



Architectural Engineering Graduate Student Handbook

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Table of Contents

1	Architectural Engineering Graduate Program – General Information	1
1.1	GRADUATE PROGRAMS OFFERED	1
1.2	REQUIREMENTS OF THE GRADUATE SCHOOL AND THE DEPARTMENT	1
1.3	NEW STUDENTS.....	1
1.4	COURSE CREDIT LOAD	1
1.5	ADDING AND/OR DROPPING OR AUDITING COURSES	2
1.6	SPECIAL COURSES	2
1.7	GRADES	2
1.8	PRIVILEGES AND BENEFITS OF GRADUATE STUDENTS	2
1.9	OBLIGATIONS AND RESPONSIBILITIES	3
1.10	USE OF DEPARTMENT COMPUTERS AND PRINTERS	3
1.11	GRADUATE STUDENTS WITH A TEACHING OR RESEARCH ASSISTANTSHIP, OR WAGE PAYROLL POSITION	3
2	Master of Science Degree Program Information	4
2.1	DEGREE REQUIREMENTS	4
2.2	SELECTING AN ADVISOR	4
2.3	MASTER OF SCIENCE PROGRAM APPROVAL FORM	4
2.4	M.S. THESIS COMMITTEE	5
2.5	M.S. THESIS PROPOSAL	5
2.6	M.S. THESIS	5
2.7	ORAL PRESENTATION OF THESIS	5
2.8	FORMAT REVIEW AND FINAL ARCHIVAL COPY OF MS THESIS	5
2.9	THESIS GUIDE	6
2.10	MASTER OF SCIENCE CHECKLIST	6
3	Master of Engineering Degree Program Information	7
3.1	MASTER OF ENGINEERING PROGRAM GOALS	7
3.2	SELECTING AN ADVISOR	7
3.3	PROGRAM REQUIREMENTS	7
3.4	MASTER OF ENGINEERING CHECKLIST	7
4	Doctor of Philosophy (Ph.D.) Program Information	8
4.1	PH.D. PROGRAM GOALS	8
4.2	ADVISOR	8
4.3	ENGLISH COMPETENCY	8
4.4	BECOMING A DOCTORAL CANDIDATE AND THE CANDIDACY EXAM	10
4.5	THE DOCTORAL COMMITTEE	11
4.6	BREADTH REQUIREMENT	12
4.7	COMPREHENSIVE EXAMINATION	12
4.8	DOCTORAL FINAL ORAL EXAMINATION AND THESIS DEFENSE	14
4.9	COURSE CREDITS	14
4.10	CONTINUOUS REGISTRATION	14
4.11	THE PH.D. DISSERTATION	15
4.12	OTHER REQUIREMENTS	15
4.13	TIME LIMITATIONS AND SCHEDULE	15
4.14	TRANSFERRING FROM MS TO PHD	15
	Appendix A: Forms and Degree Checklists	16
	Appendix B: Penn State Guidelines for the Responsible Conduct of Research	32

1 Architectural Engineering

Graduate Program - General Information

1.1 GRADUATE PROGRAMS OFFERED

There are four formal programs leading to graduate degrees in Architectural Engineering: (1) the Master of Science in Architectural Engineering (M.S.); (2) the Master of Engineering in Architectural Engineering (M. Eng.); (3) the Integrated Bachelor and Master of Architectural Engineering Degree Program (M.A.E.), which is reserved for Penn State undergraduates; and (4) the degree of Doctor of Philosophy with a major in Architectural Engineering (Ph.D.).

The M.S. offers an introduction to research, and the Ph.D. offers research competence. The M.Eng. and M.A.E. degrees offer students the opportunity to gain advanced knowledge for application in professional engineering practice.

Requirements for each of these programs are discussed in detail in separate sections of this document. The immediate sections that follow pertain to all of the graduate programs except the Integrated Master of Architectural Engineering Degree, which is a degree that is integrated with the Penn State Bachelor of Architectural Engineering degree and is covered under separate guidelines.

1.2 REQUIREMENTS OF THE GRADUATE SCHOOL AND THE DEPARTMENT

All graduate students in the Department of Architectural Engineering are required to adhere to the requirements of the Graduate School, as found in the latest [*Graduate Bulletin for Graduate Degree Programs*](#). The requirements of the Graduate School, however, are minimum requirements and the policies, procedures, and regulations listed below are additional and more specific requirements for graduate students pursuing formal programs in Architectural Engineering. Advisers will call pertinent regulations to the attention of their advisees, but students should understand that it is their personal responsibility to see that all requirements from both the Graduate Bulletin and this Department Handbook are satisfied.

All Architectural Engineering graduate students are required to attend ten approved guest lecture presentations prior to graduation. Approved lectures

include, Bowers Lectures, CE lectures, ME lectures, selected guest lectures of AE student societies (AE Graduate Student Association, ASHRAE, IES, SSAE, SPACE). This list will be expanded upon recommendation of the faculty. Lecture announcements will be distributed via email to graduate students and/or printed on posted announcements throughout the department.

Students must document their attendance at lectures using the Guest Lecture Participation Form. The form is distributed at the AE Graduate Student Orientation in the Fall and is also available from the Graduate Student Secretary. To be cleared for graduation, students must submit the completed form to the Graduate Program Officer a minimum of four weeks before graduation. Students not submitting the form by the deadline may be removed from the graduation list.

All Architectural Engineering graduate students are required to satisfy the requirements of the Scholarship and Research Integrity (SARI) program. The details of this program are on the department *Graduate Curriculum* web page at <http://www.engr.psu.edu/ae/curriculum/graduate.asp>.

1.3 NEW STUDENTS

All incoming students will be required to participate in a kick-off orientation/mixer at the beginning of the first semester of graduate study.

Immediately upon arriving on campus, a student should obtain an access account and communicate via email with the Graduate Program Officer during the first week of graduate study. Students should frequently check their email since this media will be used to communicate with students on a regular basis.

New students should also become familiar with the Engineering Library and its resources at: <http://www.libraries.psu.edu/eng/>

1.4 COURSE CREDIT LOAD

Full-time students and students receiving fellowships should register for 12-15 credits per semester. All students (US and International) receiving assistantships should register as follows:

<u>Category</u>	<u>Credits</u>
1/4-time Assistantship	9-14
1/2-time Assistantship	9-12
3/4-time Assistantship	6-8

Students may apply to the Graduate School for one credit beyond this limit, provided they have the approval of their advisor, work supervisor and the Head of the Department.

International students with student visas must maintain full-time academic status as determined by their type of assistantship, or must be registered for at least 9 credits if not supported by an assistantship during both the Fall and the Spring semesters. AE 601 also provides for full-time status as noted in the next section.

1.5 ADDING AND/OR DROPPING OR AUDITING COURSES

Courses taken formally as an audit are not included in the minimum number of credits required for assistantships or for satisfying visa requirements for international students. The Graduate Faculty of the Department strongly discourages retroactively switching a course from a "for-credit" to audit basis or initiating "late drop" procedures and receiving WF, WN or WP.

Students wishing to add or drop courses must consult their advisors before taking any action. Students on assistantships should not change their schedules to reduce or increase their course credits beyond the limits indicated in the previous section. Students adding or dropping courses should refer to the Schedule of Classes for the procedures and fees. A limited tuition refund may apply to dropped courses.

1.6 SPECIAL COURSES

AE 596, 597, 600 (610), 601 (611) Graduate students registering for the above courses should consult with their advisor to insure they are registering for the correct course. Failure to select the correct course may require the student to pay "retroactive fees" and perhaps additional course-credit fees.

AE 596 Individual Studies

This course covers creative projects and also serves as the course for the capstone project in the Master of Engineering program. AE 596 SHOULD NOT be used for M.S. or Ph.D. thesis research. Instructors or advisors may award a grade of A, B, C, D, F or R for this course. (See Graduate Bulletin.)

AE 597 Special Topics

This course is a trial or experimental course, A grade of A, B, C, D or F is awarded. (See Graduate Bulletin.)

AE 600 (610 off-campus) Thesis Research

This course should be used to register for M.S. and Ph.D. thesis research. Instructors usually award a grade of R (for research, which assumes adequate effort) for this course, but may award a grade of A, B, C, D, or F for up to 6 credits for M.S. students and 12 credits for Ph.D. students (see Graduate Bulletin.) An R need not be changed later to a quality grade. A quality grade must be reported no later than the end of the following semester.

AE 601 (611 off-campus) Ph.D. Thesis Preparation

ONLY Ph.D. STUDENTS CAN REGISTER FOR AE 601 AND ONLY AFTER THEY HAVE PASSED THEIR COMPREHENSIVE EXAM AND MET THE TWO-SEMESTER RESIDENCY REQUIREMENT. Ph.D. students cannot register for any other course when they register for AE 601. Prior to graduation, the Graduate School reviews students' transcripts. Students registering for AE 601 when they have not satisfied the above requirements will be asked to retroactively change their registration, pay retroactive fees and possible additional course-credit costs before they will be permitted to graduate.

It is vital that graduate students consult their advisors prior to each semester's registration to insure they are registering for the correct course.

1.7 GRADES

A +/- grading system is used in both graduate and undergraduate level courses. Grades with plus and minus include, A 4.0; A-, 3.67; B+, 3.33; B, 3.0; B-, 2.67; C+, 2.33. A minimum grade-point average of 3.00 for work done at the University is required for all graduate degrees.

1.8 PRIVILEGES AND BENEFITS OF GRADUATE STUDENTS

All Masters and Doctoral students are:

1. Provided with a desk within office space controlled by the department. Students who do not plan to use department office space should notify the Graduate Program Officer. (Note: M.Eng. students will be provided with a desk only if space is available within the department.)
2. Eligible to apply for financial assistance (grant-in-aid and stipend). (Note: M.Eng. students do not qualify for graduate assistantships).
3. Eligible for services at the Ritenour Health Center.
4. Provided access to the services of the University Placement Office.

5. Eligible to participate in the programs offered by the Graduate Student Association.
6. Eligible to join undergraduate student organizations except those with constitutions limiting membership to undergraduates.

