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**Graduate Student  
Policies & Procedures Manual**  
Updated November 2013



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# ABE Graduate Student Manual

The purpose of this manual is to acquaint you with the graduate policies that are followed by the Department of Agricultural and Biological Engineering at Purdue University.

All graduate programs at Purdue are under the jurisdiction of the Graduate School. In this way certain standards are maintained across the University. These standards include course credit, Plan of Study format, Advisory Committee structure, vacation policy, registration and residency requirement as well as admissions. Under these general guidelines, the Agricultural and Biological Engineering Department has a Graduate Committee that reviews programs and establishes Departmental guidelines and policies which are presented in this manual.

## 1. Degrees and Admission

### 1.1. Master's Degrees

Master of Science (MS) programs are directed by professors who work in close association with the graduate student. In practice, programs are composed of formal courses, guided individual study in a chosen field or discipline, study in such cognate subjects as may be required by the candidate's advisory committee, and original research that serves as the basis of a scholarly thesis. There are 21 credits of formal coursework required for the MS, and an additional nine (9) credits of research requirements with the student's work culminating in a written thesis. Admission to the Graduate Program at the MS level is restricted to those with an excellent undergraduate record that show potential for graduate success.

Three MS degrees are offered to students with strong undergraduate academic records. These include: MS ABE (generally for students with a BS ABE degree), MSE (generally for students with an engineering BS in another field), and MS (for students with non-engineering degrees).

A non-thesis option is also available. There are 30 credits of formal coursework required, but no research credits. The procedures described in the Graduate School Bulletin should be followed. Students who complete a non-thesis MS degree program will not normally be permitted to pursue a PhD program. Research assistantships are generally not available to students in the non-thesis program.

#### Master of Science in Agricultural and Biological Engineering

Students that have received a BS ABE degree from an ABET (Accreditation Board for Engineering and Technology) approved Agricultural and Biological Engineering program are normally admitted to this program. The student must have completed 16 hours of engineering design in their undergraduate and graduate program of study and at least three courses from ABE 320, 325, 330, 435, 450, 460, 475, 485, 526, 545, 554, 555, 556 or 580, or their equivalent.

International students are also eligible for this degree, if their undergraduate degree is in Agricultural and Biological Engineering or a closely related program. Given the diversity of engineering programs and educational systems throughout the world, the graduate committee may ask the student to document his/her eligibility for this degree option. In this case, the student may be requested to list their courses, and provide translations of catalogue descriptions (if the language is other than English), which correspond to the 32 hours of engineering sciences, math requirements, and at least 16 hours of design, as specified above.

### Master of Science in Engineering

Students that have an engineering BS degree from an ABET approved school are eligible for this degree. Students from non-accredited approved programs will be considered if their undergraduate program meets the basic guidelines of ABET or if they complete those courses, in addition to graduate level coursework during their graduate studies. The guidelines for an engineering degree are defined by ABET to include 32 hours of engineering sciences, math requirements, and at least 16 hours of design courses.

International students are also eligible for this degree, if their undergraduate degree is in engineering. The graduate committee may ask the student to help document his/her eligibility for this degree option. In this case, the student may be requested to list their courses, and provide translations of catalogue descriptions (if the language is other than English), which correspond to the 32 hours of engineering sciences, math requirements and at least 16 hours of design, as specified above.

### Master of Science

A program to the Master of Science degree is available to graduates with a non-engineering BS degree.

Students with a BS degree in Agricultural Systems Management or an equivalent area are normally admitted to this degree program and must have demonstrated acceptable performance at the undergraduate level in the biological sciences, chemistry, physics, mathematics, economics, management, and have a knowledge of computer use for communications and problem-solving. This program emphasizes the selection and management of agricultural systems and facilities.

Others with an interest in new and emerging technology areas are also admitted to this degree program. New and emerging areas in the Department of Agricultural and Biological Engineering are identified as Areas of Specialization, and currently include Biological Engineering and Technology, Computational Science and Engineering, and Ecological Sciences and Engineering. Students must have demonstrated acceptable performance at the undergraduate level in the biological sciences, chemistry, physics, food science, mathematics, and have a knowledge of computer use for communications and problem-solving.

International students are also eligible for this degree. Given the diversity of degree programs and educational systems throughout the world, the graduate committee may ask the student to provide documentation that demonstrates an equivalent academic background.

### BS/MS Dual Degree

ABE's Dual BS/MS Degree Program is restricted to undergraduate students in high academic standing. Application and admission to the Graduate School are required and the standard Graduate School application process is to be followed. This degree is also referred to as early admission. Students desiring admission into ABE's Dual BS/MS Degree Program can apply to the Department's Graduate Programs Committee as early as their junior year (Semester 5). The Committee will consider the following criteria for admission into the Dual Degree BS/MS Program:

- 1) the student's undergraduate GPA (60 or more credits; minimum GPA of 3.5)
- 2) the student's GRE scores
- 3) a formal statement of interest by the student
- 4) a nomination letter from a sponsoring faculty member (in addition to the required three letters of recommendation) confirming that the faculty member is willing to serve as the student's mentor upon entering the program as well as stating that the student is an outstanding undergraduate student with the potential to successfully complete a BS and MS degree, and who wishes to expedite their education beyond the undergraduate level
- 5) three letters of recommendation

The primary purpose of admitting outstanding undergraduate students into the M.S. degree program early is to provide them the opportunity for an early start on their thesis research. However, dual degree students are allowed to enroll in graduate courses and earn course and research credits towards their M.S. degree while completing their B.S. degree. Before the baccalaureate degree is awarded, any course and/or research credits taken to satisfy the graduate degree requirements must be designated as undergraduate excess credits.

Students must meet all requirements for the baccalaureate degree. The baccalaureate degree must be awarded before the graduate degree.

All students are assigned or will select a faculty mentor/thesis advisor upon entering the program. In order to help students plan, they are required to constitute their MS advisory committee during their first semester in the program. Working with their committee (which includes the major professor) students need to develop a Research Proposal for their M.S. thesis and complete a Plan of Study that documents the graduate courses to be taken. Both documents must be submitted and approved by the ABE Graduate Committee prior to the end of the first semester of registration. Without an approved Research Proposal and Plan of Study, dual degree students will not be allowed to register for graduate course and research credits beyond their first semester. It is expected that students complete a research-based M.S. thesis at the completion of their BS/MS program. Switching to a non-thesis M.S. would

only be possible in the case of unforeseen circumstances, and would require specific approval from the Head of the ABE Graduate Program.

Dual degree BS/MS students are eligible for assistantship and fellowship support after admission to the Graduate School. However, in most cases they are **no longer eligible for financial aid**.

*Provisional Admission Status for Students Without an Engineering Degree*

Applicants not meeting the requirements for full admission to the MS ABE or MS Engineering programs are sometimes granted provisional admission to make up academic deficiencies in order to meet the guidelines for an engineering degree as defined by ABET, which include 32 hours of engineering sciences and at least 16 hours of design courses (48 hours total). The general requirements for admission to provisional status are established by the Graduate School.

