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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 courses, 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 (CE 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 (ABE_Grad_2) 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)
• One semester of Graduate Seminar, ABE 69700. Class attendance and participation in Graduate Seminar is mandatory and required for graduation. ABE 69700 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 21 semester hours of graduate work 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. 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 twelve (12) semester hours of graduate courses (500 or 600 level) beyond undergraduate requirements in mathematics, statistics, numerical analysis, systems analysis, and/or computer sciences, with at least six (6) hours at Purdue University. (See a list of Computations classes in Appendix B.)
• At least twelve (12) 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 (See Appendix C)
• Two semesters of Graduate Seminar, ABE 69700. The second semester is normally taken in the 2nd year, after the student has enough data to write a paper. Class attendance and participation in Graduate Seminar is mandatory and required for graduation. ABE 69700 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.

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. In some cases, such as season-dependent research, a sixteen-month period may be required to complete this coursework.
3.2 Plan of Study
Each graduate student admitted to a degree program must file a Plan of Study (Appendix A). 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 courses that have S/U grades, such as research credits (69800, 69900 or 69900A), should appear on the Plan of Study. The quantitative aspects of research registration are controlled by departmental requirements and/or by residence requirements, registration limits, and thesis requirements, which are covered elsewhere in this manual.

A tentative Plan of Study should be drawn up in advance of registration for the first session of graduate work, and the formal Plan of Study should be submitted as soon as possible to the ABE Graduate Committee. All Plans of Study are to be submitted electronically to the Graduate School after approval by the ABE Graduate Committee.

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. Any additional conditions under which credit transfers may be made shall be determined by the various departments.

Course credits earned by a student whose graduate study and/or professional activity has 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
A Plan of Study for the MS degree must be approved by the student’s Advisory Committee, then submitted to the ABE Graduate Committee for approval, before filing the electronic version. It must be received by the Graduate Program Administrator three (3) weeks before it is due to the Graduate School. It must be filed with the Graduate School prior to the first day of the academic session of graduation. Students not meeting this deadline may be asked to register for "Degree Only" for the following session to receive the degree.

The Plan of Study for a Ph.D. must be filed by the end of the student’s first year in the PhD program to meet Departmental requirements. It must be filed with the Graduate School prior to the submission of a request for the appointment of a preliminary examination 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. 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 most 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 Department Head 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, program head, school dean and by 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 2011: Defense Fall 2012 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

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

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](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.

All PhD theses are required to be submitted electronically to the Grad School. A final copy of the thesis should be delivered to the Graduate School Thesis Library, ABE Graduate Student Services Office, major professor and committee members. An electronic PDF file copy of all MS or PhD theses should be submitted to the ABE Graduate Student Services office.

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 usually 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 Graduate Student Association.

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 ¾ 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.

<table>
<thead>
<tr>
<th>Month</th>
<th>Days Accrued</th>
<th>Month</th>
<th>Days Accrued</th>
<th>Month</th>
<th>Days Accrued</th>
<th>Month</th>
<th>Days Accrued</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>2</td>
<td>October</td>
<td>2</td>
<td>January</td>
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<td>August</td>
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<td>November</td>
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<td>February</td>
<td>2</td>
<td>May</td>
<td>2</td>
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<tr>
<td>September</td>
<td>1</td>
<td>December</td>
<td>2</td>
<td>March</td>
<td>1</td>
<td>June</td>
<td>2</td>
</tr>
</tbody>
</table>

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. Other graduate students will be assigned an office space that includes a desk and bookcase. There are a few offices located in laboratories. The ABE Building Deputy is in charge of assigning office space. Any requests for changes in the graduate student offices must be submitted to the Building 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/

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. Vehicle reservation and checkout are made in the Machine Shop. Vehicle problems and accidents are to be reported to the Machine Shop Manager. 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. Printing Services can provide duplicating and printing of all types of reports, brochures, and theses. Appropriate forms must be filled out in the ABE Business Office prior to using these facilities. There are several other commercial printers that reproduce theses for graduate students. Each student is expected to pay the cost of reproducing the thesis for the library, Department and major professor.

10.3 Purchasing Supplies

Students can purchase supplies for their research projects on campus. If not available from campus stores, supplies can be purchased from stores in the community. All purchases must be approved in advance by the major professor and the ABE Business Office.