1.9 OBLIGATIONS AND RESPONSIBILITIES

All graduate students must:

1. Maintain scholarship satisfactory to the department.
2. Make progress in their degree program that is acceptable to the department.
3. Assume full responsibility for knowing the regulations and pertinent procedures of the Graduate School.
4. Comply with department policies related to the use of department facilities such as computers, printers and copiers.
4. Comply with regulations governing the use of automobiles by all students.
5. Meet standards of conduct as outlined below

"By virtue of their maturity and experience, graduate students are expected to have learned the meaning and value of honesty before entering the Graduate School. However, to insure the maintenance of a high level of moral integrity, each student and faculty member is expected to assume personal responsibility for the encouragement and promotion of the highest ethical and moral standards. It is the particular responsibility of each department and each staff member to set up conditions of operation, which encourage students to strive for these high ideals on the one hand and assure the detection of violations on the other. A violation is regarded as a serious offense, raising grave doubt that the guilty student is worthy of continued membership in the Graduate School community."

1.10 USE OF DEPARTMENT COMPUTERS AND PRINTERS

Graduate students are provided access to department computers, printers and copiers to permit them to conduct their funded work activities (instructional or research). All computer use must abide by established University policies:

Graduate students are provided with allowance of free printing each semester for use on their own coursework. Page charges are incurred based on the printer that is used. Students may add money to their inting accounts at the Engineering Copy Center.

Students who are on research and teaching assistantships will be required to charge printing

conducted in support of these activities to a separate account. These accounts will be charged to the department or to a research budget. All graduate students must ensure that any charges to department and research budgets are for those purposes. No personal printing should be charged to these accounts.

Graduate students are not permitted to attempt to circumvent, in any way, the print charges imposed on them for the use of the department printing facilities. If a student finds a printer that is not charging copies to their account, the student should contact Mr. Corey Wilkinson and refrain from making excessive copies during the time that the printing system is malfunctioning.

1.11 GRADUATE STUDENTS WITH A TEACHING OR RESEARCH ASSISTANTSHIP, OR WAGE PAYROLL POSITION

A number of graduate students are appointed as graduate assistants. They are assigned tasks in teaching, research, or other activities that are educationally significant. These appointments are made by department at the recommendation of the faculty.

Although graduate assistants may assist with research, they should be distinguished from Research Assistants, who are full-time members of the staff with rank equivalent to Instructors.

Graduate students with a teaching or research assistantship must comply with Graduate School regulations governing the duties of their appointment (See Graduate Degree Programs Bulletin). For example, note that "**appointments for graduate assistants are for eighteen weeks of activities per semester.**" Typically this means that students are asked to report at least one week prior to the first day of classes and work through the finals week and/or the following week. Work may also be required during the week of Spring Break. A student is responsible for clarifying all planned absences from the University, including arrival and departure dates, with their work supervisor prior to making plans related to these activities.

On rare occasions where a student is offered a wage payroll position within the department that provides an hourly wage and no tuition benefit, international students must submit the appropriate paperwork to both the department and the Directorate of International Student and Scholar Advising (DISSA), and may work up to a maximum of 20 hours/week.

2 Master of Science Degree Program Information

2.1 DEGREE REQUIREMENTS

The following are the requirements for the Master of Science degree in Architectural Engineering:

1. Complete a minimum of 30 graduate credits (minimum 24 credits of course work, at least 12 of which must be at the 500+ level, and a minimum of 6 credits of thesis research). A maximum of three 596 credits can be applied toward the MS Degree requirements. AE 596 credits must be preapproved and supervised or co-supervised by a faculty member in the student's option. See the Appendix for the approval form. 20 of these credits must be earned on the University Park Campus. These credits must be completed with a grade point average of 3.00 or higher. Only courses where the student has earned a grade of C or higher can count toward the 30-credit requirement.
2. As a general rule, 400-level courses normally offered to non-option students in the 5-year undergraduate program at Penn State cannot be included in the 30-credit minimum.
3. All M.S. students must participate in new student orientation activities.
4. All M.S. students must attend ten approved guest lecture presentations prior to graduation. Approved lectures include, Bowers Lectures, CE lectures, ME lectures, selected guest lectures of AE student societies (AE Graduate Student Association, ASHRAE, IES, SSAE, SPACE). This list will be expanded upon recommendation of the faculty. Lecture announcements will be distributed via email to graduate students and/or printed on posted announcements throughout the department.
5. A thesis proposal must be written by the student and submitted for approval to the advisor and a faculty committee. The proposal is also presented during a meeting of the student's thesis committee. A copy of the proposal and approval sheet shall be sent to the Graduate Program Officer by the advisor. (See Appendix C for guidelines and approval sheet.)

2.2 SELECTING AN ADVISOR

For the student's first semester, a member of the Graduate Faculty will serve as a temporary advisor

until the student has chosen a thesis advisor. Students are expected to locate an advisor in their area of specialization (see Table 1 below) before beginning their second semester. The student should inform the Graduate Program Officer of the name of their advisor. Students should feel free to discuss possible advisors with the faculty in their area of specialization and the Graduate Program Officer.

TABLE 1. AE Graduate Faculty by option area

Construction	Structures
Dr. Somayeh Asadi	Dr. Thomas E. Boothby
Dr. Robert Leicht	Dr. Linda M. Hanagan
Dr. John I. Messner	Dr. Ali M. Memari
Dr. Esther Adhiambo Obonyo	Prof. M. Kevin Parfitt
Dr. David R. Riley	Dr. Aly Said
Mechanical	Lighting
Dr. William P. Bahnfleth	Dr. Kevin W. Houser
Dr. James D. Freihaut	Dr. Richard G. Mistrick
Dr. Donghyun Rim	
Dr. Susan W. Stewart	
Dr. Stephen Treado	
Dr. Michelle Vigeant	

2.3 MASTER OF SCIENCE PROGRAM APPROVAL FORM

The purpose of the M.S. Program Approval Form (Appendix B) is to insure that students have selected an advisor and begin a program of study and research tailored to their interests. Every M.S. degree student must prepare the Masters Approval Form in consultation with his/her academic advisor. The M.S. Program Approval Form must be submitted no later than the end of the first semester. The Masters Approval Form identifies courses the student intends to take and describes the topic of the thesis in the M.S. program. The Graduate Program Officer will review the Masters of Science Program Approval Form, however, the student is ultimately responsible for completeness and conformance with program guidelines. If, at a later time, the student and advisor wish to add or delete courses or change the emphasis of the thesis, they have the authority to do so, but a revised Masters Approval Form must be submitted to the Graduate Program Officer.

Students failing to submit the Masters Approval Form by the end of the first semester will be advised that such action constitutes "Unsatisfactory Scholarship"

which can be grounds for dismissal from the University.

2.4 M.S. THESIS COMMITTEE

M.S. students must assemble a committee consisting of a minimum of three faculty members with expertise in areas related to the proposed thesis project to serve as their M.S. Thesis Committee. At least two of these members must be from the AE department, but an outside member is not required.

2.5 M.S. THESIS PROPOSAL

A candidate for the M.S. degree must provide a short written and oral presentation of the thesis proposal to the student's committee for approval a minimum of one semester before graduation.

1. Written Requirements. The candidate's written thesis proposal should consist of the following:

Introduction Literature review
Research hypothesis Proposed research activity
Tools necessary to undertake the proposed research Anticipated schedule

The objective of this proposal is to:

- ◆ Clearly demonstrate that the candidate has identified and sufficiently narrowed the thesis research topic through a concise statement of the thesis hypothesis.
- ◆ Clearly demonstrate that the candidate is familiar with related work reported in the literature.
- ◆ Clearly demonstrate that the candidate is aware of and has mastery of the analytical/experimental tools necessary to successfully undertake the proposed thesis research.
- ◆ Provide a basis upon which to evaluate the final thesis research.
- ◆ Provide a basis for committee approval of the proposed work.

This written proposal must be provided to the candidate's committee a minimum of one week in advance of the oral presentation.

2. Oral Requirements: The candidate will make a formal oral presentation to his/her committee on the thesis problem and the proposed approach to its solution. The use of audio-visual aids in this presentation is encouraged. The intent of this

presentation is to provide valuable feedback to the student to assist him/her in completing the work.

3. Documentation: The candidate must submit the MS Thesis Proposal Approval Form to the Graduate Program Officer before filing their intent to graduate. Students who do not turn in the form may be removed from the graduation list.

2.6 M.S. THESIS

A candidate generally registers for a minimum of 6 credits of AE 600 and submits a thesis following the procedures specified by the Graduate School. The formatting guidelines are outlined in a document found at the following link:

<http://www.gradschool.psu.edu/current-students/etd/>

The research thesis must be a research topic resulting in work that is publishable in a professional journal. It is permissible, provided the committee approves, to have a thesis composed of parts (published or unpublished) provided a comprehensive introduction is provided. It should also have a conclusion placing the parts in perspective to the whole and making recommendations for future research.

The M.S. thesis may be written in the form of a conference paper with supporting information provided in Appendices, with the approval of the student's advisor.

2.7 ORAL PRESENTATION OF THESIS

All Masters degree students will present and defend the results of their thesis research at a meeting consisting of their advisor, the thesis committee and other members of the faculty and graduate student body. The format and content of the presentation will be similar to that used at technical meetings. Accomplishing this task in a satisfactory fashion is a requirement for graduation. *It is the student's responsibility to inform the Graduate Program Officer, using the "M.S. Thesis Oral Presentation Request Form", a minimum of 1 week in advance of the oral defense.* The Graduate Program officer will then make sure the event is publicly announced. To emphasize the importance of complying with this requirement, the Graduate Officer will not sign graduation clearance forms if the defense is held without proper notification of the Graduate Officer.

2.8 FORMAT REVIEW AND FINAL ARCHIVAL COPY OF MS THESIS

The Graduate School web site provides a Thesis Information link which is designed to provide guidance

and answer questions for a graduate student writing a thesis or dissertation. When you start your thesis, you should reference this information. Dates for the format review and the final archival copy submissions are available on the Graduate School web site.

The thesis will be reviewed by each member of the student's thesis committee. At least three faculty members must approve and sign the Master's Signatory Page which is available on the Graduate School web site. The Master's Signatory Page must also bear the signature of either the Department Head or Graduate Program Officer.

The final archival copy of the thesis (incorporating any format changes requested by the Thesis Office), must be uploaded as an eTD (electronic dissertation) by the deadline announced by the Graduate School for the semester/session in which the degree will be conferred.

Additionally, the original, signed Master's Approval Page must be submitted to the Graduate School and a **copy must be submitted to the Graduate Program Assistant** in 104 Engineering "A" Building to be retained in the student's file.

2.9 THESIS GUIDE

The Graduate School Thesis and Publications Office provides a Thesis Guide (Web site referenced earlier), which is designed to provide generation formatting information and answer most questions for a graduate student who is writing a thesis.