Applicants with BS degrees from non-engineering or non-accredited programs who possess undergraduate GPA's greater than 3.5 may be admitted to provisional status while completing credit for a minimum of 15 credit hours of remedial undergraduate engineering courses from five categories listed below (some areas of study may require more as agreed upon by the applicant and the Major Professor, and approved by ABE Graduate Program Committee). Credit for these remedial courses may be applied from equivalent courses from the applicant's BS degree, subject to approval by the Major Professor and the ABE Graduate Program Committee. The selection of courses from the five categories is left to the student subject to the approval of the student's Major Professor and Advisory Committee. The decision to admit provisionally rests with the ABE Graduate Program Committee. The equivalent of two semesters of engineering physics and four semesters of mathematics (through differential equations) are prerequisites for the engineering courses and must be considered part of the remedial coursework if the applicant's background does not include them. Two suggested remedial course plans of study are given below:

**Agricultural & Biological Engineering:**

1. Engineering Statics (ME 270 or equivalent)
2. Engineering Dynamics (ME 274 or equivalent)
3. Thermodynamics (ABE 210, ME 200, or equivalent)
4. Fluid Mechanics (ME 309, CE 340, or equivalent) – also called Hydraulics, Momentum Transfer
5. Mechanics of Materials (NUCL 273, or equivalent) – also called Strength of Materials

**Biological and Food Process Engineering:**

1. Thermodynamics (ABE 201/202, CHE 205/211, or equivalent)
2. Fluid Mechanics (CE 340, CHE 377, or equivalent) – also called Hydraulics, Momentum Transfer (CE 340 not recommended if CHE 378 will be taken)
3. Mechanics of Materials (ABE 303 or equivalent) – also called Properties of Materials
4. Heat and Mass Transfer (CHE 378 or equivalent)
5. Kinetics and Reaction Engineering (ABE 301/370 or equivalent)

Remedial courses at the 100, 200 and 300 level cannot be listed on the student's MS degree Plan of Study. Courses completed in addition to the above suggested courses to meet the 32 credit hours of engineering science and 16 credit hours of design (48 hours total) may be applied toward the requirements of completing the MS degree. A maximum of 6 hours of 400-level (at a grade "B" or higher) and any 500-level engineering science or design courses may be listed on the student's MS degree Plan of Study if approved by the student's Major Professor and ABE Graduate Program Committee.

Depending upon the applicant's background and work experience, completion of at least one 400 or 500-level engineering design course is required, and a senior capstone engineering design class (ABE 485 or ABE 556) is strongly encouraged.

Full status is generally granted when the minimum of 15 credit hours of remedial undergraduate engineering courses from the five categories listed above have been completed with a GPA of 3.0 or higher. Full status implies that the student continues to complete remedial courses to meet the ABET definition of a BS engineering degree, and courses required under the student's MS degree Plan of Study.

## **1.2 Doctor of Philosophy Degree**

Ph.D. programs are directed by professors who work in close association with the graduate student. In contrast to the various master's degrees, the Purdue doctoral degree is not designated by department or by area of specialization. The area of specialization is recorded on student transcripts. The Ph.D. is available to qualified students desiring either an engineering, technology, or systems management program in the Agricultural and Biological Engineering Department.

Admission to the Ph.D. program is contingent upon the satisfactory completion of an MS degree in an Engineering, Technology, Sciences, or Agricultural Systems Management program. If the MS is received from Purdue University, a recommendation of the examining committee is also required. A possible action, which might be recommended by the graduate committee, is that the student reapply for admission to the Ph.D. program.

Doctoral programs are composed of formal courses, successful completion of oral and written preliminary exams (see Section 5.1), guided individual study in a chosen field or discipline, study in such cognate subjects as may be required by the candidate's advisory committee, and original research that serves as the basis of a scholarly thesis. There are 42 hours of formal coursework required beyond the BS (normally 21 credits beyond the MS) and an additional 39 credits of research with the student's work culminating in a written dissertation.

Request for admission of a student who has received an MS degree in another department or university will be carried out through the established Graduate School and Department of Agricultural and Biological Engineering application procedures.

Admission into a Ph.D. program direct from a BS program is possible in exceptional cases. In such cases, the student's advisory committee will administer a bypass exam after the student has completed approximately one-half of the coursework.

### 1.3 Areas of Specialization

An Area of Specialization is used to allow a specialized area of graduate study to be reflected on a student's final transcript. The Department of Agricultural and Biological Engineering currently has the following Areas of Specialization:

- Agricultural and Biological Engineering
- Agricultural Systems Management
- Biological and Food Process Engineering
- Biological Engineering and Technology
- Ecological Sciences and Engineering
- Fluid Power

Core courses in each Area of Specialization are listed at the back of this manual.

## 2. Major Professor

When admitted to Purdue, graduate students are assigned a major professor. This initial assignment is based on expressed research interest, the research programs of the staff member and the availability of research funds. Faculty with courtesy or adjunct appointments are members of the graduate faculties of Purdue and may serve as a major professor and advisory committee member.

Students will submit an Annual Report of their Activities to their major professor each year. It will also be filed in the Graduate Student Office.

## 3. Course Work and Plan of Study

### 3.1 Course Requirements

#### Master's Degree

Minimum requirements for the program are 21 semester hours of graduate work beyond the BS level and an acceptable research thesis that contributes to the knowledge in the field of research specialization. The non-thesis MS requires 30 semester hours of graduate work beyond the BS, with at least half taken at Purdue University. Courses taken must include:

- six (6) semester hours graduate credit (500 or 600 level) of mathematics, statistics, numerical analysis, systems analysis, and/or computer sciences beyond undergraduate requirements. Approved courses are listed in Appendix B.
- at least six (6) semester hours of graduate credit (500 or 600 level) in ABE, ASM, or core courses listed for an Area of Specialization (See Appendix C)
- Two semesters of Graduate Seminar, ABE 69400 (typically taken in Fall of first grad year), and ABE 69600 (typically taken in Spring of second grad year). Class attendance and participation in Graduate Seminar is mandatory and required for

graduation—ABE 69400 and 69600 should be recorded on the paper copy of the Plan of Study that is submitted to the ABE Graduate Committee, but not on the electronic copy submitted to the Graduate School.

The Plan of Study should provide a well-balanced and integrated program in support of the area of specialization. Students on ½ time or ¼ time assistantship should complete 21 credit hours of coursework within the first twelve months of when the student enters the Department. In those cases where the student has a heavy, initial research involvement due to the nature of his/her research, 16 months may be required for coursework completion. This total can include up to 3 credits of ABE 590 or ABE 690 (Special Topics Contract), or an equivalent designation in another department. Semester-hour credits for courses transferred from institutions on a quarter-hour system are computed by multiplying the number of quarter-hour credits by 0.75.

### Doctor of Philosophy Degree

Minimum requirements for the program are 42 semester hours of graduate work, of which at least 21 semester hours must be beyond the MS level, and an acceptable research thesis that contributes to the knowledge in the field of research specialization. This total can include 3 credits of ABE 590 or 690, or an equivalent designation in another department. At least half of Ph.D. course credits must be taken at Purdue University, not including courses taken to complete a MS degree. Semester-hour credit for courses transferred from institutions on a quarter-hour system are computed by multiplying the number of quarter-hour credits by 0.75. The Plan of Study should be a well-balanced and integrated program including in-depth work in the area of specialization, breadth in Agricultural and Biological Engineering and a sound mathematical background including:

- At least six (6) semester hours of (500 or 600 level) beyond MS (12 total) requirements in mathematics, statistics, numerical analysis, systems analysis, and/or computer sciences (See a list of Computations classes in Appendix B.)
- At least six (6) semester hours of graduate courses (500 or 600 level) in ABE, ASM or core courses listed for an Area of Specialization at Purdue University beyond the MS (12 total) (See Appendix C for course list)
- Three semesters of Graduate Seminar, ABE 69400, ABE 69600, and ABE 69700. ABE 69400 is generally taken in the first fall semester of your graduate studies. ABE 69600 is generally taken in the second spring semester. ABE 69700 is generally taken after the second year of graduate studies is completed. The three Graduate Seminar courses are not listed on your electronic plan of study.

Up to 21 semester hours may be waived from the requirements from a completed MS degree. These semester hours should conform to the requirements for a MS outlined above. Individual courses applied toward a MS degree from Purdue University or other institution should not be listed in the PhD electronic plan of study. Instead, your major professor will enter and approve the total number of semester hours applied from a MS, up to 21 total.

Students admitted into the PhD program on ½ time or ¼ time assistantships should complete 21 credit hours of coursework within the first twelve months of entering the PhD program.

