BIORENEWABLE SYSTEMS, B.S.

Begin Campus: Any Penn State Campus
End Campus: University Park

Program Description
The BioRenewable Systems Major is an applied major that intertwines the study of engineering technology, natural resources, and agriculture with fundamentals of business, entrepreneurship, and management. Administered through the Department of Agricultural and Biological Engineering, the BioRenewable Systems (BRS) program uniquely prepares students to solve 21st century problems and attain careers in both traditional sectors and those relating to the emerging bioeconomy. Students in this program will secure:

1. knowledge of fundamental sciences related to resources, processes, and products in biorenewable systems;
2. communication and managerial skills relevant to careers in product development, technology, sales, marketing and management; and
3. the ability to apply systems analysis skills, positioning them for effective problem solving and leadership in the agricultural and bioproducts industries.

Graduates are typically employed as sales and field representatives, financial and technical consultants, and technical service or quality assurance personnel in renewable bioproducts or related agricultural sectors such as:

- power and machinery systems,
- forest products,
- food production,
- bioprocessing,
- environmental systems,
- wood structures,
- bioenergy,
- co-product development, and
- agrochemicals.

Graduates may continue their education in a graduate program with a science, engineering, or business orientation.

The BRS major has two options: Agricultural Systems Management (ASM) and BioProducts (BP).

Agricultural Systems Management Option
This option applies a technological approach to understanding and managing agricultural production systems to meet economical and sustainable needs. Basic study is emphasized in the agricultural and business management sciences, along with the application of the technical results of engineering research, design, and manufacturing. Graduates of this option apply their technology and management training to the diverse areas of food and fiber production; bioprocessing; and land, water, and air resources.

BioProducts Option
The scientific nature of biobased resources—their unique design, sustainability, and renewability—constitutes the core of this option. Building upon that foundation, students will learn techniques for converting and efficiently utilizing these materials to maximize product life cycles, while simultaneously exploring relevant marketing and management strategies. Technical electives for this option emphasize material sciences, engineering, and/or business. Career tracks are broad, ranging from traditional forest products companies to emerging sectors, including bioenergy co-products.

You Might Like this Program If...
- You want to make a difference in the world by developing more efficient and sustainable technologies and systems
- You want to work with engineers in the testing, development, and improvement of equipment, processes, or products
- You enjoy supervising and interacting with other professionals, employees, suppliers, and customers
- You want to demonstrate features, advantages, and benefits of new technologies or products and train service personnel
- You are interested in business, marketing and sales, with a focus on biorenewable and agricultural industries.

Entrance to Major
In order to be eligible for entrance to this major, a student must:

1. attain at least a C (2.00) cumulative grade-point average for all courses taken at the University; and
2. have third-semester classification (http://www.registrar.psu.edu/enrollment/semester-classification.cfm).

READ SENATE POLICY 37-30: ENTRANCE TO AND CHANGES IN MAJOR PROGRAMS OF STUDY (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/37-00-entrance-to-a-college-or-major/)

Degree Requirements
For the Bachelor of Science degree in BioRenewable Systems, a minimum of 120 credits is required for the BioProducts Option and minimum of 121 credits is required for the Agricultural Systems Management Option:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>105-109</td>
</tr>
</tbody>
</table>

30 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; 6 credits of GS courses; 9 credits of GWS courses.

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 (http://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.)**
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

**Knowledge Domains**
- Arts (GA): 6 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 6 credits
- Social and Behavioral Sciences (GS): 6 credits
- Natural Sciences (GN): 9 credits

**Integrative Studies (may also complete a Knowledge Domain requirement)**
- Inter-Domain or Approved Linked Courses: 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 (http://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.

**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 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#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>ACCTG 211</td>
<td>Financial and Managerial Accounting for Decision Making</td>
<td>4</td>
</tr>
<tr>
<td>BRS 391</td>
<td>Contextual Integration of Communication Skills for the Technical Workplace</td>
<td>2</td>
</tr>
<tr>
<td>BRS 392</td>
<td>Contextual Integration of Leadership Skills for the Technical Workplace</td>
<td>2</td>
</tr>
<tr>
<td>BRS 393</td>
<td>Industry Tour</td>
<td>1</td>
</tr>
<tr>
<td>BRS 422</td>
<td>Energy Analysis in Biorenewable Systems</td>
<td>3</td>
</tr>
<tr>
<td>BRS 426</td>
<td>Safety and Health in Agriculture and Biorenewable Industries</td>
<td>3</td>
</tr>
<tr>
<td>BRS 428</td>
<td>Electric Power and Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>BRS 429W</td>
<td>Biorenewable Systems Analysis and Management</td>
<td>3</td>
</tr>
<tr>
<td>BRS 490</td>
<td>BioRenewable Systems Colloquium</td>
<td>1</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>ENGL 15</td>
<td>Rhetoric and Composition</td>
<td>3</td>
</tr>
</tbody>
</table>