2.10 MASTER OF SCIENCE CHECKLIST

A checklist summarizing program requirements with a lecture approval form printed on the back is provided to each student at the beginning of their program. The checklist is also included in the Appendix.

3

Master of Engineering Degree Program Information

3.1 MASTER OF ENGINEERING PROGRAM GOALS

The goals of this program are to provide the highest quality professional education in Architectural Engineering.

3.2 SELECTING AN ADVISOR

Each student is assigned to an academic advisor, a member of the graduate faculty in their area of interest, prior to their first semester of graduate school. A student may transfer this position to another faculty member later in their program by submitting a Change of Advisor form to the Graduate Program Officer. The student's advisor assists the student in constructing a program of courses that meets the educational objectives of the student along with all department requirements. During the first semester of graduate study, each M.Eng. student must submit a M.Eng. Program Approval form, which lists the courses the student expects to take to fulfill the 30-credit coursework requirement. This form must be amended in future semesters if a student's program changes for any reason.

3.3 PROGRAM REQUIREMENTS

Requirements for graduation are the following.

- ◆ All M.Eng. students must participate in the new student orientation activities.
- ◆ Each student must complete at least 30 credits, of which at least 18 must be at the graduate level (500-level). A maximum of six 596 credits can be applied toward the MEng degree requirements with three of those credits applying toward the MEng paper requirement. AE 596 credits must be preapproved and supervised or co-supervised by a faculty member in the student's option. See the Appendix for the approval form. Students must follow the approved program of study provided in one of the four emphasis areas, or receive approval to substitute courses on the course list. A limited number of courses may be substituted for those listed in the approved programs. Students must provide valid justification for all proposed changes (such as lack of availability, previous successful completion of a similar course, greater benefit to a student's degree program, etc.). As early as possible during the first semester of study, a student should

consult with his/her advisor and submit the Master of Engineering Program Approval form, which lists the courses that are expected to make up a student's degree program. Students must file an amended plan in subsequent semesters if changes to this program are required. All changes to a student's approved program must be approved prior to enrollment in any course.

- ◆ The courses on a student's approved M.Eng. program list must be completed with a grade point average of 3.0 or better to receive the M.Eng. degree.
- ◆ Each M.Eng. student must attend a minimum of 10 department lectures and document these on the appropriate form.
- ◆ The University requires that M.Eng. students submit a formal capstone paper as part of their degree requirements. This paper should demonstrate comprehensive knowledge of the field of study, and may be take the form of an in-depth design study, technical paper, or other engineering or research activity. Each MAE student should coordinate this activity with their adviser, or another graduate faculty member in their area of study and submit a M.Eng. capstone project proposal form prior to beginning the work. The student should register for AE 596 – Independent Study (3 credits) when work on this activity will be conducted (late in their program of study). The student must submit both the paper and a copy of the M.Eng. Paper Approval Form to the Graduate Program Officer prior to graduation. The form must be signed by the faculty member who reviewed the paper, indicating that the paper is of sufficient quality to fulfill this requirement.

The student will receive notice from the Graduate Program Officer regarding final acceptance of the paper, or informing the student of required changes or modifications that must be made prior to acceptance of the paper. The department will retain a final copy of the paper.

3.4 MASTER OF ENGINEERING CHECKLIST

A checklist summarizing program requirements and with a lecture approval form printed on the back is provided to each student at the beginning of their program. The checklist is also included in the appendix.

4 Doctor of Philosophy (Ph.D.)

Program Information

4.1 Ph.D. PROGRAM GOALS

The goal of the Ph.D. program is to produce outstanding engineers who have demonstrated their abilities through the following:

1. Independent Research: Each Ph.D. candidate must demonstrate an ability to plan and carry out independent and original research. This work must show a high degree of maturity and creativity and contribute to the knowledge base in Architectural Engineering.
2. Depth of Study: Each Ph.D. candidate must develop a depth of understanding in one of the four basic areas of the department: Building Construction, Building Illumination Systems Building Mechanical and Energy Systems Building Structural Systems.

This is normally established through work on the M.S. degree and will be developed further within the Ph.D.

In the area of research, a student is expected to attain a level of understanding far above that normally acquired through typical course work. This depth is developed not only through an organized series of courses but through extensive independent study and research.

3. Breadth of Study: At all times, the concept of the Architectural Engineer as an individual who possesses a breadth of understanding of the building and building processes must be maintained. Some of this breadth will come from formal classes while the remainder of it will come from self study, active participation in a wide range of department lectures and activities, a personal interest in buildings, and interaction with fellow students.

4.2 ADVISOR

Each student, upon entering the doctoral program, is assigned to an academic advisor. The advisor selected will generally be the member of the graduate faculty who is best aligned with the student's area of academic interest, or will be the faculty member who is the student's supervisor for an assistantship. When a student decides on a faculty member with whom they plan to work on their Ph.D. dissertation, that person should then become their academic advisor. A Change of Advisor Form should be completed and submitted to

the Graduate Program Officer. The advisor assists the student in constructing a program of courses that meets the educational objectives of the student along with all department requirements; however, the Ph.D. committee will ultimately determine a student's program of courses.

4.3 ENGLISH COMPETENCY

English competence has been formally designated as part of the Ph.D. candidacy requirements as outlined in the Penn State Graduate Bulletin. Both domestic and international candidates must meet the English competency requirements set down in this policy statement. International students should note that passage of the minimal TOEFL requirement does not demonstrate the level of competence expected of a Penn State Ph.D. graduate. Required remedial actions must be completed before scheduling the doctoral comprehensive exam. The main elements of the policy are detailed below.

4.3.1 First Year English Proficiency Exam The first year evaluation of English competence comprises two components—written and oral. The written component of English competence will be assessed by the student's advisor during the first semester of the student's doctoral studies (normally in the fall semester). The oral component of English competence will be assessed by the Candidacy Exam Committee as part of the Candidacy Exam (normally in the spring semester).

Written English Competency: The student will be asked to write an essay of about 1,500 words in length on a topic selected by the Graduate Program Officer. The student will have two hours to complete this assignment in a monitored setting. The student's advisor will evaluate the essay by noting the candidate's ability to: narrow the topic appropriately; define a statement of purpose; organize ideas; present logical arguments; use accurate and appropriate spelling, grammar, and punctuation; and demonstrate syntactic variety. The results will be indicated by pass or fail, and will be communicated in writing by the advisor to the student and to the Graduate Program Officer. For failures, non-native candidates must complete *ESL 116G: ESL Composition for Academic Disciplines* with a grade of B or higher. Native candidates must complete *ENG 202C Technical Writing* with a grade of B or higher. This assessment will occur during the student's first semester of doctoral studies (normally the fall semester) so that the student can take remedial action during the second semester (normally the spring semester), if required.

Oral English Competency: The oral portion of the Candidacy Exam lends naturally to an assessment of speaking and presentation ability. The Candidacy Exam Committee will evaluate the candidate's competence in speaking English by assessing the ability to organize thoughts, use visual props available to help convey the thoughts, use appropriate language, speak with vocal variety, and use correct pronunciation, grammar, and articulation. The oral English competency part of the Candidacy Exam will be evaluated by the entire Candidacy Exam Committee, requiring a 2/3 majority to pass. The results will be indicated by a pass or fail, and will be communicated in writing by the advisor to the student and to the Graduate Program Officer. For failures, nonnative speakers must complete *ESL 115G American Oral English for International Teaching Assistants (ITAs)* with a grade of B or higher. Native candidates must complete either *CAS 100A Effective Speech* or *CAS 211 Informative Speaking* with a grade of B or higher.

Successful completion of the above-specified remedial actions will serve as the final requirements for those candidates who failed the written or oral components of first-year English proficiency. If any remedial courses are required, they must appear on the official University transcript with grades of B or better prior to scheduling the doctoral comprehensive exam.

4.3.2 Further Opportunities for Enhancement of English Competency

The student's doctoral committee will continue to assess a student's English competence at other points in the student's doctoral program, including coursework, the dissertation proposal, and the doctoral comprehensive exam. A student whose work exhibits difficulties with either spoken or written English will be required to take additional English courses to improve his or her English proficiencies. Poor performance on the comprehensive exam or on the doctoral dissertation proposal will necessitate additional English coursework so that writing and speaking deficiencies can be removed before the student attempts to write his or her doctoral dissertation. Remedial courses will be listed on the *Doctor of Philosophy Coursework Approval Form*, which is completed at the time of the doctoral comprehensive exam. Such courses, while required to complete the Ph.D. degree, do not count toward the credit requirements listed in 4.9 Course Credits. Decisions on remedial English competency coursework are the responsibility of the student's doctoral committee.

4.3.3 Expectations

It is expected that candidates for the Architectural Engineering Ph.D. be able to communicate effectively in daily academic and job-related settings, and in more formal professional conference settings. The minimum expectations for comprehensible speech are as follows:

- Accurate pronunciation, with only occasional instances of clearly non-native accent or intonation patterns, especially for engineering specific terminology.
- Appropriate grammatical constructions, with only minor non-native influences.
- Near native-like flow of speech, with only occasional non-native pauses, accentuation, or intonation.

For professional conference presentation settings, minimum speaking proficiency expectations also include the following:

- Strong clarity of purpose for the presentation.
- Appropriate adaptation to an audience.
- Effective organization.
- Effective and appropriate visual aids and delivery style.

Expectations for written material include demonstration of clear competence on both rhetorical and syntactic levels. Ph.D. students are expected to be able to do the following:

- Effectively address a writing task.
- Organize and outline written material.
- Use appropriate details to support a thesis.
- Be consistent in the use of language.
- Demonstrate syntactic variety and appropriate word choice.
- Effectively observe grammar, punctuation, and spelling conventions in English

4.3.4 Attainment of English Competence If the doctoral student completes and passes—with a grade of B or better—the course(s) required by the student's advisor, the Candidacy Exam Committee, the Graduate Program Officer, and the student's doctoral committee, then the student will have satisfied the departmental requirements. If the student fails to achieve a B or better in required courses, then the student must retake the course (or another comparable course). The AE Department's policy to evaluate English competence at multiple points within a student's doctoral program means that a student who attains first-year English competence through either the exam or coursework could still be required to take additional English coursework later in their doctoral program if English

performance at a later evaluation point does not meet the recommended standards as set forth and evaluated by his or her doctoral committee.

A student will not be permitted to schedule the final oral examination until he or she has fulfilled all English proficiency requirements established by the doctoral committee at either the comprehensive examination or at the dissertation proposal stage.

