

# GRADUATE HANDBOOK

## Agricultural and Biological Engineering (ABENG)

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## Introduction

This graduate handbook was developed to inform graduate students and faculty in the Agricultural and Biological Engineering Department at Penn State of the policies and guidelines applicable to the department's Agricultural and Biological Engineering (ABENG) graduate degree. The requirements specified in the handbook are intended to make the graduate student's degree program beneficial to both the student and the department. Some other useful publications are listed in the table below. Students and faculty are encouraged to suggest improvements for this handbook to the Graduate Program Coordinator.

Penn State's *Graduate Bulletin* contains additional, important information. This handbook is intended to supplement—rather than duplicate—the graduate bulletin. The graduate bulletin may be considered the authority, except where more stringent requirements are imposed by the department. **The student is expected to become familiar with the requirements as specified in both this handbook and the graduate bulletin.** The student is advised to obtain and keep versions of the bulletin and this handbook that are in effect when the student's degree program begins; requirements specified in both of these documents form a “contract” for graduate study between the University and the student.

The department is committed to providing a stimulating, conducive educational environment for all. Please inform the Department Head immediately of any barriers—experienced or perceived—that create problems or limitations in educational opportunities in the department.

## Sources of Graduate Information

<u>Title</u>	<u>Availability*</u>	<u>Comments</u>
ABENG Graduate Handbook	<a href="https://abe.psu.edu/graduateprograms/abe/abe-graduate-handbook">https://abe.psu.edu/graduateprograms/abe/abe-graduate-handbook</a> Updated periodically.	ABENG degree requirements - additional to the general degree requirements
Graduate Bulletin	<a href="http://bulletins.psu.edu/bulletins/whitebook/">http://bulletins.psu.edu/bulletins/whitebook/</a>	General degree requirements for all graduate programs
Graduate Course Descriptions	<a href="https://bulletins.psu.edu/university-course-descriptions/">https://bulletins.psu.edu/university-course-descriptions/</a>	Graduate degree university course descriptions
Schedule of Courses	<a href="https://public.lionpath.psu.edu/psp/CSPRD/EMPLOYEE/HRMS/c/COMMUNITY_ACCESS.CLASS_SEARCH.GBL?pslnkid=PE_S201801181044562576711220">https://public.lionpath.psu.edu/psp/CSPRD/EMPLOYEE/HRMS/c/COMMUNITY_ACCESS.CLASS_SEARCH.GBL?pslnkid=PE_S201801181044562576711220</a>	Semester courses available
Thesis and Dissertation Information	<a href="http://www.gradsch.psu.edu/current/thesis.html">http://www.gradsch.psu.edu/current/thesis.html</a>	Office of Theses and Dissertations forms and information
Policies and Rules	<a href="http://studentaffairs.psu.edu/conduct/">http://studentaffairs.psu.edu/conduct/</a>	Student Affairs, The Office of Student Conduct information
New Student Orientation	<a href="http://orientation.psu.edu/">http://orientation.psu.edu/</a>	University Park new student orientation

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

### **Admission Requirements**

Completion of an undergraduate degree in agricultural or biological engineering or in another related engineering discipline is required for direct admission to the Agricultural and Biological Engineering Graduate Program. Students need at least a 3.0 (4.0 base) junior/senior grade-point average to be considered for admission.

A student with an undergraduate degree in a non-engineering field can be admitted to the M.S. program on a provisional basis, pending the completion of a number of additional credits to be specified on an individual basis. These additional credits will not count towards the M.S. degree requirements. The provisional status continues until completion of the engineering undergraduate requirements in mathematics, physics, engineering sciences and any additional required 400-level Biological Engineering courses. Upon completion of these preparatory courses with a minimum grade-point average of 3.0, the student will be admitted to the graduate program. The required preparatory courses are:

1. Ordinary and Partial Differential Equations (MATH 251)
2. Statics (E MCH 211 or equivalent course)
3. Strength of Materials (E MCH 213 or equivalent course)
4. Thermodynamics (ME 300) or Fluid Dynamics (CE 360 or ME 320)
5. At least one senior level engineering design course
6. Any prerequisite courses required to take the above courses, especially including mathematics, chemistry, and physics.

**LANGUAGE ABOUT POTENTIAL ADVISOR: LIST THEM IN THE APPLICATION AND POTENTIAL ADVISOR'S AGREEMENT OF ADVISING APPLICANTS BASED ON THE STATEMENT OF APPLICATION/WORK AND FINANCIAL SUPPORT.**

An Advisor will be assigned to each entering graduate student by the Department Head, in consultation with the Graduate Program Committee Chair for their indicated research emphasis area.

To qualify for admission, all international applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/ university/institution in any of the following:

American Samoa, Anguilla, Antigua and Barbuda, Australia, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Canada (except Quebec), Cayman Islands, Dominica, England, Ghana, Grenada, Guyana, Jamaica, Kenya, Liberia, Montserrat, New Zealand, Nigeria, Northern Ireland, Puerto Rico, Republic of Ireland, Scotland, Singapore, South Africa, St Kitts and Nevis, St Lucia, Trinidad and Tobago, Turks and Caicos Islands, Uganda, United States, U.S. Virgin Islands and Wales.

Students should check for any updates to this list at: <https://gradschool.psu.edu/graduate-admissions/how-to-apply/new-applicants/requirements-for-graduate-admission/>

## Advisory Committee

EACH STUDENT SHOULD SCHEDULE AT LEAST A ONE-HOUR MEETING EACH WEEK WITH THE ADVISOR TO ENSURE ADEQUATE COMMUNICATIONS AND PROGRESS.

An M.S. Advisory Committee must be formed by submitting “the Master’s Research Committee Appointment” form by the second semester. The committee consist of at least three faculty, all of whom are members of the Graduate Faculty. One member of the committee must be from outside the department in a field related to the thesis problem. If a student selects a minor, then one member of the committee must be a faculty member of the minor department. See also “Advisory Committee Responsibilities” section.

## Course Requirements

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

A minimum of 30 credits at the 400, 500, 600, or 800 level is required, with at least 18 credits at the 500 and 600 level, combined. A minimum of 12 credits in course work (400, 500, and 800 series) must be completed in the major program (BE or ABE). A thesis is required and a minimum of 6 credits in thesis research (600 or 610) must be completed. The thesis must be accepted by the advisers, committee members, the head of the graduate program, and the Graduate School, and the student must pass a thesis defense.

Each M.S. program of study must meet the following requirements:

Code	Title	Credits
ABE 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)	3
STAT 5XX	Any 5XX Statistic Course	3
ABE 590	Colloquium (1 credit per semester for 3 semesters)	3
Additional 400-level BE courses (limit 3 credits), 500-level or 800-level ABE courses <sup>1</sup>		6
ABE 600	Thesis Research	6
Additional 400, 500, or 800-level courses or ABE 600 Thesis Research		6
<b>Total Credits</b>		<b>30</b>

<sup>1</sup> The list of approved courses maintained by the program (<https://abe.psu.edu/graduate/abe/graduate-courses>). Other similar graduate engineering courses (5XX or 8XX) can be taken by petition.

The following ethics courses may substitute for BRS 502:

BIOET 401Q: Science, Ethics, Policy, and Law

BIOET 533: Ethical Dimensions of Renewable Energy and Sustainability Systems

BUS 515: Business Ethics and Corporate Governance

INTAF 511: Ethical Dimensions in Food and Agricultural Governance

LEAD 863: Ethical Dimensions of Leadership

LHR 460: Ethics in the Workplace

MBADM 815: Ethical and Responsible Business Leadership

PHIL 432: Medical and Health Care Ethics

PHIL 433: Ethics in Science and Engineering

PHIL 573: Ethics and the Responsible Conduct of Biomedical Research

PHS 806: Public Health Ethics

STS 589: Ethics and Values in Science and Technology

In addition to the above-listed course work requirements, every graduate student must fulfill the Scholarship and Research Integrity (SARI) requirement. SARI requirement consists of two parts: 1) completion of ABE 500 with a grade of B or better and 2) completion of the online training program at: <http://www.research.psu.edu/training/sari> (<http://www.research.psu.edu/training/sari/>) Responsible Conduct of Research (RCR) for Engineers. The online SARI requirement must be completed within one year from the date of enrollment in the program of study. A copy of the completion certificate of the online SARI training program should be given to the Graduate Administrative Assistant. This will be placed in the student's department folder.

A minimum grade point average of 3.00 is required for graduation. Only grades of C or better are accepted for graduate credit. All courses must be approved by the student's Advisory Committee as having significance and value for the degree program. All requirements for M.S. degree, whether satisfied on this campus or elsewhere, must be met within eight years from the first semester of graduate study.

### **Master's Thesis Research Proposal**

Shortly after the first semester of graduate study, the student should present their proposed plan of research and coursework to their Advisory Committee, in the form of a written document and oral presentation. The committee will provide feedback to the student and evaluate the student's attainment of departmental learning objectives for the thesis proposal. The student's faculty advisor will send the completed evaluation form to the Graduate Program Coordinator and to the department's records coordinator for inclusion in the student's record.

### **Final Oral Examination**

Each M.S. degree student must complete a Final Oral Examination, consisting primarily of defense of the thesis research activity. However, the examination may cover the entire field of Agricultural and Biological Engineering. The M.S. degree student must provide their thesis to their committee no later than two weeks prior to their Final Oral Examination date. The Graduate Program Coordinator must be notified of the exam date, time, and location at least two weeks prior to the scheduled date. The Graduate Program Coordinator will inform the committee members, via memo, of the date, time and location and include the M.S. thesis final exam report form. The completed thesis final exam form should be returned to the Graduate Program Coordinator for placing in the student's department folder. Otherwise, the guidelines for this examination are basically the same as the guidelines for the Ph.D. Final Oral Examination; see that section for further information. In addition to online approval forms,

the committee will complete the Departmental Master's Thesis Final Exam Report form and the learning objectives evaluation form (see end of this document for copies). The student's faculty advisor will send the completed forms to the Graduate Program Coordinator and to the department's records coordinator for inclusion in the student's record.

### **Partial Remote Participation in Milestone Exams**

It is expected that all members of the student's committee (Advisory or Dissertation) will participate in the entire milestone exam (Final Oral).

A milestone exam may be held fully in-person or with partial remote participation. The student, adviser, and Committee Chair/Co-Chairs must be physically present for the examination. Other members of the committee are also expected to be present in-person, but may participate remotely with the agreement of the student and adviser.