### **3.2 Plan of Study**

Each graduate student admitted to a degree program must file an Electronic Plan of Study

before the end of the first semester of graduate work. Your Electronic Plan of Study can be accessed through MyPurdue.

Credits earned for graduate study at other universities may be applied toward an advanced degree. Only credit hours associated with graduate courses for which grades of B or better were obtained will be eligible for transfer.

Courses that are transferred to Purdue University to meet graduate course credit requirements must follow the policies and procedures outlined by the Graduate School and are subject to approval by your major professor and the ABE graduate committee. Transferred courses will appear on your Purdue University transcript and your electronic Plan of Study. Waiver of course requirements (only for Ph.D. students with a MS earned from Purdue University or another institution) are subject to the rules described in section 3.1 and are subject to the approval of your major professor and the ABE graduate committee. Waived courses from another institution will not appear on your Purdue University transcript. Waived courses applied to a MS earned at Purdue University or another institution should not be individually listed in your electronic Plan of Study. Your major professor will enter and approve the total number of waived credit hours ( $\leq 21$ ) on your electronic Plan of Study.

Course credits earned by a student whose graduate study and/or professional activity have been inactive for five years or more cannot be used in a Plan of Study for an advanced degree. A Plan of Study approved prior to such a period of inactivity is invalid. A preliminary examination passed prior to such a period of inactivity is invalid.

### Filing the Plan of Study

An initial Plan of Study for the MS degree will be developed as part of each new graduate student's successful completion of ABE69100, the Graduate Seminar Course.

The Plan of Study Worksheet (Appendix A) should be used to outline your coursework and to assure that your course work will fulfill the requirements described in section 3.1. The Plan of Study Worksheet must be approved by your major professor.

Your approved Worksheet will aid you in completing the electronic submission of your Plan of Study. The Plan of Study is filed electronically and must be completed by the student after approval of the Worksheet by your major professor. The Plan of Study includes a primary area and a related area or areas that are chosen on the basis of the student's interests and needs. It includes the specific courses the student is expected to complete and other requirements of the particular degree being sought. No research credits (ABE 69800, 69900 or 69900A) or grad seminars (ABE 69400, 69600, or 69700), should appear on the electronic Plan of Study. No courses taken pass/fail or S/U may be included in the electronic plan of study. Your initial Plan of Study must be finalized and submitted for approvals before the end of your first semester in your graduate degree program.

The Electronic Plan of Study for a Ph.D. must be filed by the end of the student's first academic semester in the PhD program to meet Departmental requirements. For student who completed a MS degree at Purdue or at another institution, up to 21 credit hours may be waived subject to the approval of the major professor and the graduate committee. Although

courses completed toward earning a MS appear on the worksheet, these courses do not appear individually on your electronic plan of study; the total number of credits that were waived will be entered and approved by your major professor.

After your initial Electronic Plan of Study has completed the approval process, it may be amended at any time subject to the approval of your major professor and graduate committee.

### **3.3 Course Registration**

Registration for all students should reflect the student's activity as accurately as possible. In fulfilling degree requirements, a maximum of 18 credit hours will be allowed from any one semester (9 credit hours for the summer session.)

Any student, whether on appointment or not, must be registered for research during each semester or summer session when doing research utilizing faculty direction or consultation, and/or requiring the use of University facilities. Research includes literature reviews and thesis writing. Departmental policy requires that each graduate student supported by an assistantship (teaching or research) must be registered as a full-time student each semester. For Fall and Spring semesters full-time is 8 credit hours, and for Summer session it is 6 credit hours. A student's research registration should be roughly proportional to the amount of time devoted to research activities, with 18 semester hours representing maximum registration.

Each MS student must be registered in ABE 69800 (Research MS Thesis) and each PhD student must be registered in ABE 69900. The designator code of the major professor should be entered in the appropriate space marked "INST. PREF/SECT". ABE 69800 and ABE 69900 should not appear on the Plan of Study but count in meeting residency requirements. To register for research credits, students should fill out Form 23, have it signed by their advisor, and bring it to the Graduate Program Administrator for registration. Early registration is recommended. Late registration will result in additional fees.

#### Registration and Billings

After the student has completed the course request form, the Department's Business Administrator will complete the primary staff classification and certify that the student has a financial assistantship from the Department, and therefore is eligible for a waiver of tuition and some fees.

The course request can then be taken to the Graduate Program Administrator to be entered. Registrations can also be forwarded by campus mail, if the student pre-registers two months before the start of the next semester, to the Registrar's Office in Hovde Hall.

When registration is completed, fees and payment schedules will be posted on MyPurdue. It is the student's responsibility to provide the correct mailing address to the Office of the Registrar, Bursar's Office, and Agricultural and Biological Engineering Department, for billing purposes.

### **3.4 Grade Index**

The graduate student is expected to perform on a high academic level. Only grades of A, B,

or C are acceptable in fulfilling Graduate School requirements on any Plan of Study. No more than six credits of "C" grades will be accepted toward graduation. The major professor and the advisory committee may require performance better than "C" in certain courses. This requirement must, however, be stated in writing to the student and placed in the student's file at least one month before the student takes the course. Pass/no pass grades are not acceptable in fulfilling degree requirements.

All graduate degree candidates must have a 3.0/4.0 or better Grade Point Average to graduate. The GPA is computed from all courses on the Plan of Study. The student's progress will be reviewed each semester by both the Graduate School and the Department. Should the student fail to perform on a level satisfactory to the major professor and the advisory committee or to the Dean of the Graduate School, he or she may be asked to discontinue graduate study at Purdue. The same scholastic requirements in effect during the regular University year apply to graduate study during the summer session and in work taken at the University's regional campuses.

In situations where a graduate student does not satisfactorily complete a graduate level course with the grade of C or better, the student may re-enroll in the course only once. The low grade will not be considered in the graduation GPA. If a student receives a D or below in more than one course, the student could lose his/her Departmental graduate appointment. In the case of students with fellowships, the sponsor will be notified of the student's unsatisfactory academic performance. A student who falls below the guideline will be notified, in writing, by the Graduate Program Chair and will have one semester in which to raise his/her GPA above 3.0. If the GPA falls below 3.0, the student's grade report will be marked as "low" by the Graduate School. The student must raise their semester GPA above 3.0 the following semester or may be asked to leave the graduate program. A GPA below 3.0 may result in the loss of the student's assistantship or fellowship.

Graduate students that receive an incomplete in a course will have one semester and 12 weeks into the second semester to complete that course. If that is not done, the Registrar automatically makes the grade a failure.

### **3.5 Resident Study Requirements**

Resident study is defined as study done under approved supervision. The Graduate School has residence requirements that are intended to ensure that the candidate has ample opportunity for close association with other scholars in the intellectual environment of the University.

The Graduate School requires that one-half of the total credits for a Master's Degree and one-third of total credits for a Ph.D. degree be earned in residence. The ABE Department requires one-half of the total credits for each degree be earned at Purdue University.

If a student completes all the academic requirements but has insufficient residence credits, a letter of explanation from the major professor and the Department head, should be forwarded to the dean of the Graduate School, justifying the deficiency. If justification is sufficient, the dean of the Graduate School may waive part of the residency requirement as an exception.

## **4. Graduate Research**

## 4.1 Advisory Committee

Each student must select an advisory committee. The major professor will help identify faculty members that have expertise in the area of research or professional interest. The Advisory Committee will advise on courses selected for the Plan of Study, and as needed during the course of graduate studies. Since the Advisory Committee must approve Plans of Study, research project outlines, and theses, the *student is responsible for keeping them informed of his/her progress*. Failure to meet the filing deadlines may result in loss of a student's graduate assistantship, until the process has been satisfactorily completed.

The Advisory Committee consists of the major professor and at least two other members of the graduate faculty for master's degree and major professor and at least three other members of the graduate faculty, one from outside the Department of Agricultural & Biological Engineering, for a Ph.D. degree.

