
Department of Agricultural and Biological Engineering
Pennsylvania State University
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University Park, PA 16802

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Introduction

This manual has been prepared to assist students majoring in BioRenewable Systems in optimizing and planning their academic careers at Penn State.

BioRenewable Systems (BRS) Major Overview

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 sustainability. Solving 21st century problems and providing a foundation for our graduates to attain careers in both traditional sectors and those relating to the emerging bioeconomy are two of our goals. 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.

BRS Options

The BRS program (BS) has two options: Agricultural Systems Management (ASM) and BioProducts (BP). Students must select an option.

BRS—Agricultural Systems Management (ASM) Option - (121 Credits Required)

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.

BRS—BioProducts Option (BP) - (120 Credits Required)

The scientific nature of bio-based resources, their unique design, sustainability, and renewability constitute the core of this option. Building upon that foundation, students 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.

If you have questions about the BioRenewable Systems program, please contact the people below, or you can visit: [http://abe.psu.edu/majors](http://abe.psu.edu/majors) for more information.

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Lead Advisor, BP option  
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Lead Advisor, ASM option  
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University Park, PA 16802  
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jxl79@psu.edu

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Lead Advisor, New BRS Students  
201 Agricultural Engineering Building  
University Park, PA 16802  
814-863-8124  
sgk16@psu.edu
Entrance to Major Requirements
Students are eligible to enter the BRS major once they:
- Earn more than 29.1 credits
- Earn a minimum cumulative GPA of 2.00 or higher

The Office of the University Registrar will notify students when they have gained 29.1 credits (3rd semester standing). This notification will include links to the full list of entrance requirements for all majors and a link to LionPATH’s “Update Academics” page, where students can submit their request to enter a major.

Advisors
As a BioRenewable Systems student, you will be assigned an academic advisor when you: enroll as a freshman at University Park Campus; declare BioRenewable Systems as your major; or when you transfer to University Park from another campus location, college, or university. Your advisor will assist you in selecting courses to meet the academic requirements of the BioRenewable Systems major, while also meeting your personal goals.

Your advisor is a resource to answer academic questions during your career at Penn State. It is hoped that your advisor will become your friend and provide useful information concerning academic and non-academic matters as the need arises. You will normally retain the same academic advisor until you graduate, but changes are available upon request.

Graduation
To graduate, you must satisfy all University, College, and major requirements that were in effect at the time of your admission, or re-enrollment, as a degree candidate. The following tables detail BRS graduation requirements. Once completed, there is a process that must be followed to apply to graduate. Steps are as follows:

1. File your intent to graduate (policy 86-00) in LionPATH.
   a. Use the "Apply for Graduation" link within the My Academics page in the LionPATH Student Center, you can set your intent to graduate.
      ▪ View LionPATH Video Tutorial on How to Apply for Graduation (https://tutorials.lionpath.psu.edu/public/S_ApplyGrad/)
      ▪ Download LionPATH Tutorial in Microsoft Word on How to Apply for Graduation (https://tutorials.lionpath.psu.edu/public/Docs/S_ApplyGraduation.docx)

2. After the activation period expires you must contact the appropriate college office or Graduate Enrollment Services to activate or remove your intent to graduate.

Unofficial programs are distributed at the commencement ceremony. If your intent to graduate is activated after the student information has been sent to the publisher, your name will not appear in the program. For fall and spring ceremonies the data is sent during the tenth week of the semester. For the summer ceremony the data is sent during the fifth week.
Tables of BRS Program Requirements

Agricultural Systems Management (ASM) Option

(121 Credits Required)
## Suggested Academic Plan for Agricultural Systems Management Option

### First Year

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### Second Year

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<td>CAS 100A†† or 100B††</td>
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<td>ASM 310*</td>
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<td>BRS 490b</td>
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Total Credits 121-124

