

# Department of Electrical & Computer Engineering (ECE)



## *Graduate Student Handbook* *2009-2010*

---



**Dreese Laboratory**



**Caldwell Laboratory**



**ElectroScience Laboratory (ESL)**

# Contents

<b>1. The Graduate School .....</b>	<b>5</b>
<b>2. The Graduate Studies Committee .....</b>	<b>5</b>
2.1.....	<i>Getting Help</i> .....5
2.2.....	<i>Communications between the Graduate Program and the Student</i> .....6
<b>3. New Student Course Registration.....</b>	<b>6</b>
<b>4. Course Registration Issues .....</b>	<b>7</b>
<b>5. Advisors.....</b>	<b>7</b>
<b>6. The Master of Science Program.....</b>	<b>8</b>
6.1.....	<i>Time Limit</i> .....8
6.2.....	<i>Satisfactory Performance</i> .....8
6.3.....	<i>Requirement of 800-level Course for M.S. Degree</i> .....8
6.4.....	<i>Thesis Option</i> .....9
6.5.....	<i>Nonthesis Option</i> .....9
6.6.....	<i>Things to do the Quarter of MS Graduation</i> ...10
6.7.....	<i>General Comments on the MS Program</i> ...11
6.8.....	<i>Dual Master's Degree Program</i> ...11
<i>Checklist</i> .....	13
<b>7. The Doctor of Philosophy Program.....</b>	<b>14</b>
7.1.....	<i>Acceptance into the Doctoral Program</i> ...14
7.2.....	<i>Summary Requirements for the PhD Degree</i> ...15
7.3.....	<i>PhD Plan of Study</i> ...16
7.4.....	<i>PhD Qualifier Examination</i> ...17
7.5.....	<i>Candidacy Examination</i> ...20
7.6 ..	<i>Dissertation, Archival Paper Submission, and Final Oral Defense or "Final Quarter"</i> ...22
<i>Checklists</i> .....	24
<b>8. Request for Transfer of Graduate Credit .....</b>	<b>28</b>
<b>9. Combined BS/MS Program.....</b>	<b>29</b>
9.1.....	<i>Criteria</i> ...29
9.2.....	<i>Application Procedures</i> ...29
9.3.....	<i>Status in Graduate Program</i> ...30
9.4.....	<i>University Fellowship Eligibility</i> ...30

**10. English Language Requirements ..... ..30**

**11. Financial Aid..... ..31**

*11.1.....Types of Appointments ...31*

*11.2.....Stipend Increases ...32*

*11.3.....Terms of Appointments ...33*

**12. Equipment and Computer Facilities ..... ..33**

**13. Miscellaneous ..... ..34**

*13.1.....Departmental Colloquia and Seminars ...34*

*13.2.....Office Assignments and Keys ...35*

*13.3.....Change of Address ...35*

## PREFACE

This handbook complements the Graduate School Handbook by providing the graduate student in Electrical and Computer Engineering (ECE) with a convenient source of information specific to our program. We strongly urge each student to keep a current edition of this document on hand for reference when planning his or her program, checking on progress through the degree requirements and deciding what needs doing next.

The Graduate School Handbook and the ECE handbook together will smooth the student's path, answer (almost) all questions of procedure and policy, and assist the faculty in its responsibilities as the primary student advisory body. Any questions not addressed in one or the other of the two books should be directed to individual advisors or to the Chair of the Graduate Studies Committee. But the student and the faculty member are kindly requested to seek the answers in these documents first.

*"The full use of your powers along lines of excellence." - definition of  
"happiness"*

***John F. Kennedy (1917-1963)***

## **1. THE GRADUATE SCHOOL**

The Graduate School is responsible for upholding the academic standards of all graduate programs at Ohio State. To this end, it establishes and enforces certain rules that must be satisfied by all graduate students and the faculty. These rules are set forth in the Graduate Student Handbook, copies of which are available from the Graduate School website (<http://www.gradsch.ohio-state.edu/>). It is important that each graduate student be familiar with the Graduate School's rules pertinent to her or his situation.

## **2. THE GRADUATE STUDIES COMMITTEE**

The Electrical and Computer Engineering Graduate Studies Committee forms a liaison between the faculty in ECE and the Graduate School. It is responsible for setting and upholding rules specific to this department (and summarized in this handbook) over and above the minimum, general requirements set by the Graduate School in its handbook. The Graduate Studies Committee is composed of ECE faculty members appointed annually by the Chairman of the Department. The Chair of the Graduate Studies Committee represents the committee members to the faculty, the students, and the Graduate School and administers the day-to-day operation of the program. The Graduate Student Counselor assists the Graduate Studies Chair in most procedural and routine matters and is a valuable source of information on most topics.

There are a number of subcommittees to the Graduate Studies Committee responsible for particular aspects of the graduate program administration and reporting to the Graduate Studies Committee Chair. These include the Graduate Admissions Committee and the Recruitment and Financial Aids Committee. The student typically has little direct interaction with these committees.

### ***2.1 Getting Help***

The most important resource person available to the graduate student is her or his advisor, but if particularly difficult or awkward questions or problems arise that the advisor cannot properly address, the Graduate Studies Committee Chair should be able to address them.

Procedural questions, if the answer can't be found in this handbook, can usually be addressed to the Graduate Student Counselor during his office hours (posted on his office door). Often, electronic mail to the Graduate Counseling Office ([ecegrad@ece.osu.edu](mailto:ecegrad@ece.osu.edu)) will suffice. For more substantive matters, the Chair of the Graduate Studies Committee is available during his or her office hours or by appointment in DL 205C. If the matter is likely to require some preparation on the part of the Chair, an appointment may be advisable. Electronic mail to the Chair ([gradstudies@eee.osu.edu](mailto:gradstudies@eee.osu.edu)) is the simplest way to arrange a meeting and often the most efficient way to handle a matter altogether.

Once again, both the Graduate Student Counselor and the Graduate Studies Chair request that you try to find the answer to your question in the handbook first, before coming to see us. If the answer is in the book (usually the case) then we will all have saved some valuable time.

## **2.2 Communications between the Graduate Program and the Student**

Most routine correspondence between the Graduate Studies Committee (via the Graduate Counselor or the Graduate Studies Chair) is handled by electronic mail. This mail will be sent to the student's "ECE" regional computing account. We obtain this email address automatically from the computer facilities personnel and *it is the only one we will use*. Students wishing to read their email on another account must configure the email software on their ECE accounts to have the mail forwarded. The Graduate Studies Committee is not responsible for problems arising from unread electronic correspondence when the student has failed to arrange for forwarding to a preferred account. *Arranging for forwarding is trivial, and is the student's responsibility.*

There are occasions when physical documents must be sent to the student from the graduate program. There are two mechanisms for this: US mail to the student's local address, and a mailbox for each graduate student located in Drees Lab., Room 223. Students should therefore keep the Graduate Counselor and the University Registrar apprised of their current address at all times, and should check their mailboxes regularly.

## **3. NEW STUDENT COURSE REGISTRATION**

New students are walked through the registration procedure during their orientation period (when they are given this handbook for the first time). We will offer a few comments on the registration procedure for continuing students in this section. After the first quarter, registration is online at <http://buckeyelink.osu.edu/>. Online registration information is given in the **Master Schedule of Classes Bulletin** each quarter. Before your registration window opens, you should consult your advisor for approval of the courses you intend to take.

## 4. COURSE REGISTRATION ISSUES

There are different course registration requirements for pre and post candidacy students:

- **MS students and PhD students who have not taken the candidacy exam:**
  - The computer will not permit you to register for more than 18 graduate hours, and you should not register for less than 12 graduate hours (any quarter) if you hold a GRA, GAA or GTA. Students with Fellowship appointments must register for at least 15 credits. Furthermore, if you do not meet the minimum registration requirements for a GA position set by the Graduate School, the graduate school will revoke your tuition waiver.
  - International students NOT holding a GRA or GTA must register for 10 hours or more (including any required undergraduate hours) to keep their visas in order.
- The Graduate school has additional requirements. Two important ones are as follows:
  - Candidates for the doctoral degree are required to complete a minimum of 45 graduate credit hours at Ohio State after the master's degree has been earned or after their first 45 hours of graduate credit have been completed.
  - Candidates for the doctoral degree are required to enroll three out of four consecutive quarters for at least 9 graduate credit hours per quarter while in residence at Ohio State
  - Registration for at least 3 graduate credit hours during the quarters when:
    - *candidacy and final oral examinations are taken*
    - *quarter of graduation*
- When a doctoral student has taken a master's degree at this university and has earned graduate credit in excess of the minimum required for that degree, the student's advisor, with the approval of the Graduate Studies Committee, notifies the Graduate School of the courses to be counted toward the graduate credit hours required for the doctoral degree. This notification must occur no later than the end of the first quarter of enrollment beyond completion of the master's degree.
- **Post Candidacy PhD students:**
  - Doctoral students (domestic and international) who have passed the Candidacy Examination must register for 3 graduate hours (per quarter). You will need special permission to register for more than 3 credits.
  - At a minimum, a doctoral student must be enrolled for at least two quarters and at least six graduate credits after passing the candidacy exam.
- Completion of PhD degree requirements within 5 years after candidacy exam
- There are additional course registration requirements. Please see the Graduate School Handbook for more detailed information:  
<http://www.gradsch.ohio-state.edu/Depo/PDF/Handbook/Handbook.pdf>

Most of the courses can be signed up online; however, there are some courses that should be done with the graduate counselor. These are ECE 881, ECE 999, and any course for which you do not have a prerequisite (This often occurs for students who did not do their undergraduate program at OSU).