If the student, adviser, and/or committee chair/co-chair is not able to participate in-person due to extenuating circumstances, the Graduate Program Head (Department Head) may approve at his/her discretion the remote participation of one or more individuals or approve a fully remote examination. If the Graduate Program Head does not approve the request for remote participation, either the student or adviser may appeal to the Dean or Associate Dean for Graduate Education.

### **Schedule for M.S. Requirements**

Many of the M.S. degree requirements are listed in approximate chronological order on the following page. It is the student's responsibility to ensure that these and all other requirements are met in a timely manner. It is expected that M.S. students should complete the degree in about 17 months and departmental assistantship support (if awarded) to a M.S. student is granted for no more than 17 months.



## Summary Schedule for M.S. Degree

Requirement	Suggested Completion Dates
Submit to Advisor a list of courses to comprise graduate plan of study.	End of first semester.
Recommend to Graduate Coordinator faculty members to serve on Advisory Committee.	End of first semester.
Transfer credit from undergraduate or post-baccalaureate program, if appropriate.	End of first semester.
Prepare thesis research project proposal for Advisor.	End of first semester.
Complete semi-annual progress report form.	Each January and July.
Submit Dissertation Committee Appointment Form	Before the beginning of second semester
Submit plan of study and thesis project proposal to Advisory Committee for approval (copy to Graduate Program Coordinator).	Beginning of second semester.
SARI Online Requirement, <a href="http://www.research.psu.edu/training/sari">http://www.research.psu.edu/training/sari</a>	Complete the online requirement within one year from the date of enrollment in the program of study. Give a copy of the completion certificate to the Graduate Administrative Assistant.
Apply to graduate in LionPATH.	Beginning of semester or summer session in which degree is expected.
Pay thesis fee through the Graduate School Payment Portal at <a href="https://secure.gradsch.psu.edu/paymentportal/">https://secure.gradsch.psu.edu/paymentportal/</a> .	Beginning of semester or summer session in which degree is expected.
Submit draft thesis to Advisor for the feedback.	Early in last semester.
Schedule final oral examination through the Graduate Program Coordinator, communicate date/time to Graduate Administrative Assistant and distribute copies of thesis to Advisory Committee members.	Distribute thesis only AFTER the thesis has been approved by Advisor and no later than two weeks prior to the thesis defense date.
Present departmental seminar based on results of thesis research; schedule through the Seminar Chair	After Final Oral Exam if practical; otherwise, as close to it as is practical.
Upload thesis to the eTD (Electronic Theses and Dissertations for Graduate School website <a href="https://submit-etda.libraries.psu.edu/main">https://submit-etda.libraries.psu.edu/main</a>	After Advisory Committee signs and prior to Graduate School deadline.
Departure meeting with the Director of Graduate Studies.	Two weeks prior to departure.
Prepare manuscript(s) for publication based on thesis research activity.	Prior to departure.
Disassemble research apparatus and clean as necessary; return equipment and supplies to designated areas. Clean office, desk and file space; empty all drawers and shelves and remove posters.	Prior to departure.
Return departmental keys, books, software, supplies, etc. to Administrative Assistant.	Prior to departure.
Provide an electronic copy of thesis to Advisor.	Prior to departure.

## **Doctor of Philosophy (Ph.D.)**

### **Admission Requirements**

The program requirement for acceptance to graduate study toward a Ph.D. degree in Agricultural and Biological Engineering is an M.S. degree with research thesis in an engineering or science discipline with a B.S. degree from an engineering program. Outstanding students interested in direct admission from a B.S. engineering program to the Ph.D. Program should contact the Graduate Program Coordinator. Direct admission will be based on critical evaluation of the student's potential to conduct publishable research, academic record, statement of purpose, and reference letters. Students who apply directly to the Ph.D. program but are not qualified will be considered for admission into the M.S. program.

A student with an undergraduate degree in a non-engineering field can be admitted to the Ph.D. program on a provisional basis, pending the completion of a number of additional credits to be specified on an individual basis. These additional credits will not count towards the Ph.D. degree requirements. The provisional status continues until completion of the engineering undergraduate requirements in mathematics, physics, engineering sciences and any additional required 400-level Biological Engineering courses. Upon completion of these preparatory courses with a minimum grade-point average of 3.0, the student will be admitted to the graduate program.. The required preparatory courses are:

1. Ordinary and Partial Differential Equations (MATH 251)
2. Statics (E MCH 211 or equivalent course)
3. Strength of Materials (E MCH 213 or equivalent course)
4. Thermodynamics (ME 300) or Fluid Dynamics (CE 360 or ME 320)
5. At least one senior level engineering design course
6. Any prerequisite courses required to take the above courses, especially including mathematics, chemistry, and physics.

To qualify for admission, all international applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, 213 for the computer-based test, or a total score of 80 with a 19 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5.

International applicants are exempt from the TOEFL/IELTS requirement who have received a baccalaureate or a master's degree from a college/ university/institution in any of the following:

American Samoa, Anguilla, Antigua and Barbuda, Australia, Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Canada (except Quebec), Cayman Islands, Dominica, England, Ghana, Grenada, Guyana, Jamaica, Kenya, Liberia, Montserrat, New Zealand, Nigeria, Northern Ireland, Puerto Rico, Republic of Ireland, Scotland, Singapore, South Africa, St Kitts and Nevis, St Lucia, Trinidad and Tobago, Turks and Caicos Islands, Uganda, United States, U.S. Virgin Islands and Wales. Students should check for any updates to this list at: <https://gradschool.psu.edu/graduate-admissions/how-to-apply/new-applicants/requirements-for-graduate-admission/>.

### **Dissertation Committee**

EACH STUDENT SHOULD SCHEDULE AT LEAST A ONE-HOUR MEETING EACH WEEK WITH THE ADVISOR TO ENSURE ADEQUATE COMMUNICATIONS.

A Ph.D. Dissertation committee must be formed right after passing the qualifying exam by submitting Ph.D. Committee Appointment Form to the Graduate School. The committee consist of four or more members of the Graduate Faculty and:

- The chairperson and at least one other member must be from ABENG.
- At least one member must be from a department other than ABE.
- At least two members must have doctoral degrees in engineering or be licensed professional engineers.
- At least one member must represent any minor department(s) if the student selects a minor(s).
- The Dissertation committee can be appointed only after the Qualifying Examination has been passed. See also “Advisory & Dissertation committee Responsibilities” section.

## Course Requirements

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

Ph.D. degree requirements include successful completion of the following: approved graduate course work, a qualifying examination, English Competence requirements, a comprehensive examination, and a final oral examination (the dissertation defense). To earn the Ph.D. degree, doctoral candidates must write a dissertation that is accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

Each Ph.D. program of study, for students holding a masters level engineering degree, must meet the following requirements (courses taken previously do not have to be repeated, except ABE 590):

Code	Title	Credits
ABE 500	Research Methods (unless previously taken)	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
ABE 590	Colloquium (1 credit per semester for 4 semesters)	4
	500-level or 800-level ABE courses (excluding ABE 500, 590-596) <sup>1</sup>	6
EDCE 530	Teaching and Learning in Agricultural Science (B grade minimum) <sup>2</sup>	3
ABE 602	Supervised Experience in College Teaching (at least 1 credit)	1-3
Communications <sup>2</sup>	See description below	3
Additional coursework as approved by the Ph.D. Committee		

<sup>1</sup> One 500-level ABE course (3 credits) and one engineering graduate (500-level) course (3 credits) from the list of approved courses maintained by the program office (<https://abe.psu.edu/graduate/abe/graduate-courses>) fulfills this requirement. Other similar graduate engineering courses can be taken by petition.

<sup>2</sup> B- does not meet this requirement.

The following ethics courses may substitute for BRS 502:

BIOET 401Q: Science, Ethics, Policy, and Law

BIOET 533: Ethical Dimensions of Renewable Energy and Sustainability Systems

BUS 515: Business Ethics and Corporate Governance

INTAF 511: Ethical Dimensions in Food and Agricultural Governance

LEAD 863: Ethical Dimensions of Leadership

LHR 460: Ethics in the Workplace

MBADM 815: Ethical and Responsible Business Leadership

PHIL 432: Medical and Health Care Ethics

PHIL 433: Ethics in Science and Engineering

PHIL 573: Ethics and the Responsible Conduct of Biomedical Research

PHS 806: Public Health Ethics

STS 589: Ethics and Values in Science and Technology

Except as specified above, no particular course levels, total number of courses or total credits are required by the department. The Dissertation committee will determine the minimum requirements in such supporting areas as mathematics, engineering, agricultural/biological sciences, and physical sciences. The candidate is expected to develop a program of study and submit it to the Dissertation committee for consideration and approval.

In addition to the above listed course work requirements, every graduate student must fulfill the Scholarship and Research integrity (SARI) requirement. SARI requirement consists of two parts: 1) completion of ABE 500 with a grade of B or better, and 2) completion of online training program at <http://www.research.psu.edu/training/sari>- Responsible Conduct of Research (RCR) for Engineers. The online SARI requirement must be completed within one year from date of enrollment in the program of study. A copy of the completion certificate of the online training program should be given to the Graduate Administrative Assistant. This will be placed in the student's department folder.

It is expected that each Ph.D. student not holding an M.S. engineering degree will satisfy the intent of the M.S. degree coursework requirements specified elsewhere in this document. Research credits (ABE 600) are in addition to coursework credits. The Dissertation committee will determine the minimum research credits but typically the total number is 24 credits beyond the M.S.

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.

A Ph.D. candidate is not required to have a minor field of study. However, if the student selects a minor field, the minor must consist of not fewer than 15 graduate credits above and beyond any credits used for a master's minor. The coursework must be distinct from the student's primary academic and research focus regardless of the course abbreviation/prefix. All credits must be approved by the graduate major program and graduate minor program heads. The minor must meet Graduate Council policy requirements listed under GCAC-611 Minor – Research Doctorate.

### **Communications Course Requirements**

The purpose of the Communications Requirement is to strengthen the student's professional communication skills. The candidate must take AEE 450 or EDCE 530 or HI ED 546. An additional 3-credit course in communications must be taken. A grade of B or better is required in each course (Note: getting a B- does not meet this requirement). Course selections must be approved by the Advisor prior to

registration and must meet the expectations of the Dissertation committee. Courses used to satisfy this requirement cannot be courses taken as remedial for the Qualifying Exam and must include the substantial practice of writing and/or speaking. Examples of courses to consider are:

EDCE 525	Program Design and Delivery (3)
AGCOM 462W	Advanced Agricultural Writing (3)
CAS 450W	Group Communication Theory and Research (3)
CAS 452W	Organizational Communication Theory and Research (3)
ENGL 417	The Editorial Process (3)
ENGL 418	Advanced Technical Writing and Editing (3)
ENGL 511	Thesis Workshop and Professional Writing (3)
ENGL 584	Studies in Rhetoric (3)
HI ED 546	College Teaching (3)

Any 3 credit 4XX foreign language course (Excluding 49X; Must not be candidate's native language).