* Course requires a grade of C or better for the major
† Course satisfies General Education and degree requirement
†† Course requires a grade of C or better for General Education
b BIOL 11 and 12 are not available at University Park
b BRS 393 and BRS 490 are repeatable courses. BRS 393 is offered a week before the Fall semester and requires an additional fee.
The ASM option includes 18 “Selection” credits. These 15 credits must be either 1) selected from courses on this approved list, or, 2) approved by petition following consultation with an advisor. The first column of the table notes suggested specialization areas. Students do not need to choose a specialization area, nor do they need to take all of the classes within a given specialization area. Although we encourage students to use these 15 selection credits to specialize in a given niche, or better yet to acquire a minor, it is up to the student how these credits are used. Some students prefer to mix and match courses from various areas, and that is ok. Common minors for ASM students include: Agribusiness Management, Agronomy, Engineering Entrepreneurship, Animal Science, Horticulture, Forest Science, Sustainability Leadership, Off Road Equipment, and Environmental Resource Management.

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<tr>
<th>Specialization Area</th>
<th>Possible Courses</th>
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<td><strong>Agronomy</strong></td>
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<td>AGRO 423</td>
<td>Forage Crop Mgmt</td>
<td>AGRO 028</td>
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<td>AGRO 425</td>
<td>Field Crop Mgmt</td>
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<td>AGRO 438</td>
<td>Principles of Weed Mgmt</td>
<td>AGRO 028</td>
<td>6 cr. in plant sciences</td>
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<td><strong>Agribusiness Management</strong></td>
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<td>AGBM 302</td>
<td>Food Prod Mktg</td>
<td>AGBM 101, AGBM 102, AGBM 106</td>
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<td>AGBM 308W</td>
<td>Strategic Decision Making in Agribusiness</td>
<td>AGBM 101, AGBM 102, AGBM 106</td>
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<td>AGBM 320</td>
<td>Markets and Prices</td>
<td>SCM 200 or STAT 200</td>
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<td>AGBM 338 (IL)</td>
<td>AGBM in the Global Economy</td>
<td>AGBM 101, AGBM 102, AGBM 106</td>
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<td>AGBM 407</td>
<td>Farm Plan and Fin Mgmt</td>
<td>AGBM 101, AGBM 106</td>
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<td>AGBM 408</td>
<td>Fin Decision Making for Agribusiness</td>
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<td>AGBM 440</td>
<td>Food Product Innovation Management</td>
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<td>AGBM 320, AGBM 338</td>
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<td>ASM 320</td>
<td>Combustion Engines</td>
<td>ASM 310</td>
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<td>ASM 420</td>
<td>Principles of Off-Road Machines</td>
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<td>ASM 424</td>
<td>Sel Mgmt Ag Mach</td>
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<td><strong>Animal Sciences</strong></td>
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<td>ANSC 300</td>
<td>Intgratd Anml Biol</td>
<td>BIOL 011 and BIOL 012 or BIOL 110</td>
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<td>ANSC 301</td>
<td>Animal Nutrition</td>
<td>3 cr. in biochemistry or organic chemistry</td>
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<td>ANSC 305</td>
<td>Comp Anim Ntr Mgmt</td>
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<td>ANSC 306</td>
<td>Swine Prod &amp; Mgmt</td>
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<td>Sheep/Goat-Prd Mgt</td>
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<td>Beef Prod &amp; Mgmt</td>
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<td>Dairy Mgmt</td>
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<td>Poul Prod &amp; Mgmt</td>
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<td>Insect Connection</td>
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<td>Field Crops Ent</td>
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<td>ENT 402W</td>
<td>Biol Anim Parasit</td>
<td>BIOL 110</td>
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<td>ENT 410</td>
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<td>Basic Princ Calc Env Analysis</td>
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<td>Resource System Analysis</td>
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<td>FOR 320</td>
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<td>STAT 240</td>
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<td>FOR 366</td>
<td>Forest Resources Measurements</td>
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<td>FOR 410</td>
<td>Forest Ecosys Mgmt</td>
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<td>FOR 475</td>
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<td>HORT 202</td>
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<td>Turf Orn Weed Ctrl</td>
<td>CHEM 110</td>
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<td>HORT 315</td>
<td>Envir Effect Hort</td>
<td>HORT 101, HORT 202</td>
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<td>HORT 412W</td>
<td>Post-Har Physiol</td>
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**Biology**