## 5. ADVISORS

Each graduate student must have a faculty advisor whose responsibility it is to help form an academic program, monitor progress through the agreed-upon program, implement necessary procedures that require signatures at various steps along the way, and guide the thesis (if any) or dissertation research that forms part of the student's course of study.

Faculty members within ECE and outside of ECE can hold graduate faculty status within ECE. In addition, some research scientists within ECE hold graduate faculty status. These graduate faculty members are either Category M or Category P. Category P faculty members can advise Ph.D. and M.S. students and serve on all student committees within the department. Category M faculty members can advise M.S. students and serve on M.S. exam committees. In addition, M status faculty members can serve on the committee for Ph.D. candidacy and final exams with the approval of the Graduate Studies Chair. If the student wants non-Graduate faculty to serve on the committee, a petition from the Graduate Studies Chair can be made to the Graduate School to gain approval. However, it is not guaranteed that the Graduate School will approve the petition.

Currently, all tenure-track faculty members within ECE hold Category P. There are also a few emeritus faculty members within ECE and faculty members from other departments with P status in our department. There are a number of research scientists and Non-ECE faculty with M status as well.

A new graduate student is usually assigned a temporary advisor for the first (or first few) quarters here. Often, this relationship is satisfactory to both the student and the advisor and the relationship becomes permanent. Just as often, however, it becomes clear that another faculty member may be a more appropriate advisor. In that case, after discussing the change with both the current and new advisors, the student should use the **Change of Advisor** form, have both advisors sign it, and submit the form to the Graduate Student Counselor, who will record the change. Changes in advisors should not be made frivolously, but the student is encouraged to seek the advisor best suited to his or her research or study interests. If a permanent advisor is not found by the beginning of the second quarter the student will automatically be assigned to the Graduate Program Counselor. As a non-faculty member, the Graduate Program Counselor will be unable to sign any forms requiring faculty advisor approval.

For BS/MS students, the students should fill out a change of advisor form to switch from their undergraduate advisor to a faculty advisor once they have finished the BS degree.



## 6. THE MASTER OF SCIENCE PROGRAM

The MS degree is offered in Electrical and Computer Engineering with two options: Thesis and Nonthesis. The two options produce identical MS degrees; the selection of one option over the other is a matter for the student and the advisor to decide between them according to the needs, goals, and interests of both. There is, in fact, no formal paperwork to distinguish between the two options until the student applies to graduate. The Graduate School Handbook provides details on the requirements of these plans as set by the Graduate School for all MS programs. Here, we will outline the essentials and specific requirements set by the Department of Electrical and Computer Engineering. The checklist below for the M.S. program can also be downloaded from the ECE website. In fact, there are many forms on the ECE website that may be useful to you.

A minimum of 45 Graduate credit hours is required to earn a master's degree. Eighty (80) percent of those required credit hours must be completed at this university over a period of at least 2 quarters. A student must be registered for at least three (3) graduate credit hours the quarter in which graduation is expected.

### 6.1 Time Limit

The MS program (either option) has a 6 year time limit for completion. Failure to complete the program within this limit is cause for dismissal. All course credit earned in a given quarter is lost by a student who does not complete the MS degree within six years from that quarter.

### 6.2 Satisfactory Performance

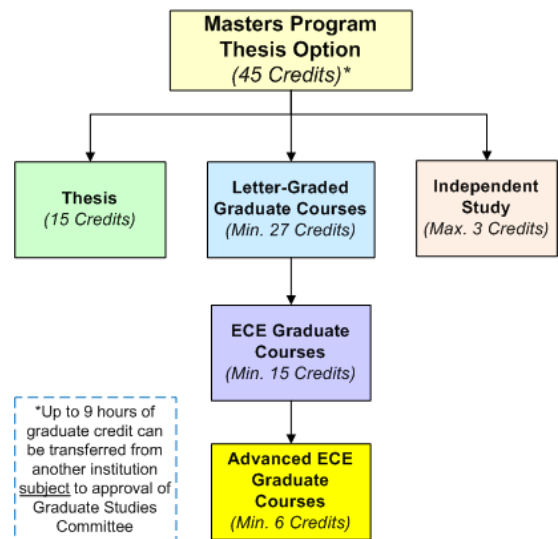
The minimum grade average over all courses acceptable to the Graduate School is 3.0/4.0 and is the same minimum recognized by the department. Poor performance may lead to warnings, probation, and ultimately to dismissal for unsatisfactory performance. Any student may inspect his or her grade record online at the registrar website or in the office of the Graduate Student Counselor during the posted office hours.

### 6.3 Requirement of 800-level Course for M.S. Degree

A requirement of the M.S. degree is that the student must take 6 credits of ECE graded courses that are at the 800-level or higher. For the purposes of this requirement, the following courses count as 800-level courses: ECE 724, ECE 741, ECE 744, ECE 764, ECE 767, and ECE 769. This list can be updated when requested by an area

### 6.4 Thesis Option

The thesis option requires at least 45 hours of graduate credit with an average grade of 3.0 or better and including:



1. No more than 9 hours of graduate credit transferred from another institution.
2. A satisfactory thesis represented by not less than 15 hours of ECE 999 credits.
3. At least 30 hours of graduate course work exclusive of thesis (ECE 999). Of these 30 hours:
  - a. At least 27 must be letter-graded (no S/U), of which
    - b. At least 15 must be ECE courses, of which
      - c. At least 6 must be from ECE courses 800 level or higher.

The thesis option also requires satisfactory performance on a 1-hour final oral examination (Master’s Examination) with emphasis on the thesis investigation. The thesis approval and the oral examination are conducted by the student’s MS advisory committee, consisting of the advisor and at least one other faculty member (the “reader”). The term “reader” can be misleading; often the second faculty member is significantly involved in a secondary advising capacity for much of the MS program.

### 6.5 Nonthesis Option

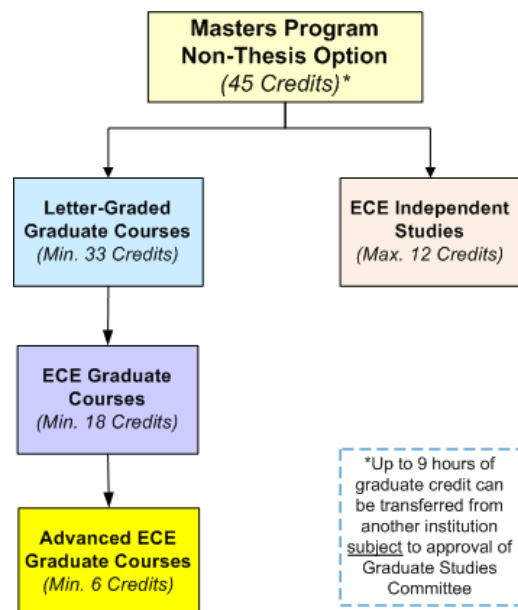
The Nonthesis option requires at least 45 hours of graduate credit with an average grade of 3.0 or better and including:

1. Not more than 9 hours of graduate credit transferred from another institution.
2. At least 45 hours of courses and of these 45 hours:
  - a. At least 33 must be letter-graded (no S/U), of which
    - b. At least 18 must be ECE courses, of which
      - c. At least 6 must be from ECE courses 800 level or higher.
  - d. For non-thesis students a limit of 12 hours of Individual Studies (ECE 793) credit is permitted.
3. ECE 881, ECE 888, ECE 891 and ECE 999 credit hours do not count toward the fulfillment of the 45 hours required for the **MS Non-thesis** degree.

The non-thesis option also requires satisfactory performance on the **MS Non-thesis** exam, which consists of a **take home written exam** based on the individual studies courses taken by the student, followed by a 1-hour **oral exam** given in the quarter the student files an application to graduate. An MS exam committee consisting of the advisor and one more faculty member administers both portions of the exam.

For the take home written exam, the student will be asked to read assigned papers, do a literature survey on a given topic and/or run simulations and write a report. The student will have two weeks to complete the written exam.