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

**Additional Courses**
Select 1 credit of First-Year Seminar

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGBM 106</td>
<td>Agribusiness Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>BRS 221</td>
<td>Engineering Principles of Biorenewable Systems</td>
<td>3</td>
</tr>
<tr>
<td>BRS 300</td>
<td>Introduction to Biorenewable Products</td>
<td>3</td>
</tr>
<tr>
<td>BRS 437</td>
<td>Bioproduct Marketing and Sales</td>
<td>4</td>
</tr>
<tr>
<td>EDSGN 100</td>
<td>Introduction to Engineering Design</td>
<td>3</td>
</tr>
</tbody>
</table>

**Prescribed Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGBM 101</td>
<td>Economic Principles of Agribusiness Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>or ECON 102</td>
<td>Introductory Microeconomic Analysis and Policy</td>
<td></td>
</tr>
<tr>
<td>BIOL 11</td>
<td>Introductory Biology I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; BIOL 12</td>
<td>and Introductory Biology II</td>
<td></td>
</tr>
<tr>
<td>or BIOL 110</td>
<td>Biology: Basic Concepts and Biodiversity</td>
<td></td>
</tr>
<tr>
<td>CAS 100A</td>
<td>Effective Speech</td>
<td>3</td>
</tr>
<tr>
<td>or CAS 100B</td>
<td>Effective Speech</td>
<td></td>
</tr>
<tr>
<td>EBF 200</td>
<td>Introduction to Energy and Earth Sciences Economics</td>
<td>3</td>
</tr>
<tr>
<td>or ECON 104</td>
<td>Introductory Macroeconomic Analysis and Policy</td>
<td></td>
</tr>
<tr>
<td>MATH 110</td>
<td>Techniques of Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 140</td>
<td>Calculus With Analytic Geometry I</td>
<td></td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 250</td>
<td>Introductory Physics I</td>
<td></td>
</tr>
<tr>
<td>STAT 200</td>
<td>Elementary Statistics</td>
<td>3-4</td>
</tr>
<tr>
<td>or STAT 240</td>
<td>Introduction to Biometry</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>BA 241</td>
<td>Legal Environment of Business</td>
<td></td>
</tr>
<tr>
<td>&amp; BA 242</td>
<td>and Social and Ethical Environment of Business</td>
<td></td>
</tr>
<tr>
<td>BA 243</td>
<td>Social, Legal, and Ethical Environment of Business</td>
<td></td>
</tr>
</tbody>
</table>
Program Learning Objectives

1. Graduates will demonstrate knowledge of engineering technologies, materials sciences, and safety as they pertain to biorenewable systems.
2. Graduates will demonstrate knowledge of sales, marketing, management, and/or entrepreneurship principles relating to biorenewable systems and industries.
3. Graduates will be able to analyze and interpret data using relevant software, and demonstrate an ability to draw sound conclusions from data.
4. Graduates will be able to communicate, both orally and in writing, business and technical concepts within the context of biorenewable industries.
5. Graduates will be able to identify solutions to problems relevant to biorenewable systems.
6. Graduates will be able to apply systems analysis skills for effective decision making in the operations and management of biorenewable resource industries.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and-out-of-class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary adviser. Advisers assume a significant educational role. Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary adviser.

University Park

Paul Heinemann
Professor of Agricultural and Biological Engineering
220 Agricultural Engineering Building
University Park, PA 16802
814-865-2633
hz@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2020-21 academic year. To access previous years' suggested academic plans, please visit the archive (http://bulletins.psu.edu/undergraduate/archive/) to view the appropriate Undergraduate Bulletin edition (Note: the archive only contain suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin).