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<td>Pop Ecol Glob Clim</td>
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**Business**

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**Engr. Tech. Fund.**

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**Math**

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### BRS Agricultural Systems Management Option Checklist

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#### Prescribed courses

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- □ World Language Admission Requirement
- □ United States Culture Course
- □ International Competence Course
Tables of BRS Program Requirements

BioProducts (BP) Option

(120 Credits Required)
# Suggested Academic Plan for BioProducts Option, University Park Campus

## First Year

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Total Credits 120-122

* Course requires a grade of C or better for the major
** ENGR 310, AEE 360, MGMT 215, or SUST 200 are acceptable. Consult with your advisor
† Course satisfies General Education and degree requirement
‡† Course requires a grade of C or better for General Education
a BIOL 11 and 12 are not available at University Park
b BRS 393 and BRS 490 are repeatable courses. BRS 393 is offered a week before the Fall semester and cost incurred
Bioproducts (BP) Option -- Selection List

The BP option includes 15 “Selection” credits.

These 15 credits must be either 1) selected from courses on this approved list, or, 2) approved by petition following consultation with an advisor. The first column of the table notes suggested specialization areas. Students do not need to choose a specialization area, nor do they need to take all of the classes within a given specialization area. Although we encourage students to use these 15 selection credits to specialize in a given niche, or better yet to acquire a minor, it is up to the student how these credits are used. Some students prefer to mix and match courses from various areas, and that is ok. Common minors for BP students include Biology, Business Logistics, Chemistry, Economics, Energy Business and Finance, Engineering Entrepreneurship, Engineering Leadership Development, Environmental and Renewable Resource Economics, Forest Science, Labor Studies and Employment Relations, Leadership Development, Physics, Polymer Science, Statistics, or Sustainability Leadership.