The **MS non-thesis** program is structured to allow its completion within **one-year (four quarters)**. An example of a possible course load sequence for completion in one-year is given in the Table below:



	Graduate Credit Hours		
Quarter	Letter-graded ECE courses	Letter-graded technical electives	Individual studies (ECE 793)
Fall	12		
Winter	9	3	
Spring	9		3
Summer			9

### 6.6 Things to do the Quarter of MS Graduation

1. The student must file an **Application to Graduate - Master's Degree** by the second Friday of the quarter of graduation. The form must include the name of the advisor and the name of the second faculty member. The application is available from the Graduate School. To file it, the student first (if he or she has not already done so):

- Completes the **Statement of Intent** (provided on the ECE webpage and discussed below)
- Completes a standard resume and affixes a recent photograph (passport style)

The student then delivers these materials, with the completed application to graduate, to the Graduate Student Counselor for processing and delivery to the Graduate School. Because of unavoidable processing delays (including the fact that the Graduate Studies Chair, who has to sign the form, could be out of town, in a meeting, or ill) you are encouraged *not* to wait until the last minute to attend to this form. *In no case will the graduate program be responsible for materials submitted to the Graduate Student Counselor later than NOON on the second Friday of the quarter of graduation.* Missing the filing deadline could cause your graduation to be delayed. A possible option if you miss the deadline is to file for end-of-quarter graduation (see item 4 below).

2 a. If you are a **Nonthesis** MS student you should pass the **Nonthesis** MS exam.

b. If you are a thesis MS student, you will complete the writing of the thesis and prepare and deliver an oral presentation defending the work to your advisor and at least one other faculty member (the "reader"). This constitutes your final MS examination. Approval of non ECE faculty on the MS Thesis Reading Committee is at the discretion of the Graduate Studies Committee by petition. It is expected that at least one reader, in addition to the advisor, will be from ECE.

3. Once the application to graduate is filed, the Graduate School will automatically generate and deliver the necessary forms to complete the process to the student's advisor. These include:

- **The Master's Examination Report** on which the result of either the Nonthesis MS Final Examination or the oral defense of the thesis (whichever applies) is recorded. This is a single page form that, when completed must be copied and the copy submitted to the ECE Graduate Program Office with the original submitted to the Graduate School no later than *two weeks before commencement* (this sets the timing constraint on the thesis defense).
- The **Thesis Approval Form** on which the approval of the thesis document by the MS advisory committee (advisor and reader) is recorded. This document does not apply to Nonthesis programs. This single page form, if applicable, must be copied and the copy submitted to the ECE Graduate Program Office with the original submitted to the Graduate School no later than *one week before commencement*.

4. If a student misses the Examination Report or Thesis Approval Form deadline, but is able to complete all requirements by the last business day before the start of the next quarter, then the student can graduate that following quarter without registering or paying fees (“end-of-quarter” graduation).

5. The **Statement of Intent** is an internal ECE department form on which you declare what you plan to do after graduation. In many cases, you may have already been admitted to the Ph.D. when you were initially admitted to the Masters program (Check with the Graduate Counselor if you are not sure). If you wish to continue at OSU for the PhD degree, you only need to mark your intention as such on the form and return it to the Graduate Counselor. For those students who were only admitted to the masters program initially and wish to continue for the Ph.D. degree, you are instructed on the form to provide certain materials (thesis or other evidence of independent research ability, if any, and two letters of recommendation on special pink forms), together with the Statement of Intent, *all in one package*, to the Graduate Counselor. The package will be submitted to the Graduate Admissions Committee for their consideration; any missing items will simply delay their decision. When a decision is made you will be informed. If admission to the PhD program is denied, you will be granted one quarter of Special status to seek another university or employment.

6. The **Resume** or **Curriculum Vitae** in any common form containing basic educational, employment, etc. information, must be submitted. You should attach a recent photograph of yourself to the resume for the departmental archives. Unless this form is in your file when you apply to graduate, the application will not be approved, and this could delay your graduation. We advise that you attend to this form well in advance of graduation.

### **6.7 General Comments on the MS Program**

As mentioned above, there is no formal paperwork or record to distinguish the thesis option from the Nonthesis option. The only way in which the choice becomes evident is when the student registers for ECE 999, checks the “Thesis Option” box on the Application to Graduate, and writes and defends the thesis as the final examination.

Practically, the choice will depend on a mix of the student’s educational goals and desires, the advisor’s recommendations and wishes, and so on. It is not unusual for Nonthesis students to become involved in a measure of research through independent study (ECE 793), and this is a particularly effective “toe in the water” mode for the student to explore a research area, and for the student and advisor to become acquainted, prior to plunging in on either a thesis program, or a subsequent doctoral program.

Either option is a viable path to the PhD degree. But students should be aware that if they wish to continue for the PhD, they may be asked to provide some evidence of research ability as part of their application requirements. This can be largely dependent on the policies and opinions of individual faculty members who are prospective doctoral advisors. Some tangible evidence of your ability in technical writing is always useful.

Individual faculty members retain the right to select prospective doctoral advisees according to any criteria they feel appropriate including the type of MS program pursued by the student.

### **6.8 Dual Master's Degree Program**

In certain circumstances graduate students in Electrical and Computer Engineering may wish to pursue a dual MS degree in conjunction with another department. The Graduate School provides a mechanism for such a plan of study, and the necessary form, the **Program Plan for Dual Degree Students**, is available there. The requirements set down by the Electrical and Computer Department over and above those of the Graduate School are as follows:

1. Two advisors, one from each department, must assist in the formulation and approve the student's dual degree plan, and the student-prepared dual degree proposal. At the time the plan is submitted for approval, no more than 50 percent of the total graduate hours included in the plan for either degree may have been completed.
2. If the two degrees are to be taken with thesis, a single thesis will suffice, but its topic must be interdisciplinary in nature and must have the approval and require the expertise of both advisors. In the Nonthesis option, the ECE Nonthesis MS Exam must be passed. The dual degree *cannot* be taken with thesis in one program and without thesis in the other; that would not constitute an integrated program.
3. Two readers (or secondary committee members if Nonthesis), one from each program, are required.
4. At least 30 hours of credit toward the dual degree must be exclusive to the ECE degree. This number must include at least 15 hours of letter-graded ECE courses. At least 6 of these 15 hours must be from courses at the 800 level or higher.
5. The dual degree option is not intended to be used to "tag" one degree with a second endorsement; it is intended to define an *integrated* program of interdisciplinary study. To this end, the student must submit to the ECE Graduate Student Counselor, in addition to the program plan form, a brief description of the rationale behind the specific dual degree he or she has planned, endorsed by the advisors from both departments. This dual degree proposal must also list the quarter of completion and grade earned for any courses already taken, and the predicted quarter of completion for the remainder. This package is then considered for approval by the Graduate Studies Committee.
6. Students whose admission to graduate school came via another department must also arrange to have a copy of their file from the primary academic unit, including up to date student advising reports, forwarded to the ECE Graduate Student Counselor along with their program plan and dual degree proposal. These materials are then forwarded to the ECE Graduate Admissions Committee for their approval prior to being considered by the Graduate Studies Committee.

*Checklist for*

## **M.S. Graduation Requirements**

- 1. Among your course credits make certain you have taken at least 6 quarter hours of graduate credit at the 800 level
- 2. In quarter of graduation you must be registered for a minimum of 3 quarter hours of credit (15 if you hold a GRA/GTA, or Fellowship)
- 3. If you are enrolled in the MS program:
  - (a) Submit (1) **Application to Graduate-Master's Degree**, (2) **Statement of Intent** and (3) **Resume** with passport style photograph to the Graduate Student Counselor by the second Friday of the quarter of graduation
  - (b) Complete the Master's Examination (defense of thesis for thesis-option or comprehensive exam for non-thesis option) during the quarter of graduation, and submit the Master's Examination Report form to the Graduate School no later than Wednesday two weeks before commencement. Submit copy to ECE department.
  - (c) For the thesis option submit the thesis and the Thesis Approval form to the Graduate School no later than one week before commencement. Submit copy to ECE department.
  - (d) If you cannot submit your thesis and Thesis approval form by the date required, you may graduate the following quarter without registering or paying fees, if you submit the form and thesis before the first day of classes of the following quarter
- 4. Graduate with MSEE degree
- If you are enrolled in direct BS-to-PhD program, see checklist "**Direct BS-to-PhD Graduation Requirements**" in page (26) for instructions for getting MS degree

## 7. THE DOCTOR OF PHILOSOPHY PROGRAM

The PhD degree is offered by the Electrical and Computer Engineering Graduate Program in all areas of specialization. The Graduate School Handbook provides details on the requirements of this degree as set by the Graduate School for all doctoral programs. Here, we will outline the essentials and specific requirements set by the Electrical and Computer Engineering Program.