### Teaching Experience Requirement

All Ph.D. students are required to participate in resident education or extension teaching activities after completion of EDCE 530 (or an approved alternate course). A typical ABE teaching experience would involve the student 1) Developing/refining their teaching and mentoring philosophy, 1) developing a lesson plan, 2) developing teaching materials including assignments and assessments, 3) delivering lectures and/or laboratory experiences, 4) grading associated assignments and assessments, 5) discussing the results of their experience with the course instructor and their advisor. The expected time commitment would be a total of approximately 20-30 hours. A plan to meet the teaching activity requirement must be prepared by the student with guidance from their advisor and course instructor and requires approval, first by the Advisor and then by the Graduate Program Coordinator. Approval should be obtained before commencement of the teaching experience activity. After approval of the teaching experience activity, ABE 602 must be enrolled for 1-3 credits for the same semester at which the teaching experience activity.

### Qualifying Examination

*Ph.D. Qualifying Examination Committee* - This committee **must** consist of four graduate faculty members from the ABENG program, including the Advisor, the Department Head (or annually appointed designee), the 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 Exam will consist of developing a Ph.D. research proposal, presenting the proposal, and defending/discussing the proposed research with the Committee. The Qualifying Exam will be completed by the student within the first four to nine months after entering the Ph.D. graduate program. Successful completion of the Qualifying Exam 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 Dissertation committee.

Each Ph.D. student will submit to each Committee member a detailed proposal for the Ph.D. research a **minimum** of two weeks prior to the exam. This proposal should contain justification, objectives, related literature, methodology, practical significance, resources required, bibliography, proposed program of study and a statement of possible funding sources to which the proposal could be submitted.

The student will present a 20-minute seminar to the Committee. The seminar is open to all in the department and participants may ask questions of the potential Ph.D. candidate concerning the proposed study, technical and engineering aspects, and other related items. The total seminar time will be limited to approximately 30 minutes. Upon completion of this seminar, the graduate faculty members and members of the Committee (may) hold a discussion period (no longer than approximately 15 minutes) regarding the student, the proposed research and the seminar. The student will not be present during this discussion period. Following this discussion, the Committee and the student will undertake the remainder of the exam.

The Committee will review the written proposal and discuss (up to 2 hours) with the student the proposed research and related topics. The Committee will assess the student's understanding of the research process, the student's technical expertise related to agricultural and biological engineering and the proposed research, suitability of the proposed research relative to departmental expectations of Ph.D. candidates, the student's understanding of needed resources and other pertinent topics. The Committee will also judge the ability of the student to communicate and will complete a "*Report on Departmental Assessment of English Competency*" (see "English Competency Requirements" section below). The Committee will select, based on the student's performance, one of the following: 1) recommendation that the student become a Ph.D. Candidate, 2) rejection of the student as a Ph.D. Candidate, or 3) recommendation that the student undertake additional activities as prescribed by the Committee and retake the Qualifying Exam. A student will not be allowed to take the Qualifying Exam more than twice. The Qualifying Examination Assessment Form (see end of this document for copy) will be completed by the examination committee and provided to the department's records coordinator for inclusion in the student's record.

### **English Competency Assessment**

The Graduate School and the ABENG graduate program require candidates for the Ph.D. degree to demonstrate high-level competence in the use of the English language, including reading, writing, listening, and speaking. To fulfill this requirement, the ABENG program requires that all Ph.D. students undergo an assessment of English competency during the first year of their Ph.D. program. The assessment will include the student's ability to read and comprehend, write, speak, and give presentations so as to effectively participate in scientific and technical discussions. The assessment will be conducted during the Ph.D. Qualifying Examination by the Ph.D. Qualifying Exam Committee and will consist of three parts:

*Writing*—As part of the Ph.D. Qualifying Examination, the student will prepare a detailed research proposal on the topic chosen for his/her Ph.D. dissertation (see "Qualifying Examination" for further details about proposal). The written document will be judged for its organization, logical arguments in support of the hypotheses, inclusion of relevant details, and appropriate style in the use of language, grammar, punctuation and spelling. The "Literature Section" of the written proposal containing analysis of pertinent literature will be used to evaluate the student's reading comprehension of the technical literature.

*Presentation*—As part of the Ph.D. Qualifying Examination, the student will present a 20-minute seminar to the Committee. The seminar is open to all in the ABE department. The presentation will be judged for its organization, clarity, appropriateness to the audience, appropriate use of visual aids, and effectiveness of delivery. The quality of the formal presentation should be comparable to papers presented at technical sessions of professional society meetings.

*Oral Discussion*—The main purpose of the Oral Discussion part of the English Competency Test is to evaluate the oral skills of the student to participate in scientific and technical discussions with other technical professionals. The Oral Discussion will follow the formal presentation of the research proposal by the student. The examination committee will conduct a discussion with the student on various aspects of the research proposal and also on the scientific and technical issues surrounding the research area.

At the end of the Qualifying Exam, each member of the Committee will present an assessment of the student's English competency in the three categories: writing, presentation, and oral discussion. These assessments will be used to certify the attainment of English competency or to recommend measures for improving English competency. A "Report on Departmental Assessment of English Competency" form will be completed by the Committee, shared with the student, and placed in the student's departmental records.

***Improving English Competency of Students with Deficiencies***—If the expected level of English Competence is not demonstrated, the student must enroll in course(s) to improve English competency. The committee will recommend suitable course(s) which may include selections from the following:

- Writing Skills
  - ESL 116G – ESL/Composition for Academic Disciplines
- Presentational Skills
  - CAS 100A – Effective Speech
  - CAS 211 – Informative Speaking
- Oral Language Skills
  - ESL 114G – American Oral English for Academic Purposes
  - ESL 115G – American Oral English for ITAs I

If the student completes and passes the recommended course(s) with a B- grade or higher, then the student will be certified as having attained English competency. Otherwise, the student will have to retake the course (or another comparable course). Students judged as not making sufficient progress towards achieving competency in English will have their funding terminated.

## **Residency Requirement**

There is no required minimum number of semesters of study. However, over some twelve-month period during the interval between admission to the Ph.D. program and completion of the Ph.D. program, the candidate must spend at least two semesters (summer sessions are not included) as a registered full-time student engaged in academic work at the University Park campus, The Milton S. Hershey Medical Center, or Penn State Harrisburg. Full-time University employees must be certified by the department as devoting half-time or more to graduate studies and/or thesis research to meet the degree requirements.

## **Comprehensive Examination**

When a Ph.D. candidate has substantially completed the coursework, including the communication requirements, he/she is required to take a Comprehensive Examination covering the major, minor, and related areas of study. The Comprehensive Examination should be scheduled through the Graduate Program Coordinator and the Graduate Administrative Assistant at least two weeks prior to the selected date. All candidates are required to have a minimum grade point average of 3.00 for graduate work completed at the University at the time the Comprehensive Examination is given, and may not have deferred or missing grades. The student must be registered as a full-time or part-time student for the semester in which the Comprehensive Exam is taken. The Comprehensive Examination must be taken at least three months before the Final Oral Examination. If a period of six years has elapsed between the

passing of the Comprehensive Examination and the completion of the program, the student is required to pass a second Comprehensive Examination before the Final Oral Examination can be scheduled.

The Comprehensive Examination will be both written and oral. The nature and details of the Comprehensive Examination will be determined by the Dissertation 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 engineering problems. Accordingly, the Comprehensive Examination will consist of 1) The completion of a written examination provided by each of the Dissertation committee members prior to the oral examination; 2) A presentation of the candidate's research; 3) An oral examination that may cover content in the written examination research presentation or relevant subject matter. The written examination should conclude a minimum of one week before the oral examination. 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. Results of the exam are reported directly to the Graduate School, and the Comprehensive Examination Assessment Form (see end of this document for copy) will be completed by the Dissertation Committee and provided to the department's records coordinator for inclusion in the student's record.

### **Final Oral Examination**

Upon recommendation of the advisor, a Ph.D. candidate who has satisfied all other requirements for the degree will be scheduled by the Dean of the Graduate School to take a Final Oral Examination. The scheduling form can be obtained from the Graduate Administrative Assistant and must be submitted at least two weeks prior to the scheduled exam date. The student must be a registered full-time or part-time degree student for the semester in which the Final Oral Exam is taken. The Ph.D. Candidate must provide each committee member with a copy of the dissertation two weeks prior to the Final Oral Examination. The examination student presentation 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. Ph.D. candidates enrolled in a dual-title degree program must orally defend a dissertation on a topic that reflects their original research and education in both their ABENG graduate program and their dual-title program. 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 (approximately 20-25 minutes unless otherwise specified), 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. Results of the exam are reported directly to the Graduate School.

#### *Criteria for evaluation of the final oral examination:*

The following criteria are used to evaluate the final oral examination. The student should be able to demonstrate the ability to 1) understand and communicate potential new short and long-term research hypotheses and/or objectives; 2) create new knowledge and/or develop new solutions/solution methodology(ies); 3) understand and communicate the implications of the new knowledge and findings and their generalization; 4) articulate and defend results to the doctoral committee; and 5) produce a quality dissertation suitable for publication. The Dissertation Defense Examination Assessment Form (see end of this document for copy) will be completed by the Dissertation Committee and provided to the department's records coordinator for inclusion in the student's record.

### **Partial Remote Participation in Milestone Exams**



It is expected that all members of the student's committee (Qualifying, Advisory or Dissertation) will participate for the entire milestone exam (Qualifying, Comprehensive or Final Oral) and that each member of the committee will have read the proposal or final thesis or dissertation carefully and critically.

A milestone exam may be held fully in-person or with partial remote participation. The student, adviser, and Committee Chair/Co-Chairs must be physically present for the examination. Other members of the committee are also expected to be present in-person, but may participate remotely with the agreement of the student and adviser.

If the student, adviser, and/or committee chair/co-chair is not able to participate in-person due to extenuating circumstances, the Graduate Program Head (Department Head) may approve at his/her discretion the remote participation of one or more individuals or approve a fully remote examination. If the Graduate Program Head does not approve the request for remote participation, either the student or adviser may appeal to the Dean or Associate Dean for Graduate Education.

### **Schedule for Ph.D. Requirements**

Many of the requirements for the Ph.D. degree are listed in approximate chronological order on the following page. It is the student's responsibility to ensure that these and all other requirements are met in a timely manner. It is expected that Ph.D. students should complete the degree in about 36 months and departmental assistantship support (if awarded) to a Ph.D. student is granted for no more than 36 months.