## 4.2 Research Project Proposal

Graduate students are expected to complete a research project proposal during the first year in which they are enrolled. A copy of the research proposal should be approved by the Advisory Committee, submitted to the Graduate Program Administrator, and placed in the student's file.

### Ph.D. Research Proposal

- The PhD Research Proposal must be distributed to the Advisory Committee before the beginning of the Written Preliminary Exam. As students should have annual meetings with their Advisory Committee, the Committee will normally have discussed the proposal before the Preliminary Exam, although it does not need to be approved.
- All Advisory Committee members will be asked to complete the "Rubric for Evaluation PhD Dissertation Research Proposal". This can be done before, during, or after the Preliminary Exam, at the discretion of the Committee.
- A copy of the proposal, together with the Rubric from each Committee Member, will be placed in the student's file.

## 4.3 Integrity in Research

Integrity in research is an essential part of Purdue University's intellectual and social structure, and adherence to its spirit and principles must be maintained. These principles include commitment to truth, objectivity, fairness, honesty, and free inquiry. Violations of integrity may result in dismissal from the University.

Serious violations of integrity in research are rare. However, those that do occur strike at the very heart of scholarship and the concept of the university. Advances in scientific knowledge depend on reliable data and honestly reported conclusions. In any academic institution, scholars, researchers, and artists have a special obligation to exemplify the best qualities and highest standards of personal and professional conduct.

The integrity of the research process must depend largely on self-regulation; it is the responsibility of all that engage in the search for knowledge. Advances are gleaned from rigorous application of scientific and scholarly methods in compliance with ethical codes rooted in intellectual honesty.

All ABE students are required to complete the online training course on Responsible Conduct of Research developed by the Collaborative Institutional Training Initiative (CITI) available at <http://www.gradschool.purdue.edu/RCR/>. This is a requirement of the Fall ABE 69700 seminar. Students should also be familiar with policies on responsible conduct of research at that web site.

## 5. Admission to Candidacy and Preliminary Exam

Admission to candidacy for the Master's degree is granted after approval of a Plan of Study by the student's advisory committee, Department Head, Dean of the School and the Graduate School Dean.

Admission to candidacy for the degree of Doctor of Philosophy takes place only after the student has passed the preliminary examination. After admission to candidacy, the candidate must devote at least two semesters to research before taking the final examination. Request for the final examination must be made at least two weeks prior to examination date.

### 5.1 Preliminary Examination for Ph.D.

Written and oral preliminary examinations are required. The examination procedures must consist of both written and oral examinations. Both the written and oral examinations are administered by the student's major professor and preliminary examining or thesis advisory committee. These examinations are to determine if the student has an adequate understanding of his/her research problem, has a reasonable plan of attack, and has the necessary academic background and capability to be able to successfully conduct the research.

The written examination may be taken at any time after the following conditions are met:

- The student has completed 15 credits of graduate coursework beyond the master's degree
- The student has filed an approved Plan of Study and has satisfied all or most of the formal coursework listed in the plan.
- The student must have distributed a Research Proposal to the Advisory Committee.

Two full semesters (including summer) must elapse between successful completion of the preliminary exam and the defense of the dissertation. (Example: prelim Fall 2013; final defense, Fall 2014 or later.)

The **written examination** should be comprehensive and should include subject matter other than the student's specific PhD research topic. Completed examinations must be promptly graded and returned to the student by members of the Examining Committee. The questions and the student's answers should be submitted to the student's file, together with the *Rubric for Research Proposal and Preliminary Exam*. The written component of the exam must be passed before proceeding to the oral component.

At least two weeks prior to the **oral examination**, a *Request for Appointment of Examining Committee* (G.S. Form 8), signed by the major professor and the chair of the graduate program, must be received by the Graduate School. At or after the oral exam, committee members will be asked to complete the *Rubric for Research Proposal and Preliminary Exam*, and the Advisor will submit copies to the Graduate Program Administrator.

If the report of the examining committee is unfavorable, the student may repeat the examination after the lapse of at least one semester if the examining committee so recommends. Should the preliminary examination be failed twice, the student may not be

given a third examination, except on the recommendation of the examining committee and with *special approval* of the Graduate Council.

Table 2: Timeline for Ph.D. Preliminary Exams

<b>Accomplishment</b>	<b>Timing</b>
Advisory Committee meets	Each year
Student submits Research Proposal to Advisory Committee. Committee may meet to discuss and approve it, or wait until the Oral Prelim.	As soon as possible after coursework is completed.
<b>Written Preliminary Exam.</b> All Committee members are encouraged to submit questions. At least one question is required.	At least 3 weeks before Oral Prelim scheduled
Submit GS Form 8 to Graduate School	Two weeks before Oral Prelim
<b>Oral Preliminary Exam.</b> If the student passes, he/she becomes a Ph.D. candidate.	After Written Prelim has been passed; At least one year before Final Examination

## 6. Thesis and Defense

### 6.1 Thesis or Dissertation

The final product of most graduate research programs is a thesis. This document represents the diligent and original work of the student. Care should be taken to be sure this document is of high quality. The thesis must be distributed to the Advisory Committee at least two weeks before the final exam is given.

The Graduate School requires a specific format for all graduate theses. Detailed information on formatting your thesis can be found at the Purdue Grad School Website: <http://www.gradschool.purdue.edu/thesis.cfm>. Each student is responsible for completing and submitting their thesis as outlined by the Grad School. In the ABE Department, authority for approving the thesis format has been delegated to chairs of final examining committee.

Both MS and PhD theses are required to be submitted electronically to the Purdue Graduate School for review. An electronic PDF file of all MS and PhD theses will be uploaded to the ProQuest website. A final copy of the thesis should be delivered to the major professor and committee members, or as the major professor dictates.

### 6.2 Final Exams

A final oral examination is taken after the completion of all course work and the thesis. This exam may cover any material in the candidate's program, but typically is a defense of the thesis. In the case of Ph.D. candidates, at least two semesters must elapse and be devoted to research between the preliminary and final dissertation examinations.

Final examination requests must be approved by the Department Head and received by the Graduate School at least two weeks before the examination date. A final public oral examination will be given to candidates before the completion of requirements of the graduating student. Once you have passed the final examination for your degree, your chair and examining committee members will sign the *Graduate School Examination Report* (GS Form 7 for master's candidates or Form 11 for doctoral candidates). The examination report will then be forwarded to your departmental Graduate Studies Office. Once any other required signatures are secured, the report is sent to the Graduate School.

Committee members should complete the “*Rubric for Thesis and Defense*” for MS exams and “*Rubric for Dissertation and Defense*” for PhD exams. The Advisor will submit copies to the Graduate Program Administrator, and provide a summary to the student.

## **7. Other policies**

### **7.1 Graduate Students' Right to Appeal**

Graduate students, like all students officially enrolled at Purdue University, are subject to all University regulations. At the same time, their rights as individuals and as students are duly protected. Graduate students who feel that their rights have been violated by a disciplinary decision may seek redress through the Campus Appeals Board, according to procedures specified in Part 5, Section III, C and D of the handbook entitled *University Regulations*, which is issued annually. Graduate students who wish to appeal decisions concerning matters of academic standards may seek redress according to procedures specified in Part 5, Section III, E, 2, e, of *University Regulations* and to the procedures detailed in Graduate Council Document 91-C which have been established in accordance with the authority thereby delegated to the Graduate Council.

### **7.2 Nondiscrimination Policy Statement**

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran. The University will

conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1, which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.

Any question of interpretation regarding this Nondiscrimination Policy Statement shall be referred to the Vice President for Human Relations for final determination

## **8. Professional Development**

### **8.1 Professional Societies**

Attendance at professional meetings and membership in professional societies is encouraged. In most cases travel and lodging are the student's personal responsibility except in cases where project funds are available for this purpose. There are usually car pools formed to attend the annual American Society of Agricultural and Biological Engineers meeting. Many professional and research associations have branches on campus such as Sigma Xi and Alpha Epsilon. Students are expected to be active in professional societies while pursuing advanced degrees at Purdue University.