The ECE department offers two different tracks to pursue a PhD degree

- Direct PhD from BS degree
- PhD after the MS degree

Two checklists for both tracks to the Ph.D. degree are provided below. These forms can also be downloaded from the ECE website. Other forms relevant to the doctoral program are also available on the ECE website.

### *7.1 Acceptance into the Doctoral Program*

Students with a BS degree applying for graduate school in the ECE department will be either admitted to 1) the Master program or 2) the direct PhD program.

#### *Direct PhD from BS:*

The students with the most promising dossier will be directly admitted in the PhD program by the admission committee. The direct admission criteria will typically correspond to those expected for the University fellowship.

#### *Transfer from MS program to Direct PhD program:*

Students admitted in the MS program in the ECE department can transfer to the direct PhD program during the course of their studies before the completion of their MS exam, if they have the support of their advisor and have demonstrated promising evidences of scholarship. The students seeking this transfer should submit to the Graduate Admission Committee a **Statement of Intent** with the necessary supporting letters (two letters from ECE faculty including the advisor) and evidences of scholarship such as the publication of a paper in an archival journal. Once these students have been admitted into the Ph.D. program all the course credits they have acquired in the MS program will be counted toward the direct Ph.D. program as long as the students have not taken the final exam for the M.S. program.

#### *PhD from OSU MS:*

Students completing the MS degree at OSU and wishing to continue for the PhD degree must have the approval of the Graduate Admissions Committee. The student seeks this approval by completing the **Statement of Intent** appropriately and submitting the necessary supporting letters (two letters from ECE faculty, one of which should be from someone willing to advise your Ph.D. studies) and, if applicable, the MS thesis. In the absence of a thesis, other evidence of independent research ability *will* be requested. This could be as simple as the endorsement of the intended doctoral advisor based on his or her knowledge of the student, a final report from an independent study project (ECE 793, for example), or something similar.

**PhD from non-OSU MS:**

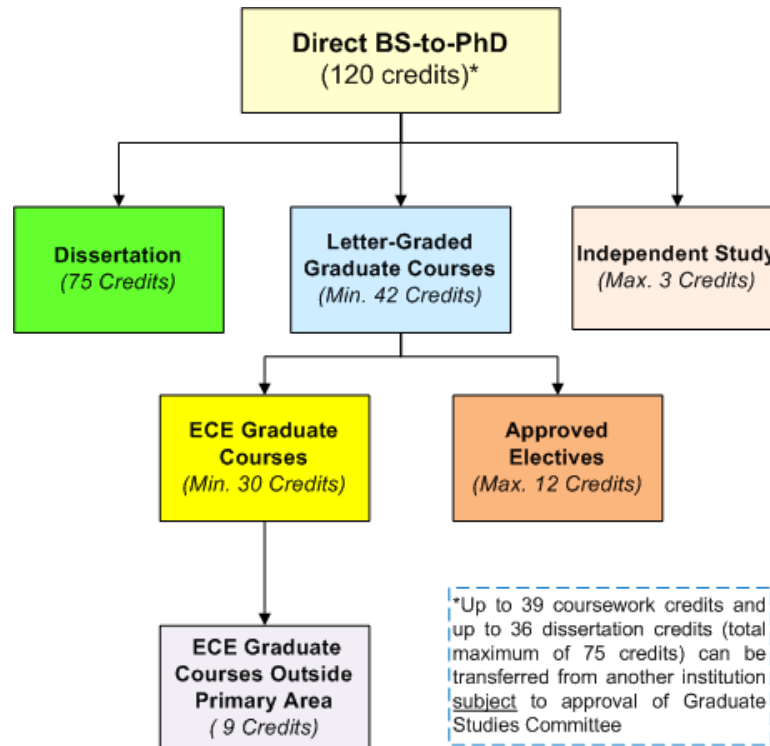
Students having completed an MS degree outside OSU need to follow standard admission procedures. Evidences of independent research ability is critical for admission in the Doctoral program.

**7.2 Summary Requirements for the PhD Degree**

The coursework and requirements for the **PhD** degree program are:

**Direct PhD degree from the BS:**

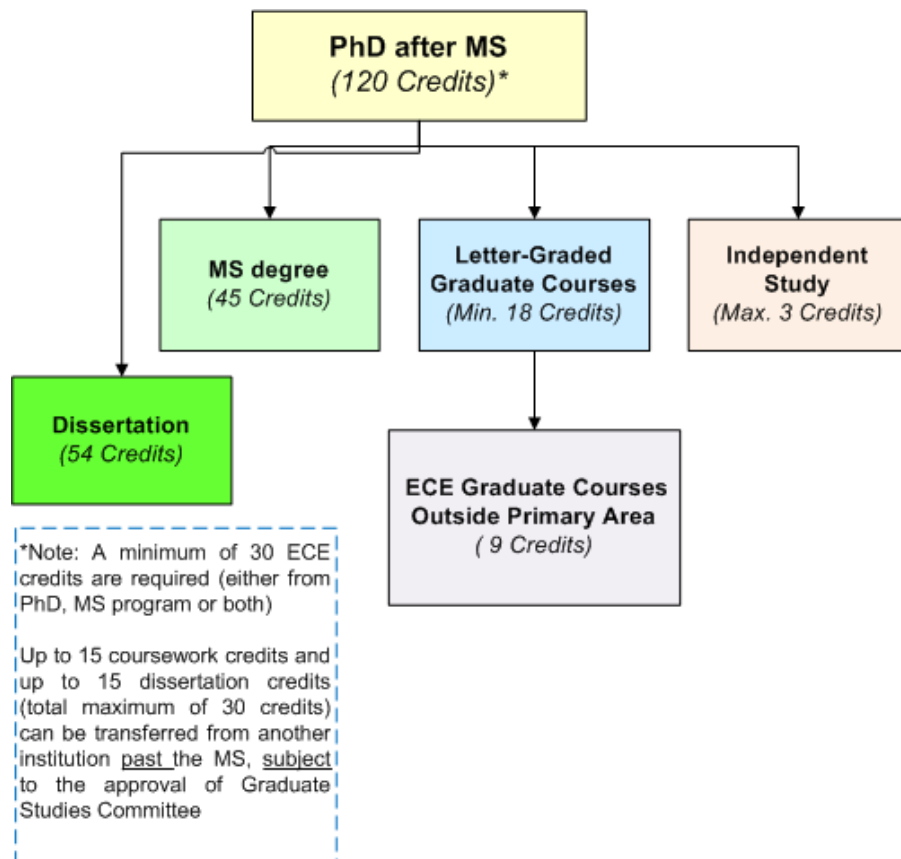
1. At least 45 graduate credit hours of coursework beyond the Bachelor’s degree of which 30 credits must be graded ECE courses and 15 credits must be approved electives. Of the 30 ECE graded course credits, 9 must be associated with an area of concentration outside the student’s *primary area* of study (does not have to match the traditional areas in department). Of the 45 credits of coursework, 42 must be graded courses and 3 can be independent study. Up to 39 coursework credits and up to 36 dissertation credits (for a maximum total of 75 credits) from another institution can be transferred into the direct PhD program, subject to the approval of the Graduate Studies Committee.
2. A dissertation embodying a significant original research contribution and counting 75 hours (ECE 999) toward the 120 hour requirement.





***PhD program from MS degree***

1. M.S. degree counts for 45 credits
2. 21 credits of coursework of which 18 must be graded coursework and 3 credits can be independent study. All 21 credits of coursework must be approved electives. Up to 15 coursework credits and up to 15 dissertation credits (for a maximum total of 30 credits) from another institution can be transferred past the MS, subject to the approval of the Graduate Studies Committee.
3. A dissertation embodying a significant original research contribution and counting 69 hours (ECE 999) toward the 120 hour requirement.
4. The student must have taken at least 30 quarter credits of letter graded ECE courses. These 30 credits can come from either the M.S. or Ph.D. program. The ECE courses from the M.S. program (non-OSU MS) must be approved by the Graduate Studies Chair as being equivalent to ECE courses at OSU. Nine (9) of the 30 ECE credits must be associated with an area of concentration outside the student's *primary area of study* (does not have to match the traditional areas in department).
5. When a doctoral student has taken a master's degree at this university and has earned graduate credit in excess of the minimum required for that degree, the student's advisor, with the approval of the Graduate Studies Committee, notifies the Graduate School of the courses to be counted toward the graduate credit hours required for the doctoral degree. This notification must occur no later than the end of the first quarter of enrollment beyond completion of the master's degree.