Students who do not make sufficient progress towards achieving competency in English jeopardize the renewal of their graduate assistantship funding and/or their continued enrollment in the Penn State University Architectural Engineering Doctoral Program.

4.3.5 Summary of English Proficiency Program The overall objective of the English Proficiency program implemented by the department of Architectural Engineering is to ensure that all doctoral students exhibit the high level of competence in the use of the English language necessary to complete their doctoral dissertations and enable them to become successful members of the research, academic, and building industry communities. Students are evaluated at a number of different points throughout their AE doctoral program to ensure they have the English skills necessary to succeed in their doctoral studies and in their future careers.

4.4 BECOMING A DOCTORAL CANDIDATE AND THE CANDIDACY EXAM

4.4.1 Becoming a Doctoral Candidate

Graduate students who wish to become doctoral candidates must be approved for candidacy by the graduate faculty of the department. This approval is based on:

- a) the academic record of the student, including the fulfillment of any conditions of acceptance
- b) a candidacy examination given by the department
- c) evidence of research capability based on a concise written preliminary research plan that must be submitted by each student prior to the exam. Details on the format of this document and due date will be provided on the department's candidacy exam Angel site*.
- d) Other evidence of research capability.

To begin to develop a research record, it is essential that a new student begin working with an advisor as soon as possible.

4.4.2 Candidacy examination

Potential candidates are strongly encouraged to undertake the candidacy evaluation at the earliest possible time. The purpose of the candidacy exam is to assist the faculty in determining whether or not the student is competent to pursue a Ph.D. program and to provide the doctoral committee with a basis for recommending a program of study. Participation in the exam requires that the student:

- a) Has submitted official transcripts (English translation) showing the completion of prior coursework and degrees earned. When the official transcript does not show the completion of a degree, an official certification of the degree is required.
- b) Has become associated with some member of the graduate faculty to a sufficient degree to allow evaluation of the potential candidate's ability to do independent research.
- c) Has earned a minimum of 18 course credits in graduate work (taken at PSU or accepted from another institution recognized by the AE Graduate Faculty) beyond the baccalaureate degree.
- d) Has fulfilled other pertinent requirements of the Graduate School as stated in the Graduate Catalog and the AE Graduate Student Handbook.
- e) Has demonstrated sufficient intellectual capacity and maturity to progress successfully through the coursework and other organized aspects of the Ph.D. program.
- f) Has demonstrated the ability to perform original and independent work required for research and design activities.

The first attempt of the candidacy examination must be completed during, or immediately following, the two semesters of residency beyond the MS in order to identify any deficiencies and to discourage the marginal student from further effort in the Ph.D. program. Students enrolled in the doctoral program without first completing a masters degree must take the exam at the first offering after completing a minimum of 18 credits of coursework.

The candidacy exam will be administered in April, approximately two weeks prior to the end of the Spring Semester. The timing of the exam permits faculty to base second year funding on the results of the exam, and permits the students to be accepted to candidacy prior to the start of their third semester.

The form of the exam will consist of an eight-hour written test in one of 4 AE specialty areas (Construction, Illumination, Mechanical Systems, and

Structures). An oral exam will be scheduled for each student so that specific depth topic questions, often based on, but not limited to, the written exam may be directed to each student.

4.4.3 Written Exam

The material covered in the candidacy examination will include general and advanced topics related to the student's specialty area. Details about the topical coverage of the exam can be found on the AE website—click on “Current Students”, “Graduate”, “Degree Programs”, “Ph.D.”, “Candidacy Exam”. Topics in each of the four AE depth areas will include fundamental knowledge expected of a Ph.D. student in that field, as well as selected items from graduate courses taken by the students in the semesters preceding the exam. The exam may consist of both closed and open-book sections. While some of the material may be based on baccalaureate degree topics, the *faculty expects competency and maturity at a level conducive to graduate study*. The faculty expects candidates to possess an understanding of architectural engineering principles, to be able to recall them quickly, and to synthesize them accurately. In addition, candidates should be able to express themselves verbally with clarity and persuasion.

4.4.4 Oral Exam

The purpose of the oral portion of the exam (approximately 60 minutes long) is to evaluate the student's depth of understanding of basic concepts through his/her answers to questions. The student's ability to express ideas and concepts verbally, and with clarity, will be assessed. The oral exam is typically scheduled to occur within 2 weeks of the written exam.

The oral exam will be conducted by a minimum of four AE faculty members, which will include at least two from the student's specialty area, and at least one AE faculty member from outside the student's specialty area. The faculty in a specialty area (Structures, Illumination, Mechanical Systems or Construction) may elect to have more than two faculty members participate in the Candidacy Exam. One of the four faculty members will be the AE Graduate Program Officer or their designee. All faculty members are welcome to attend the scheduled exams, however, only designated examination committee members will vote on the exam outcome.

4.4.5 Results of the Exam

Based on the student's performance related to the criteria provided above, one of the following recommendations will be implemented by the Graduate

Program Officer for communication to both the student and The Graduate School.

1. Full admission to Ph.D. candidacy: Approval of at least 3/4 of the Graduate Faculty Candidacy Exam Committee assigned to conduct the student's exam is required to admit a student to Ph.D. candidacy. This recommendation may include the stipulation that specific courses be included in the student's “committee approved” program of study.
2. Rejection as a doctoral candidate: A negative decision of the Graduate Faculty may yield the following recommendations:
 - a) The student should be reexamined while remaining in the doctoral program.
 - b) The student should first be enrolled in the M.S. program. Upon successful completion, the student may be reconsidered for admission to the doctoral program.
 - c) The student should withdraw from the department.

The decision to accept or deny admission to doctoral study in Architectural Engineering will be based on:

1. Results of the written exam.
2. Results of the oral exam.
3. Academic record of the student.
4. The student's written preliminary research plan, faculty and advisor recommendations, and the quality of work performed for the student's research or teaching.

A formal letter from the AE Graduate Program Officer reporting the result of the exam will be provided to each student taking the exam. Additionally, the results are reported to the Graduate School for entry into the student's record. Admission to candidacy is noted on the student's transcript.

4.5 THE DOCTORAL COMMITTEE

When a graduate student has passed the candidacy examination, a Ph.D. Committee should be formed IMMEDIATELY. In this way, the student will receive proper guidance early in his/her program. The candidate and the advisor should discuss possible committee members. The committee must have a minimum of four members. At least two members must be from Architectural Engineering and one must be from outside the department and have no project or financial ties to the AE department or the committee

chair. Names of the proposed committee should be forwarded to the Graduate Program Officer for action. The Graduate Officer may act on the suggested committee members or may discuss possible changes prior to requesting that the Graduate School form the committee. The Graduate School will appoint the committee and notify all persons concerned. At this point, the student's program is under the complete control of the Ph.D. Committee. The function and organization of the doctoral committee are as follows:

Chairperson and Thesis Advisor

The chairperson is responsible for the administrative aspects of the doctoral program and for coordinating the committee's activities. The chairperson convenes all meetings of the committee. The chairperson's duties also include:

- 1) directing the research program. 2) assisting the student in selecting and scheduling courses. 3) supervising and releasing:
 - the research proposal
 - the final draft of the thesis for defense
 - the final copy of the thesis that will be sent to the Graduate School

Meetings of the Doctoral Committee

Planning Meeting

The Ph.D. candidate and committee will meet immediately (within 30 days) after the doctoral committee is formed. The objective of the meeting is as follows:

- 1) listen to brief comments by the student regarding his/her academic record and work or educational experience.
- 2) define a tentative series of courses to be taken by the student.
- 3) define a tentative time schedule.

A written record of the meeting will be sent to the Graduate Program Officer.

The committee should meet as a body at least once a year to review the status of the student's program of study and research. Alternatively, the student can meet individually (at least once a year) with each committee member for these purposes. If there is a substantial change in the student's program of study or research objective, the committee will meet to discuss this change, and a written record of this meeting (describing

the changes) will be sent to the Graduate Program Officer.

Other Meetings

The committee will also meet to review the thesis proposal, to administer the comprehensive exam, and to conduct the final oral exam.

4. 6 BREADTH REQUIREMENT

All AE doctoral students, prior to scheduling the comprehensive examination, are required to show a basic level of understanding in at least two of the three AE undergraduate options which lie outside their primary area of specialization. This breadth requirement in a particular area can be met by fulfilling one of the following.

1. Successfully complete, with a grade of C or better, one or more designated exams developed from content delivered in a third-year 300-level option specific course (AE 308, 310, 311 or 372), or a department approved 400-level option course. The required exam or exams that fulfill this requirement for a given course will be determined by the course instructor. The Ph.D. student will generally take the exam at the same time and location as students who are formally enrolled in the course.
2. Enroll for credit, and successfully complete, with a grade of C or better, a department approved 300, 400 or 500-level course in one of the three option areas outside the student's main area of focus.

A student may elect to participate in a breadth course or exam at any time prior to the comprehensive exam, including prior to passing the candidacy exam.

Graduates of ABET-accredited Architectural Engineering programs can fulfill the breadth area requirement using a full-semester course from their undergraduate program, following a review of the course's content by the Graduate Program Officer in consultation with the faculty.

4.7 COMPREHENSIVE EXAMINATION

The purpose of the comprehensive examination is to demonstrate that candidates have achieved mastery in their field and are qualified to undertake the research phase of the Ph.D. program. This requires that students:

- 1) have substantially completed, with a minimum grade point average of 3.00, a program of courses approved by their committee. Any courses required of the

student to fulfill deficiencies noted at the candidacy examination must also have been completed.

2) have spent at least two semesters in a twelve-month period as a registered student during which time they were engaged in full-time academic work at the University Park Campus.

3) have completed the department's Ph.D. program breadth requirement (see 4.6).

The comprehensive exam will consist of a written and oral thesis proposal, followed by a question and answer session on the thesis subject areas and topics from the student's major field of study (and minor field, if applicable). The written document, oral presentation, and verbal examination allow the Ph.D. committee to evaluate the student's mastery of the major (and minor) area(s), as well as the student's preparedness to move on to the dissertation phase of the doctoral program. A student must receive a favorable vote of at least two-thirds of the members of the doctoral committee to pass the comprehensive exam.