### **8.2 ABE Graduate Student Association**

Students are encouraged to participate in the Agricultural and Biological Graduate Student Association. ABE GSA is an organization made up of graduate students dedicated to improving the experience of graduate students in the ABE department at Purdue University.

## **9. Graduate Student Employment**

### **9.1 Workloads of Students with Graduate Staff Appointments**

Most graduate students in the Agricultural and Biological Engineering Department are supported by half-time assistantships. Purdue, like many other major research universities, assumes that a half-time appointment constitutes a contract for 20 hours of service per week. If an assistant's duties are independent of the student's course work and research, the definition of the half-time work load is relatively straight forward: not more than 20 hours per week. All graduate assistants should realize that any research relating to their degree is not included in the 20 hours, and must be done in addition to the 20 hours the half-time appointment involves. Disputes between graduate assistants and major professors should be discussed between the parties involved, and moderated by the Department Head if necessary. See the [Purdue University Graduate School Policies and Procedures Manual](#) for additional information.

For those students on  $\frac{3}{4}$  or full time assistantships, the time guidelines delineated above will be modified to account for the reduced course load restrictions due to such appointments.

Maximum academic loads and residence credits for the 8 week summer session are one-half that of the regular semester.

To be eligible to hold a graduate staff appointment during any session, an individual must be enrolled as a degree objective graduate student and be registered for at least three credit hours of graduate-level course and/or research work during the entire appointment period. Graduate staff on appointment during the summer are obligated to register for a minimum of three graduate hours during at least one of the summer modules.

## 9.2 Vacation and Sick Leave Policy

As staff of the department, graduate research assistants receive 22 days of vacation per year. These vacation days do not automatically occur during university breaks, unless vacation is requested. To request vacation or other absence from the Department, fill out Form 33a (available online), have it signed by your supervisor, and turn it in to the business office one week before vacation. Those graduate assistants employed only during the academic year are not paid during university breaks and are not required to use Form 33 during this time..

The official policy reads as follows: Graduate student staff employed on a fiscal-year basis may be granted a maximum of twenty-two (22) working days of vacation per fiscal year. Vacation will be granted at the student's normal rate of pay. Vacation credits accrue on a monthly basis up to a maximum of twenty-two (22) working days. Vacation credits accrued in excess of 22 working days are forfeited. Vacation allowance is accrued from the date of employment, but may not be taken before the completion of three months of service.

Month	Days Accrued	Month	Days Accrued	Month	Days Accrued	Month	Days Accrued
July	2	October	2	January	2	April	2
August	2	November	2	February	2	May	2
September	1	December	2	March	1	June	2

Graduate student staff terminating their employment with the University may not be paid for any unused vacation allowance, nor may their appointment be extended to cover any unused vacation.

Official holidays are announced annually by Purdue's president and provide for ten additional leave days. The holiday schedule is posted on the bulletin board in the Agricultural and Biological Engineering Main Office.

Up to two weeks per year sick leave and 15 days per year military leave (with pay) may also be granted. The Department Head may approve requests for emergency leave because of death in the immediate family. All graduate students must complete a sick leave form upon returning to work for time missed due to illness.

### 9.3 Student Offices

Graduate students that are employed by the ABE Department are assigned office space if available when they begin studies. The ABE Schedule Deputy is in charge of assigning office space. Any requests for changes in the graduate student offices must be submitted to the Schedule Deputy.

### 9.4 Keys

Graduate students are also assigned keys so that they can enter the building after it is officially closed. The student I.D. can be used with the cardswipe keyless entry on the Northeast entrance of the ABE building. The outside doors are open to the public Monday-Friday 6 a.m. to 8 p.m. A key request form can be obtained from the ABE Building Deputy. The form should be signed by the major professor and the Assistant to the Head and then be returned to the Building Deputy to obtain keys. Keys must be returned and the proper space on the checkout sheet signed by the Department Head before your degree will be awarded and your last paycheck approved.

### 9.5 Travel

#### Travel Requests and Reimbursement

Requests for University-related travel outside Tippecanoe County must be submitted at least two weeks in advance. Trip request forms are obtained from and returned to the ABE Business Office. If your research project requires extensive travel beyond the local area, your major professor may request blanket authorization for in-state travel. Requests for reimbursement of travel expenses are made on forms available from the Business Office. Reimbursements may not be made for trips for which prior approval was not requested and granted. See the following web page for more detailed information:

[www.adpc.purdue.edu/~travel/](http://www.adpc.purdue.edu/~travel/)

#### Departmental Vehicles

Vehicles are available in ABE for transportation on project work. Students using these vehicles must possess a valid U.S. drivers' license and be on the University payroll. Please be aware that you will need to allow approx. 5 business days for processing of Driver Authorization Requests, which must be secured PRIOR your first use of a Departmental Vehicle. Form RM01 can be obtained in the Business Office.

Vehicle reservation and checkout are made in the Main Office. Vehicle problems and accidents are to be reported to the Building Deputy. Seat belt use is mandatory in all university vehicles.

#### University Car Pool

For trips which may take more than one-half day, cars and vans may be obtained from the University Transportation Department. Vehicle request forms are available in the ABE Business Office. When completed and approved by your major professor, return this form to the Business Office along with a travel request form describing the nature and purpose of the

intended trip. When approved, the request form will be returned to you and must be presented to the University Transportation Service when picking up the vehicle. Students using university vehicles must possess a valid driver's license and be on the University payroll.

## **9.6 Safety**

All graduate students are required to attend a Hazard Communication training session. This will include a short segment on the proper use of Personal Protective Equipment. The training will be conducted in the ABE Department by the Safety Committee Chairman.

# **10. Resources for Graduate Student Research**

## **10.1 Fabrication of Research Equipment**

Research equipment is often constructed for specific projects. The Department and University can provide students with help in the construction of this equipment. The departmental Shop Manager can provide assistance and advice for your specific research needs.

### Shop

The express purpose of the shop is to build or assist in building research apparatus along with assisting with senior design projects. It is not for personal use. The procedure for obtaining assistance in the shop is as follows: (1) in consultation with your major professor determine what type of equipment is needed for your research; (2) develop an engineering drawing clearly showing the apparatus desired, giving necessary dimensions, sizes, type of material, and notes for its fabrication; (3) provide an account number for acquisition of components and material; (4) discuss your project with the Shop Manager. In some cases it may be necessary for you to assist the Shop Manager or his assistants in the work.

There is a short safety training course required for students to work in the Shop. Students with Machine Shop experience are allowed to assist with projects. The Shop hours are 7:30-3:30 Monday-Friday.

### Tools

Tools may be borrowed from the ABE Shop. Return tools as promptly as possible. If you break a tool, inform the Shop Manager so he can replace or repair it. If you need a certain tool and do not find it, ask the Shop Manager for assistance. Tools can be borrowed from other University Shops.

### Central Machine Shop

The Central Machine Shop is equipped and staffed to perform work requiring precision machining, machining on large work pieces and specialized fabrications which cannot be performed economically in departmental machine shops. Material for student projects can be purchased from the Central Machine Shop by going through the ABE Machine Shop Manager. Work orders are available in the ABE Machine Shop Office and must be submitted by the Machine Shop Manager.

## **10.2 Printing and Photocopying**

Use of the photocopier for research must be approved by your major professor. Duplicating services are also available at several locations on campus. Each student is expected to pay the cost of reproducing the thesis for the library, Department and major professor.

## **10.3 Purchasing Supplies**

### University Stores

The University has several stores that handle commonly used materials. The stores catalogue in the ABE Business Office has a complete listing of materials available. To order materials, consult with your major professor about your needs and obtain the stores requisition forms from the Business Office.

### Requisitions

Most supplies and equipment should be ordered by regular requisition. After equipment and supply needs are approved by the major professor, the student should complete the information for requisition forms and submit them to the ABE Business Office for typing.