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 Telephone
The major professor may grant long distance phone privileges. Only business related calls will be allowed. If such calls are necessary, the major professor will provide a special seven-digit "MERS" number that allows access to long-distance direct dialing.

10.5 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.
# Appendix A: Plan of Study Form

(See pp. 6-7 [Section 3.1, 3.2] and Appendices B,C, this document)

## AGRICULTURAL & BIOLOGICAL ENGINEERING

### PLAN OF STUDY

<table>
<thead>
<tr>
<th>Name:</th>
<th>Student I.D.:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### Degree Title:

- [ ] Master of Science
- [ ] Master of Science in Engineering
- [ ] Master of Science in Ag & Biological Engineering
- [ ] Doctor of Philosophy

### Area of Specialization:

- [ ] Ag & Biological Engineering
- [ ] Ag Systems Management
- [ ] Biological & Food Process Engineering
- [ ] Biological Engineering & Technology
- [ ] Ecological Sciences & Engineering
- [ ] Fluid Power

### Date Degree Initiated:

<table>
<thead>
<tr>
<th>Date Degree Expected:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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### Thesis Title:

<table>
<thead>
<tr>
<th>Thesis Title:</th>
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</thead>
<tbody>
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</tbody>
</table>

### Advisory Committee

<table>
<thead>
<tr>
<th>Members</th>
<th>Signature</th>
<th>Grad Faculty ID</th>
<th>Department</th>
<th>Area of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Major Professor)</td>
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</tr>
<tr>
<td>(Member)</td>
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<table>
<thead>
<tr>
<th>Approved: Chairman, ABE Graduate Committee</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
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</tr>
</tbody>
</table>
PROGRAM OF STUDY
(Include all courses beyond BS degree. List MS courses before PhD courses.)

Computations (math, statistics, numerical analysis, systems analysis, computer sciences) (min. 6 cr for MS, 12 cr for PhD)

See pp. 6-7 and Appendix B of the ABE Graduate Student Policies & Procedures Manual for section requirement details.

<table>
<thead>
<tr>
<th>COURSES</th>
<th>Other or Transfer From</th>
<th>Grade R'cd</th>
<th>Date Completed or to be Completed</th>
<th>MS* or PhD</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

MS total = _______  PhD total = _______  Total _______

Area of Specialization Core Courses (minimum 6 cr for MS, 12 cr for PhD)

See pp. 6-7 and Appendix C of the ABE Graduate Student Policies & Procedures Manual for section requirement details.

<table>
<thead>
<tr>
<th>COURSES</th>
<th>Other or Transfer From</th>
<th>Grade R'cd</th>
<th>Date Completed or to be Completed</th>
<th>MS* or PhD</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

MS total = _______  PhD total = _______  Total _______

Other Related Areas (in sequence)

<table>
<thead>
<tr>
<th>COURSES</th>
<th>Other or Transfer From</th>
<th>Grade R'cd</th>
<th>Date Completed or to be Completed</th>
<th>MS* or PhD</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

MS total = _______  PhD total = _______  Total _______

☐ ABE 69700 MS Seminar (Fall) Year:_______
☐ ABE 69700 PhD Seminar (Spring) Year:_______

GRAND TOTAL _______

* list MS courses first
Minimum Credits: 21 for MS; 42 for PhD
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

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

*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

<table>
<thead>
<tr>
<th>Group A – Fluid Power Theories and Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABE 43500</td>
</tr>
<tr>
<td>ABE 59100 / ME 59700</td>
</tr>
<tr>
<td>ABE 69100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group B – Electrohydraulics and Advanced Modeling Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABE 53100</td>
</tr>
<tr>
<td>ME 57500</td>
</tr>
<tr>
<td>ME 55600</td>
</tr>
</tbody>
</table>

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
- PhD Student Tracking Form (ABE_PhD-1)
- PhD Annual Progress Report (ABE_PhD-2)
- PhD Research Proposal and Preliminary Exam (ABE_PhD-3)
- PhD Dissertation and Dissertation Defense (ABE-PhD-4)

The following will be added when ready. They are expected to be similar to the PhD Rubrics