Agricultural Systems Management Option, University Park Campus

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>BE 1</td>
<td>1</td>
</tr>
</tbody>
</table>
| CHEM 110† | 1 CHEM 111† | 1
| EDSGN 100* | 3 ACCTG 211 | 4
| MATH 110 or 140‡† | 3 ENGL 15, 30, or ESL 15‡† | 3
| General Education Course (GHW) | 1.5 General Education Course | 3
| Spring |         |
| ACCTG 211 | 4       |
| EDSGN 100* | 4 PHYS 250 or 211† | 4

Note: at least 12 credits must be at 200-400 level.
Used to designate a Linked course.

An Inter-Domain course and Z is the suffix at the end of a course number.

Integrative Studies courses are required for the General Education program.

The U.S. and I.L. are abbreviations used to designate courses that satisfy University Writing Across the Curriculum.

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time.

Advising Note:

A list of ‘selection’ courses can be found in the BRS Advising Manual: https://abe.psu.edu/documents/brs-advising-manual.pdf. Students should consult with an academic adviser to discuss appropriate course selection.

BioProducts Option, University Park Campus

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time.

Advising Note:

A list of ‘selection’ courses can be found in the BRS Advising Manual: https://abe.psu.edu/documents/brs-advising-manual.pdf. Students should consult with an academic adviser to discuss appropriate course selection.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.
The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year Seminar</td>
<td>1-3 CHEM 111†</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CHEM 110†</td>
<td>3</td>
<td>ACCTG 211</td>
<td>4</td>
</tr>
<tr>
<td>EDSGN 100</td>
<td>3</td>
<td>ENGL 15, 30, or ESL 15†</td>
<td>3</td>
</tr>
<tr>
<td>MATH 110 or 140†</td>
<td>4</td>
<td>PHYS 250 or 211†</td>
<td>4</td>
</tr>
<tr>
<td>General Education Course (GHW)</td>
<td>1.5 General Education Course</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits 120-122**

* Course requires a grade of C or better for the major
† Course requires a grade of C or better for General Education
‡ Course is an Entrance to Major requirement
‡† Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

All incoming Schreyer Honors College first-year students at University Park will take ENGL/CAS 137 in the fall semester and ENGL/CAS 138 in the spring semester. These courses carry the GWS designation and replace both ENGL 30 and CAS 100. Each course is 3 credits.

### Agricultural Systems Management Option, Commonwealth Campuses

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGBM 101 or ECON 102†</td>
<td>3</td>
<td>BLAW 243, BA 243, or BA 241 and BA 242</td>
<td>3-4</td>
</tr>
<tr>
<td>BIOL 110 or 112†</td>
<td>4</td>
<td>SOILS 101</td>
<td>3</td>
</tr>
<tr>
<td>CAS 100A or 100B†</td>
<td>3</td>
<td>AGRO 28 or HORT 101</td>
<td>3</td>
</tr>
<tr>
<td>STAT 200 or 240†</td>
<td>3-4 General Education Course</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>General Education Course</td>
<td>3</td>
<td>General Education Course</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits 16-17**

**15-17.5**

**16.5**

### Third Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGBM 106*</td>
<td>3</td>
<td>BRS 392†</td>
<td>2</td>
</tr>
<tr>
<td>BRS 221†</td>
<td>3</td>
<td>BRS 437†</td>
<td>4</td>
</tr>
<tr>
<td>BRS 300*</td>
<td>3</td>
<td>ANSC 201 or 100</td>
<td>3-4</td>
</tr>
<tr>
<td>ASM 310†</td>
<td>3</td>
<td>Selection</td>
<td>3</td>
</tr>
<tr>
<td>ASM 327†</td>
<td>3</td>
<td>Selection</td>
<td>3</td>
</tr>
<tr>
<td>BRS 391†</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits 17**

**15-16**

### Fourth Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRS 428</td>
<td>3</td>
<td>BRS 426</td>
<td>3</td>
</tr>
<tr>
<td>BRS 393</td>
<td>3</td>
<td>BRS 429W</td>
<td>3</td>
</tr>
<tr>
<td>BRS 422</td>
<td>3</td>
<td>BRS 490</td>
<td>1</td>
</tr>
<tr>
<td>Selection</td>
<td>3</td>
<td>Selection</td>
<td>3</td>
</tr>
<tr>
<td>Selection</td>
<td>3</td>
<td>Selection</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits 13**

**13**

**13**

**Total Credits 121-126**

* Course requires a grade of C or better for the major
† Course requires a grade of C or better for General Education
‡ Course is an Entrance to Major requirement
‡† Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

All incoming Schreyer Honors College first-year students at University Park will take ENGL/CAS 137 in the fall semester and ENGL/CAS 138 in the spring semester. These courses carry the GWS designation and replace both ENGL 30 and CAS 100. Each course is 3 credits.