A number of standing orders are set up with local suppliers to expedite work on projects. A list of standing orders may be obtained from the Business Office. Materials may be obtained directly from these suppliers, with the approval of the major professor and the completion of a ship order form. The ship order is available from the Business Office.

Students can check out the departmental credit card for departmental purchases from the Business Office with the approval of their major professor.

## **10.4 Web Presence**

Each graduate student is encouraged to develop a professional web presence. Space is provided on a department drive to publish a personal web site. Guidance will be provided during the Graduate Seminar.

## ABE Graduate Student Timeline

### Prior to first registration

- Visit with your advisor and current graduate students for advice on courses to take in the first semester. Be sure to include ABE 694, the graduate seminar.
- Register for courses in Banner and fill out Form 23 for research credits and have it signed by your advisor. Students on an assistantship generally register for 9-12 credits of coursework and an additional 3-9 credits of research (for a total of 15-18) during their first semester. Take the form to the Graduate Office (ABE 201) to have research credits entered before the first day of class.

### During first semester

- Satisfy all admission conditions (such as sending your final transcripts to the Graduate School) that are in your letter recommending admission.
- Develop an initial Plan of Study. You can look at the examples available on the web to give you an idea of what is often done in your area. This will also be part of the ABE 694 orientation in the Fall semester. You will be able to change it in future semesters once you have more definite plans for thesis topic and committee members.
- Check out Purdue's writing program if you need help with your writing.
- Visit with your advisor and current graduate students for advice on courses to take in the second semester.
- Register for courses in Banner and fill out Form 23 for research credits for the second semester.

### During second semester

- Form your advisory committee and hold a meeting to discuss your courses and thesis research.
- Clarify your summer goals and plans before the term ends. Faculty may be less available over the summer.
- Fill out Form 23 to register for at least 8 credits of research for the third semester.

### Third semester

- Review your initial Plan of Study and make any changes to reflect your advisory committee's ideas. Once again click "Submit" so that the changes are made in the system.
- Fill out Form 23 to register for at least 8 credits of research for the next semester.

### Fourth semester (and additional semesters before Final semester)

- If you are a Ph.D. student, discuss your progress toward taking the Preliminary Exams with your major professor and advisory committee. You must be registered for at least two full semesters (summer counts as a semester) after successfully completing the Preliminary Exams before you can take your Final Exam. (i.e. if you pass the Prelim in the spring semester, you will not be eligible to graduate until the following spring semester.)
- MS students – Sign up for ABE 696 in Spring of your second year of graduate work.
- Ph.D. students – Sign up for ABE 697, in Spring of your second year of PhD studies, and ABE 696 your final spring semester.

- Fill out Form 23 to register for at least 8 credits of research for the next semester.

#### ***PhD students only – Semester of Preliminary Exam***

- Schedule the written preliminary exam, which usually consists of one or more questions from each committee member which are taken by the student over the course of one to two weeks. The ABE Department requires that each member of the committee participate in the written exam.
- In preparation for the Oral Preliminary Exam, review **your plan of study** with your advisor and committee to ensure all degree and residency requirements are, or will be, met.
- Schedule the Oral Preliminary Exam with your major professor and advisory committee, and the Graduate Office, at least two weeks prior to the proposed date of the exam. Ask the Graduate Coordinator to obtain a Form 8 for taking the Preliminary Exam. Provide time, date, and title.
- Distribute copies of your proposal to your advisory committee at least two weeks before the oral preliminary exam.
- You must complete two full semesters (summer counts as a semester) as a registered student between the semester you complete your oral preliminary exam and the semester you will defend. In other words, if your prelim is completed during the Fall semester you cannot graduate before the following Fall semester.

#### **Final Semester**

- Sign up for ABE 696, the Graduate Research Seminar, and plan to present your research to your peers.
- Notify the Graduate Coordinator that this is your final semester. Declare candidacy on the registration form when you register for your final semester.
- Finalize your plan of study with your advisor and committee to ensure all degree and residency requirements *are* met. Make any changes in enough time to meet the deadline.
- If you will complete your exam and thesis submittal near the beginning of the semester, you might be able to register as “Exam Only.” However, if your thesis is not submitted by the deadline you will need to register for one credit and pay the regular fees.
- Schedule a deposit date with the Graduate School Thesis office. Deposit meeting slots are limited. The schedule near the end of the semester fills quickly, so do this early in the semester to guarantee a spot. If you are unable to schedule a time during the semester, your graduation will be pushed back by a semester.
- Schedule your final oral exam with your major professor and advisory committee, and the Graduate Office, at least two weeks prior to the proposed date of the exam. Check [Graduate School Deadlines](#). The final exam must be completed before the semester deadline (approximately one week before the last day of classes). We strongly recommend you do not wait until this late date.
- Distribute copies of your thesis to your advisory committee at least two weeks before the oral exam. As a courtesy, try to provide copies three weeks before the oral exam to account for faculty schedules and commitments.
- Take the Final Exam.
- Deposit your thesis

#### **Post Graduation**

- Complete the exit survey as required by the Graduate School

**Appendix A: Plan of Study Worksheet (see section 3 of the ABE Grad Manual for details)**

**AGRICULTURAL & BIOLOGICAL ENGINEERING  
PLAN OF STUDY WORKSHEET**

Name: \_\_\_\_\_

Student I.D. \_\_\_\_\_

- Degree Title:
- Master of Science (ASM)
  - Master of Science in Engineering
  - Master of Science in Ag & Biological Engineering
  - Doctor of Philosophy
- Thesis Option
  - Non-Thesis Option (MS only)

- Area of Specialization:
- Ag & Biological Engineering
  - Ag Systems Management
  - Biological & Food Process Engineering
  - Biological Engineering & Technology
  - Ecological Sciences & Engineering
  - Fluid Power

Initial Advisory Committee

Name _____	Department _____
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\_\_\_\_\_  
(Major Professor)

\_\_\_\_\_  
(Member)

\_\_\_\_\_  
(Member)

\_\_\_\_\_  
(Member)

\_\_\_\_\_  
(Member)

Approval of Major Professor _____	Date _____
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Approval of ABE Graduate Committee _____	Date _____
------------------------------------------	------------

Note: Student must enter his/her POS into the Grad School database at [https://ias.itap.purdue.edu/rgs/wpu\\_intra.pu\\_dispauth](https://ias.itap.purdue.edu/rgs/wpu_intra.pu_dispauth) AND abide by all deadlines for candidacy as defined on the Grad School's website.

**CURRENT PROGRAM OF STUDY**

**Current Degree Program (courses listed below will be included in your electronic plan of study)**

- MS
- PhD with prior MS
- PhD (no MS)

**Primary: Computations**

(math, statistics, numerical analysis, systems analysis, computer sciences) (min. 6 cr, 12 for PhD without MS)

See Section 3 and Appendix B of the ABE Graduate Student Policies & Procedures Manual for section requirement details

COURSES				Campus Where Completed	Grade Re'cd	Date Completed or to be Completed
Official Title Abbreviation	Subject	Course No.	Credit Hours			

Total \_\_\_\_\_

**Primary: Area of Specialization Core Courses (minimum 6 cr for MS, 12 cr for PhD without MS)**

See Section 3 and Appendix B of the ABE Graduate Student Policies & Procedures Manual for section requirement details

COURSES				Campus Where Completed	Grade Re'cd	Date Completed or to be Completed
Official Title Abbreviation	Subject	Course No.	Credit Hours			

Total \_\_\_\_\_

**Secondary: Other Related Areas (in sequence)**

See Section 3 and Appendix B of the ABE Graduate Student Policies & Procedures Manual for section requirement details

COURSES				Campus Where Completed	Grade Re'cd	Date Completed or to be Completed
Official Title Abbreviation	Subject	Course No.	Credit Hours			

Total \_\_\_\_\_

**TOTAL CREDIT HOURS \_\_\_\_\_**

Minimum Credits: 21 (MS or PhD with prior MS) or 42 (PhD without MS)

- ABE 69400 MS/PhD Seminar (Fall) Year: \_\_\_\_\_
- ABE 69600 MS/PhD Seminar (Spring) Year: \_\_\_\_\_
- ABE 69700 PhD Professional Development (Spring) Year: \_\_\_\_\_

**PRIOR GRADUATE DEGREE**

(Complete only if you have earned a prior graduate degree from Purdue or another university.)