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<td></td>
<td>MGMT 100</td>
<td>Survey of Mgmt</td>
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<td>MGMT 326</td>
<td>Org Beh &amp; Design</td>
<td>B A 304 or MGMT 301</td>
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<td>MGMT 471W</td>
<td>Strategic Management</td>
<td>MGMT 301, MKTG 301, FIN 301, SCM 301</td>
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<td>MKTG 221</td>
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<td>PSYCH 100(GS)</td>
<td>Introductory Psychology</td>
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<td>PSYCH 281(GS)</td>
<td>Indust-Org Psych</td>
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<td>Supply Chain Management</td>
<td>ACCTG 211, ECON 102, SCM 200 or STAT 200</td>
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<td>Chemistry</td>
<td>BMB 211</td>
<td>Elementary Biochemistry</td>
<td>CHEM 110; CHEM 202 or CHEM 210</td>
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<td>BMB 200 and higher</td>
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<td></td>
<td>CHEM 112</td>
<td>Chemical Principles II</td>
<td>CHEM 110</td>
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<td>CHEM 113 (1)</td>
<td>Continuation of CHEM 111</td>
<td>CHEM 110, concurrent: CHEM 112</td>
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<td>CHEM 202, or CHEM 210</td>
<td>Fundamentals of Organic Chemistry I, or Organic Chemistry I</td>
<td>CHEM 101 OR CHEM 110 OR CHEM 106</td>
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<td>CHEM 203, or CHEM 212</td>
<td>Fundamentals of Organic Chemistry II, or Organic Chemistry II</td>
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<td>CHEM 227</td>
<td>Analytical Chemistry</td>
<td>CHEM 113 and MATH 140</td>
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<tr>
<td>Biology and Plants</td>
<td>AGECO 201</td>
<td>Introductory Agroecology</td>
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<td>AGRO 028</td>
<td>Principles of Crop Management</td>
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<td>BIOL 127, or BIOL 240W (4)</td>
<td>Introduction to Plant Biology, or Biology: Funct. &amp; Devel. of Organisms</td>
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<td>BIOL 230W (4)</td>
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<tr>
<td>Course Code/Title</td>
<td>Description</td>
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<td>BMB 251/MICRB 251</td>
<td>Molecular and Cell Biology</td>
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<td>BIOL 407</td>
<td>Plant Developmental Anatomy</td>
<td>BIOL 240W</td>
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<tr>
<td>BIOL 424</td>
<td>Seeds of Change: The Uses of Plants</td>
<td>BIOL 110; BIOL 220W, BIOL 230W or BIOL 240W</td>
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<td>BIOL 441</td>
<td>Plant Physiology</td>
<td>BIOL 230W, BIOL 240W</td>
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<tr>
<td>BIOL 459</td>
<td>Plant Tissue Culture and Biotechnology</td>
<td>BIOL 230W; or BMB 251, BMB 252</td>
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<tr>
<td>HORT 101</td>
<td>Horticultural Science</td>
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<tr>
<td>FOR 203</td>
<td>Field Dendrology</td>
<td>Concurrent: FOR 200W or W P 200W and W P 203</td>
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<tr>
<td>FOR 308</td>
<td>Forest Ecology</td>
<td>Concurrent: FOR 203</td>
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<tr>
<td>FOR 366</td>
<td>Forest Resources Measurements</td>
<td>STAT 240</td>
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<tr>
<td>FOR 410</td>
<td>Forest Ecosys Mgmt</td>
<td>3 cr. in both biology and ecology</td>
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<tr>
<td>FOR 418 (US;IL)</td>
<td>Agroforestry</td>
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<td>FOR 421</td>
<td>Silviculture</td>
<td>FOR 308, FOR 366</td>
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<tr>
<td>PPATH 405</td>
<td>Microbe-Plant Interactions</td>
<td>BIOL 110</td>
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<tr>
<td>PLANT 461</td>
<td>Emerging Issues in Plant Sciences</td>
<td>AGRO 028 or HORT 101; AGECO201 or BIOL 127 or HORT 202; ENT 313 and SOILS 101</td>
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<td>MATSE 101</td>
<td>Energy and the Environment</td>
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<td>MATSE 112</td>
<td>Applied Materials Chemistry for Engineers</td>
<td>CHEM 110</td>
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<tr>
<td>MATSE 201</td>
<td>Introduction to Materials Science</td>
<td>CHEM 112; MATH 231</td>
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<td>MATSE 202</td>
<td>Introduction to Polymer Materials</td>
<td>CHEM 202, MATH 231</td>
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<td>MATSE 441</td>
<td>Polymeric Materials I</td>
<td>CHEM 210, MATH 231</td>
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<tr>
<td>MATSE 443</td>
<td>Introduction to the Materials Science of Polymers</td>
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<td>MATSE 447</td>
<td>Rheology and Processing of Polymers</td>
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<tr>
<td>MATSE 448</td>
<td>Polymer Processing Technology</td>
<td>MATSE 447 or CHE 302A</td>
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<td>MATSE 473</td>
<td>Polymeric Materials Lab — Synthesis (1)</td>
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<td>MATSE 474</td>
<td>Polymeric Materials Lab — Characterization (1)</td>
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<tr>
<td>EMCH 315</td>
<td>Mechanical Reponses of Materials</td>
<td>EMCH 213 or EMCH 210</td>
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<td>EMCH 471</td>
<td>Engineering Composite Materials</td>
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<td>E SC 484</td>
<td>Biologically Inspired Nanomaterials</td>
<td>PHYS 214, MATH 230</td>
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<td>EMCH 211</td>
<td>Statics</td>
<td>Concurrent: MATH 141</td>
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<td>EMCH 212</td>
<td>Dynamics</td>
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<td>EMCH 213</td>
<td>Strength of Materials</td>
<td>EMCH 211</td>
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<td>PHYS 212</td>
<td>Physics: Elec and Mag</td>
<td>PHYS 211, concurrent: MATH 141</td>
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<tr>
<td>MATH 034</td>
<td>The Mathematics of Money</td>
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<tr>
<td>MATH 111 (2) or MATH 141 (4)</td>
<td>Calculus II with Analytic Geometry, or Techniques of Calculus II</td>
<td>MATH 110</td>
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<tr>
<td>MATH 200 or higher</td>
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<tr>
<td>STAT 300 or higher</td>
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BRS BioProducts Option checklist