The oral comprehensive exam is scheduled by the Graduate School upon request by the Graduate Program Officer. The oral thesis proposal presentation will be open to the public, to be immediately followed by a private oral examination of the student by the Ph.D. committee. To schedule the oral exam, the student must submit the "Doctoral Comprehensive Exam Request" form in the Appendix to the Graduate Program Officer at least two weeks prior to the exam. The student must have completed the written thesis proposal for distribution to the Ph.D. committee at this time. See the Graduate Degree Programs Bulletin for rules pertaining to physical presence at the oral exam. All committee members must participate in the oral component of the exam. **The student must be registered on the comprehensive examination date.** Copies of all transactions between the Ph.D. committee chairperson and the Graduate School shall be forwarded to the Graduate Program Officer.

1. Written Requirements. The comprehensive exam is based on the student's development and presentation of a comprehensive thesis proposal. The written thesis proposal, at minimum, shall consist of the following:

- Introduction
- Literature review
- Research goal or hypothesis
- Proposed research methodology

- Tools necessary to undertake the proposed research
- Expected contributions
- Anticipated schedule

The objectives of this proposal are to:

- Clearly demonstrate that a candidate has identified and sufficiently narrowed the thesis research topic through a concise statement of the thesis goal or hypothesis.
- Clearly demonstrate that the candidate is familiar with related work reported in the literature.
- Clearly demonstrate that the candidate is applying an appropriate analytical/experimental approach that should lead to a successful research project.
- Provide a basis upon which to evaluate the final thesis research.
- Provide a basis for comment and committee approval of the proposed work.

2. Oral Requirements: The candidate will make a formal oral presentation to his/her doctoral committee and other guests on the thesis problem and the proposed approach to its solution at the comprehensive exam.

Following the proposal presentation and general questions from the audience, the committee will meet privately with the student to conduct an oral examination on topics related to both the thesis proposal and the student's major (and minor) field(s). The student should expect questions related to topics covering the full range of their coursework, as the committee investigates the student's depth of knowledge and understanding in these areas, and his/her ability to apply it to research and general engineering practice.

At the conclusion of the exam, the committee will evaluate the student's performance on the comprehensive exam separate from approval of the thesis proposal. The committee may elect to pass the student on the comprehensive exam while still requiring revisions or modifications to the thesis proposal. In addition to the Graduate School's Comprehensive Examination form, the AE Department requires a student to submit a Thesis Proposal Approval Form that is signed by all committee members. If changes or revisions to the written proposal are requested by the committee prior to approval, the thesis proposal form may be submitted at a later date.

4.8 DOCTORAL FINAL ORAL EXAMINATION AND THESIS DEFENSE

The purpose of this examination is for students to defend their Ph.D. dissertation. In the interim between successful completion of the comprehensive examination and the final oral examination, the following regulations apply:

1. A request for scheduling the oral examination is made to the Dean of the Graduate School by the Graduate Program Officer. To make this request, the student must submit the "Doctoral Final Oral Exam Request" form in the Appendix to the Graduate Program Officer at least two weeks prior to the exam.
2. A candidate must be registered and maintain student status until passing the final oral examination and the thesis is accepted by his/her Ph.D. Committee. This may be satisfied by registering (at least two semesters per calendar year) for AE 601 and AE 611, which are for Ph.D. thesis preparation and are non-credit.
3. When a period of more than five years has elapsed between passing of the comprehensive examination and the completion of the program, the student is required to pass a second comprehensive examination before the final oral examination can be scheduled.
4. The final oral examination may not be scheduled until at least three months have elapsed after the comprehensive examination was passed, although the Dean of the Graduate School may grant a waiver in the case of an outstanding student.
5. The final oral examination will be administered by the student's Ph.D. Committee and will be a defense of the student's dissertation. The student must receive a favorable vote of at least three-fourths of the members of his/her doctoral committee. The final oral exam will be publicized and members of the academic community will be encouraged to attend.

4.9 COURSE CREDITS

The Ph.D. degree is based upon the achievement of a high level of competency in the area of specialization as demonstrated through a combination of course work, independent study, and research. This competency must be demonstrated through successful completion of the comprehensive examination and the Ph.D. thesis. The student's program of courses is developed in cooperation with the student's Ph.D. committee, and must consist of at least 42 non-thesis graduate credits beyond the Bachelors degree with a minimum of 24 credits at the 500 or 800 level, and no more than 6 credits earned

through individual study (496 or 596). A maximum of 24 graduate course credits earned prior to enrolling in the AE Ph.D. program may be counted toward the 42 credit limit. Penn State AE's proceeding directly to the Ph.D. (without pursuing a MAE or M.S.) are required to take a minimum of 30 non-thesis course credits beyond the B. AE, with at least 24 at the 500 or 800 level and no more than 6 course credits earned through individual study. AE 596 credits must be preapproved by the Graduate Program Officer and supervised or co-supervised by a faculty member in the student's option. See the Appendix for the approval form.

The student's doctoral committee is responsible for establishing the coursework and other study that will lead to the desired level of competency. In many cases, the total number of credits established by a student's doctoral committee will be higher than the minimum listed if the committee believes that more courses are necessary for the student to achieve the required mastery of the major field. Students who earned a Masters degree at another institution and who do not take the Ph.D. Candidacy Exam until the beginning of their third semester at Penn State are likely to reach the minimum credit total prior to forming their Ph.D. committee. It is in a student's best interest to undertake the candidacy exam at the earliest possible date to allow formation of the doctoral committee, which ultimately governs the student's program of courses. The Doctor of Philosophy Coursework Approval form must be submitted to the Graduate Program Officer within one week of passing the Oral Comprehensive Exam.

The doctoral committee is responsible for the evaluation of both competency and thesis quality. As a component of the thesis research, the student is to complete AE 6XX thesis credits as defined by the committee. No more than 12 credits of Thesis Research (AE 600 or AE 610), earned for doctoral research, can be given a quality grade. All other Thesis Research credits, earned for doctoral research, must be given an R grade. An additional 6 credits (18 total) of Thesis Research can be given a quality grade if earned for Master of Science research resulting in an MS degree.

4.10 CONTINUOUS REGISTRATION

After passing the comprehensive exam, all Ph.D. students must maintain "continuous registration", which requires them to register for AE 601, AE 611 or conventional courses for the Fall and Spring semesters at a course load appropriate for their assistantship or visa requirements. If Ph.D. students use university facilities during the Summer, or plans to take their final oral or comprehensive exams during the summer, they must be registered (see Graduate Bulletin).

4.11 THE Ph.D. DISSERTATION

Graduate School Thesis Information

The Graduate School web site provides a Thesis Information link which is designed to provide guidance and answer questions for a graduate student writing a thesis or dissertation. When a student starts their dissertation, they should reference this information. Dates for the format review and the final archival copy submissions are available on the Graduate School web site.

Approval Procedure

The Ph.D. dissertation will be reviewed by each member of the student's doctoral committee. At least three fourths of the committee must approve and sign the Doctoral Approval form. The Doctoral Approval Form must also bear the signature of either the Department Head or Graduate Program Officer.

Final Archival Copy of the Ph.D. Dissertation

The final archival copy of the dissertation (incorporating any format changes requested by the Thesis Office), must be uploaded as an eTD (electronic dissertation) by the deadline announced by the Graduate School for the semester/session in which the degree will be conferred. Additionally, the original, signed Doctoral Approval Form must be submitted to the Graduate School and a copy must be submitted to the Department Head Secretary in 104 Engineering "A" Building to be retained in the student's file.

As a courtesy, most students also present their advisor with both a bound and an electronic copy (for ease of reproduction and distribution) of their dissertation. Students should consult their advisor about their desire to receive a bound copy. Information on binding can be found on the Graduate School web site.

4.12 OTHER REQUIREMENTS

All first semester graduate students are required to participate in the departmental orientation activities,

and to attend a minimum of 10 lectures on a variety of topics during prior to their comprehensive exam. Students submitting a Lecture form to satisfy the MS or MENG degree requirements must submit a second Lecture Participation form.

4.13 TIME LIMITATIONS AND SCHEDULE

The Department records the progress of each student in meeting the requirements through the use of a checklist on which completion dates are recorded. This checklist summarizes the sequence and time schedule of the requirements. A copy of the Ph.D. Degree Clearance Sheet is included in Appendix E.

A student is required to complete his/her program within 8 years from the date of acceptance as a candidate as established by the Graduate School.

4.14 TRANSFERRING FROM MS TO PHD

Students currently enrolled in the MS program can request admission to the PhD program by filing a "Resume Study" form with the graduate School. This form is available on the Graduate School website. Additionally, students must submit a new letter of intent and a letter of support from their current MS advisor. This letter should clearly indicate whether their support is conditional on completing the MS degree requirements, including the MS thesis. If admission is conditional on completing the MS degree requirements, students must complete these requirements before taking the candidacy exam. Requests for transfer will be considered by three department faculty. In cases where students have transferred to the Ph.D. program, the M.S. degree would not be granted unless the student completes all requirements for the M.S., including the submission and successful defense of a thesis.

Appendix A

Forms and Degree Checklists

Table of Contents

• MASTER OF SCIENCE CHECKLIST.....	17
• MS PROGRAM APPROVAL FORM	18
• MS THESIS PROPOSAL FORM	19
• MS THESIS ORAL PRESENTATION REQUEST FORM	20
• MASTER OF ENGINEERING CHECKLIST	21
• MENG PROGRAM APPROVAL FORM	22
• MENG PAPER PROPOSAL FORM	23
• MENG PAPER APPROVAL FORM	24
• DOCTOR OF PHILOSOPHY CHECKLIST	25
• PHD COMPREHENSIVE EXAM REQUEST FORM	26
• PHD PROPOSAL APPROVAL FORM	27
• PHD COURSEWORK APPROVAL FORM	28
• PHD FINAL ORAL EXAM REQUEST FORM	29
• AE 596 COURSE APPROVAL FORM	30
• GUEST LECTURE PARTICIPATION FORM	31

Department of Architectural Engineering
Master of Science Checklist (2016/2017)

Forms and a complete explanation of the requirements noted below are available in the Architectural Engineering Graduate Student Handbook on the AE website.

http://www.engr.psu.edu/ae/degree_programs/GraduateHandbook.pdf

The University Calendar can be found on the University website.

http://www.registrar.psu.edu/academic_calendar/calendar_index.cfm

The Graduate School requirements can be found in the Graduate Degree Programs Bulletin on the Graduate School website. <http://bulletins.psu.edu/bulletins/whitebook/index.cfm>

The requirements for the submission of a Masters Thesis can be found on the Graduate School Website's Thesis Page. <http://www.gradsch.psu.edu/current/thesis.html>