## Summary Schedule for Ph.D. Degree

Requirement	Suggested Completion Dates
Submit to Advisor a list of courses to comprise Ph.D. plan of study.	End of first semester.
Complete semiannual report form.	Each January and July.
Schedule (communicate date/time to Graduate Administrative Assistant) and complete Ph.D. Qualifying Examination.	Beginning of second semester.
Submit thesis research project proposal to Qualifying Examination Committee.	Two weeks prior to Qualifying Examination.
Recommend to Graduate School faculty members to serve on Dissertation committee.	Within one month following Qualifying Examination.
Submit Dissertation Committee Appointment Form	Within one month following Qualifying Examination and before middle of second semester
Submit plan of study and thesis project proposal to Dissertation committee for approval (copy to Graduate Program Coordinator).	Middle of second semester.
SARI Online Requirement, <a href="http://www.research.psu.edu/training/sari">http://www.research.psu.edu/training/sari</a>	Complete the online requirement within one year from the date of enrollment in the program of study. Give a copy of the completion certificate to the Graduate Administrative Assistant.
Resident education or extension teaching.	Prior to Final Oral Examination.
Schedule (communicate date/time to Graduate Administrative Assistant) and complete Comprehensive Examination.	Upon substantial completion of coursework and 3 months prior to Final Oral Exam.
Apply to graduate in LionPATH.	Beginning of semester or summer session in which degree is expected.
Pay thesis fee through the Graduate School Payment Portal at <a href="https://secure.gradsch.psu.edu/paymentportal/">https://secure.gradsch.psu.edu/paymentportal/</a> .	Beginning of semester or summer session in which degree is expected.
Submit draft copy of thesis to Advisor for the feedback.	Early in last semester.
Schedule (communicate date/time to Graduate Administrative Assistant) Final Oral Examination and distribute copies of thesis to each committee member and Graduate Program Coordinator	Distribute thesis only AFTER the thesis has been approved by Advisor.
Present departmental seminar based on results of thesis research; schedule through Seminar Chair.	After Final Oral Exam, if practical; otherwise, as close to it as is practical.
Upload dissertation to the eTD (Electronic Theses and Dissertations for Graduate School website <a href="https://submit-etda.libraries.psu.edu/main">https://submit-etda.libraries.psu.edu/main</a>	After Committee signs and prior to Graduate School deadline.
Prepare manuscript(s) for publication based on thesis research activity.	Prior to departure.
Departure meeting with Director of Graduate Studies.	Two weeks prior to departure.
Disassemble research apparatus and clean as necessary; return equipment and supplies to designated areas. Clean office, desk and file space; empty all drawers and shelves and remove posters.	Prior to departure.
Return departmental keys, books, software, supplies, etc. to Administrative Assistant.	Prior to departure.
Provide an electronic copy of dissertation to Advisor.	Prior to departure.

## **Other Degrees**

### **Minors in Agricultural and Biological Engineering**

A student pursuing a master's degree in a field other than ABENG may earn a minor in ABENG by completing at least 9 credits of 4XX or 5XX ABE courses. No more than a total of 3 of the minimum credits may be earned in 49X or 59X courses.

A minor in ABENG for a Ph.D. student must consist of no less than 15 credits of 4XX or 5XX ABE courses. No more than a total of 6 of the minimum credits may be earned in 49X or 59X courses. If the student received a master's minor in the same field as is being proposed for a Ph.D. minor, the 15 credits taken must be above and beyond those used for the master's minor. At least one faculty member from the minor field must be on the candidate's Dissertation committee.

### **Degrees in Intercollege and Dual-Title Degree Programs**

As an alternative or addition to the M.S. and Ph.D. degrees in ABENG, a student may pursue a graduate degree in an intercollege or dual-title degree programs and be advised by a faculty member in the ABE Department. For example, a number of students in the intercollege Environmental Pollution Control (EPC) program and the dual-title Operations Research (OR) program have been advised by faculty members in ABE. The most recent dual-title program available to ABENG students is the International Agriculture and Development (INTAD). These programs are offered under the supervision of appropriate interdepartmental or intercollege committees.

Students in these programs should consult with the person listed under the major program heading in the Graduate Bulletin for information regarding admission, course selection and degree requirements. When students in such programs are advised by ABE faculty, they must be familiar with, and adhere to, the administrative policies detailed in this handbook. In general, the academic policies also apply to these students, but may be superseded or supplemented by policies promulgated for the students' specific majors. Students are required to give a seminar on their thesis research and attend all ABE departmental seminars. The required seminar presentation may be in a departmental or program series other than ABE.

Additional information about the EPC, INTAD, and OR can be found at (1) Environmental Pollution Control (EPC) <https://bulletins.psu.edu/graduate/programs/majors/environmental-pollution-control/>, (2) International Agriculture and Development (INTAD) <http://agsci.psu.edu/international/intad>, (3) Operations Research (OR) <http://www.or.psu.edu> and <https://bulletins.psu.edu/graduate/programs/majors/operations-research/>.

### **Dual-Title M.S. and Ph.D. in Agricultural and Biological Engineering and International Agriculture and Development**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Graduate students with research and educational interests in international education may apply to the dual-title program in Agricultural and Biological Engineering and International Agriculture and Development. The goal of the dual-title program in ABENG and INTAD is to enable graduate students from ABENG to acquire the knowledge and skills of their primary area of specialization in ABENG, while at the same time gaining the perspective and methods needed for work in the international

agriculture. Graduate study in this program seeks to prepare students to assume leadership roles in science, engineering, outreach, and project management anywhere in the world. Students acquire a broad perspective on how to apply their research findings in the context of the broader international community. Thus, the dual-title will allow students to master their field of specialization from an international perspective so that they can effectively engage in agricultural development activities within various countries and regions.

### **Admission Requirements**

Students must apply and be admitted to the graduate program in ABENG and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the INTAD dual-title program. Refer to the Admission Requirements section of the INTAD Bulletin page. Doctoral students must be admitted into the dual-title degree program in INTAD prior to taking the qualifying examination in their primary graduate program.

### **Degree Requirements for the Dual-Title M.S.**

To qualify for the dual-title degree, students must satisfy the degree requirements for the M.S. degree, listed on the Degree Requirements tab. In addition, students must complete the degree requirements for the dual-title M.S. in INTAD, listed on the INTAD Bulletin page. Up to 6 credits of INTAD approved courses can be applied to fulfilling ABENG program requirements. Final course selection must be approved by the student's advisory committee.

### **Degree Requirements for the Dual-Title Ph.D.**

To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. degree, listed on the Degree Requirements tab. In addition, students must complete the degree requirements for the dual-title Ph.D. in INTAD, listed on the INTAD Bulletin page. Some courses may satisfy both ABENG program requirements and those of the INTAD program. Up to 6 credits of INTAD approved courses can be applied to fulfilling ABENG program requirements. Final course selection must be approved by the student's Ph.D. committee.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from ABENG and must include at least one Graduate Faculty member from the INTAD program. Faculty members who hold appointments in both programs' Graduate Faculty may service in a combined role. There will be a single qualifying examination, containing elements of both ABENG and INTAD. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed by one semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for Ph.D. committees, the Ph.D. committee of an ABENG and INTAD dual-title Ph.D. student must include at least one member of the INTAD Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may service in a combined role. If the chair of the Ph.D. committee is not also a member of the Graduate Faculty in INTAD, the member of the committee representing INTAD must be appointed as co-chair. The INTAD representative on the student's Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their Ph.D. committee and reflects their original research and education in ABENG and INTAD. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

## **Dual-Title M.S. and Ph.D. in Agricultural and Biological Engineering and Operations Research**

Requirements listed here are in addition to requirements listed in GCAC-208 Dual-Title Graduate Degree Programs.

Graduate students with interests in operations research may apply to the dual-title program in Agricultural and Biological Engineering and Operations Research. The goal of the dual-title program in ABENG and Operations Research is to enable graduate students from ABENG to acquire the knowledge and skills of their primary area of specialization in ABENG, while at the same time gaining the perspective and methods needed for work systems analysis and modeling. Graduate study in this program seeks to prepare students to utilize the tools, techniques, and methodology of operations research, while maintaining a close association with areas of application. Operations research is the analysis--usually involving mathematical treatment--of a process, problem, or operation to determine its purpose and effectiveness and to gain maximum efficiency.

### **Admission Requirements**

Students must apply and be admitted to the graduate program in ABENG and The Graduate School before they can apply for admission to the dual-title degree program. After admission to their primary program, students must apply for admission to and meet the admissions requirements of the OR dual-title program. Refer to the Admission Requirements section of the OR Bulletin page. Doctoral students must be admitted into the dual-title degree program in OR prior to taking the qualifying examination in their primary graduate program.

### **Degree Requirements for the Dual-Title M.S.**

To qualify for the dual-title degree, students must satisfy the degree requirements for the M.S. degree, listed on the Degree Requirements tab. In addition, students must complete the degree requirements for the dual-title M.S. in OR, listed on the OR Bulletin page. Up to 6 credits of OR approved courses can be applied to fulfilling ABENG program requirements. Final course selection must be approved by the student's advisory committee.

### **Degree Requirements for the Dual-Title Ph.D.**

To qualify for the dual-title degree, students must satisfy the degree requirements for the Ph.D. degree, listed on the Degree Requirements tab. In addition, students must complete the degree requirements for the dual-title Ph.D. in OR, listed on the OR Bulletin page. Some courses may satisfy both ABENG program requirements and those of the OR program. Up to 6 credits of OR approved courses can be applied to fulfilling ABENG program requirements. Final course selection must be approved by the student's Ph.D. committee.

The qualifying examination committee for the dual-title Ph.D. degree will be composed of Graduate Faculty from ABENG and must include at least one Graduate Faculty member from the OR program. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. There will be a single qualifying examination, containing elements of both ABENG and OR. Dual-title graduate degree students may require an additional semester to fulfill requirements for both areas of study and, therefore, the qualifying examination may be delayed on semester beyond the normal period allowable.

In addition to the general Graduate Council requirements for Ph.D. committees, the Ph.D. committee of an ABENG and OR dual-title Ph.D. student must include at least one member of the OR Graduate Faculty. Faculty members who hold appointments in both programs' Graduate Faculty may serve in a combined role. If the chair of the Ph.D. committee is also not a member of the Graduate Faculty in OR a member of the Graduate Faculty in OR, the member of the committee representing OR must be appointed as co-chair. The OR representative on the student's Ph.D. committee will develop questions for and participate in the evaluation of the comprehensive examination.