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<thead>
<tr>
<th>Communications</th>
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<th>Alternative</th>
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<td>CAS 100A/B</td>
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<td>BRS 392</td>
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<td>A B C</td>
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<td>STAT 200</td>
<td>4-3</td>
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<td>A B C</td>
<td>STAT 240</td>
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| Natural Science      |    |     |       |             |
| BIOL 110             | 4  |     |       | BIOL 11 & 12|
| CHEM 110             | 3  |     |       |             |
| CHEM 111             | 1  |     |       |             |
| PHYS 250             | 4  |     |       | PHYS 211    |

| Art (3)              |    |     |       |             |
| Single domain        | 3  |     |       |             |

| Humanities (3)       |    |     |       |             |
| Single domain        | 3  |     |       |             |

| Social Science (6)   |    |     |       |             |
| AGBM 101             | 3  |     |       | ECON 102    |
| ECON 104             | 3  |     |       | EBF 200     |

| Health & Wellness (3)|    |     |       |             |
| Single domain        |    |     |       |             |

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<tr>
<th>Integrative Studies (6)</th>
<th>Domains</th>
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<table>
<thead>
<tr>
<th>Prescribed courses</th>
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<th>Sem</th>
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<tr>
<td>1st Year Seminar</td>
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| Business               |    |     |       |             |
| ACCTG 211              | 4  |     |       |             |
| BLAW 243               | 3-4|     |       | BA 241 & BA 242|
| AGBM 106               | 3  |     | A B C |             |
| BRS 437                | 4  |     | A B C |             |

| Option Courses         |    |     |       |             |
| BRS 411                | 4  |     |       |             |
| BRS 423                | 3  |     |       |             |
| BRS 417                | 4  |     |       |             |
| ENGR 310**             | 3  |     | A B C |             |
| BRS 402                | 3  |     | A B C |             |

| Engineering Technology |    |     |       |             |
| EDSGN 100              | 3  |     | A B C |             |
| BRS 221                | 3  |     | A B C |             |
| BRS 300                | 3  |     | A B C |             |
| BRS 393                | 1  |     |       |             |
| BRS 422                | 3  |     |       |             |
| BRS 426                | 3  |     |       |             |
| BRS 428                | 3  |     |       |             |
| BRS 429W               | 3  |     |       |             |
| BRS 490                | 1  |     |       |             |

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<tr>
<th>Specialization Area Selections</th>
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- World Language Admission Requirement
- United States Culture Course
- International Competence Course
Minors

Opportunities exist for BRS majors to develop areas of interest by obtaining a Minor. Early planning with an advisor may allow you to add depth and breadth to your college career and help you to attain additional personal and academic goals. (Note: A grade of C or better must be earned in courses applying to a minor). A minor can be declared after a student reaches third semester standing or has been accepted into a major. Several minors fit well into the BRS curriculum.

Selected Minors to Complement a BRS Major

<table>
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<tr>
<th>Minor</th>
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<tbody>
<tr>
<td>Technology</td>
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<tr>
<td>Off-Road Equipment</td>
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<tr>
<td>Science, Technology, and Society</td>
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<tr>
<td>Geographic Information Systems</td>
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<tr>
<td>Agricultural Sciences and Environment</td>
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<tr>
<td>Agronomy</td>
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<tr>
<td>Watersheds and Water Resources</td>
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<tr>
<td>Mushroom Science and Technology</td>
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<tr>
<td>Animal Science</td>
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<tr>
<td>Horticulture</td>
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<tr>
<td>Energy, Environmental &amp; Mineral Economics</td>
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<tr>
<td>Environmental and Renewable Resource Economics</td>
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<tr>
<td>Forest Science</td>
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<tr>
<td>Environmental Resource Management</td>
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<tr>
<td>Business and Leadership</td>
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<tr>
<td>Agricultural Business Management</td>
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<tr>
<td>Legal Environment of Business Biology</td>
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<tr>
<td>Labor and Industrial Relations</td>
</tr>
<tr>
<td>Business (offered by Liberal Arts)</td>
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<tr>
<td>Dispute Management Resolution</td>
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<tr>
<td>Economics</td>
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<tr>
<td>Global Business Strategies for the Earth, Energy &amp; Material Industries</td>
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<tr>
<td>Engineering Entrepreneurship</td>
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<tr>
<td>Information Systems and Statistical Analysis</td>
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<td>Operations Management</td>
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<tr>
<td>Management Information Systems</td>
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<tr>
<td>Industrial Health and Safety</td>
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<tr>
<td>Insurance</td>
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<tr>
<td>Real Estate</td>
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<tr>
<td>Science</td>
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<tr>
<td>Biochemistry and Molecular Biology</td>
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<tr>
<td>Microbiology</td>
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<tr>
<td>Biology</td>
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Opportunities for International Experiences