***Additional Requirements for the PhD (both direct and from MS)***

1. At least 6 credits of **OSU** ECE graded courses that are of the 800-level or higher must be taken. For the purpose of this requirement, some 700-level courses can count as 800-level courses by some area (more below).
2. **Residency Requirement:** The following requirements must be fulfilled after the master's degree has been earned or after the first 45 hours of graduate credit have been completed:
  - A minimum of 45 graduate credit hours must be completed at this university
  - A minimum of three out of four consecutive quarters with an enrollment of at least 9 graduate credit hours per quarter must be completed while in residence at this university.
3. Submission of an acceptable PhD Plan of Study (more on this below).
4. Passage of the PhD Qualifying Examination (discussed in more detail in **Section 7.4** below).
5. Two graduate seminars (ECE 881) of at least two credit hours each. Credits for these seminars are not included in the 120 hour requirement. Two of these credits should be taken before the candidacy exam and two afterwards.
6. Passage of the Candidacy Examination, with both written and oral parts and judged by the student's Candidacy Exam Committee (more on this below).
7. **Post Candidacy PhD students:** Doctoral students (domestic and international) who have passed the Candidacy Examination must register for 3 graduate hours (per quarter). You will need special permission to register for more than 3 credits. At a minimum, a doctoral student must be enrolled for at least two quarters and at least six graduate credits after passing the candidacy exam.
8. Submission of at least one substantial, original paper based on the dissertation research to a refereed, archival journal before approval of the final defense of the dissertation is granted. A signed form from the advisor (form is online) stating the status of the paper along with a copy of the paper must be provided with the Application to Graduate at the beginning of the quarter of graduation to the ECE graduate counselor. If the paper has not yet been published, the student must also provide a copy of the letter or e-mail acknowledging the acceptance or submission of the paper to the journal. Typically, advisors expect two or more journal papers from their PhD students.
9. A final oral examination in defense of the dissertation.

**Voluntary Breadth Increase:**

*With their advisor's consent, Ph.D. students can petition to have up to 9 credits of additional OSU ECE coursework (above the Ph.D. course requirement) counted toward their dissertation credits.*

**Definition of Technical Elective:**

*Any course that the advisor approves is considered a technical elective. Technical electives can therefore be non ECE courses.*

**Current list of courses which can be counted as 800-level courses:**

ECE 724, 741, 744, 764, 767, 769.

*Note that this list can be updated when requested by an area to the graduate studies committee.*

### **7.3      *PhD Plan of Study***

The PhD Plan of Study (form in your orientation package) will define an ECE primary area of emphasis, an ECE minor area of emphasis, and a secondary area of emphasis outside ECE. Approval of the outside secondary coursework (outside the student's *primary area of study*) is at the discretion of the advisor. All *graduate* courses taken at The Ohio State University must be listed on this form. If you have a Master from another institution a transcript must accompany the Plan of Study form.

Students interested in pursuing multi-disciplinary or cross-disciplinary programs of study in either their nominal primary or secondary area are encouraged to do so. These students may submit such a Plan of Study to the Graduate Studies Committee, with a brief letter of explanation and the advisor's endorsement, for approval. The formulation of the student's Candidacy Exam Committee should also be chosen, and will be approved, according to these area definitions.

Two faculty signatures are required on the Plan prior to submission: the advisor and a secondary area representative. In the event of a nontraditional secondary area (one not exclusively drawn from courses in one of the curricular areas listed above), the secondary area representative (not necessarily an ECE) signing the Plan is also agreeing to serve as the secondary area examiner on the student's Candidacy Exam committee, and should be from outside the student's primary area, as defined above.

### **7.4      *Ph.D. Qualifier Exam***

The PhD Qualifying Examination (QE) serves as one of the key filters in allowing a student to pass from Special (simple admission to the program) to Regular doctoral student status. As such, the QE is designed in accordance with the following principles:

- The examination promotes breadth in the preparation for doctoral studies. The examination also accommodates those students wishing to pursue nontraditional paths of scholarship, since much of the most exciting new work can occur "between" traditional curricular areas.
- The examination establishes that the student is prepared for further advanced studies at the doctoral level.
- Since there is some flexibility in the nature of the exam, the student must carefully discuss with his/her advisor details about the material that will be covered in the exam.

#### **Other Requirements:**

To pass from Special to Regular status, the doctoral student must have a **GPA of at least 3.5** and also obtain a commitment from a faculty advisor on his or her PhD Plan of Study. Thus the QE is not the sole determinant for acceptance as a Regular doctoral student. Students who have demonstrated significant research activity and an excellent academic record while at OSU may be able to waive the qualifier. A typical record that would be considered for waiver has the following:

1. Support letter from Ph.D. advisor attesting to the student's outstanding research ability
2. Evidence of research accomplishment including journal and conference papers.
3. Graduate GPA of approximately 3.8 or higher.

Only students who have been at OSU for *at least 3 quarters* (including time in both M.S. and Ph.D.) will be considered for this waiver. The graduate studies committee will evaluate each waiver request case-by-case and decide if the student's qualifying exam can be waived. The student should submit a CV with the advisor's letter and a copy of all journal and conference papers (preprint if not published) to the grad studies chair. To verify GPA, print out a copy of your advising report (from the registrar website) and submit it with your package. Students who are not waived must take the qualifying exam.

The Ph. D. qualifying exam is an oral exam given by a committee of three faculty members, consisting of the student's advisor and two other members. The members of the committee will be jointly decided by the student with the advisor. The committee members must be faculty with P status within the department and also hold a departmental appointment (excluding 0% appointments). The student may petition the graduate studies committee to allow at most one committee member who does not meet the above criteria. The timing of the exam depends on whether the student is in the direct BS-to-PhD program or where the student received the MS degree, as outlined in the three cases below. The student is notified about the result within a week after the exam. Two attempts are allowed in each case.

***CASE 1: Ph.D. qualifier for students in the direct BS-to-Ph.D. program***

- The student must have three committee members for this exam (one of them must be the advisor). The student should take this exam by the 18<sup>th</sup> month from start of studies at The Ohio State University.
- The Qualifying Exam is a one hour oral exam. Each member will have approximately 20 minutes to ask questions. It is expected that the student will pick committee members who have had the student in a class to facilitate the formulation of the questions. After the hour, the student leaves the room, and the advisor may make a statement to the remaining committee members about the student's capabilities as a Ph.D. student. Then the advisor should leave the room for the two remaining committee members to discuss the student's performance on the exam without grading the student.
- All three committee members will then submit (by e-mail) a grade for the student directly to the Graduate Studies chair. If the advisor is the Graduate Studies chair, the grades will be sent to the Dept. chair.

***CASE 2: Ph.D. qualifier combined with MS exam (advisor for Ph.D. is the same):***

- The student must have three committee members for the MS exam. After the MS exam, the student is asked to leave the room, and the committee decides whether the student has passed or failed.
- The student is then called back into the room and informed of the decision. If the student passes the MS exam, he/she is allowed to continue to the Qualifying Exam. The Qualifying

Exam is a one hour oral exam taken immediately following the MS exam. Each member will have approximately 20 minutes to ask questions. It is expected that the student will pick committee members who have had the student in a class to facilitate the formulation of the questions. After the hour, the student leaves the room, and the advisor may make a statement to the remaining committee members about the student's capabilities as a Ph.D. student. Then the advisor should leave the room for the two remaining committee members to discuss the student's performance on the exam without grading the student.

- All three committee members will then submit (by e-mail) a grade for the student directly to the Graduate Studies chair. If the advisor is the Graduate Studies chair, the grades will be sent to the Dept. chair.

### ***CASE 3: All other cases***

In principle, the exam is similar. The differences are outlined below:

- The first attempt of the qualifying exam must be taken by at least the end of the 3<sup>rd</sup> quarter after admission to the Ph.D. program if the student obtained the MS at OSU or by at least the end of the 5<sup>th</sup> quarter if the student obtained the MS elsewhere.
- The Qualifying exam consists of a written component and an oral exam. For the written exam, the student will be asked to respond to an open-ended research question (or set of questions) and write a report. All committee members should participate in defining the research project. This project would ordinarily be assigned at least one month prior to the oral exam. The oral exam will be for 90 minutes of which the first 20 minutes will be for presentation associated with the research project. The format is similar to a conference where the questions are reserved for the end. After the presentation, 10 minutes will be allocated for questions associated with a research topic. The remaining hour will be reserved for questions by the committee members. Each member will have approximately 20 minutes to ask questions. It is expected that the student will pick committee members who have had the student in a class to facilitate the formulation of the questions. After the 90 minutes, the student leaves the room, and the advisor may make a statement to the remaining committee members about the student's capabilities as a Ph.D. student. Then the advisor should leave the room for the two remaining committee members to discuss the student's performance on the exam without grading the student.
- All three committee members will then submit (by e-mail) a grade for the student directly to the Graduate Studies chair. If the advisor is the Graduate Studies chair, the grades will be sent to the Dept. chair.
- Students in non-traditional areas who do not have their MS degrees in ECE may petition if they need more time to prepare for the exam.