Students in the dual-title program are required to write and orally defend a dissertation on a topic that is approved in advance by their Ph.D. committee and reflects their original research and education in ABENG and OR. Upon completion of the doctoral dissertation, the candidate must pass a final oral examination (the dissertation defense) to earn the Ph.D. degree. The dissertation must be accepted by the Ph.D. committee, the head of the graduate program, and the Graduate School.

## **Academic Policies**

### **Registration**

The responsibility for being properly registered rests first with the student and secondarily with the Advisor. A student may register for coursework or research or both. In the case of research, the number of credits shall be determined by the amount of time devoted to the investigation, with 1 credit representing the approximate equivalent of one week of full-time work.

An M.S. candidate is required to register continuously but is not required to register for the final semester in order to graduate or in order to make minor revisions to the thesis and/or take a final examination for the degree.

A candidate for the Ph.D. degree is required to register continuously for each semester from the time the comprehensive examination is passed until the thesis is accepted by the Dissertation committee, regardless of whether work is being done on the thesis during this interval.

If all degree requirements (including thesis defense and thesis submission) are completed prior to the beginning of the semester in which the student will be graduating, then the student is not required to register for that semester. For example, if a student is planning to graduate at the end of fall semester, then he/she must either complete all degree requirements two days prior to the first day of fall classes, or register for the appropriate number of credits for the fall semester. Courses to meet continuous registration requirements are:

- ABE 600/610—If a student does not need to maintain full-time status, he/she should register for the appropriate number of thesis credits (determined in consultation with Advisor) which

accurately reflects the amount of research being done on the thesis. ABE 600 is for students who will be on campus; ABE 610 is for students who will be off campus.

- ABE 601/611—This special registration may be used only by Ph.D. students starting with the semester after the Comprehensive Examination is passed. If a student must maintain full-time status for an assistantship, fellowship, bank loan deferment, etc., ABE 601 would be an appropriate registration. ABE 611 is the appropriate course for a part-time Ph.D. student. To register for ABE 601, students must be devoting their degree efforts entirely to thesis research/writing.

*International Students*—International students must satisfy additional registration requirements set by the Immigration and Naturalization Service (INS) and others. Further information can be found at: <http://global.psu.edu>.

*Graduate Assistants*—Graduate assistants must be enrolled at Penn State as graduate students. More specifically, since assistantships are provided as aids to completion of advanced degrees, assistants are expected to enroll for credit loads each semester that fall within the limits indicated in the table below. Maximum limits on permissible credit loads help assure that the student can give appropriate attention both to academic progress and assistantship responsibilities.

Level of Assistantship	Credits per Semester		Credits per 6-Week Summer Session	
	Minimum	Maximum	Minimum	Maximum
Quarter-time	9	14	5	7
Half-time	9	12	4	6
Three-quarter-time	6	8	3	5

Graduate assistants whose credit loads equal or exceed the minimum indicated in the table, and whose assistantship activities are directly related to their degree objectives, are considered by the Graduate School to be engaged in full-time academic work.

## Dropping Courses

Each graduate student must maintain full-time registration throughout each semester or summer session in order to continue receiving assistantship support. **Each request to drop a course must be approved by the Advisor.**

A student receiving tuition remission must recognize that if he/she drops a course, the tuition already paid out of the departmental allocation is lost and can never be recovered. Excessive dropping of courses will mean that tuition support may not be available in the future.

## Normal Academic Progress

Students are expected to complete the minimum credit requirement each semester and maintain an acceptable academic grade point average (3.00 minimum). Students who fall below these standards will be considered to be on academic probation. If a student remains below these standards for two consecutive semesters, his/her enrollment may be terminated.

Each student has the responsibility to submit a Progress Report form each January and July to the Graduate Program Coordinator. The report must have the Advisor's comments and signature and must be submitted on time if the graduate student is continuing in the next semester (or summer session). If a student receives unsatisfactory evaluations in two consecutive progress reports, his/her enrollment in the graduate program may be terminated; subject to a meeting between his/her advisor, the Graduate Program Coordinator, and the Department Head.

### **Advisory and Dissertation committee Responsibilities**

Each Advisory and Dissertation committee has the following responsibilities:

- Review and approve the graduate student's plan of study.
- Consult with and advise the graduate student on research approach, techniques, findings, and reports.
- Review and approve the graduate student's thesis research project proposal before substantial steps are implemented to do the research.
- Review the graduate student's thesis and suggest improvements.
- Monitor and evaluate the student's progress in meeting course and research requirements for the degree.
- Conduct required examinations for the candidate's degree program. For the M.S. degree, the required examination is the Final Oral Examination. For the Ph.D. degree, the required examinations are the Comprehensive and Final Oral Examinations.

A two-thirds majority vote from the Advisory or Dissertation committee members is required to approve the plan of study and research proposal, pass examinations, and approve the thesis.

### **Plan of Study**

A plan of study is required so that no student proceeds without advice and guidance on earning an advanced degree. The graduate student, in close consultation with the Advisor, is expected to develop a tentative plan of study by the end of the first semester. The plan of study is to be submitted for approval to the Advisory or Dissertation committee by early in the second semester for a M.S. student and within one month after completing the Qualifying Examination for a Ph.D. student. An electronic copy of the approved plan of study is to be submitted to the Graduate Program Coordinator for placement in the student's file.

The plan of study for a Ph.D. student is to include all course credits and thesis research credits to be completed (or already completed) after the B.S. degree. If any course credits or thesis research credits were earned at another institution, then the institution should be identified on the plan of study.

Each plan of study is unique to the individual student and should be tailored to meet his/her career goals and objectives. The plan should be reasonably cohesive and concentrate in an area or interrelated areas of study. Since a plan of study is developed quite early, a student may modify his/her plan with approval by the Advisor and the Advisory or Dissertation committee.

### **Statistical Consulting Services**

The Statistical Consulting Center (<http://stat.psu.edu/consulting/statistical-consulting-center>) is an educational and service unit in Penn State's Department of Statistics. Faculty, staff, and graduate and undergraduate students from Statistics, Computer Science/ Engineering, and Management



Science/Information Services provide advice, project management, data management, and statistical analysis for the University and private research community. The Center provides walk-in, short term, and longer-term consulting services to graduate students, staff and faculty. Short-term services include two free consultation meetings; whereas longer-term services are on an arranged-fee basis.

It is recommended that each student consult with the Statistical Consulting Service during the planning of experiments and prior to data collection, to assure that adequate consideration has been given to statistical analysis.

## **Thesis Guidelines and Specifications**

A degree candidate must demonstrate ability to do independent research and competence in scholarly exposition by the preparation of a thesis on a topic related to the major subject. The thesis should represent a significant contribution to knowledge, be presented in a scholarly manner, reveal an ability on the part of the candidate to do independent research of high quality and indicate considerable experience in using a variety of research techniques. In conformance with the Family Educational Rights and Privacy Act, students are hereby notified that their thesis and other research work may be made publicly available through libraries and other means.

The thesis is to be developed by the student with the supervision, support and critique of the Advisor. The draft thesis is to be submitted first to the Advisor. The student and the Advisor may agree to prior review of the thesis, either section-by-section or in its entirety, or both. After the thesis has been approved by the Advisor, the student distributes a copy to each member of the Advisory or Dissertation committee. This draft should be complete in every respect including figures, tables and bibliography; the content and style should be correct and polished.

Graduate students should allow a minimum of five working days before the Final Oral Exam for Advisory or Dissertation committee members to review the thesis. Some members may require more time. Time for thesis reviews can often be reduced considerably if the graduate student notifies the committee members in advance of the date when copies will be submitted for review.

*Acknowledgments.* A student is highly encouraged to acknowledge the funding source(s) in the acknowledgments section of the thesis. In all cases, the Penn State College of Agricultural Sciences should be recognized for the contributions it has made to the student's thesis research activities. If the student or the student's research is additionally supported by a contract or grant activity, then it is highly appropriate to acknowledge the source of the external support. An example appropriate statement to acknowledge the support is "Thank you to <Department Head's name> for providing financial support from the Penn State College of Agricultural Sciences throughout my graduate study" or, more simply, "The support received from the Penn State College of Agricultural Sciences is gratefully acknowledged."

*Units.* All theses must be in SI Units. Customary units may be included in parentheses for special applications.

*Thesis Typing.* The Graduate School offers the thesis template, which can be found at <http://www.gradsch.psu.edu/current/thesis.html>. The thesis is to be completed at the student's expense. Departmental computers may be used for thesis preparation under the following conditions:

- The equipment may be used only by the student.

- The student will readily relinquish the use of the equipment when needed by students or others for extension, research, or teaching purposes.
- The printers are not to be used for multiple copies.

*Submission of Thesis.* The thesis must meet the Graduate School's format and other requirements. The Office of Theses and Dissertations at: <http://www.gradsch.psu.edu/current/thesis.html> publishes a “Thesis Guide” <http://www.gradschool.psu.edu/current-students/etd/thesisdissertationguidepdf/> and provides thesis writers workshops several times each semester. In addition to Graduate School requirements, the student must provide an electronic copy to the Thesis Office and his/her Advisor.

*(Advisors and the Advisory or Dissertation committee may require additional copies, perhaps in bound or other formats. The cost of any additional copies required by the sponsor of the research project will be covered by the project funds.)*

## **Graduate Seminar**

A graduate student must present a departmental seminar at the termination of each degree program, based on his/her thesis project. Seminars should be scheduled through the Seminar Chair, be during the regular seminar time slot, and be after the Final Exam or at least as close to the end of the degree program as is practical.

Graduate students **must** attend all department seminars each semester unless they have course conflicts and are encouraged to suggest topics and speakers to the seminar committee. Seminar attendance after passing the Final Oral Exam is optional.

If a student has a regularly scheduled course during the seminar period, then the student must inform the Graduate Program Coordinator and the Graduate Administrative Assistant at the beginning of the semester prior to the first scheduled seminar. A student may miss up to three seminars per semester without any penalty. If the number of missed seminars exceeds three, this absence will be noted on the student’s progress report and the department may withdraw funds for travel to conferences and/or other departmental support. No remedial action will be required if the student provides evidence of attending seminars elsewhere at PSU; equal in number to the missed seminars during the same semester.

## **Participation in Departmental Activities**

All graduate students are invited and encouraged to attend department meetings, retreats, seminars, socials, and all other activities. However, at the discretion of the Department Head, some departmental activities may be for only the faculty.

Graduate students are also invited and encouraged to become involved with departmental committees. Graduate students may not serve on the Graduate Applications Subcommittee to avoid any possible conflict of interests. Graduate student members of committees shall have full voting rights.