One of the characteristics of a world-class graduate in a technical field is knowledge and appreciation for the global economy. Probably the best way to gain global experiences is through participation in an international activity while you are still a student. Fortunately, there are numerous opportunities for gaining international experiences and perspectives through activities such as study abroad programs (for a semester or academic year), international co-ops and internships, alternative Spring Break tours, technical study tours, PSU course/international tour combinations, and May study tours.
Financial Support for International Activities

Some study abroad programs offer financial support to each student who is accepted into the program. There are scholarships available through the College of Agricultural Sciences specifically for students who are gaining international experiences. The deadline dates to apply for awards from College of Agricultural Sciences for programs are typically:

- Summer semester: March 15
- Fall semester: April 15
- Spring semester: September 30 of previous year
- Spring break study tour: December 15 of previous year

Students who apply after the above deadline dates might be considered for awards, depending on whether all the funds have been awarded or not. For additional information, exact deadline dates, application forms, or any questions regarding studying abroad, please contact the International Programs Office at 106 Agricultural Administration Building, 814-863-0249, or visit their website: [http://agsci.psu.edu/international/undergraduates](http://agsci.psu.edu/international/undergraduates).

The Penn State Office of Global Programs also offers scholarships to study abroad and has an Education Abroad Fair every year. Visit [http://gpglobalea.gp.psu.edu/](http://gpglobalea.gp.psu.edu/) for more information.

Global Engineering Education

The mission of Global Engineering Education Programs is to provide opportunities for College of Engineering students, faculty, and staff to participate in international educational experiences and help them to become World Class Engineers. The website contains a searchable database of study abroad programs for engineering majors and others, checklists for how to prepare for international experiences, information about program deadlines and application procedures, and useful resources for going abroad. Please take a look at [http://www.engr.psu.edu/international](http://www.engr.psu.edu/international).

Clubs

Agricultural Systems Management Club

The Agricultural Systems Management Club exists for you, the student. It is organized so that you will have an opportunity to meet on an informal basis as individuals who have similar interests. Club meetings are every two weeks during the semester. Club activities have included speaker programs, picnics and banquets, fund raisers, and trips. Social activities have included a fall and spring picnic, hay-ride, and trap shoot. Fund raising activities have included: Christmas wreath sales, lawn mower clinics, yard clean-up, picnic table sales, and tractor overhaul. The Club normally supports college and university functions.

The ASM Club offers many opportunities to develop leadership skills by having officers and student-organized events. The club provides national and international leadership opportunities and involvement through its participation in the National Council of Student Mechanization Branches of the American Society of Agricultural and Biological Engineers. The club has supported student travel to the International Summer and Winter Meetings and has had several members hold office in the national organization.

The key to the club's success and to your satisfaction is your involvement in the planning and organizing of club activities. You are encouraged to become involved in the Agricultural Systems Management Club and make the club function be of benefit to you. While the Agricultural Systems Management Club is not the
largest group on campus, it is a strong group that works together to be heard. The potential of the Agricultural Systems Management Club is limited only by your level of involvement. Commit some time to get involved and make the club your organization, meeting your needs.