- MS Mapping Guide
- MS Student Tracking Form (ABE_MS_1)
- MS Annual Progress Report (ABE_MS_2)
- MS Thesis and Defense (ABE_MS_3)
<p>| Learning Outcomes: | Outcome 1: Knowledge and Scholarship: Identify and conduct original research, scholarship or creative endeavors | Outcome 2: Communication: Effectively communicate their field of study | Outcome 3: Critical Thinking and Problem Solving: Think critically, creatively and solve problems in their field of study | Outcome 4: Ethical Conduct: Conduct research in an ethical and responsible manner | Outcome 5: Professional Development: Demonstrate attributes of professional development consistent with expectations within their field of study |
|---|---|---|---|---|
| Activities and Evidence: | | | | | |
| 1. ABE 69700 Fall MS/PhD Seminar (one time for all incoming graduate students) (Form ABE-PhD-1) | | | | | Attend workshops or take online training on responsible conduct of research |
| 2. ABE 69700 Spring PhD Seminar (for advanced 2nd or 3rd year PhD students) (Form ABE-PhD-1) | | | | | Gain appreciation for membership in professional societies; Attend scientific seminars across campus |
| 3. Plan of Study Coursework (Form ABE-PhD-1) | | | | | 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 |
| 4. ABE 69900: PhD Research credits (Form ABE-PhD-1) | | | | | |
| 5. PhD Research Proposal | | | | | |</p>
<table>
<thead>
<tr>
<th><strong>(Form ABE-PhD-3)</strong></th>
<th><strong>6. Written and Oral Preliminary Exam</strong> (Form ABE-PhD -4)</th>
<th><strong>7. Publish Research in Appropriate Outlets</strong> (Form ABE-PhD -6)</th>
<th><strong>8. Presentation of Research at Appropriate Venues</strong> (Form ABE-PhD -6)</th>
<th><strong>9. Ph.D. Dissertation</strong> (Form ABE-PhD -7)</th>
<th><strong>10. Dissertation Defense</strong> (Form ABE-PhD -7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a formal research proposal</td>
<td>Demonstrate sufficient knowledge of subject matter to become a PhD Candidate</td>
<td>Submit manuscripts for publication in the peer-reviewed literature</td>
<td>Present an oral presentation or poster to a professional audience</td>
<td>Prepare a dissertation that meets expectations for original, independent research</td>
<td>Present the research in a public seminar and defend the dissertation</td>
</tr>
<tr>
<td>that will achieve the research objectives</td>
<td>Demonstrate ability to communicate knowledge and research through a written and oral preliminary exam</td>
<td></td>
<td></td>
<td>Prepare a dissertation that demonstrates critical thinking and creativity</td>
<td>Defend the dissertation research before the student’s Advisory Committee</td>
</tr>
<tr>
<td>ethical and responsible manner.</td>
<td>Demonstrate the ability to think clearly and solve problems through a written and oral preliminary exam</td>
<td></td>
<td></td>
<td>Prepare a dissertation based on ethical and responsible research.</td>
<td>Present the dissertation research in a public seminar and defend the dissertation research before the student’s Advisory Committee</td>
</tr>
</tbody>
</table>

**February 2011**
**PhD Student Tracking Form**

**Student Name:**

**Beginning Semester and Year:**

**Area of Specialization:**

<table>
<thead>
<tr>
<th>Course work:</th>
<th>Rubric or Document on File in ABE</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan of Study Approved by Advisory Committee and ABE Graduate Committee</td>
<td>Plan of Study</td>
<td></td>
</tr>
<tr>
<td>Plan of Study Approved by Graduate School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan of Study Coursework Completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall Seminar ABE 69700 Taken -- All new MS &amp; PhD students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring PhD Seminar ABE 69700 Taken (2nd or 3rd year PhD students)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 Research Credits Completed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Research and Examinations:**

<table>
<thead>
<tr>
<th></th>
<th>Rubric or Document on File in ABE</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Approved by Advisory Committee</td>
<td>ABE-PhD-3</td>
<td></td>
</tr>
<tr>
<td>Proposal on File</td>
<td>Proposal</td>
<td></td>
</tr>
<tr>
<td>Annual Progress Report for each year</td>
<td>ABE-PhD-2</td>
<td></td>
</tr>
<tr>
<td>Annual Committee Review for each year (Optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph.D. Preliminary Written Exam</td>
<td>ABE-PhD-3; Written Exam (Questions and Answers)</td>
<td></td>
</tr>
<tr>
<td>Ph.D. Preliminary Oral Exam</td>
<td>ABE-PhD-3</td>
<td></td>
</tr>
<tr>
<td>Ph.D. Dissertation Oral Defense</td>
<td>ABE-PhD-4</td>
<td></td>
</tr>
<tr>
<td>Ph.D. Dissertation Deposited with Graduate School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph.D. Dissertation Copy to ABE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:**
Annual Progress Review of Graduate Staff – Student Data