- Submit MS Program Approval Form (Appendix, AE Handbook) to Graduate Program Officer by end of first semester. (Section 2.4, AE Handbook)
- By the end of the first semester, submit documentation to Graduate Program Officer indicating successful completion of Responsible Conduct of Research online training in the first year of graduate study. See SARI portal on Office of Research Protections website. (Section 1.2, AE Handbook)
<http://www.research.psu.edu/education/sari/>
- Submit documentation to Graduate Program Officer indicating successful completion of SARI discussion-based training. Documentation must be submitted by April 30. (Section 1.2, AE Handbook)
- Submit the MS Thesis Proposal Form (Appendix, AE Handbook) to Graduate Program Officer a minimum of one semester before graduation. (Section 2.6, AE Handbook)
- Review the "How to submit a Master's Thesis" document on the Graduate School website.
<http://www.gradsch.psu.edu/current/thesis.html>
- In the semester you plan to graduate, file your intent to graduate in elion by the deadline noted on the university calendar. The time window is near the beginning of the semester.
http://www.registrar.psu.edu/academic_calendar/calendar_index.cfm
- At least one week in advance of the oral thesis defense (Section 2.8, AE Handbook), submit the MS Thesis Oral Presentation Request Form. (Appendix, AE Handbook)
- Submit a copy of the signed "Master's Approval Page" to the graduate Program officer before submitting the original to the Graduate School. (Section 2.9, AE Handbook)
<http://www.gradsch.psu.edu/current/thesis.html>
- Submit completed Lecture Participation Form to the Graduate Program Officer by the end of the late drop period in the semester you plan to graduate. The late drop period is posted on the university calendar. (Section 1.2, AE Handbook)

Department of Architectural Engineering
M.S. THESIS PROPOSAL APPROVAL FORM

Note: For MS students, the thesis final oral exam cannot be scheduled before this form is submitted to the Graduate Program Officer. The MS Thesis Proposal must be approved at least one semester prior to filing the intent to graduate.

For: _____
(Candidate's name)

Proposed Thesis Topic: _____

Thesis Committee Approval of oral exam and proposal document:

Name	Si g n a t u r e	Da t e
_____ (Advisor)	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Received by: _____ Date _____
Graduate Program Officer

Department of Architectural Engineering

Master of Engineering Checklist (2016/2017)

Forms and a complete explanation of the requirements noted below are available in the Architectural Engineering Graduate Student Handbook on the AE website.

http://www.engr.psu.edu/ae/degree_programs/GraduateHandbook.pdf

The University Calendar can be found on the University website.

http://www.registrar.psu.edu/academic_calendar/calendar_index.cfm

The Graduate School requirements can be found in the Graduate Degree Programs Bulletin on the Graduate School website. <http://bulletins.psu.edu/bulletins/whitebook/index.cfm>

- Submit MEng Program Approval Form (Appendix, AE Handbook) to Graduate Program Officer by end of first semester. (Section 3.3, AE Handbook)
- By the end of the first semester, submit documentation to Graduate Program Officer indicating successful completion of Responsible Conduct of Research online training in the first year of graduate study. See SARI portal on Office of Research Protections website. (Section 1.2, AE Handbook)
<http://www.research.psu.edu/education/sari/>
- Submit documentation to Graduate Program Officer indicating successful completion of SARI discussion-based training. Documentation must be submitted by April 30. (Section 1.2, AE Handbook)
- Register for 3 credits of AE 596, as specified on the Program of Study, by submitting the MEng Paper Proposal Form (Appendix, AE Handbook) to the Graduate Program Officer.
- Submit the MEng Paper Approval Form (Appendix, AE Handbook) and a copy of the approved paper to the Graduate Program Officer by the end of the final exam period in the semester registered for AE 596. (Section 3.3, AE Handbook)
- In the semester you plan to graduate, file your intent to graduate in elion by the deadline noted on the university calendar. The time window is near the beginning of the semester.
http://www.registrar.psu.edu/academic_calendar/calendar_index.cfm
- Submit completed Lecture Participation Form to the Graduate Program Officer by the end of the late drop period in the semester you plan to graduate. The late drop period is posted on the university calendar. (Section 1.2, AE Handbook)

**Department of Architectural Engineering
Master of Engineering
PROGRAM APPROVAL FORM**

 MENG Candidate's Name

 Date

Area of Emphasis (circle one): Construction Illumination Mechanical Structural

Each student must complete at least **30 credits**, of which **at least 18** must be at the **graduate** level (500- level). Students must follow the approved program of study provided in one of the four emphasis areas, or receive approval to substitute courses on the course list. A **limited number** of courses may be substituted for those listed in the approved programs. Students must provide **valid justification** for all proposed changes (such as lack of availability, previous successful completion of a similar course, greater benefit to a student's degree program, etc.). The approved program of study for each option area is listed on the following website:

<http://www.engr.psu.edu/ac/curriculum/meng.asp>

PROPOSED PROGRAM OF STUDY:

SEMESTER*	COURSE NO.	COURSE TITLE	CREDITS	SUBST. FOR
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

* Indicate Fall, Spring or Summer and the year.

Reasons for Substitutions: _____

This course of study is approved by:

 (Signature of Advisor) (Date)

Approved for completeness: _____
 (Graduate Program Officer) (Date)

Department of Architectural Engineering
MASTER OF ENGINEERING PAPER PROPOSAL FORM

Student: _____

Student Email: _____ Student #: _____

Semester Scheduling AE 596: _____

Paper Title: _____

Description of the Work:

AE Faculty Reviewer for Paper (signature below indicates agreement to work with the student on the listed project):

Faculty Reviewer:

Name	Signature	Date
_____ (Faculty Reviewer)	_____	_____

Graduate Program Officer: _____

Department of Architectural Engineering
MASTER OF ENGINEERING PAPER APPROVAL FORM

Student: _____

Paper Title: _____

Please submit this form along with a copy of the paper. This copy will be retained by the AE Department for its records.

AE Faculty Reviewer for Paper (signature below indicates acceptance of this paper to meet the Master of Engineering Paper Requirement):

Faculty Reviewer:

Name

Signature

Date

(Faculty Reviewer)

Accepted:

Yes _____

No _____

Received by:

Graduate Program Officer: _____

Department of Architectural Engineering

Doctor of Philosophy Checklist (2016/2017)

Forms and a complete explanation of the requirements noted below are available in the Architectural Engineering Graduate Student Handbook on the AE website.

http://www.engr.psu.edu/ae/degree_programs/GraduateHandbook.pdf

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http://www.registrar.psu.edu/academic_calendar/calendar_index.cfm

The Graduate School requirements can be found in the Graduate Degree Programs Bulletin on the Graduate School website. <http://bulletins.psu.edu/bulletins/whitebook/index.cfm>

The requirements for the submission of a Masters Thesis can be found on the Graduate School Website's Thesis Page. <http://www.gradsch.psu.edu/current/thesis.html>

- Satisfy AE Department English Proficiency requirements. (Section 4.3, AE Handbook) The First Year English Proficiency Examination, offered in November, must be taken by all students in their first year.
- By the end of the first semester, submit documentation to Graduate Program Officer indicating successful completion of Responsible Conduct of Research online training in the first year of graduate study. See SARI portal on Office of Research Protections website. (Section 1.2, AE Handbook)
<http://www.research.psu.edu/education/sari/>
- Submit documentation to Graduate Program Officer indicating successful completion of SARI discussion-based training. Documentation must be submitted by April 30. (Section 1.2, AE Handbook)
- The candidacy examination must be completed during, or immediately following, the two semesters of residency beyond the Masters degree. (Section 4.4, AE Handbook) The exam is administered late in the Spring semester each year.
- Immediately after passing the Candidacy exam the student's committee should be formed. The names should be submitted, via email, to the Graduate Program Officer by the committee chair. (Section 4.5, AE Handbook) http://bulletins.psu.edu/bulletins/whitebook/degree_requirements.cfm?section=degreeReq1#doctoralAdvisers
- Before scheduling the oral comprehensive exam, AE breadth requirements must be completed. (Section 4.6, AE handbook)
- Prepare a proposal and schedule the oral comprehensive exam. At least two weeks in advance of the comprehensive exam, submit the PhD Comprehensive Exam Request form (Appendix, AE Handbook) to the Graduate Program Officer. (Section 4.7, AE Handbook)
- Submit the PhD Dissertation Proposal Form (Appendix, AE Handbook) to Graduate Program Officer a minimum of three months before requesting to schedule the final oral exam. (Section 4.7, AE Handbook)
- Submit the PhD Coursework Approval Form within one week of passing the Oral Comprehensive Exam. (Section 4.9, AE Handbook)
- Review the "How to submit a Doctoral Dissertation" document on the Graduate School website.
<http://www.gradsch.psu.edu/current/thesis.html>
- In the semester you plan to graduate, file your intent to graduate in elion by the deadline noted on the university calendar. The time window is near the beginning of the semester.
http://www.registrar.psu.edu/academic_calendar/calendar_index.cfm
- At least two weeks in advance of the final oral exam (Section 4.8, AE Handbook) , submit the PhD Final Oral Exam Request Form (Appendix, AE Handbook) to the Graduate Program Officer. A minimum of three months must elapse between the comprehensive exam and the final oral exam.
- Submit a copy of the signed "Doctoral Approval Page" to the graduate Program officer before submitting the original to the Graduate School. (Section 4.10, AE Handbook)
<http://www.gradsch.psu.edu/current/thesis.html>
- Submit completed Lecture Participation Form to the Graduate Program Officer by the end of the late drop period in the semester you plan to graduate. The late drop period is posted on the university calendar. (Section 1.2, AE Handbook)

**Department of Architectural Engineering
PhD COMPREHENSIVE EXAM REQUEST FORM**

Note: For PhD Students, this form must be submitted a minimum of two weeks prior to the date proposed for the comprehensive exam.

Student Name:

PSU ID:

PSU Email Address:

Date of Oral Exam:

Place of Oral Exam:

Time of Oral Exam:

Doctoral Committee*

Chair of Committee:	
Co-Chair (if necessary):	
Major Field Members:	
Outside Member:	
Special Members (if necessary):	

* If the members of the committee have changed since submitting the Doctoral Committee Appointment Signature Form, please see the Graduate Program Assistant about resubmitting that form.

Approval of Request:

Chair of Doctoral Committee

Date

Graduate Program Officer

Date

**Department of Architectural Engineering
PhD DISSERTATION PROPOSAL APPROVAL FORM**

Note: For PhD Students, the final oral exam cannot be scheduled before this form is submitted to the Graduate Program Officer.

