

# BIORENEWABLE SYSTEMS

## Degree Requirements

### Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

All candidates for the M.S. degree must:

- prepare and complete a thesis
- complete a minimum of 30 credits at the 400, 500, 600, or 800 level (including a minimum of 18 credits at the 500 and 600 level, combined, and a minimum of 6 credits of research)
- obtain a minimum grade-point average of 3.00.

Only courses in which grades of C or better are earned may be counted toward the requirements of the master's degree. Each program must include:

Code	Title	Credits
<b>Required Courses</b>		
BRS 500	Research Methods	3
BRS 502	Human Behavior and ethics in Management and Technology (or other Ethics course from a list of approved courses maintained by the program office, unless previously taken)	3
BRS 504	Biorenewable Systems Analysis	3
BRS 590	Colloquium	3
<b>Electives</b>		
Two courses from list of electives maintained by the program office		6
At least one 5XX statistics course		3
Additional 4XX or 5XX course or BRS 600 Thesis Research		3
<b>Culminating Experience</b>		
BRS 600	Thesis Research	6
<b>Total Credits</b>		<b>30</b>

### Doctor of Philosophy (ph.D.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

Official entrance into a Ph.D. program occurs upon successful completion of the Ph.D. Qualifying Examination. Ph.D. degree requirements include successful completion of the following:

- approved graduate course work,
- Ph.D. language and communication requirements,
- a comprehensive examination,
- and defense, approval, and submission of a dissertation.

No University-level (Graduate Council) minimum number of courses completed or credits earned are specified for the Ph.D.; the student's Ph.D. committee will recommend the minimum requirements as appropriate for each individual student's program of study and dissertation research. Unless previously taken for the M.S., each Ph.D. student must complete:

Code	Title	Credits
<b>Required Courses</b>		
BRS 500	Research Methods	3
BRS 502	Human Behavior and ethics in Management and Technology (or other Ethics course from a list of approved courses maintained by the program office, unless previously taken)	3
BRS 504	Biorenewable Systems Analysis	3
BRS 590	Colloquium	4
BRS 602	Supervised Experiences in College Teaching (at least 1 credit)	1-3
Communications or International Language/Culture		3
In addition the candidate must complete 6 credits of BRS 5XX (excluding BRS 500 and 590-596) or select from a list maintained by the program office		6

The candidate is expected to develop a program of study and submit it to the appointed Ph.D. committee for consideration and approval. All requirements for a Ph.D. degree, whether satisfied on this campus or elsewhere, must be completed within eight years after passing the qualifying examination.

### Qualifying Examination

The Ph.D. Qualifying Examination Committee will administer the Qualifying Examination. This committee will consist of four BRS graduate faculty members, including the Adviser, the ABE Department Head (or annually appointed designee), the BRS Graduate Program Coordinator, and one faculty member selected by the student. In cases where a member serves two roles on the committee, an additional member will be appointed by the Graduate Program Coordinator. The Qualifying Examination will consist of developing a Ph.D. research proposal following the completion of BRS 500, presenting the proposal, and defending/discussing the proposed research with the Committee. The Qualifying Examination will be completed by the student soon after they have completed at least 18 credits but before the end of the third semester. Successful completion of the Qualifying Examination does not mean that the student's Ph.D. research proposal is approved. Rather, final approval of the candidate's research proposal will be the responsibility of the Ph.D. committee.

### Ph.D. Committee

The Ph.D. committee must meet all of the Graduate Council requirements (<http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/phd-dissertation-committee-formation/>), and:

1. the chairperson and at least one other member must be BRS Graduate Faculty members,
2. at least one member must be from a department other than ABE and s/he should be a Graduate Faculty member of a program other than BRS,
3. at least one member must represent any minor department(s) if the student selects a minor(s), and
4. the Ph.D. committee can be appointed only after the Qualifying Examination has been passed.

### Ph.D. Language and Communication Requirement

The purpose of the communication requirement is to strengthen the student's professional communication skills. The candidate must take a minimum of one three-credit course and receive a grade of B or better. Course selections must be approved by the academic adviser prior to

registration. Courses used to satisfy this requirement must include the substantial practice of writing and/or speaking.

### **Comprehensive Examination**

When a Ph.D. candidate has substantially completed the course work, including the communication requirements, s/he is required to take a Comprehensive Examination covering the major, minor, and related areas of study. The Comprehensive Examination will be both written and oral. The nature and details of the Comprehensive Examination will be determined by the student's Ph.D. committee. In general, the student will be required to demonstrate ability to synthesize information acquired through formal coursework and to use technical literature to find information required for solving biorenewable systems problems. A favorable vote of at least two-thirds of the committee is required for passing. If a candidate fails, the committee will determine whether another examination may be taken.

### **Final Oral Examination**

Upon recommendation of the Adviser, a Ph.D. candidate who has satisfied all other requirements for the degree will be scheduled to take a Final Oral Examination. The student must be registered appropriately for the semester in which the Final Oral Examination is taken. This examination is open to the public and the student should notify all departmental faculty and graduate students. The examination is related largely to the dissertation, but may cover the candidate's entire field of study without regard to courses that have been taken either at Penn State University or elsewhere. The defense of the dissertation should be well-prepared including any appropriate visual aids. One of the aims of the preparation should be to synthesize the important conclusions in a time-efficient presentation, leaving ample time for questions and discussion. A favorable vote of at least two-thirds of the committee is required for passing. If a candidate fails, the committee will determine whether another examination may be taken.