Student Name: 

Date of Report (Due May 15 each year, covering May 16 of previous year through May 15):

Expected Date of Graduation: 

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 Charlie Armstrong, Graduate Program Administrator, by May 30.

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.
Rubric for Evaluating PhD Dissertation Research Proposal, Written Prelim, and Oral Prelim

(This page should be filled out by the student prior to distribution to Committee. ***Note: This is provided for information in the Graduate Manual, but may not be the current copy. The current copy should always be obtained from the ABE Intranet.)

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Committee Members</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name</td>
</tr>
<tr>
<td>Advisor (Chair of Evaluation Committee)</td>
<td></td>
</tr>
<tr>
<td>Advisor email (Return form to this address)</td>
<td></td>
</tr>
<tr>
<td>Date of Proposal Review</td>
<td></td>
</tr>
<tr>
<td>Research Proposal Title</td>
<td></td>
</tr>
</tbody>
</table>

Committee Member Name: __________________________________________

Committee Member Signature ______________________________________ Date: __________________

If returned electronically, signature is not needed as the email record serves that purpose.

Instructions
This form contains three rubrics. Please complete each one.
- Research Proposal
- Written Preliminary Exam
- Oral Preliminary Exam

Students: Please fill out (electronically) all sections of the table above, then distribute to your Advisory Committee members when you provide your Research Proposal to them.

Committee members: Please complete pages 2 and 3 of this form, either electronically or on paper. For each attribute you feel is deficient, please provide a short explanation. The rubric will be discussed with the student and placed in the student’s file.

Please return by either of the following methods:
- Email completed copies to the Advisor (email address above)
- Submit paper copies to the Advisor (Campus mail address: ABE/ABE). The Advisor is responsible for providing a copy to the Graduate Program Administrator.

Advisor:
1. Provide comments or a summary of comments from committee members to the student.
2. Provide a copy of each Committee Member’s form to the ABE Graduate Program Administrator within 1 week of the completion of the proposal review process.
## Ph.D. Research Proposal

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Does Not Meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall quality of science</strong></td>
<td>Research problem is poorly defined or motivation for undertaking the research is inadequate</td>
<td>Research problem is clearly stated, with motivation for undertaking the research</td>
<td>Excellent statement of research problem and motivation for undertaking the research</td>
</tr>
<tr>
<td></td>
<td>reflects poor understanding of subject matter and associated literature</td>
<td>Research methods are adequately developed and described</td>
<td>Excellent description of research methods</td>
</tr>
<tr>
<td></td>
<td>Research methods are not adequately developed or described</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demonstrates rudimentary critical thinking skills</td>
<td>Demonstrates adequate critical thinking skills</td>
<td>Exhibits mature critical thinking skills</td>
</tr>
<tr>
<td><strong>Contribution to discipline</strong></td>
<td>Limited potential for discovery</td>
<td>Some potential for discovery</td>
<td>Exceptional potential for discovery</td>
</tr>
<tr>
<td></td>
<td>Demonstrates limited theoretical or applied significance</td>
<td>Demonstrates reasonable theoretical or applied significance</td>
<td>Demonstrates exceptional theoretical or applied significance</td>
</tr>
<tr>
<td><strong>Quality of writing</strong></td>
<td>Writing is weak (numerous grammatical and spelling errors)</td>
<td>Writing is adequate (Only minor grammatical and spelling errors apparent)</td>
<td>Writing is publication quality (No grammatical or spelling errors apparent)</td>
</tr>
<tr>
<td></td>
<td>Organization is poor</td>
<td>Organizational is logical</td>
<td>Organization is excellent</td>
</tr>
<tr>
<td><strong>Overall Assessment</strong></td>
<td>Does not meet expectations</td>
<td>Meets expectations</td>
<td>Exceeds expectations</td>
</tr>
</tbody>
</table>