**Prior Graduate Degree:**

- MS
- ME
- Other \_\_\_\_\_

**Department or School:** \_\_\_\_\_

(ASM, ABE, ME, ChE, Biochemistry, etc.)

**Granting University:** \_\_\_\_\_

**Date Awarded:** \_\_\_\_\_

(Purdue, etc.)

**Computations** (math, statistics, numerical analysis, systems analysis, computer sciences)

COURSES				Campus Where Completed	Grade Re'cd	Date Completed
Official Title Abbreviation	Subject	Course No.	Credit Hours			

Total \_\_\_\_\_

**Area of Specialization Core Courses** (minimum 6 cr)

COURSES				Campus Where Completed	Grade Re'cd	Date Completed
Official Title Abbreviation	Subject	Course No.	Credit Hours			

Total \_\_\_\_\_

**Other Related Areas** (in sequence)

COURSES				Campus Where Completed	Grade Re'cd	Date Completed
Official Title Abbreviation	Subject	Course No.	Credit Hours			

Total \_\_\_\_\_

TOTAL CREDIT HOURS \_\_\_\_\_

CREDIT HOURS TO WAIVE ( $\leq 21$ ) \_\_\_\_\_

**Appendix B: Approved Computations Courses**

***Math, Statistics, Numerical Analysis, Systems Analysis, and/or Computer Sciences***

**Agricultural & Biological Engineering**

ABE 59100 Non-Linear Dynamics in Biological Systems  
 ABE 60100 Applied Finite Element Analysis  
 ABE 69100 Environmental Data Handling

**Ag Economics**

AGEC 55200 Introduction to Mathematical Programming

**Agriculture**

AGR 62000 Experimental Design and Analysis

**Chemical Engineering**

CHE 63000 Applied Mathematics for Chemical Engineers

**Civil Engineering**

CE 559 Water Quality Modeling

**Computer Sciences**

CS 50100 Introduction to Computational Science

**Earth and Atmospheric Sciences**

EAS 509 Data Analysis Techniques in Earth and Atmospheric Sciences

**Educational Studies**

EDPS 63000 Research Procedures in Education  
 EDPS 63200 Data Analysis and Procedures  
 EDPS 63700 Data Analytic SAS Procedures for Applied Research

**Electrical and Computer Engineering**

ECE 60200 Lumped System Theory

**Forestry and Natural Resources**

FNR 64700 Quantitative Methods for Ecologists

**Industrial Engineering**

IE 580000 Systems Simulation

**Math**

*All Math courses are acceptable. The following have been taken successfully by ABE students:*

MA 51100 Linear Algebra with Applications  
 MA 51400 Numerical Analysis  
 MA 52700 Advanced Mathematics for Engineers and Physicists  
 MA 59800 Porous Media: Theory, Numerical Analysis and Applications

**Mechanical Engineering**

ME 61400 Computational Fluid Dynamics  
 ME 58100 Numerical Methods in Mechanical Engineering

**Statistics**

*All Statistics courses are acceptable. The following have been taken successfully by ABE students:*

STAT 50300 Statistical Methods for Biology  
 STAT 51100 Statistical Methods  
 STAT 51200 Applied Regression Analysis  
 STAT 51300 Statistical Quality Control  
 STAT 51400 Design of Experiments  
 STAT 52200 Sampling and Survey Techniques

## Appendix C: Core Courses for Areas of Specialization

**Biological Engineering and Technology**

## Core Courses

<b>Course</b>	<b>Description</b>
ABE 56000	Biosensors: Application and Fundamentals
ABE 58000	Process Engineering of Renewal Resources
ABE 59100	Biophysical Methods
ABE 59100	Biological Foundations of Bio-MEMS and Bio-Nanotechnology
ABE 59100	Computational methods in Single molecule systems
ABE 59100	Engineering Approaches to Systems Biology
ABE 59100/PHY59100	Introduction to Biophysics
ABE 59100	Nonlinear Dynamics in Biological Systems
ABE 59100	Methods in single molecule spectroscopy/microscopy
ABE 68000	Bioseparations and Bioprocess Engineering
ABE 69100	Transport phenomena in Food and Bioprocess Engineering
ABE 62700	Colloidal Phenomena in Bioprocessing
AGRY 59800/60000	Genomics
BCHM 55900	Structure function of proteins
BCHM 56000	Structure function of nucleic acids
BCHM 56100	General Biochemistry I
BCHM 56200	General Biochemistry II
BCHM 57200	Advanced Biochemical Techniques
BCHM 63000	Analytical Biochemistry
BIOL 51600	Molecular Biology of Cancer
BIOL 57300	Molecular Biology of Animal Cell
BIOL 59500	Methods and Measurements in Physical Biochemistry
BIOL 60000	Bioenergetics
BME 59500	Problems in Measurement of Physiological Events
BME 59500	Biomedical Optics
BME 69500	Scanning Probe Microscopy: Imaging and Analysis
BME 69500	Bioinstrumentation
BME 65800/BMS63500	Cell and Tissue Culture: Techniques and Application Module
BMS 52400	Introduction to Confocal Microscopy and Image Analysis
BMS 63400	Confocal Microscopy: Techniques and applications module
CHM 62000	Spectrochemical Instrumentation
CHM 68200	Statistical Thermodynamics

\*One Credit "Hands on" courses relating to Analytical or Biomolecular Techniques (HPLC; GC-MS; Genetics, Bioinformatics etc) will be counted upon petition to, and approval of, the course contents by the Graduate Committee with the consent of the advisor.

**Fluid Power**  
Core Courses

ABE 43500	Hydraulic Control Systems for Mobile Equipment
ABE 59100 / ME 59700	Design of Fluid Power System
ABE 69100	Hydraulic Power Trains and Hybrid Systems
ABE 53100	Instrumentation and Data Acquisition
ME 57500	Theory and Design of Control Systems
ME 55600	Lubrication, Friction, & Wear

The courses in **Group A** cover fluid power theories and applications. Courses in **Group B** are important to the design, modeling, optimization, and control of fluid power systems.

**At least half of a student's Fluid Power Core ("Area of Specialization Core Courses" on the Plan of Study) must be drawn from Group A.**

## Ecological Sciences and Engineering

### Core Courses

All ESE students must take:

- A minimum of 2 credits of the ESE Seminar.
- Recommended for all students but required of all Non-thesis MS only: 2-credit integrating Maymester course or Summer Internship experience

All students must take during their degree program or have taken in their previous degree program the following courses:

- Biology 585 (Ecology) 3 credits OR alternately with pre-approval of ESE Program Head, BIOL 652 (Review of Primary Fundamental Ecology Literature) 1 credit –
- One course (3 credits) in the area of Environmental Policy, Economics, Human Dimensions, and/or Institutional Analysis
- ENTM 612 (Responsible Conduct in Research) 1 credit or comparable course
- One course each from two of the four of the following ESE cores:
  - Life Cycle Thinking/Sustainable Design Core
  - Biogeochemistry
  - Hydrological Sciences
  - Ecosystem Analysis Tools

An updated listing of courses for each core area is available in an Excel file on the [ESE web site](#).

At least one professional development activity is also required.