### **Grading of Qualifying Exam**

The grading for the exam will be either a 2 (pass), 1 (marginal), or 0 (fail). In order to pass the qualifier, the student must score at least 4 out of 6. The committee members should send their

score for the exam by e-mail to the Graduate Studies chair. The student and advisor will be informed by the Graduate Studies chair as to whether the student passed or failed. If it is the student's first try, the student will have one more opportunity to pass the exam. The second try must be taken the next quarter after the failed exam. In addition, the committee for the second try must remain the same. If the student wishes to change the committee, he/she must petition the Graduate Studies Committee with a reason for the change.

### **Documents required and deadlines:**

Two weeks before the start of the qualifying exam, the student should turn in the request for the Qualifying Exam. This form is on the web.

### **One week before the exam:**

The student should give the following documents to the exam committee members one week before the exam:

1. List of graduate courses taken (with brief descriptions if courses are not OSU courses).
2. A resume with list of publications.
3. Summary of MS thesis if applicable or of an independent study report (maximum 5 pages, NOT edited by advisor) for Case 3.
4. Written report for the research project (NOT edited by advisor) for Case 3.

## **7.5 Candidacy Examination**

The Candidacy Examination is intended to establish the student's preparation and readiness for independent doctoral level research by assessing the following:

- Intellectual independence
- Familiarity with the literature relevant to the research area(s)
- The formulation of a research problem, and a corresponding research plan

### **Outcome from the Candidacy Examination:**

**Direct PhD from BS:** There are 3 possible results:

- 1 The student passes and is awarded the M.S. degree automatically.
- 2 The student fails; however, the student is awarded the M.S. degree
- 3 The student fails and is not awarded any degree

**PhD from MS:** There are 2 possible results:

- 1 The student passes.
- 2 The student fails.

### **Timing of Candidacy Exam:**

The candidacy exam should be taken **no later than the third year**. The candidacy exam will typically consist in the presentation of the preliminary doctoral research work which has led to the submission of one or more papers in an archival journal and/or has been published in conference proceedings.

**Procedure:**

The first step is the formation of the candidacy exam committee. This Committee consists of the student's advisor (who must have graduate faculty P status in ECE) and at least three other faculty members chosen by the student and advisor together, subject to the approval of the Graduate Studies Committee. One of the members should be an ECE faculty member from the student's secondary area (Usually the faculty member who signs the Ph.D. plan of study). There must be at least three faculty members (including the advisor) with P graduate faculty status in ECE. The fourth member can have P or M status. If the student wishes to have two or more committee members with non-P status within ECE, they must obtain permission from the Graduate Studies chair and also increase the committee size to satisfy the requirement of three P status committee members.

Simultaneously with the formation of the committee, the student should be working on a research proposal. The substance of this proposal forms a major part of the oral portion of the exam. As such, it must be a complete document with a thoughtful, in-depth treatment of the dissertation topic. It should be substantial enough to form the basis of a meaningful oral examination, establishing a worthy research problem and developing an effective research plan. It should only be written after the student has done enough work on the problem to speak meaningfully about it, including discussing her or his preliminary investigations. Above all, it should be a technically sound and scholarly document, not to exceed 15 pages (single spaced, 11 pt. or larger fonts), excluding title page, abstract, table of contents, references cited and appendices.

The proposal should include:

1. Cover sheet including title, one page abstract and table of contents.
2. A discussion of the problem and its significance.
3. A history of the problem and previous relevant research.
4. A summary of the student's own preliminary work on the problem and results to date (details of the preliminary results can be placed in appendices).
5. A research plan leading from the current status toward a clearly defined goal or goals. Listing multiple methods of attacking the problem, or other options, by priority is strongly advised. The research plan should typically be about 5 of the 15 pages.
6. Anticipated results (the goals, as well as acceptable results perhaps a bit short of the ultimate goals) should be discussed along with the contributions these results are expected to make to our understanding of the problem domain.
7. References should be listed in a format acceptable to the Graduate School.

The research proposal must be submitted to the Graduate Studies Chair along with the request for approval of a Candidacy Examination Committee (form is online). The signatures of three members of the Candidacy Exam Committee approving the proposal (for examination purposes) should be affixed to the cover sheet of the proposal. The approval form for the proposal can be obtained from the graduate counselor. Once the proposal and committee composition is approved by the graduate studies committee, the candidacy exam officially begins. To check to see if you are approved to start the candidacy exam, you need to check with the Graduate Counselor 1 week after your submission of the approval forms. Because of possible delays, it is suggested that you turn in the forms at least 2 weeks before you plan to start the written portion of the exam.

The entire examination, written and oral, must be completed within 13 weeks and the oral exam must be held within one month of the end of the written portion. Two attempts are allowed, and the second must be made no sooner than the quarter following that in which the first oral exam was taken.

Should the student change advisors or topics after the Candidacy Exam is passed, he or she would have to repeat the process. This would not be a formal exam in the eyes of the Graduate School; it would be an internal matter to the Department.

The Candidacy Examination includes both oral and written parts. The written part of the exam will consist of:

- At least one significant, open-ended problem (to assess intellectual independence)
- A critique, simulation, or analysis of one or two key papers written by non-OSU authors in the student's area of study (to assess familiarity with the relevant literature)

The written portion of the examination is made up by the entire Candidacy Exam Committee.

At least two weeks prior to date of the oral exam, the student should turn in the form entitled **Notification of Candidacy Examination** to the graduate school. This form can be obtained either from the ECE Graduate Counselor or the graduate school. This form must be signed by the advisor. It also requires the Graduate Studies Chair signature if non-Category P members are on the committee. At the time this handbook was written, the Graduate School no longer assigns an external representative to the committee, except when the student is taking the exam (oral exam only) for the second time. However, this policy can change at any time. The oral exam is 2 hours long, and the vote must be unanimous in order for the student to pass the exam.

Once the Candidacy Examination Form is completed it should be copied with the copy submitted to the Graduate Program Office and the original delivered to the Graduate School.

### ***7.6 Dissertation, Archival Paper Submission, and Final Oral Defense or "The Final Quarter"***

Research conducted by the student under the PhD program culminates in a dissertation that must be defended orally before the advisor and two other Dissertation Reading Committee members ("readers"). Unless there is a compelling reason (such as sabbatical, illness, etc.) the Dissertation Reading Committee will normally be drawn from the Candidacy Exam Committee. That is, two of the CE committee members in addition to the advisor will also be readers of the Dissertation.

When sufficient research has been completed to warrant it, the student must submit a substantial paper based upon her or his dissertation work to a refereed archival journal. The paper may be sole-authored, but will usually be coauthored with the advisor. *This submission is required before approval can be given on the* **Application to Graduate - Doctoral Program**. The intent of this requirement is to give the student experience in reporting on research at this level in a clear and concise form suitable for publication. It is also expected that the work is of a quality level and originality suitable for such publication. Typically, advisors require two or more journal submissions from their PhD students before approving the **Application to Graduate** form.

The **Application to Graduate - Doctoral Program** should be filed by the second Friday of the quarter of graduation. The student delivers this completed form to the Graduate Student



Counselor for processing and delivery to the Graduate School. For approval of the application to graduate, the student's file should also contain a **Resume** in any common form containing basic educational, employment, etc. information. You should attach a recent photograph of yourself to the resume for the departmental archives. Unless this form is in your file when you apply to graduate, the application will not be approved, and this could delay your graduation. We advise that you attend to this form well in advance of graduation. This form will also contain your dissertation reading committee, and approval of the committee by the graduate studies chair will be done through this form. If you decide to change the composition of the committee after turning in the form, the advisor must provide a written request for a change in the committee to the Graduate Studies Chair. Because of unavoidable processing delays (including the fact that the Graduate Studies Chair, who has to sign the form, could be out of town, in a meeting, or ill) you are encouraged *not* to wait until the last minute to attend to this form. *In no case will the graduate program be responsible for materials submitted to the Graduate Student Counselor later than NOON on the second Friday of the quarter of graduation.* Missing the filing deadline could cause your graduation to be delayed.

When the dissertation is near completion, the advisor notifies the Graduate School and Graduate Studies Committee via the **Doctoral Draft Approval/Notification of Final Oral Examination** form. The Final Oral Examination Committee members are named on this form and must include, at a minimum, the approved Dissertation Reading Committee. Once the Graduate School receives this notification, they will automatically generate the final dissertation approval and oral exam forms necessary to complete the process. The Graduate School also assigns an external representative to the committee to ensure the integrity of the examination and fair treatment of the student. The vote of the committee must be unanimous for the student to pass the exam.

