>
<td>Plant Tissue Culture and Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 250</td>
<td>Introductory Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

*Prescribed Courses: Require a grade of C or better*

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPEM 405</td>
<td>Microbe-Plant Interactions: Plant Disease and Biological Control</td>
<td>3</td>
</tr>
</tbody>
</table>

**Additional Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 28</td>
<td>Principles of Crop Management</td>
<td>3</td>
</tr>
<tr>
<td>or HORT 101</td>
<td>Horticultural Science</td>
<td></td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Experimental Chemistry II</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 113B</td>
<td>Experimental Chemistry II–Bioscience</td>
<td></td>
</tr>
</tbody>
</table>

Select 4-6 credits from the following: 4-6

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 230W</td>
<td>Biology: Molecules and Cells</td>
<td></td>
</tr>
<tr>
<td>BIOL 240W</td>
<td>Biology: Function and Development of Organisms</td>
<td></td>
</tr>
<tr>
<td>BMB 211 &amp; BMB 212</td>
<td>Elementary Biochemistry and Elementary Biochemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>MICRB 201 &amp; MICRB 202</td>
<td>Introductory Microbiology and Introductory Microbiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>MICRB 251/B251 &amp; MICRB 252/B252</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select 3-4 credits from the following: 3-4

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 414</td>
<td>Taxonomy of Seed Plants</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 427</td>
<td>Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOL 428</td>
<td>Population Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOL 436</td>
<td>Population Ecology and Global Climate Change</td>
<td></td>
</tr>
<tr>
<td>BIOL 448</td>
<td>Ecology of Plant Reproduction</td>
<td></td>
</tr>
<tr>
<td>ENT 420</td>
<td>Introduction to Population Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>HORT 445</td>
<td>Plant Ecology</td>
<td></td>
</tr>
<tr>
<td>PPEM/BIOI 425</td>
<td>Biology of Fungi</td>
<td></td>
</tr>
</tbody>
</table>

Select 2-3 credits from the following: 2-3

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 439</td>
<td>Practical Bioinformatics</td>
</tr>
<tr>
<td>BIOTC 479</td>
<td>Methods in Biofermentations</td>
</tr>
</tbody>
</table>

### Plant Science Option (47-53 credits)

**Prescribed Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 222</td>
<td>Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>Chemical Principles II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 212</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 213</td>
<td>Laboratory in Organic Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 250</td>
<td>Introductory Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

*Prescribed Courses: Require a grade of C or better*

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPEM 405</td>
<td>Microbe-Plant Interactions: Plant Disease and Biological Control</td>
<td>3</td>
</tr>
</tbody>
</table>

**Additional Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGRO 28</td>
<td>Principles of Crop Management</td>
<td>3</td>
</tr>
<tr>
<td>or HORT 101</td>
<td>Horticultural Science</td>
<td></td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Experimental Chemistry II</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 113B</td>
<td>Experimental Chemistry II–Bioscience</td>
<td></td>
</tr>
</tbody>
</table>

Select 4-6 credits from the following: 4-6

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMB 211 &amp; BMB 212</td>
<td>Elementary Biochemistry and Elementary Biochemistry Laboratory</td>
</tr>
</tbody>
</table>
**Plant Sciences, B.S.**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 230W</td>
<td>Biology: Molecules and Cells</td>
</tr>
<tr>
<td>BIOL 240W</td>
<td>Biology: Function and Development of Organisms</td>
</tr>
<tr>
<td>MICRB 201</td>
<td>Introductory Microbiology</td>
</tr>
<tr>
<td>&amp; MICRB 202</td>
<td>and Introductory Microbiology Laboratory</td>
</tr>
<tr>
<td>MICRB 251</td>
<td>Molecular and Cell Biology I</td>
</tr>
<tr>
<td>MICRB 252</td>
<td>Molecular and Cell Biology II</td>
</tr>
</tbody>
</table>

Select 3-4 credits of the following: 3-4
- BIOL 439  | Practical Bioinformatics ¹
- ENT 402W  | Biology of Animal Parasites                        |
- ENT 410   | Insect Structure and Function                       |
- PPEM 416  | Plant Virology: Molecules to Populations            |
- PPEM 417W | Mechanisms of Bacterial Pathogenesis in Plants ¹    |
- PPEM 425  | Biology of Fungi                                   |

Select 3-4 credits of the following: 3-4
- BIOL 412  | Ecology of Infectious Diseases                    |
- BIOL 414  | Taxonomy of Seed Plants                            |
- BIOL 427  | Evolution                                         |
- BIOL 428  | Population Genetics                                |
- BIOL 436  | Population Ecology and Global Climate Change       |
- BIOL 448  | Ecology of Plant Reproduction                      |
- ENT/VBSC 402W | Biology of Animal Parasites                      |
- ENT 420   | Introduction to Population Dynamics                |
- HORT 445  | Plant Ecology                                     |
- PPEM 425  | Biology of Fungi                                  |

Select 3 credits of the following: 3
- AGRO 460  | Advances and Applications of Plant Biotechnology  |
- BIOL 439  | Practical Bioinformatics                          |
- HORT 407  | Plant Breeding                                    |
- HORT 459  | Plant Tissue Culture and Biotechnology            |

Select 6-7 credits of the following: 6-7
- AGRO 410W | Physiology of Agricultural Crops                  |
- AGRO 460  | Advances and Applications of Plant Biotechnology  |
- BIOL 407  | Plant Developmental Anatomy                       |
- BIOL 441  | Plant Physiology                                  |
- BIOL 424  | Seeds of Change: The Uses of Plants               |
- HORT 402W | Plant Nutrition                                   |
- HORT 407  | Plant Breeding                                    |
- HORT 412W | Post-Harvest Physiology                           |
- HORT 420  |                                             |
- PPEM 417W | Mechanisms of Bacterial Pathogenesis in Plants ¹    |
- PPEM/ERM 430 | Air Pollution Impacts to Terrestrial Ecosystems |

Select 3-4 credits of the following: 3-4
- AGRO 410W | Physiology of Agricultural Crops                  |
- HORT 412W | Post-Harvest Physiology                           |
- SOILS 412W | Soil Ecology                                      |

¹ Students cannot use the same course more than once as an additional course

---

**General Education**

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

**Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)**
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

**Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)**
- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

**Integrative Studies**
- Inter-Domain Courses (Inter-Domain): 6 credits

**Exploration**
- GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

**University Degree Requirements**

**First Year Engagement**

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

**Cultures Requirement**

6 credits are required and may satisfy other requirements
- United States Cultures: 3 credits
- International Cultures: 3 credits
Writing Across the Curriculum
3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits
A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work
Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition
The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.