## **Appendix D: Forms and Rubrics for Graduate Outcome Assessment**

- PhD Mapping Guide
- Graduate Student Annual Progress Report
- PhD Dissertation and Dissertation Defense Rubric  
MS Thesis and Defense Rubric

## Mapping Guide for the Ph.D. Degree - Agricultural & Biological Engineering

*Only the top 5 activities are listed for each outcome. Other activities may also support the outcomes; however, data will be collected for those listed in each column.*

<i>Learning Outcomes: Graduate students in the ABE PhD program will be able to demonstrate the ability to:</i>	<b>Outcome 1: Knowledge and Scholarship:</b>	<b>Outcome 2: Communication:</b>	<b>Outcome 3: Critical Thinking and Problem Solving:</b>	<b>Outcome 4: Ethical Conduct:</b>	<b>Outcome 5: Professional Development :</b>
<b>Activities and Evidence:</b>	Identify and conduct original research, scholarship or creative endeavors	Effectively communicate their field of study	Think critically, creatively and solve problems in their field of study	Conduct research in an ethical and responsible manner	Demonstrate attributes of professional development consistent with expectations within their field of study
<b>1. ABE 69700 Fall MS/PhD Seminar</b> (one time for all incoming graduate students) (Form ABE-PhD-1)				Attend workshops or take online training on responsible conduct of research	Gain appreciation for membership in professional societies; Attend scientific seminars across campus
<b>2. ABE 69700 Spring PhD Seminar</b> (for advanced 2 <sup>nd</sup> or 3 <sup>rd</sup> year PhD students)  (Form ABE-PhD-1)			Critically analyze ideas and data presented and discussed by others and participate in the peer review process	Participate in discussions on responsible conduct of research	Understand the importance of membership in professional societies; Organize a departmental seminar with an invited speaker; Participate in a graduate research competition; Attend at least one professional development workshop offered by Purdue's Graduate School
<b>3. Plan of Study Coursework</b>  (Form ABE-PhD-1)	Gain knowledge needed for conducting original research				
<b>4. ABE 69900: PhD Research credits</b>  (Form ABE-PhD-1)	Earn a Satisfactory in at least 42 credits of ABE 69800			Earn a Satisfactory in at least 42 credits of ABE 69800	
<b>5. PhD Research Proposal</b>	Define and justify a set of original research objectives in	Write and defend an original proposal	Define and defend a set of research methods and analyses	Define methods to achieve the research objectives in an	

(Form ABE-PhD-3)	a formal research proposal		that will achieve the research objectives	ethical and responsible manner.	
<b>6. Written and Oral Preliminary Exam</b> (Form ABE-PhD -4)	Demonstrate sufficient knowledge of subject matter to become a PhD Candidate	Demonstrate ability to communicate knowledge and research through a written and oral preliminary exam	Demonstrate the ability to think clearly and solve problems through a written and oral preliminary exam		
<b>7. Publish Research in Appropriate Outlets</b> (Form ABE-PhD -6)		Submit manuscripts for publication in the peer-reviewed literature			Publish research, extension, or teaching results in peer-reviewed and/or other outlets
<b>8. Presentation of Research at Appropriate Venues</b> (Form ABE-PhD -6)		Present an oral presentation or poster to a professional audience			Present an oral presentation or poster to a professional audience
<b>9. Ph.D. Dissertation</b> (Form ABE-PhD -7)	Prepare a dissertation that meets expectations for original, independent research		Prepare a dissertation that demonstrates critical thinking and creativity	Prepare a dissertation based on ethical and responsible research.	
<b>10. Dissertation Defense</b> (Form ABE-PhD -7)		Present the research in a public seminar and defend the dissertation	Defend the dissertation research before the student's Advisory Committee		Present the dissertation research in a public seminar and defend the dissertation research before the student's Advisory Committee

## Annual Progress Review of Graduate Staff – Student Data

<b>Student Name:</b>	
<b>Date of Report</b> (Due May 15 each year, covering May 16 of previous year through May 15):	
<b>Expected Date of Graduation:</b>	
Degree Program:    PhD    MSABE        MSE        __MS    (Check if non-thesis Masters_ )	

*Note: This report serves as a record of your accomplishments and activities as a graduate student in the Agricultural and Biological Engineering Department. It will be used by your major professor and the ABE Graduate Program, which is required to track outcomes of the overall program (aggregating the results from all students). Please include only publication or activities from May 16 last year to May 15 this year. Submit copies to both your advisor and to Gail Biberstine, Graduate Program Administrator, by May 15.*

**PUBLICATIONS** (List all published or in-press articles in research, teaching, outreach, or popular outlets)

1.

**PRESENTATIONS** (List all oral and poster presentations to research, teaching, outreach, or popular audiences)

1.

**TEACHING** (List and indicate role in any courses in which you taught, served as a TA, or provided a guest lecture)

1.

**PROPOSALS WRITTEN** (List any proposals for research, teaching, outreach, or service activities in which you had a lead role)

1.

**AWARDS** (List any awards you received for research, teaching, outreach, or service activities)

1.

**WORKSHOPS** (List any professional workshops you organized, or served as a presenter, or attended)

1.

**SERVICE** (List participation in professional societies, on committees, or as a reviewer for a journal or granting agency)

1.

**OTHER** (List any service as an officer for professional or campus groups, establishment of patents, etc.)

1.

## PhD Dissertation and Defense Rubric

Student Name: \_\_\_\_\_

Major Professor(s): \_\_\_\_\_

Committee Member Name (please print): \_\_\_\_\_

Signed: \_\_\_\_\_

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

<b>Dissertation Document</b>	Does not meet expectations	Meets Expectations	Exceeds Expectations
<b>Quality of Science</b>			
Clearly define the research problem and the motivation for research			
Clearly define the objectives of the research			
Demonstrate understanding of subject matter and associated literature			
Use and describe appropriate research methods/tools			
Demonstrate critical thinking skills			
<b>Contribution to the Discipline</b>			
Demonstrate the potential values of solution to the research problem in advancing knowledge within and outside the area of study			
Publication potential			
<b>Quality of Writing</b>			
Demonstrate adequate writing			
Use logical organization			
<b>Overall Assessment</b>			

<b>Dissertation Defense</b>	Does <u>not</u> meet	Meets	Exceeds
<b>Quality of Presentation</b>			
Clearly organize and present the material			
Demonstrate communication skills			
<b>Breadth of Knowledge</b>			
Demonstrate depth of knowledge in subject matter			
Demonstrate critical thinking skills			
<b>Quality of Responses to Questions</b>			
Completeness and organization of responses			
Demonstrate knowledge in subject area			
<b>Overall Assessment</b>			

**Committee Members:** Use the back of this form to provide a brief explanation regarding any deficiencies. Please return completed rubric to the major professor.

## MSABE or MSE Thesis and Defense

Student Name: \_\_\_\_\_

Major Professor(s): \_\_\_\_\_

Committee Member Name (please print): \_\_\_\_\_

Signed: \_\_\_\_\_

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

<b>Thesis Document</b>	Does <u>not</u> meet expectations	Meets Expectations	Exceeds Expectations
<b>Quality of Science/Engineering</b>			
Clearly define the research problem and the motivation for research			
Demonstrate understanding of subject matter and associated literature			
Develop and describe appropriate research methods/tools			
Analyze and interpret results/data effectively			
Demonstrate theoretical or applied significance			
Demonstrate critical thinking skills			
<b>Quality of Writing</b>			
Demonstrate adequate writing			
Use logical organization			
<b>Overall Assessment</b>			

<b>Thesis Defense</b>	Does <u>not</u> meet	Meets	Exceeds
<b>Overall Quality of Presentation</b>			
Clearly organize and present the material			
Demonstrate communication skills			
<b>Overall Breadth of Knowledge</b>			
Demonstrate depth of knowledge in subject matter			
Demonstrate critical thinking skills			
Quality of Responses to Questions (complete, well presented)			
<b>Overall Assessment</b>			

**Committee Members:** Use the back of this form to provide a brief explanation regarding any deficiencies. Please return completed rubric to the major professor.