### Advising Note:


### BioProducts Option, Commonwealth Campuses

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

#### First Year

**Fall** | Credits | Spring | Credits
--- | --- | --- | ---
First Year Seminar | 1-3 | CHEM 111† | 1
CHEM 110† | 3 | ACCTG 211 | 4
EDSGN 100‡ | 3 | ENGL 15, 30, or ESL 15†‡ | 3
MATH 110 or 140‡‡ | 4 | PHYS 250 or 211† | 4
General Education Course (GHW) | 1.5 | General Education Course (GHW) | 3
ECON 104 or EBF 200† | 3 | General Education Course (GHW) | 1.5

Total Credits 15:5-17.5

#### Second Year

**Fall** | Credits | Spring | Credits
--- | --- | --- | ---
AGBM 101 or ECON 102† | 3 | BLAW 243, BA 243, or BA 241 and BA 242 | 3-4
BIOL 110 or 11 and 12† | 4 | Selection | 3
CAS 100A or 100B‡‡ | 3 | Selection | 3
STAT 200 or 240‡‡ | 3-4 | General Education Course | 3
General Education Course | 3 | General Education Course | 3

Total Credits 16-17

#### Third Year

**Fall** | Credits | Spring | Credits
--- | --- | --- | ---
AGBM 106* | 3 | BRS 392‡‡ | 2
BRS 221† | 3 | BRS 437* | 4
BRS 300* | 3 | BRS 417 | 4
Selection - BRS Leadership/Entrepreneurship (ENGR 310, AEE 360, MGMT 215, or SUST 200) | 3 | BRS 411 | 4
Selection | 3 | BRS 391‡‡ | 2

Total Credits 17:3-14

#### Fourth Year

**Fall** | Credits | Spring | Credits
--- | --- | --- | ---
BRS 402* | 3 | BRS 426 | 3
BRS 428 | 3 | BRS 429W | 3
BRS 393 | 1 | BRS 490 | 1
BRS 422 | 3 | BRS 423 | 3

Total Credits 120-124

* Course requires a grade of C or better for the major
† Course requires a grade of C or better for General Education
‡ Course is an Entrance to Major requirement
# Course satisfies General Education and degree requirement

**University Requirements and General Education Notes:**

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

**Advising Note:**

A list of ‘selection’ courses can be found in the BRS Advising Manual: abe.psu.edu/documents/brs-advising-manual.pdf. Students should consult with an academic adviser to discuss appropriate course selection.

**Career Paths**

The BioRenewable Systems major provides a broad background in science, technology, and business that can help you succeed in industry or a graduate degree program. Career opportunities for students are diverse, and the demand for graduates is expected to be very strong. According to the USDA, scientists, engineers, managers, sales representatives, and marketing specialists will account for 73 percent of the total annual U.S. employment openings for new college graduates in the early twenty-first century. Specific career paths vary by option.

**Careers**

Graduates may find jobs as market analysts, policy advocates, quality assurance managers, materials brokers, production-line supervisors, sales associates, educators, or technical service specialists within bioproducts or agricultural industries. These opportunities may be entrepreneurial, within small businesses, or with large food, agricultural, forest products, or industrial machinery firms. We expect our graduates to advance quickly in their fields. The success of our past graduates in related fields has created a continuing demand for future graduates. Recent annual starting salaries in these fields ranged from $35,000 to $60,000.
Opportunities for Graduate Studies
As a BioRenewable Systems graduate, you may pursue an advanced degree in agricultural and biological engineering departments or related science, sustainability, or business disciplines.

Professional Resources
• American Society of Agricultural and Biological Engineers (http://www.asabe.org)
• Society for Wood Science and Technology (http://www.swst.org/wp/)

Contact
University Park
DEPARTMENT OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
105 Agricultural Engineering Building
University Park, PA 16802
814-865-1524
wjt11@psu.edu

http://abe.psu.edu