## **Student Organizations**

The Agricultural and Biological Engineering Graduate Student Council (ABEGSC) is the department’s graduate student organization. This group holds meetings and events on a regular basis. Each graduate student is highly encouraged to proactively participate in the ABEGSC. In addition, there are several student organizations responding to the needs of graduate students. The largest group is the Graduate Student Association (GSA) which is a university-wide group consisting of representatives from each department. GSA provides a liaison between ABE graduate students and University Administration and

acts as both a lobbying group for student issues (such as insurance and taxes) and as a social organization providing such opportunities as happy hours and the summer rental of garden plots. The Engineering Graduate Student Council (EGSC) performs a similar function by providing a communication link to the College of Engineering. EGSC often sponsors panel discussions and brown-bag lunches while also having input on various college advisory committees. Representatives for both of these groups are elected from within the department near the end of each spring semester.

The diversity among graduate students is reflected by the number of ethnic and social groups available to students. Among the many groups are: Friends of India (FOI), Women in Science and Engineering (WISE), and the Black Caucus. The Penn State Outing Club has many divisions including canoeing, hiking, biking, skiing, and equestrian

## **Post-Graduation Employment**

Assistance finding employment is available at the department, College, and University levels. The Agricultural Sciences Careers Fair is held each fall and attracts about 50 employers. University-wide career fairs are held each September and April in Bryce Jordan Center. Career Services (<http://studentaffairs.psu.edu/career/>) provides assistance in the following areas:

- Drop-In & Career Counseling
- Nittany Lion Career Network
- Job Search and Career Fairs
- Workshops & Events
- Career Information Center
- Education Credentials Services

## **Student Petitions**

A graduate student has the right to submit a [petition](#) concerning any academic and/or administrative policy related to the graduate degree program. The following summarizes the petition process:

1. Student completes the petition form in consultation with their advisor.
2. Student submits the petition to the graduate program coordinator. If the petition details a known approved action, coordinator forwards to director of graduate studies and department head with recommendation of approval/rejection based on known policy. If the petition is new, the coordinator forwards to the director of graduate studies and graduate studies committee for review, discussion and vote. The director of graduate studies provides a summary of discussion, vote and recommendation to the department head.
3. Department head approves or denies the petition with reason(s) and returns to the graduate studies committee.
4. Coordinator returns petition to student, advisor and graduate studies administrative assistant with results.

Note: If any member of the graduate studies committee or department head is in a conflict of interest (e.g., is an advisor of the student) a suitable replacement may be identified for voting if necessary.

In all cases, a petition must be submitted as early as possible so that the student has time to develop alternative plans if the petition is denied. Problems that develop between a student and member(s) of the Advisory or Dissertation committee can be arbitrated on a confidential basis by the Department Head and/or Dean of the Graduate School, as appropriate.

## **Administrative Policies**

### **Assistantship Responsibilities**

Students on 1/2-time or full-time assistantships are expected to work on a similar basis for a minimum of 20 hours or 40 hours per week, respectively. These work requirements may include thesis research activities.

To allow for obtaining a broad base of experiences and professional growth, each graduate student is encouraged to seek involvement with the Advisor and/or Advisory/Dissertation committee members to gain teaching (classroom or extension) experiences as a part of the graduate education. This experience is expected for all Ph.D. candidates. In addition, each Ph.D. candidate should seek involvement with his/her Advisor to write and submit a research proposal for external funding. Each graduate student should discuss the opportunities for participation in teaching and proposal preparation with his/her Advisor and the Department Head.

The Test of Spoken English (TSE) is required of graduate students whose native language is not English before such students can be appointed to graduate teaching assistantships. Students who score less than 220 on the TSE will not be permitted to hold teaching assistantships.

### **Work Related Injury**

The University covers its employees with Worker's Compensation Insurance as a protection for injuries or illness compensable under the Pennsylvania Worker's Compensation Act.

An employee has an obligation to report any work-related injury, regardless of how minor, to his or her supervisor. The employee will be provided with a "Workers' Compensation Employee Notification" form and a copy of the "Healthcare Provider Panel" list. Any treatment for the first 90 days from first treatment must come from a "Panel" provider in order to ensure that the University will pay for medical treatment. If the injury results in an immediate medical emergency, initial medical assistance may be obtained from a hospital or health care provider of the employee's choice. However, subsequent treatment must be from a "Provider Panel" participant.

Additional information on this topic can be obtained from the following link: <https://hr.psu.edu/workers-compensation>.

### **Health Insurance**

The Student Insurance Office is responsible for administering two health insurance plans for graduate students. A graduate student who is on a Graduate Assistantship or Graduate Fellowship is automatically enrolled in the Penn State Graduate Assistant and Graduate Fellow Health Insurance Plan, and the Vision and Dental Plans, which also provides coverage for eligible dependents. Penn State will provide a subsidy of 80% of the annual premium cost for the graduate assistant or fellow and deduct the student's 20% contribution from the monthly paycheck. Health insurance subsidy for eligible dependents is 70% of the annual premium expense. To enroll a spouse and/or dependents for Medical, Dental, and Vision benefits, graduate students must complete the "*Online Dependent Enrollment Form*" within the initial website listed below.

Graduate students not on an assistantship or fellowship may enroll in the Penn State Student Accident and Sickness Insurance Plan. All international students and their accompanying dependents (spouse and/or children) must have health insurance coverage. This may be fulfilled in one of two ways:

Purchase the Penn State Student Accident and Illness Plan

Acquire a comparable health insurance plan and provide the University with documentation that provides proof of insurance by submitting a waiver application to the Student Insurance Office.

Further details regarding student health insurance are available at the University Health Services Office, 302 Student Health Center, phone 814-865-7467, or visit: <https://studentaffairs.psu.edu/health-wellness/health-insurance>.

## **Publication and Presentation**

Publication and presentation of knowledge created through research is an essential experience in graduate education. Future employers in academia, government and industry use a student's publication and presentation records as important metrics in evaluating the quality of applicants. The experience and skills developed by preparing and submitting a manuscript, engaging in scholarly debate during the review process, and producing a polished final publication are important for a student's career. Similarly, the ability to provide a clear, accurate and compelling scholarly presentation will be needed throughout one's professional life. In addition, student and faculty productivity in publishing and presenting research results are important to the success of the department. Publication and/or presentation may also be a requirement associated with some sources of student funding.

To prepare graduate students for success in obtaining and excelling in future positions, it is expected that students will prepare and submit publications appropriate for their specific field of study. These may include peer reviewed journal articles, conference papers or extension publications. Students are also expected to present their research at a conference or venue appropriate for their field. Specific expectations for number of publications and presentations will be established by the student, advisor and advisory/doctoral committee. For example, an M.S. student may be expected to submit 1-2 peer reviewed journal articles and provide 1 technical conference presentation. A Ph.D. student may be expected to submit 3-4 peer reviewed journal articles and provide 1-2 conference presentations. Students should discuss expectations with their advisor at the start of the degree program and, once an advisory/doctoral committee is formed, discuss again so that the expectations are clear. Expectations should be revisited at least yearly during committee meetings and be included in student's progress reports. The student, advisor and committee should establish and follow a research plan that will enable the student to achieve the publication and presentation goals. Students are also expected to support the publication process after graduation. This may include leading the preparation of new publications, aiding in the development of a response to reviewer comments, revising manuscripts and reviewing proofs. In the event that a student graduates having obtained publishable research but does not submit a publication on that research after a period of 6 months, the student's advisor(s) and collaborator(s) may submit a manuscript based on, or that includes, the research. Authorship will be determined based on the level of effort and intellectual contributions of those involved. The student will be notified in writing of the intent to publish and authorship status. Reasonable expenses for publication of manuscripts based on theses (i.e. page charges) are considered legitimate departmental expenses and will be paid by the department. However, expenses for thesis preparation are considered personal expenses and must be paid by the student.

## **Research Data, Software, Designs and Manuscripts**

All research data, patents, designs, computer software, creations, slides, pictures, reports, etc. obtained by graduate students on assistantship support are the property of the ABE Department. All research data and other requested materials must be submitted to the Advisor before the student leaves Penn State University. The student must also archive all research data using a university archive service such as ScholarSphere available at the university library. If any patents or copyrights are awarded to the inventions or designs of any graduate student's thesis research, then both the student and Advisor are credited. They can receive a percentage of the profits or royalties realized from the patents or copyrights.

## **Professional Ethics**

Penn State policy AC-47 <https://policy.psu.edu/policies/ac47> sets forth statements of general standards of professional ethics to serve as a reminder of the variety of obligations assumed by all members of the academic community, including graduate students. The handling of inquiries into questions of ethics is covered in RA-10. RPG01 deals with the co-authorship of scholarly reports, papers, and publications. These policies are available on the Policies website <https://policy.psu.edu/>.

## **Academic Integrity**

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others. Students should read and become familiar with The Pennsylvania State University Policies AC47 *General Standards of Professional Ethics*; AD67 *Disclosure of Wrongful Conduct and Protection From Retaliation*; and AD88 *Code of Responsible Conduct*.

Academic Integrity Guidelines for the College of Agricultural Sciences can be found at <http://agsci.psu.edu/students/resources/academic-integrity>.

A lack of knowledge or understanding of the University's Academic Integrity policy and the types of actions it prohibits and/or requires does not excuse one from complying with the policy. Penn State and the College of Agricultural Sciences take violations of academic integrity very seriously. Faculty, alumni, staff and fellow students expect each student to uphold the University's standards of academic integrity both in and outside of the classroom.

## **Disability Statement**

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable accommodation in the ABENG graduate program, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at <http://equity.psu.edu/ods/guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your

instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

### **Leave of absence**

A graduate student may request a leave of absence as described in Penn State policy GSAD-906 when they, or an immediate family member, experiences a significant life event that has the potential to disrupt progress towards the student's degree. Significant life events may include, but are not limited to, illness/injury and recovery of the graduate student, illness/injury and recovery of an immediate family member requiring care by the graduate student, birth or adoption of a child and bereavement for the death of an immediate family member. Active-duty service members or activated reserve-component members of the U.S. Armed Forces and/or spouses/domestic partners of active-duty members or activated reserve-component members who are ordered by their military service to relocate or deploy and, as a result, are unable to complete a schedule of courses for a given semester may also request a leave of absence. In the case of foreseeable events (e.g., impending birth of a child), the student should inform their adviser and department head as soon as the circumstances and dates of needed leave are known. Three months notice would be ideal. For unforeseeable events, notification should be made as soon as possible once the need arises. Please see full details included in policy GSAD-906.