The ASM Club website can be found at: http://abe.psu.edu/students/clubs-and-organizations/agricultural-systems-management-club.

BioRenewable Systems Club
The BioRenewable Systems Club aims to create a platform to begin growth of this field with a community of resources and shared ideas by providing programs and opportunities related to the major. We make this possible by partnering with other organizations and hosting events throughout the school year. Together we can enhance the development of this program through innovated ideas and actions.

Penn State Pullers
The Penn State Pullers compete in a ¼ scale tractor pulling contest sponsored by ASABE (The American Society of Agricultural and Biological Engineers). Students design and build ¼ scale tractors to compete nationally with other universities. The four main judging categories are: written design report, team presentation, individual tractor design, and performance competition. The performance competition is a multi-stage tractor pull using a progressive weight sled.

The Penn State pullers website can be found at: http://pennstatepullers.weebly.com/.

Scholarships
Students are eligible for scholarships awarded through the College of Agricultural Sciences. The scholarship application for the academic year is usually available until April 30th of that year. Those who are selected to receive a College and/or Department scholarship will be notified via mail in July. Please visit http://agsci.psu.edu/students/scholarships for more information.

Our Department of Agricultural and Biological Engineering awards over $80,000 in scholarships annually.
Course Descriptions in BioRenewable Systems

ASM 309: MEASUREMENT & MONITORING OF HYDROLOGIC SYSTEMS (3) Measurement and monitoring equipment/techniques commonly used in analysis and design of hydraulic systems. Prerequisite: PHYS 211 or PHYS 250, CHEM 110. Offered each Fall Semester.

ASM 310: POWER TRANSMISSION IN AGRICULTURE (3) Selection and maintenance of mechanical, hydraulic, and pneumatic power transmission components and systems. Prerequisite or concurrent: BRS 221. Offered each Fall Semester.

ASM 320: COMBUSTION ENGINES FOR MOBILE EQUIPMENT (3) Theoretical and practical aspects of internal combustion engines. Prerequisite: ASM 310; BE 306; ME 360. Offered each Spring Semester.

ASM 327: SOIL AND WATER RESOURCE MANAGEMENT (3) Soil and water management systems and practices including hydrology, surface drainage, open channels, and erosion, subsurface drainage, impoundments and irrigation. Prerequisite: PHYS 250. Offered each Fall Semester.

ASM 420: PRINCIPLES OF OFF-ROAD MACHINES (3) Technical aspects of off-road power machinery, experience with full-scale equipment with instrumentation. Prerequisite: BE 306; ASM 310; ME 360. Offered each Spring Semester.

ASM 424: SELECTION AND MANAGEMENT OF AGRICULTURAL MACHINERY (3) Mobile agricultural machinery, precision agriculture, and fleet management. Economic analysis and functional performance. Prerequisite: BE 306 or ASM 310 or ME 360. Offered each Fall Semester.

ASM 496: INDEPENDENT STUDIES (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

BRS 221: ENGINEERING PRINCIPLES OF BIORENEWABLE SYSTEMS (3) Unit factoring, dimensional analysis, hands-examples. Prerequisite: MATH 110 or MATH 140, PHYS 250 or PHYS 211. Offered each Fall Semester.

BRS 300: INTRODUCTION TO BIORENEWABLE PRODUCTS (3) Overview of nature and utilization of bioproducts, utilization of bioproducts. Prerequisite or concurrent: CHEM 110. Offered each Fall Semester.

BRS 391: CONTEXTUAL INTEGRATION OF COMMUNICATION SKILLS FOR THE TECHNICAL WORKPLACE (2) (GWS) Oral and written communication skills, leadership and career skills, interaction with individual from industry. Prerequisite: Junior level standing in BE or BRS. Offered each Fall Semester.

BRS 392: CONTEXTUAL INTEGRATION OF LEADERSHIPS SKILLS FOR THE TECHNICAL WORKPLACE (2) (GWS) Leadership, communication, ethics, sustainability, career issues, interactions with individuals from industry. Prerequisite: BRS 391, junior level standing in BE or BRS. Offered each Spring Semester.