**Comments and explanations:** (Continue on additional page if needed.)
# Written Preliminary Exam

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Does Not Meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall quality of responses</strong></td>
<td>Responses are flawed</td>
<td>Responses are adequate</td>
<td>Responses are exceptional</td>
</tr>
<tr>
<td></td>
<td>Lacks critical thinking skills</td>
<td>Demonstrates adequate critical thinking skills</td>
<td>Arguments are skillfully presented</td>
</tr>
<tr>
<td></td>
<td>Reflects inadequate understanding of subject matter,</td>
<td>Exhibits understanding of subject matter, theoretical</td>
<td>Exhibits superior knowledge in subject area,</td>
</tr>
<tr>
<td></td>
<td>theoretical concepts or pertinent literature</td>
<td>concepts and pertinent literature</td>
<td>theoretical concepts and pertinent literature</td>
</tr>
<tr>
<td><strong>Quality of Communication Skills</strong></td>
<td>Writing is weak (Numerous grammatical and spelling</td>
<td>Writing is adequate (Only minor grammatical and spelling</td>
<td>Writing is publication quality (No grammatical and</td>
</tr>
<tr>
<td></td>
<td>errors apparent)</td>
<td>errors apparent)</td>
<td>spelling errors apparent)</td>
</tr>
<tr>
<td></td>
<td>Organization is poor</td>
<td>Organization is logical</td>
<td>Organization is excellent</td>
</tr>
<tr>
<td><strong>Overall Assessment</strong></td>
<td>Does not meet expectations</td>
<td>Meets Expectations</td>
<td>Exceeds Expectations</td>
</tr>
</tbody>
</table>

**Comments and Explanations:** (Continue on additional page if needed.)
### Oral Preliminary Exam

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Does Not Meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall quality of responses</td>
<td>Responses are incomplete and poorly presented</td>
<td>Responses are complete and well organized</td>
<td>Responses are eloquent</td>
</tr>
<tr>
<td></td>
<td>Respondent lacks knowledge in subject area or pertinent literature</td>
<td>Respondent exhibits adequate knowledge in subject area and pertinent literature</td>
<td>Respondent exhibits superior knowledge in subject area and pertinent literature</td>
</tr>
<tr>
<td></td>
<td>Responses reveal poor critical thinking skills</td>
<td>Responses reveal above average critical thinking skills</td>
<td>Responses reveal well developed critical thinking skills</td>
</tr>
<tr>
<td></td>
<td>Responses are narrow in scope</td>
<td>Responses reveal the ability to draw from knowledge in several disciplines</td>
<td>Responses reveals the ability to interconnect and extend knowledge from multiple disciplines</td>
</tr>
</tbody>
</table>

**Quality of Communication Skills**

|                                    | Respondent exhibits weak verbal communication skills | Respondent exhibits adequate verbal communication skills | Respondent exhibits superior verbal communication skills |

**Overall Assessment**

|                                    | Does not meet expectations | Meets Expectations | Exceeds Expectations |

**Comments and Explanations:** (Continue on additional page if needed.)
**Rubric for Evaluating PhD Dissertation and Defense**

(This page should be filled out by the student prior to distribution to Committee. ***Note: This is provided for information in the Graduate Manual, but may not be the current copy. The current copy should always be obtained from the ABE Intranet.)

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Committee Members</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name</td>
</tr>
<tr>
<td>Advisors (Co-Chairs of Evaluation Committee)</td>
<td></td>
</tr>
<tr>
<td>Advisor email (Return form to this address)</td>
<td></td>
</tr>
<tr>
<td>Date of Proposal Review</td>
<td></td>
</tr>
<tr>
<td>Dissertation Title</td>
<td></td>
</tr>
</tbody>
</table>

Committee Member Name: __________________________________________

Committee Member Signature________________________________________ Date: ___________________________

If returned electronically, signature is not needed as the email record serves that purpose.

**Instructions**

This form contains two rubrics. Please complete each one.

- Dissertation Rubric
- Dissertation Defense Rubric

**Students:** Please fill out (electronically) all sections of the table above, then distribute to your Advisory Committee members when you provide your Research Proposal to them.

**Committee members:** Please complete pages 2 and 3 of this form, either electronically or on paper. For each attribute you feel is deficient, please provide a short explanation. The rubric will be discussed with the student and placed in the student's file.