The **Final Oral Examination** and **Final Dissertation Approval** Forms, again, are single page forms. These forms are sent directly to the advisor through e-mail before the date of the exam. Once completed these forms must be copied with the copies submitted to the ECE Graduate Program Office and the originals delivered to the Graduate School by the appropriate deadlines (Wednesday of the ninth week for the Final Examination Form and Wednesday of the tenth Week for the Final Dissertation Approval Form).

*Checklist for*  
**Ph.D. from MS Graduation Requirements**

1. Pass the Ph.D. Qualifying Examination (or your request for a waiver is approved).
2. If you graduated with the M.S.E.E. degree from Ohio State, you were required to submit a **Statement of Intent**, your thesis, and two (pink) letters of recommendation. Based upon these, you were admitted to the Ph.D. program as a Special Student until you passed the Ph.D. Qualifying Examination or as a Regular Student (the latter if you already passed the Ph.D. Qualifying Examination).
  - If applicable, as soon as you pass the Ph.D. Qualifying Examination (or waiver if approved), submit the **Transfer of Excess Master's Hours to the Doctoral Degree** form to transfer to your Ph.D. program any course hours you earned over and above the required courses for the M.S. degree.
3. If you obtained your M.S.E.E. degree at another university, you were accepted into the Ph.D. program as a Special Student until you pass the Ph.D. Qualifying Examination at which time you automatically become a Regular Student.
  - As soon as you pass the Ph.D. Qualifying Examination use the **Transfer of Graduate Credit** form to transfer 45 hours of credit for your M.S. degree into your Ph.D. program. If you have any credit taken at another university beyond the M.S. degree, use the same form to request transfer of those credits as well.
4. As soon as you pass the Ph.D. Qualifying Examination (or waiver is approved), submit your **Petition for Approval of Ph.D. Plan**. If any of this plan must change as you proceed through the program, have your advisor request such changes by writing a letter to the Graduate Studies Chair
5. Take first two credits of ECE 881 before Candidacy Examination.
  - Satisfy **Residency Requirement** (see Graduate School Handbook)
6. When you have completed your planned courses, submit the **Request for Candidacy Examination Committee** through your advisor. Include your Ph.D. Research Proposal. This should be done at least a two weeks before the first written examination.

7. Submit the form **Doctoral Notification of Candidacy Examination** to the Graduate School at least two weeks before the oral examination. (There must be at least one week between the written and the oral examination.)
8. Pass General Examination and submit the **Candidacy Examination Report** to the Graduate School. **Submit copy to ECE department**
9. Take second two credit hours of ECE 881.
10. Submit **Application to Graduate—Doctoral Degree** no later than the second Friday of the quarter of graduation. If you have not already submitted Resumé with a passport style photo attached, do so along with your application to graduate. This form also acts as your Dissertation Reading Committee Approval form.
11. Submit the form **Submission of a Paper**, along with a copy of the paper and proof of submission.
12. Notify the Graduate School of the date and location of your dissertation defense at least two weeks in advance with the form, **Doctoral Draft Approval/Notification of Final Oral Examination** along with a complete draft copy of your dissertation.
13. Pass the oral defense of your dissertation and submit the **Final Oral Examination Report** form to the Graduate School no later than Wednesday two weeks before commencement. Submit copy to ECE department.
14. Submit the dissertation and **Final Approval** form to the Graduate School no later than one week before commencement. Submit copy to ECE department
15. Graduate with Ph.D. degree

*Checklist for*  
**Direct BS-to-Ph.D. Graduation Requirements**

1. Pass the Ph.D. Qualifying Examination (or your request for a waiver is approved).
2. As soon as you pass the Ph.D. Qualifying Examination (or waiver is approved), submit your **Petition for Approval of Ph.D. Plan**. If any of this plan must change as you proceed through the program, have your advisor request such changes by writing a letter to the Graduate Studies Chair
3. Take first two credits of ECE 881 before Candidacy Examination.

Satisfy **Residency Requirement**

4. When you have completed your planned courses, submit the **Request for Candidacy Examination Committee** through your advisor. Include your Ph.D. Research Proposal. This should be done at least a two weeks before the first written examination.
5. Submit the form **Doctoral Notification of Candidacy Examination** to the Graduate School.
6. Pass General Examination and submit the **Candidacy Examination Report** to the Graduate School at least two weeks before the oral examination. (There must be at least one week between the written and the oral examination.)
7. Since you will get your MS degree after passing the candidacy exam:
  - a. Submit (before taking Candidacy Exam) (1) **Application to Graduate-Master's Degree** (2) **and Resume** with passport style photograph to the Graduate Student Counselor by the second Friday of the quarter of graduation
  - b. Submit the Master's Examination Report form to the Graduate School no later than Wednesday two weeks before commencement. Submit copy to ECE department
  - c. Graduate with MSEE degree
8. Take second two credit hours of ECE 881.
9. Submit **Application to Graduate—Doctoral Degree** no later than the second Friday of the quarter of graduation. If you have not already submitted Resumé with a passport style photo attached, do so along with your

application to graduate. This form also acts as your Dissertation Reading Committee Approval form.

10. Submit the form **Submission of a Paper**, along with a copy of the paper and proof of submission.
11. Notify the Graduate School of the date and location of your dissertation defense at least two weeks in advance with the form, **Doctoral Draft Approval/Notification of Final Oral Examination** along with a complete draft copy of your dissertation.
12. Pass the oral defense of your dissertation and submit the **Final Oral Examination Report** form to the Graduate School no later than Wednesday two weeks before commencement. **Submit copy of report to ECE department**
13. Submit the dissertation and **Final Approval** form to the Graduate School no later than one week before commencement. Submit copy to ECE department
14. Graduate with Ph.D. degree

## 8. REQUEST FOR TRANSFER OF GRADUATE CREDIT

If you have taken courses *at the graduate level* at another university, some credit *may* be transferable to your MS or PhD program here. Graduate School rules allow us to consider transfer of graduate credit only if your transcript explicitly shows the graduate level courses you wish to transfer as having been taken *after* the date you received the BS degree. They will not allow transfer of graduate level courses which were intermingled with undergraduate courses and taken *before* receiving the BS degree, even though these course credits are in excess of those required for your BS degree. Up to 9 quarter hours may be transferred into either the MS thesis option or the MS Nonthesis option. Subject to the approval of Graduate Studies Committee, up to 30 quarter hours beyond the 45 quarter hours given for the MS degree may be transferred into the PhD-from-MS program (15 credits of course work and 15 dissertation credits). Up to 39 credits of coursework and 36 dissertation credits can be transferred from another institution into direct BS-to-PhD program also subject to approval of Graduate Studies Committee. Residency requirements may limit the number of hours which may be counted toward a graduate degree, however. Under these constraints to request transfer of credit you must:

1. Fill out the two top parts of the Request for Transfer of Graduate Credit. Be sure to indicate that your credit hours were taken on a semester or quarter basis.
2. Attach a copy of your university transcript indicating which courses are to be transferred. *It must **clearly indicate** that these courses were taken for graduate credit, beyond the requirements of your BS (or MS) degree.*
3. Attach course descriptions from your university catalogue, course syllabi, or any other documentation which would help the Graduate Studies Committee evaluate the courses requested.
4. Attach a cover letter, addressed to the Chair of the Graduate Studies Committee, giving any other pertinent information, such as the texts used, the number of hours of lecture each course involved, and OSU course equivalent if possible, etc.
5. Give the entire package to the Chair of the Graduate Studies Committee. You will be notified by electronic mail of the Committee's decision. The Graduate Counselor then forwards the request to the Graduate School.

It frequently happens that a student studying for the MS degree at Ohio State takes more course credits than the 30 hours required (MS thesis option). If that student is admitted to the PhD program at Ohio State, graduate course credits (not ECE 999 or 793) over and above 30 hours transfer into the PhD program, but the transfer is not automatic; it is accomplished by submitting the form Transfer of Excess Master's Hours to the Doctoral Degree to the Graduate School via your advisor and the Graduate Studies Chair. This form should be submitted as soon as the PhD Qualifying Examination is passed, and certainly *before* the Application to Graduate - Doctoral Program form is sent to the Graduate School.

Students who study for their BSECE degree at Ohio State sometimes take more than the total credit hours required. Up to 6 quarter hours of excess credit may be applied for graduate credit under the following conditions: 1) the course is numbered 600 or above if it is in ECE, or 500 or above if it is outside of ECE; 2) a grade of B or higher is achieved and 3) a Senior Petition, obtainable from the Undergraduate Student Counselor, was filed with the Graduate School *before* the course was taken. Assuming all these conditions are satisfied, the student may request that the courses in question be transferred to his or her graduate program by

means of a letter to the Chair of Graduate Studies naming the courses and grades achieved.