BRS 393: INDUSTRY TOUR (1-2) Week-long tour of bioproducts industry and agricultural systems. Prerequisite: Junior standing in BRS or BE. Offered each Fall Semester.

BRS 399: FOREIGN STUDIES (1-12) (IL) Courses offered in foreign countries by individual or group instruction
BRS 402: FOUNDATIONS OF SUSTAINABLE BUSINESS (3) Impact of environmental and sustainability issues on business strategies and profits, impact of external stakeholders on business management. Prerequisite: AG BM 101 or ECON 102 or ECON 104 and 7th semester standing. Offered each Fall Semester.

BRS 411: BIOBASED FIBER SCIENCE (4) Aspects of biobased industrial fibers, relationship between biological and chemical structure of biobased industrial fibers to macroscale properties. Prerequisite: CHEM 110, BRS 300. Offered each Spring Semester.

BRS 417: PROCESSING AND MANUFACTURING SYSTEMS FOR BIOPRODUCTS (4) Detailed understanding of major bioproducts and how they are industrially manufactured. Prerequisites: BRS 221 and BRS 300. Offered each Spring Semester.

BRS 422: ENERGY ANALYSIS IN BIORENEWABLE SYSTEMS (3) Energy management, energy conversions, renewable energy alternatives, engineering economic analyses, national and international perspectives on energy resources. Prerequisite: BRS 221. Offered each Fall Semester.

BRS 423: DETERIORATION AND PROTECTION OF BIOPRODUCTS (3) Timber, wood, and bioproduct deterioration from fungi, insects, fire; treatment of bioproducts for in service protection. Prerequisite: BRS 300. Concurrent: BRS 411. Offered each Spring Semester.

BRS 426: SAFETY AND HEALTH IN AGRICULTURE AND BIORENEWABLE INDUSTRIES (3) Management of occupational safety and health in production agriculture, bioproducts and related operations. Prerequisite: 5th semester standing. Offered each Spring Semester.

BRS 428: ELECTRIC POWER AND INSTRUMENTATION (3) Use of electric circuits for power distribution, motors, automatic controls, and instrumentation. Prerequisite: BRS 221. Offered each Fall Semester.

BRS 429W: BIORENEWABLE SYSTEMS ANALYSIS AND MANAGEMENT (3) (Writing Across the Curriculum) Systems theory, qualitative and quantitative analysis, linear programming, waiting line models, PERT/CPM, minimal spanning tree, calculus methods, simulation modeling for decision making, inventory, and energy audits. Prerequisite: BRS 422. Offered each Spring Semester.

BRS 437: BIOPRODUCT MARKETING AND SALES (4) Fundamentals of business-to-business bioproduct marketing and overview of key forest industry sectors. Prerequisite: BRS 300 or AG BM 101 or ECON 102. Offered each Spring Semester.

BRS 490: BIORENEWABLE SYSTEMS COLLOQUIUM (1-2) Presentations and discussions of solutions to problems within the biorenewable systems industries. Prerequisite: BRS 300. Prerequisite or concurrent: ASM 391. Offered each Spring Semester.

BRS 494: UNDERGRADUATE RESEARCH (1-12) Supervised student activities on research projects identified on an individual or small group basis.

BRS 494H: HONORS THESIS (1-6) Independent study directed by a faculty supervisor that culminates in the production of a BioRenewable Systems honors thesis. Prerequisite: Junior or senior standing in the Schreyer Honors College and permission of a BioRenewable Systems honors advisor.

BRS 495: INTERNSHIP (1-18) Supervised off-campus, nongroup instruction including field experiences, practica, or internships. Written and oral critique of activity required.
BRS 496: INDEPENDENT STUDIES (1-18) Creative projects, including research and design, which are supervised on an individual basis and which fall outside the scope of formal courses.

BRS 497: SPECIAL TOPICS (1-9) Formal courses given infrequently to explore, in depth, a comparatively narrow subject which may be topical or of special interest.

BRS 499: FOREIGN STUDIES (1-12) (IL) Courses offered in foreign countries by individual or group instruction.