Please return by either of the following methods:

- Email completed copies to the Advisor (email address above)
- Submit paper copies to the Advisor (Campus mail address: ABE/ABE). The Advisor is responsible for providing a copy to the Graduate Program Administrator.

**Advisor:**

1. Provide comments or a summary of comments from committee members to the student.
2. Provide a copy of each Committee Member’s form to the ABE Graduate Program Administrator within 1 week of the completion of the defense.
## Dissertation Rubric

<table>
<thead>
<tr>
<th><strong>Overall quality of science</strong></th>
<th>Research problem is poorly defined or motivation for undertaking the research is inadequate</th>
<th>Research problem is clearly stated, with motivation for undertaking the research</th>
<th>Excellent statement of research problem and motivation for undertaking the research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives are poorly defined</td>
<td>Objectives are clear</td>
<td>Objectives are well defined</td>
<td></td>
</tr>
<tr>
<td>Does not reflect understanding of subject matter and associated literature</td>
<td>Reflects understanding of subject matter and associated literature</td>
<td>Exhibits mastery of subject matter and associated literature</td>
<td></td>
</tr>
<tr>
<td>Does not apply or describe sound state-of-the-field research methods/tools to solve the defined problem</td>
<td>Research methods/tools applied and described are appropriate to solve the defined problem</td>
<td>Excellent application of research methods/tools to solve the defined problem</td>
<td></td>
</tr>
<tr>
<td>Demonstrates rudimentary critical thinking skills</td>
<td>Demonstrates average critical thinking skills</td>
<td>Exhibits mature, critical thinking skills</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Contribution to discipline</strong></th>
<th>Does not demonstrate the potential values of solution to the research problem in advancing knowledge within and outside the area of study</th>
<th>Adequately demonstrates the potential values of solution to the research problem in advancing knowledge within and outside the area of study</th>
<th>Excellent demonstration of potential value solution to the research problem in advancing knowledge within and outside the area of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited publication potential</td>
<td>Reasonable publication potential</td>
<td>Exceptional publication potential</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Quality of writing</strong></th>
<th>Writing is weak (Numerous grammatical and spelling errors apparent)</th>
<th>Writing is adequate (Only minor grammatical and spelling errors apparent)</th>
<th>Writing is publication quality (No grammatical or spelling errors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization is poor</td>
<td>Organization is logical</td>
<td>Organization is excellent</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Overall Assessment</strong></th>
<th>Does not meet expectations</th>
<th>Meets expectations</th>
<th>Exceeds expectations</th>
</tr>
</thead>
</table>

Comments and Explanations: (Continue on additional page if needed.)
# Dissertation Defense Rubric

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Does Not Meet Expectations</th>
<th>Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall quality presentation</strong></td>
<td>Poorly organized and presented</td>
<td>Clearly organized and presented</td>
<td>Well organized and presented</td>
</tr>
<tr>
<td></td>
<td>Poor communication skills</td>
<td>Good communication skills</td>
<td>Excellent communication skills</td>
</tr>
<tr>
<td><strong>Overall breadth of knowledge</strong></td>
<td>Presentation reveals critical weaknesses in depth of knowledge in subject matter</td>
<td>Presentation reveals adequate depth of knowledge in subject matter</td>
<td>Presentation reveals exceptional depth of knowledge in subject matter</td>
</tr>
<tr>
<td></td>
<td>Presentation does not reflect well developed critical thinking skills</td>
<td>Presentation reveals above average critical thinking skills</td>
<td>Presentation reveals well developed critical thinking skills</td>
</tr>
<tr>
<td><strong>Quality of response to questions</strong></td>
<td>Responses are incomplete and poorly presented</td>
<td>Responses are complete and well organized</td>
<td>Responses are eloquent</td>
</tr>
<tr>
<td></td>
<td>Respondent exhibits lack of knowledge in subject area</td>
<td>Respondent exhibits adequate knowledge in subject area</td>
<td>Respondent exhibits superior knowledge in subject area</td>
</tr>
<tr>
<td><strong>Overall Assessment</strong></td>
<td>Does not meet expectations</td>
<td>Meets expectations</td>
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</tbody>
</table>

Comments and explanations: (Continue on additional page if needed.)