### **Travel to Professional Meetings**

The College of Agricultural Sciences Graduate Student Travel Awards are available to any registered full-time Graduate Student advised by our faculty (College or Inter-College major). These awards should be used for presenting original research at national or international meetings. Please note that either an oral or poster presentation is required to be eligible for these funds. One travel award per degree is allowed. Awards are limited to \$500 for domestic travel and international travel. Each full-time graduate student will be encouraged to attend additional ASABE meetings with this level of support when he/she is senior author of a paper that he/she is presenting. Support for graduate students to attend other national professional meetings may be provided with the recommendation of the Advisor. Additional information is available through the College of Agricultural Sciences, [http://agsci.psu.edu/graduatestudents/funding-opportunities/copy\\_of\\_travel-awards](http://agsci.psu.edu/graduatestudents/funding-opportunities/copy_of_travel-awards).

### **Office and Key Assignments**

Office space is assigned to graduate students on a space-available, priority basis; assignments are made by the Graduate Administrative Assistant. Priority of office space is generally given in the order of: 1) graduate students with assistantship support; 2) full-time graduate students without assistantship support; 3) full-time graduate students on provisional admittance; and 4) part-time graduate students.

Door keys will be assigned to graduate students by the Administrative Assistant; assigned keys will unlock doors to graduate student offices, conference rooms and common spaces. If a graduate student needs access to other facilities, an appropriate key will be assigned.

Graduate students must return keys assigned to them upon completion of their graduate program. Keys are not to be loaned to anyone and it is unlawful to duplicate them. GRADUATE OFFICE DOORS ARE TO BE KEPT LOCKED WHENEVER NO ONE IS PRESENT IN THE ROOM

### **Recycling**

Each graduate student is expected to participate in recycling, per Policy AD34 <https://policy.psu.edu/policies/ad34> University Recycling Program. Recycling Guidelines are posted on departmental bulletin boards.

## Smoking

Smoking and the use of tobacco are prohibited in and on all University owned or leased properties, facilities, and vehicles. The policy includes all University locations. The following purposes are exempted:

1. Research
2. Cultural and religious uses

### DEFINITION:

Smoking includes the burning of any type of lit pipe, cigar, cigarette, or any other smoking equipment, whether filled with tobacco or any other type of material.

Tobacco is defined as all tobacco-derived or containing products, including and not limited to cigarettes (e.g., clove, bidis, kreteks, electronic cigarettes, cigars and cigarillos), hookah smoked products, pipes and oral tobacco (e.g., spit and spitless, smokeless, chew, snuff) and nasal tobacco. It also includes any product intended to mimic tobacco products, contain tobacco flavoring or deliver nicotine. Products approved by the U.S. Food and Drug Administration, when used for cessation, are not considered tobacco under this policy. <https://policy.psu.edu/policies/ad32>

## Regulatory Compliance

*Human Research Subjects.* University policy requires institutional review and approval of all activities that involve using human subjects in research. A human subject is defined as an individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information. Contact the Office for Research Protections, The 330 Building, Suite 205, University Park, PA, or phone 814-865-1775 or e-mail [orp@psu.edu](mailto:orp@psu.edu) or <https://www.research.psu.edu/orp>, for more details.

*Vertebrate Animals.* Approval by the University's Institutional Animal Care and Use Committee (IACUC) is required prior to the involvement of a vertebrate animal in any University activity. This policy applies to non-human vertebrate animals, live or dead, and parts thereof, excluding established cell lines, biological fluids, and conventional foods. Contact the Office for Research Protections, The 330 Building, Suite 205, University Park, PA, or phone 814-865-1775 or e-mail [orp@psu.edu](mailto:orp@psu.edu) or <https://www.research.psu.edu/orp>, for more details.

*Biohazardous Materials.* All University research and teaching activities involving biohazardous materials shall be reviewed and approved by the University Biosafety Committee prior to the use of any such reagent. Included are carcinogens, toxins, infectious agents, recombinant DNA, and human body fluids or tissue. Contact the Office for Research Protections, The 330 Building, Suite 205, University Park, PA, 814-865-1775, [orp@psu.edu](mailto:orp@psu.edu), or Office of Environmental Health and Safety, 6 Eisenhower Parking Deck, 814-865-6391, for more details.

*Hazardous Materials.* All hazardous materials must be properly handled, including proper waste disposal. Contact your Department representative (Randall Bock, [rgb@psu.edu](mailto:rgb@psu.edu)) before reaching out to the Office of Environmental Health and Safety, 6 Eisenhower Parking Deck, 814-865-6391, for more details.

## Purchasing

Materials, supplies, equipment and travel required for conducting research contributing to a departmental research program will be supported by the department with state and federal funds and special grants.



All purchases made for extension, research, and teaching activities, whether related to thesis research or not, must be approved in advance by the Advisor and should be made using a Penn State Purchasing Card whenever practical. The policy of the department with respect to purchases is as follows:

- A graduate student must obtain approval of the Advisor before ordering or picking up material.
- The signed receipt must be attached to a yellow reconciliation form and submitted as soon as possible but no later than three working days to the Administrative Financial Assistant.
- These receipts are kept on file by the Administrative Financial Assistant to be checked against the monthly bills.

### **Supplies and Support Services**

Requests for supplies and support services, especially including the assistance of Administrative Assistants and technicians, are to be channeled through the Advisor. Supplies and services are restricted to work in support of research activities with approval of the Advisor. However, expenses related to coursework and thesis preparation are considered personal expenses and must be paid by the student.

Graduate students are expected to write manuscripts for publication based on thesis or technical projects and to participate with faculty in the preparation of grant proposals. Related expenses are considered legitimate departmental expenses and, with Advisor approval, necessary supplies and support services will be made available.

### **Computers and Access Accounts**

The department has a computer lab in room 309, Agricultural Engineering Building that is available for graduate student use. All lab computers are directly connected to the university network backbone for full Internet capabilities.

All students will be assigned an access account by the university. Account IDs and passwords can be obtained by showing proper identification (student ID) at any public computer laboratory on campus, which can be found at <http://lat.tlt.psu.edu/>. The access account provides electronic mail support and other privileges. All computers in the department support electronic mail and Internet access programs.

Computers in rooms 309, Ag Engineering Building are available for coursework, research, and any university-related use. In addition, they can be used for professional development materials such as thesis, resumes, letters, etc. However, use of laser printers for personal use, including professional development items, will cost 10 cents per page, payable to the Administrative Coordinator.

No software may be placed on any departmental computer without permission of the computer systems manager and/or Advisor. Commercial software on these computers may not be copied at any time. Graduate students can be allocated storage space on a server by requesting it from the systems administrator with approval of your advisor. Personal files should be kept on a USB drive, since all personal files and unofficial software will be removed periodically.

Occasionally, instructors will reserve the computer lab for a particular class period. During these times, the class has priority on the lab computers. However, in many cases the instructor will allow use of open computers during that time. Please check with the instructor who reserved the lab if you desire to use a computer during that time.

Graduate students have access to the computer lab after regular work hours. It is the student's responsibility to lock the doors in the computer room when leaving during the hours of 5:00 p.m. to 8:00 a.m. and during weekends and holidays.

## **Fabrication Lab**

Students are expected to fabricate experimental equipment needed for their thesis research if the equipment is not otherwise available. Students must follow all guidelines and policies, found at <http://abe.psu.edu/research/facilities/fabrication-lab>. Please note the following:

- The Fabrication Lab is intended only for extension, research, and teaching activities.
- All graduate students must attend and satisfactorily complete workshops of instruction on the proper, safe use of facilities and tools. Upon completion of this course, the graduate student will be extended the privilege of Fabrication Lab access. See Fabrication Lab Supervisor for more details. Faculty and staff are expected to complete the workshops as well.
- Eye protection (safety spectacles or cover goggles) and disposable hearing protection are available free of charge to all graduate students upon their initial employment. This equipment is considered the property of the individual student. It is recommended that an individual wearing prescription glasses use the cover goggles on top of prescription glasses.
- Each graduate student shall use the personal protective equipment when working with any of the tools, equipment, and facilities in the Fabrication Lab. Safety instructions, more specialized safety equipment, and reminders are mounted on or near the tools, equipment, and facilities. If there is ever any doubt concerning the safe, proper use of any of the tools, equipment, or facilities, please check with the Fabrication Lab Supervisor.
- A graduate student may not permit people outside the department to use any departmental equipment, facilities, or supplies.
- In cases of extensive or complex fabrication, personnel may help with the work or the work may be contracted out. Use of personnel must be arranged by the Advisor in advance. Graduate students should not use general Lab supplies (steel, plastic, pipe, wood, etc.) without prior approval of the Fabrication Lab Supervisor and Advisor.

## **Use of University Vehicles**

University vehicles are for OFFICIAL USE ONLY. Operators of university vehicles must abide by all highway laws. Special courtesy to other drivers should be exercised at all times, since one is representing the department, University and Commonwealth when driving a university vehicle. Only University students and employees may be passengers in university vehicles unless others have been authorized to participate in official business. An operator should check with the Department Head or the Advisor to determine whether a non-employee has been authorized to ride.

Requirements to operate university vehicles include that the drivers have a driver's license that is valid in Pennsylvania and be an employee of the University. Only those graduate students who are receiving an assistantship, fellowship, or wages from Penn State are employees. Students operating University vehicles must check with the Fabrication Lab Supervisor concerning procedures for signing out vehicles, purchasing fuel, and maintaining vehicle records.

## Graduate Faculty

**Ramaswamy C. Anantheswaran** ([swamy@psu.edu](mailto:swamy@psu.edu))

Ph.D., Cornell University, Food Science, 1984

Professor of Food Science

Food engineering and modeling, Heat and mass transfer during food processing, High pressure processing

**Florence Becot** ([ffb5072@psu.edu](mailto:ffb5072@psu.edu))

Ph.D., Ohio State University, 2020

Nationwide Insurance Early Career Professor

Agricultural health and safety, Rural Sociology, Sociology of food and agriculture, Farm household's social and economic needs, Social and agricultural policies, Community and economic development

**Rachel Brennan** ([rab44@psu.edu](mailto:rab44@psu.edu))

Ph.D., University of Illinois at Urbana-Champaign, 2003

Associate Professor

Ecological wastewater treatment, bioremediation of soil and groundwater contaminants

**Jeffrey M. Catchmark** ([jmc102@psu.edu](mailto:jmc102@psu.edu))

Ph.D., Lehigh University, 1995

Professor

Cellulose synthesis and organization, nanofabrication and nanocharacterization, molecular and catalytic motors and sensors, plasmonics

**Stephen Chmely** ([sc411@psu.edu](mailto:sc411@psu.edu))

Ph.D., Vanderbilt University, 2010.