Ph.D. Candidate's Name

Date

Proposed Dissertation Topic: _____

Thesis Committee Approval of written proposal:

Name	Signature	Date
_____ (Advisor)	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Received by: _____
Graduate Program Officer

Date

Department of Architectural Engineering
Doctor of Philosophy
COURSEWORK APPROVAL FORM

Note: The PhD committee dictates a student's program of courses. It is expected that the courses previously prescribed by the committee are completed prior to the comprehensive examination, however additional courses may be added based on the outcome of the exam.

 Ph.D. Candidate's Name

 Date

This form should be submitted to the Graduate Program Officer within one week of passing the comprehensive exam. Course requirements assigned by the Candidacy Exam Committee must be included.

Proposed List of Coursework

Course No.	Course Title	Credits	Course No.	Course Title	Credits

The coursework listed above meets the spirit of the guidelines provided in Section 4.9 of the AE Graduate Student Handbook. Courses accepted by the committee for transfer from another university must also be listed.

 Committee Chair

 Signature

 Date

 Committee Member

 Signature

 Date

 Committee Member

 Signature

 Date

 Committee Member

 Signature

 Date

 Committee Member

 Signature

 Date

Submitted to: _____
 Graduate Program Officer

 Date Received

Department of Architectural Engineering
AE 596 Independent Study Approval Form

Note: Students must be graduate students (GR or IP) to sign up for AE 596 credits. This form must be signed by the Graduate Program Officer before students can be registered for AE 596 credits. AE 596 credits must be supervised or co-supervised by a faculty member in the student's option. For a PhD, a maximum of 6 credits of independent study, 496 or 596, may be applied toward the minimum guidelines for course credits. A maximum of three 496 or 596 credits may be applied toward the MS or MAE degree requirements. A maximum of six 496 or 596 credits can be applied toward the MEng degree requirements with three AE 596 credits applying toward the MEng paper requirement. This form should not be used for the Master of Engineering paper requirement in the MEng Program. Please see the AE Graduate Student Handbook for the MEng Paper Proposal form. AE 496 or 596 credits must be listed on the student's approved program of study to count toward satisfying degree requirements. A separate University Drop/Add form does not need to be submitted.

Student Name: _____ Student #: _____

Semester Classification: IP or GR (circle one) Student Email: _____

Student Signature: _____

Semester Scheduling AE 596: _____ Number of Credits: _____

Description of the Work:

Description of Expected Deliverables:

AE Faculty member supervising the independent study (signature below indicates agreement to work with the student on the listed project and that the deliverables will not be included in a Thesis or Dissertation):

Faculty Supervisor:

Name	Signature	Date
_____ (Faculty Supervisor)	_____	_____

Graduate Program Officer: _____



Guest Lecture Participation Form

Student Name _____

Lecture Title	Date	Faculty Signature

Note: It is the student's responsibility to keep this form up-to-date. A total of ten guest lectures are required to satisfy the requirement. See AE Handbook Section 1.2.

Appendix B

Penn State Guidelines for the Responsible Conduct of Research

Guideline RAG16 THE RESPONSIBLE CONDUCT OF RESEARCH

Contents:

- Purpose
 - Policy Guidelines
 - Approval Procedures
-

PURPOSE:

The Pennsylvania State University is committed to fostering integrity in the conduct of research. All members of the research community, including faculty, research staff, students, fellows, adjunct faculty, and visiting researchers, are expected to adhere to the highest ethical and professional standards as they pursue research activities to further scientific understanding.

The goal of the Guidelines is to offer a set of values, principles, and standards to guide decision-making and conduct throughout the research process. It is not intended to provide a set of rules that prescribe how researchers should act in all situations. Rather, the Guidelines are intended to increase awareness of research integrity and outline the University's expectations for ethical behavior amongst all researchers.

The Guidelines discussed are not mutually exclusive. There are many circumstances when many of them apply to a single project or activity. The risks of non-adherence to the Guidelines can be both personally and institutionally great. Potential consequences of non-adherence are outlined in the University policies that form the foundation for these Guidelines.

GUIDING PRINCIPLES:

The Code of Conduct prescribes standards of work performance and ethical conduct expected of all persons engaged in research at The Pennsylvania State University based upon the following guiding principles:

- Research is the pursuit of truth in the advancement of knowledge
- Researchers should, in all aspects of research-
 - Demonstrate integrity and professionalism;
 - Observe fairness and equity;
 - Disclose and appropriately manage all conflicts of interest;
 - Ensure the rights, safety, and dignity of those associated with research; and
 - Comply with all legal, regulatory, and ethical requirements established by the University, regulatory bodies, funding sources, and professional organizations.
- Research methods and results should be open to scrutiny and debate.

I. DATA MANAGEMENT AND DATA INTEGRITY:

Data integrity depends on the proper and ethical collection, representation, and retention of data. Falsification or fabrication of one's own data and unacknowledged use of data generated by others are unacceptable behaviors and constitute misconduct. The University maintains ownership of all data collected from research conducted at the University, under the auspices of the University, or with University resources, subject to restrictions stipulated in University-approved agreements with sponsors and other third parties.

Guidelines:

- Accept primary responsibility for data collection, proper attribution, recording, storage, retention, and disposal or transfer to University Archives, as appropriate.
- Scrupulously record data in a form that is easily accessible for analysis and review and, if the research is supported by external funding, readily identifiable with and traceable to the sponsored project.
- Maintain the privacy of data as required by confidentiality agreements and regulations.

- d. Make data immediately available to scientific supervisors and collaborators, as confidentiality agreements permit.
- e. Post-publication, share data with other interested researchers who seek to verify and/or complement existing research.
- f. Maintain research data intact, preferably in original form, in accordance with University or sponsor's retention requirements or for a sufficient amount of time to allow for analysis of published results by other researchers, optimally a minimum of five years after publication.

II. RESPONSIBLE AUTHORSHIP:

Authorship is the process by which the results of original research are translated to published form to facilitate the communication of new knowledge to the professional community. Thus, the integrity of the scholarly record is of paramount concern to the research community. See University Policy [RA13](#).

Guidelines:

- a. Attest to the originality of work.
- b. Assign credit appropriately in publications by citing relevant work of others.
- c. Discuss and resolve issues of authorship before beginning a study or as they arise during a study.
- d. Assign appropriate credit in publications to all those who have contributed significantly to the research process, including research staff, students, and support staff. See PSU Policy [RA13](#) for further clarification on coauthorship.
- e. Confirm that all coauthors willingly agree to be listed as coauthors of publications and to assume responsibility for the accuracy and integrity of their contributions.
- f. Actively involve all coauthors in reviewing and verifying any and all parts of the manuscript.
- g. Identify a primary author to be responsible for the validity of the entire manuscript and for assuring that all contributions are appropriately recognized.
- h. Avoid honorary authorship, which is the practice of subscribing authorship to an individual who has not made a substantial contribution to a manuscript. Instead, utilize alternative forms of acknowledgment as allowed by the publication venue.
- i. Include information in the publication on the sources of financial support for the research. Be cautious of financial sponsorship that prohibits the naming of the sponsor in publication.

III. DISSEMINATION OF RESEARCH:

The University strongly upholds principles of academic freedom, and as an institution serving the public, encourages every effort to ensure that research conducted under the auspices of the University can be freely pursued and disseminated. Researchers are urged to be aware of overtly commercialized research that attempts to place boundaries on academic freedom to pursue research for the good of society and to make research results available to the general public. However, the nature of some research, particularly industrial and defense-related research, does present some circumstances where it may be appropriate and necessary for restrictions to be placed on dissemination. Where such situations are warranted, researchers should practice caution and abide by the following guidelines.

Guidelines:

- a. Conduct classified research only in the Applied Research Laboratory.
- b. Maintain the secrecy of classified research.
- c. Maintain the confidentiality of proprietary information that has been provided to enable research.
- d. Refrain from publishing or otherwise disseminating research related to inventions until appropriate disclosure filings are made to protect your intellectual property.
- e. Abide by export control regulations that can place legal restrictions on the ability to publish or present.
- f. Refrain from disseminating research that may result in future harm to the public.

IV. PUBLICATION PRACTICES:

Timely communication of research results is the primary method for the public dissemination of new knowledge, which is necessary for fostering growth in a professional field. As such, researchers have the responsibility to communicate research results to the scholarly community. Both the reputation and the growth of a profession depend upon three key values: 1) openness in communication, 2) honesty in reporting results and methods, and 3) fairness in apportioning credit. All investigators are obligated to uphold these values.

Guidelines:

- a. Include sufficient information in publications to enable others to replicate the results or otherwise scientifically validate the research.
- b. Avoid simultaneous submission of the same abstract or manuscript to multiple journals.
- c. Avoid fragmentary publication or multiple publications of highly similar research findings based on the same data set.
- d. Acknowledge any sources of financial support for the research and disclose any conflicts of interest in publications.

V. PEER REVIEW:

Peer review is an essential part of the research process. Peer review helps ensure that research has been carried out in an effective manner and will make a significant, timely contribution to the field. Researchers of all fields may find themselves in the position to offer peer review, and the obligation should be thought of as an additional way to contribute to the profession. The review process must be conducted according to the highest professional standards to ensure continuing widespread confidence in the peer review system.

Guideline:

- a. Review only manuscripts and grant applications on a subject matter of personal expertise and return a thoughtful review.
- b. Disclose real or perceived conflicts of interest. Identification of a conflict of interest may require a decision to remove oneself from the review process.
- c. Base a review objectively within the context of published information. Offer positively constructive comments rather than confrontational remarks.
- d. Retain the confidentiality of all manuscript and grant application contents, as both contain privileged information.

VI. COLLABORATIVE RESEARCH:

Collaborative research affords many opportunities to significantly expand research in response to more detailed questions by sharing expertise and resources. Researchers are encouraged to partake in collaborative research within the institution as well as across institutions, keeping in mind that all of the guidelines for research put forth are applicable to collaborative projects. Noncompliance by any single individual contributing to collaborative research may have negative repercussions for the entire research team.

Guidelines:

- a. Ensure all those involved confirm their compliance with applicable regulations and policies of all institutions and professional standards.
- b. Abide by export control regulations that can place legal restrictions on the ability to publish or present.
- c. Ensure collaborators adhere to all grant management regulations and contractual obligations.
- d. Discuss and agree to authorship guidelines for the project.
- e. Advise collaborators of institutional policies for intellectual property and requirements for protecting privileged work invented in the course of the collaboration.
- f. Disclose all real or perceived conflicts of interest with collaborators prior to embarking on collaboration.

VII. FINANCIAL CONFLICT OF INTEREST:

Conflict of interest occurs when a researcher uses his/her position, relationships, and reputation for personal gain or for the profit of a family member. Real or perceived conflict of interest can be detrimental to the research process in that it may lead some researchers to inappropriately influence a research study or results. The existence of a financial relationship does not necessarily lead to inappropriate actions. Consequently, it is important for researchers to disclose all relevant financial relationships. See University Policies [RA05](#), [RA12](#), [HR91](#), and [RA20](#).

Guidelines:

- a. Disclose all potential significant conflicts of interest to:
 - a. the University Conflict of Interest Committee prior to the submission of proposals or initiation of sponsored projects or at least annually or as changes in status occur.
 - b. funding agencies when submitting funding applications.
 - c. journal editors when submitting manuscripts for publication or acting as a peer reviewer.
 - d. meeting organizers prior to delivering a scholarly presentation.
 - e. the Institutional Review Board, when applicable.
- b. Attempt to eliminate significant conflicts of interest and appropriately manage those that cannot be eliminated.

VIII. CONFLICT OF COMMITMENT:

Conflict of commitment occurs when demands on time and/or effort made by non-institutional entities or persons interfere with primary professional responsibilities to the University. Avoiding irresponsible conflicts of commitment is essential for supporting credibility and accountability, providing sound stewardship of University resources, increasing trust among members of the University community, protecting researchers and the University from litigation, and for maintaining mission focus and academic freedom. The University allows and encourages extra-university research activities as long as such activities support the mission of the University and do not compete with the University. To avoid the appearance of unethical conflicts of commitment, researchers should disclose all potential conflicts to academic supervisors. See University Policy [RA12](#).

Guidelines:

- a. Attempt to effectively manage time and effort commitments that may detract from University obligations.
- b. Disclose all potential conflicts of commitment that arise from activities such as consulting, external teaching, privately-funded research, and start-up companies.

IX. FISCAL RESPONSIBILITY:

Accurately managing research funds contributes to the fiscally sound and ethically responsible conduct of research. Managing project budgets and effort responsibly contributes to the legitimacy of the overall research project. See University Policies [RA01](#), [RA03](#), [RA04](#), [RA06](#), and [RA08](#).

Guidelines:

- a. Understand that grants, contracts, and gifts are awarded to the University, rather than to individuals employed by the University.
- b. Effectively manage research-appropriated funds to ensure all costs incurred on a project are reasonable, allowable, and allocable.
- c. Comply with all terms and conditions imposed by the financial sponsor.
- d. Initiate all required approvals for budgetary and programmatic changes that may be necessary during a project.
- e. Comply with University purchasing and travel policies as well as all sponsor regulations.
- f. Submit effort certifications for all projects annually, but review effort assignments monthly to avoid unallowed expenses for federally funded projects in particular.

X. RESPONSIBILITIES OF RESEARCH SUPERVISORS:

Mentoring young researchers in the technical as well as ethical aspects of research is a significant responsibility. Research supervisors have the rewarding and unique opportunity to inform, instruct, and set an example for the responsible conduct of research. However, researchers should be cognizant of ethical issues related to the supervision of research trainees such as the potential abuse of power over those who are dependent for financial, academic, and emotional support; conflicts of commitment between the productivity of the supervisor's research and the trainee's academic progress; and financial conflicts of interest created by assigning research trainees to projects in which the supervisor stands to gain financially.

Guidelines:

- a. Ensure the scientific integrity of all work stemming from one's research group.
- b. Provide supervision, guidance, and example to trainees to further their academic, technical, and professional development.
- c. Provide oversight of experimental procedures including study design and data collection, validity, reporting, and retention.
- d. Instruct graduate students, post doctoral fellows, and other research assistants on all relevant regulations, university policies, and university procedures for research with humans, animals, and/or hazardous materials.
- e. Ensure the proper fiscal management and conduct of the project.
- f. Oversee the preparation and submission of technical reports and any other required deliverables.

XI. RESEARCH WITH HUMAN PARTICIPANTS:

The conduct of research with human participants is highly regulated and is guided by ethical considerations. First and foremost, researchers should be cognizant of the fact that research with human participants is a privilege, not a right stemming from Academic Freedom. Researchers are obligated to conduct research with human participants in such a way as to minimize any risks or harm to participants. The Institutional Review Board (IRB) review and approval process is in place to ensure that all research with human participants adheres to this mandate. See University Policies [RA14](#) and [RA22](#).

Guidelines:

- a. Minimize risk to participants and ensure that research is justified by maximizing potential benefits.
- b. Obtain informed consent of participants throughout the duration of the research as appropriate.
- c. Ensure the safety and privacy of all participants, as well as the confidentiality of all information.
- d. Employ additional safeguards when vulnerable populations are involved.
- e. Obtain written IRB approval for research prior to contact with human participants.
- f. Adhere to all relevant federal regulations.

XII. RESEARCH WITH ANIMAL SUBJECTS:

Research involving animals must be humane and meet normative standards of conduct. Animal researchers are duty-bound to conduct their research ethically and humanely. Researchers should be cognizant of the fact that the use of animals in research is a privilege, not a right stemming from Academic Freedom. See University Policy [RA15](#).

Guidelines:

- a. Ensure all research associates working with animals are adequately evaluated according to the Animal Care and Use Occupational Health and Safety program, trained and supervised.
- b. Identify how the research will benefit animals or human kind.
- c. Minimize the number of animals involved in a research study to include only the number necessary to ensure the integrity of the research.
- d. Design protocols to avoid or minimize discomfort, distress, and pain, using appropriate pain medication where appropriate.

- e. Obtain written approval of research from the Institutional Animal Care and Use Committee (IACUC) prior to the commencement of any research or teaching with animals.
- f. Adhere to the IACUC-approved protocol throughout the study.
- g. Conduct all research activities in accordance with University policy, the Animal Welfare Act, the Public Health Service Policy on Humane Care and Use of Laboratory Animals, the Guide for Care and Use of Laboratory Animals, and U.S. Government Principles for the Utilization and Care of Vertebrate Animals Used in Teaching, Research, and Training.

XIII. RESEARCH INVOLVING HAZARDOUS MATERIALS AND POTENTIAL SAFETY HAZARDS:

Research involving biohazardous, radioactive and other hazardous materials, such as chemicals, if, improperly handled, has the potential to pose a threat to researchers, the Penn State community, and society at large. Additionally, other potential safety hazards may exist in the research environment and measures need to be in-place to prevent injury or negative impacts. It is essential that an organizational structure for safety be established and followed so that safe processes are integral with daily activities. See University Policy [SY01](#).

Supervisor Responsibilities:

All supervisors (department chairs, faculty, and other employees with direct oversight of University activities) have specific responsibilities to provide for the health and safety of those supervised.

- a. Be thoroughly informed of appropriate University and Departmental safety policies, rules and procedures and how they specifically apply to your responsibilities and authority.
- b. Ensure all employees and students understand and abide by relevant safety and health policies, rules, regulations, and procedures.
- c. Provide and maintain required safety equipment, devices and personal protective equipment and apparel. Ensure proper usage.
- d. Provide instruction and assistance in the proper operation of equipment or materials that may be potentially hazardous.
- e. Encourage reporting of health and safety concerns. Take prompt, corrective action when unsafe conditions, practices or equipment are reported or observed.
- f. Conduct a thorough investigation in all work-related injuries, illnesses and accidents, submit appropriate recommendations on all accident reports, and follow through to ensure corrective measures have been implemented.
- g. Coordinate or conduct inspections to maintain safe and healthful conditions, and address any deficiencies that are identified.
- h. Provide for health and safety training.

Guidelines for Use Involving Biohazardous Materials:

The Institutional Biosafety Committee (IBC) and Environmental Health and Safety (EHS) exist to ensure compliance with regulations pertaining to the use of these materials. See University Policy [SY24](#).

- a. Submit any research or teaching involving the use of genetically modified materials (recombinant DNA); infectious agents; human blood, tissues, or unpreserved body fluids; Select Agents, or USDA regulated agents to the Institutional Biosafety Committee for review and written approval prior to conducting the activities.
- b. Ensure all laboratory work areas have current and protocol appropriate inspections by Environmental Health and Safety.
- c. Ensure all research personnel are properly trained and supervised for handling biologic and chemical materials to which they may be exposed.
- d. Dispose of all biological hazards and chemical materials according to established regulations.
- e. Conduct all research activities in accordance with relevant University policies, federal regulations, and state laws.

Guidelines for Use of Radioactive Materials:

The University Isotope Committee (UIC) and Environmental Health and Safety (EHS) exist to ensure compliance with radiation rules and procedures. See University Policy [SY14](#).

- a. Obtain written authorization from the University Isotope Committee prior to beginning research utilizing radioactive materials.
- b. Acquire all radioactive research materials through Environmental Health and Safety.
- c. Ensure the proper containment of radioactive materials being utilized in work areas.
- d. Ensure all research associates and technicians working with radioactive materials are properly trained by EHS.
- e. Immediately report radioactive material spills or exposure to the environment.
- f. Dispose of all radioactive materials according to established regulations.
- g. Conduct all research activities in accordance with all relevant University policies, federal regulations, and state laws.

Guidelines for Use of Radiation-Producing Equipment:

The use of radiation-producing equipment such as x-rays poses a potential serious hazard to those individuals exposed. It is also regulated by federal and state agencies. See Policy [SY15](#).

- a. Consult with EHS as early as possible prior to ordering or installing any radiation-producing equipment.
- b. Arrange to have newly installed systems inspected by EHS for required labeling, safety devices, radiation levels, and evaluation of the system location to assure user and non-user safety.
- c. Prepare written operating procedures for the use of all radiation-producing instruments and review them with the user(s).
- d. Inform EHS prior to the transfer of the equipment or when a system is permanently removed from service and is to be either disposed of or used for parts.
- e. Contact EHS for guidance on proper disposal.

CONCLUDING STATEMENT:

The responsible conduct of research is essential for promoting public trust in research and in the University. The University expects that all research and other scholarly activities be conducted according to the highest ethical standards and guidelines. The personal and institutional consequences associated with unethical conduct can be significant. The risks of non-adherence to the guidelines stated here can include fines, loss of privileges to conduct particular types of research, loss of funding or the inability to apply for certain types of funding in the future, damaged reputation, disbarment from a federal agency, and dismissal from the University. As is stated in Policy [RA10](#), the University will take all necessary actions to ensure the integrity of research and scholarly work.

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