Assistant Professor

Biorefining; lignin valorization; new materials and products from biomass; chemical catalysis

**Daniel Ciolkosz** ([dec109@psu.edu](mailto:dec109@psu.edu))

Ph.D., Cornell University, 2000

Associate Research Professor

Bioenergy

**Christine Costello** ([cxc693@psu.edu](mailto:cxc693@psu.edu))

Ph.D., Carnegie Mellon University, 2010

Assistant Professor

Industrial ecology; ethical decision making; life cycle analysis

**Ali Demirci** ([axd29@psu.edu](mailto:axd29@psu.edu))

Ph.D., Iowa State University, 1992

Professor

Fermentation; bioprocessing; food safety engineering

**Eileen E. Fabian (Wheeler)** ([efw2@psu.edu](mailto:efw2@psu.edu))

Ph.D., Cornell University, 1995

Professor

Environmental biophysics, ventilation systems, air quality

**Shirin Ghatrehsamani (spg5994@psu.edu)**

Ph.D., University of Florida

Assistant Professor

Robotics and automation of agriculture

**Federico Harte (fmh14@psu.edu)**

Ph.D., Washington State University

Associate Professor

Food Engineering; Food Rheology

**Long He (luh378@psu.edu)**

Ph.D., Yanshan University, 2010

Assistant Professor

Mechanization & Automation for Specialty Crops, Precision Agriculture

**Paul H. Heinemann (hzh@psu.edu)**

Ph.D., University of Florida, 1985

Professor

Systems modeling; mushroom production, odor and air emissions; advanced sensors for food quality evaluation

**Sibel Irmak (sji5137@psu.edu)**

Ph.D., Cukurova University, 2003

Research Professor

Value-added products from biomass, catalysts, biodegradable biofilms

**Suat Irmak (sfi5069@psu.edu)**

Ph.D., University of Florida, 2003

Professor and Department Head

Soil & Water Resources Engineering, Climate Science and Evapotranspiration and Surface Energy Balance

**Armen Kemanian (kxa15@psu.edu)**

Ph.D., University of Washington, 2003

Associate Professor

Production systems and modeling; crop ecology and management

**Jude Liu (jxl79@psu.edu)**

Ph.D., University of Manitoba, 2005

Associate Professor

Machine development for biomass harvesting and processing, and bioenergy utilization.

**David Lyons (djl272@psu.edu)**

Ph.D., Pennsylvania State University, 2013

Assistant Research Professor

Automation and mechanization of biological systems and processes

**Michael L Mashtare Jr (mmashtare@psu.edu)**

Ph.D., Purdue University, 2013

Assistant Professor

Environmental soil chemistry, emerging contaminant fate and transport, SoTL

**Lauren McPhillips (lxm500@psu.edu)**

Ph.D., Cornell University, 2016

Assistant Professor

Water quality; stormwater management; green infrastructure; urban ecohydrology; biogeochemistry

**Judd Michael (jhm104@psu.edu)**

Ph.D., Pennsylvania State University, 1994

Professor

Sustainable enterprises, packaging, entrepreneurship, business management

**Heather E. Preisendanz (hpreisen@psu.edu)**

Ph.D., Purdue University, 2011

Associate Professor

Fate and transport of emerging contaminants; water quality; best management practices; green stormwater infrastructure

**Cibin Raj (craj@psu.edu)**

Ph.D., Purdue University, 2013

Associate Professor

Storm water management, watershed analysis, application of computational methods in watershed analysis, ecohydrological impacts of climate and land use change

**C. Alan Rotz (car18@psu.edu)**

Ph.D., Penn State University, 1977

Adjunct Professor (USDA-ARS Pasture Systems and Watershed Management Research Unit)

Farm production systems; farm environmental impact

**Howard M. Salis (hms17@psu.edu)**

Ph.D., University of Minnesota, 2007

Associate Professor

Synthetic Biology, Genetic compiler, Metabolic Engineering

**Robert D. Shannon (rds13@psu.edu)**

Ph.D., Indiana University, 1993

Associate Professor

Wetland and aquatic biogeochemistry; pollution of aquatic systems

**Juliana Vasco-Correa (jpv5237@psu.edu)**

Ph.D., Ohio State University, 2017

Assistant Professor

Bioproducts systems analysis; biologically based processing

**Tamie L. Veith (tlv11@psu.edu)**

Ph.D., Virginia Tech, 2002

Adjunct Associate Professor (USDA-ARS Pasture Systems and Watershed Management Research Unit)

Farm and watershed scale impacts, optimization, water quality, sustainable intensification

**Hojae Yi (huy1@psu.edu)**

Ph.D., Seoul National University, 2003

Assistant Research Professor

Mechanics of Food and Biological Materials; Mechanics of Particulate Materials and Systems

# Agricultural and Biological Engineering (ABE) Masters Program Assessment Form

## M.S. Thesis Proposal Review and Evaluation

Student name: \_\_\_\_\_

Date: \_\_\_\_\_

*Form to be completed by the student's Thesis committee, as appropriate, and given to the department's Graduate Studies Committee administrative support staff.*

Criterion 1: Demonstrated ability to apply knowledge of agricultural and biological engineering and knowledge of a specialized field to the design of an original research proposal.

Criterion 2: Demonstrated a well-defined ability to approach the solution of new problems by the methodical and logical application of sound scientific methods.

Criterion 3: Demonstrated ability to articulate and defend scientific reasoning to the advisory committee.

**Note: in the table below D-Deficient; A-Acceptable; S-Superior**

Faculty name <i>(print above, sign below)</i>	Criterion 1			Criterion 2			Criterion 3		
	D	A	S	D	A	S	D	A	S

**Please provide comments or recommendations for any Criterion that received a score of D below or on other side.**

# Agricultural and Biological Engineering (ABE) Masters Program Assessment Form

## M.S. Thesis Oral Examination

Student name: \_\_\_\_\_

Date: \_\_\_\_\_

*Form to be completed by the student's Thesis committee, as appropriate, and given to the department's Graduate Studies Committee administrative support staff.*

Criterion 1: Demonstrated ability to create new knowledge and solution methodology(ies).

Criterion 2: Demonstrated ability to understand the implications of new findings and their possible generalization. Criterion 3: Quality of thesis.

Criterion 4: Demonstrated ability to articulate and defend results to the advisory committee.

**Note: in the table below D-Deficient; A-Acceptable; S-Superior**

Faculty name <i>(print above, sign below)</i>	Criterion 1			Criterion 2			Criterion 3			Criterion 4		
	D	A	S	D	A	S	D	A	S	D	A	S

**Please provide comments or recommendations for any Criterion that received a score of D below or on other side.**



# Agricultural and Biological Engineering (ABE) Doctoral Program Assessment Form

## Qualifying Exam

Student name: \_\_\_\_\_

Date: \_\_\_\_\_

*Form to be completed by the student's Qualifying committee, as appropriate, and given to the department's Graduate Studies Committee administrative support staff.*

Criterion 1: Demonstrated ability to apply knowledge of agricultural and biological engineering and knowledge of a specialized field to the design of an original research proposal.

Criterion 2: Demonstrated a well-defined ability to approach the solution of new problems by the methodical and logical application of sound scientific methods.

Criterion 3: Demonstrated ability to articulate and defend scientific reasoning to the Qualifying committee.

**Note: in the table below D-Deficient; A-Acceptable; S-Superior**

Faculty name <i>(print above, sign below)</i>	Criterion 1			Criterion 2			Criterion 3		
	D	A	S	D	A	S	D	A	S

**Please provide comments or recommendations for any Criterion that received a score of D below or on other side.**

# Agricultural and Biological Engineering (ABE) Doctoral Program Assessment Form

## Comprehensive Exam

Student name: \_\_\_\_\_

Date: \_\_\_\_\_

*Form to be completed by the student's Qualifying committee, as appropriate, and given to the department's Graduate Studies Committee administrative support staff.*

Criterion 1: Demonstrated ability to apply in-depth knowledge of a specialized field to the design and execution of an original research question.

Criterion 2: Demonstrated well-defined ability to approach the solution of new problems by the methodical and logical application of sound scientific methods.

Criterion 3: Presentation of a set of experimental and/or theoretical results in support of one of more hypotheses and/or objectives

Criterion 4: Presentation of a well thought through research roadmap and timeline for completion of research.

Criterion 5: Demonstrated ability to articulate and defend approach and results to the doctoral committee.

**Note: in the table below D-Deficient; A-Acceptable; S-Superior**

Faculty name ( <i>print above, sign below</i> )	Criterion 1			Criterion 2			Criterion 3			Criterion 4			Criterion 5		
	D	A	S	D	A	S	D	A	S	D	A	S	D	A	S

Please provide comments or recommendations for any Criterion that received a score of D below or on other side.

# Agricultural and Biological Engineering (ABE) Doctoral Program Assessment Form

## Dissertation Defense

Student name: \_\_\_\_\_

Date: \_\_\_\_\_

*Form to be completed by the student's Qualifying committee, as appropriate, and given to the department's Graduate Studies Committee administrative support staff.*

Criterion 1: Creation of new knowledge and/or development of new solutions/solution methodology(ies).

Criterion 2: Demonstrated ability to understand and communicate the implications of the new knowledge and findings and their generalization.

Criterion 3: Demonstrated ability to understand and communicate potential new short and long-term research hypotheses and/or objectives.

Criterion 4: Quality of dissertation.

Criterion 5: Demonstrated ability to articulate and defend results to the doctoral committee.

**Note: in the table below D-Deficient; A-Acceptable; S-Superior**

Faculty name <i>(print above, sign below)</i>	Criterion 1			Criterion 2			Criterion 3			Criterion 4			Criterion 5		
	D	A	S	D	A	S	D	A	S	D	A	S	D	A	S

**Please provide comments or recommendations for any Criterion that received a score of D below or on other side.**



## Other Forms

*As a graduate student, you may need to utilize one of the following departmental forms during your degree program. These forms are available from the Graduate Records Officer for the department.*

- *Semi Annual Progress Report Form – Use every 6 months to record your degree progress*
- *Petition Form – Use to request special permission to modify any of the degree requirements listed in this handbook.*
- *Graduation Checklist – Use during your final semester to make sure you have done all of the things that are required by the department before you leave the university.*

**PLEASE NOTE THAT ALL THESE FORMS ARE ALSO AVAILABLE ON CANVAS UNDER**

**“RESOURCES FOR ABE GRADUATE PROGRAM”**