## 9. COMBINED BS/MS PROGRAM

This program is designed to allow a select group of undergraduate students to earn course credits that can be applied toward satisfaction of the degree requirements of both their BSECE and MSECE simultaneously. Thus, outstanding students are given the opportunity to reduce the total time required to obtain both the BS and MS degrees. Students in this program will typically graduate with a BSECE within 3 quarters after they enter the combined program, and will then subsequently graduate with an MSECE.

The College of Engineering approved the Department of Electrical and Computer Engineering BS/MS Combined Program in November 1998.

### 9.1 Criteria

To be admitted to the combined BS/MS program, the applicant must submit documentation that demonstrates satisfactory fulfillment of the following admission criteria:

- Current registration in the Department,
- Rank of Senior at time of Combined Program initiation, and
- A minimum of 3.5 cumulative point hour ratio in all previous undergraduate work. Ordinarily, it is expected that students will have a minimum major GPA of 3.7.

### 9.2 Application Procedures

- The student should apply to the BS/MS program just as if he/she were applying to the MS program, by first obtaining the required forms from the Admissions office or the Graduate Student Counselor, who will handle all status inquiries.
- The student should be enrolled in the BS/MS program by the time he/she takes the first Technical Elective course to be credited to the MS Degree.
- Application deadlines are given below:

Admission Quarter	Deadline
Autumn	June 1
Winter	October 1
Spring	January 15
Summer	April 1

- Consideration of the application will begin only when the file is complete, as described below. Files will be routed to the Graduate Studies Committee and then to Admissions.

The following material is needed to complete the application procedure:

- Completed application form, to be sent to the Admissions Office. Write BS/MS on the application, in the box labeled "Graduate Degree Objective"; and
- Three letters of recommendation, to be sent directly to the ECE Graduate Studies Committee; and
- Statement of purpose or autobiographical statement, explaining motivation for graduate study, to be sent to the ECE Graduate Studies Committee; and
- The student's technical elective plan. Note the restrictions below on the courses to be included in this plan if they are to receive dual credit. The quarter and year in which the technical elective courses will be taken should also be noted on the technical elective plan.

Up to 9 credit hours of BS technical elective courses may receive credit toward the MS degree. In order to be eligible for graduate credit, the courses must meet the following requirements:

- Students must achieve a score of B+ or better for the course.
- Courses must be taken at OSU, and be at the 600- or 700-level.
- ECE 999, ECE 682, and ECE 683 cannot be included.
- No more than two 600-level ECE courses may be included.
- Not more than three total hours from among ECE 693, ECE 793 and/or ECE H783 can be included.
- Students can take any ECE 700-level course, or courses offered in other departments that are normally eligible for inclusion in the MSECE program, subject to the constraints listed above.
- The student's technical elective program must be received by the Graduate Studies Committee at the time of admission to the BS/MS program to ensure that it is a component of an MS course program.

The combined BS/MS program is meant to be applicable to both the Electrical and Computer Engineering BS specializations. For the purpose of counting technical elective courses to be applied to the MS program, any ECE course that would be a valid elective for the Electrical Engineering specialization (EES), also counts as a technical elective for the Computer Engineering specialization (CES). For example, ECE 662 is core in the CES program but is elective in the EES program and therefore, within the restrictions of no more than two 600-level courses be included, can be applied to the MS program.

The student should plan his/her technical electives such that he/she is not in the BS/MS plan for more than three quarters before graduation with the baccalaureate degree.

### ***9.3. Status in Graduate Program***

Following receipt of the baccalaureate degree, the student must meet the requirements of the MS program as specified by the Graduate School and the ECE Department.

### ***9.4 University Fellowship Eligibility***

Since University Fellowships are intended for recruitment, students in the Combined BS/MS program will only be eligible for nomination for Distinguished University Fellowships (DUF), which provide support for one year early in the Graduate program, and support for the final dissertation year. Accordingly, students who wish to apply for these prestigious fellowships are advised to:

- Prepare their Personal Statements and career goal statements with particular care.
- Notify all referees from whom letters of reference are being solicited that the references are to be used to support nomination for the DUF.
- Plan to take the GRE at an appropriate time.

## **10. ENGLISH LANGUAGE REQUIREMENTS**

All International students who are accepted into the University are required to take an English proficiency test administered by the Department of English. (A TOEFL score of 280 or above waives this requirement.) Depending upon the level achieved in this test a student will be placed in English 106, 107, or 108, or, if proficient enough, will have the English requirement waived. If you are placed in any course, say 107, you are required to take 107 and 108 *within your first three quarters here*. If the English requirement is not satisfied, *you*



*will not be allowed to graduate.* Thus, it is very important that you make your advisor aware of any English courses you must take so that they can be planned for in your curriculum.

All International students who apply for a Graduate Teaching Associateship must first pass a test of spoken English administered by the Spoken English Department. These tests are scheduled each quarter, as are the two courses EDU T&L 104 and 105, which help prepare students for this test. For more information, the student should call the Spoken English Department 292-5005. It must be emphasized that passing the speaking exam does not mean that a teaching associateship will be offered; it is simply a necessary step in applying for a GTA. Fellowship students should also take and pass the exam within three quarters, as Departmental funding may require them to perform GTA duties at some point in their tenure at OSU.

## 11. FINANCIAL AID

Financial aid in the Department of Electrical and Computer comes in four forms:

- University Fellowships
- Industrial Fellowships
- Graduate Teaching Associateships (GTA)
- Graduate Research Associateships (GRA)

### *11.1 Types of Appointments*

1. **University Fellowships** are supported by the Graduate School and provide tuition and fee waivers for one year (four quarters) and a monthly stipend which can change annually. Usually this stipend is somewhat lower than the Associateship stipend offered by the ECE Department. Thus the ECE Department typically augments the University Fellowship to a level commensurate with the Departmental Associateships. For this augmentation, the student will be expected to contribute some research time to the Department. Since the typical graduate student is usually eager to become involved in research, this expectation presents no burden.

The University Fellow must carry at least a 15 quarter hour course load (post candidacy PhD students must be enrolled with 3 credits), though some or all of this is expected to be ECE 793, ECE 888, ECE 891 or ECE 999 credit given for time committed to research. University Fellowships cannot be applied for; they are granted to a student based upon his or her academic background and upon the recommendation of the department. A University Fellowship is regarded by the Graduate School and the department as one of the most prestigious awards that can be granted to a graduate student as they progress to a PhD. Accordingly, students holding Fellowships are expected to engage in an active program of research which culminates in significant evidence of scholarship. Evidence of scholarship includes refereed publications, and a PhD dissertation.

2. **Industrial Fellowships** are awards made with industrial funds to newly arrived students and those who are already progressing through their graduate programs here. They are given with the recommendation of the department and concurrence of the companies involved. Most of these fellowships are intended for students in the PhD program. Stipends vary and tuition and fees are generally waived. Students with this type of appointment, must carry at least 12 quarter-hours of graduate course load (post

candidacy PhD students must be enrolled with 3 credits).

3. **Graduate Teaching Associateships (GTA)** are awarded to newly arrived and presently enrolled students as needs arise and budgets allow. Teaching Associates usually are responsible for 2 or 3 sections of an introductory laboratory course or serve as an aide to a professor teaching an introductory theory course under a halftime (20 hours/week) appointment. The appointments often extend over the three quarters (A, W, SP) of the academic year with summer appointments available to a lesser extent. However, it is hoped that the GTA will be successful in obtaining a GRA so the GTA renewal will not normally be necessary.

A number of the available GTA positions are made to new incoming graduate students. The selection is made on the basis of the student's previous academic record and the area of specialization. The remaining positions are reserved for continuing students and are granted on the basis of academic record and research progress, past teaching performance, and the course/lab positions that need to be filled.

GTA's must carry at least 12 quarter-hours of graduate course load (post candidacy PhD students must be enrolled with 3 credits). All tuition and fees are waived and stipends can change annually. A presently enrolled student who wishes to obtain a GTA appointment may submit a letter stating this fact and a recent resume to the Associate Chair for Curriculum.

4. **Graduate Research Associateships (GRA)** are awarded to newly arrived and presently enrolled students as needs arise and budgets allow. Research Associates usually are responsible for performing research tasks on a particular budgeted contract secured by an individual faculty or research staff member or laboratory group. The appointment is for halftime (20 hours/week) and the research usually leads to the satisfaction of thesis or dissertation requirements. GRA's must carry at least 12 quarter-hours of graduate course load (post candidacy PhD students must be enrolled with 3 credits). All tuition and fees are waived and stipends can change annually. Since these stipends are paid through individual research contracts, the presently enrolled student who seeks a GRA appointment must contact individual faculty members or research groups in the area of interest and see if needs and funds exist to provide support.

### ***11.2 Stipend Increases***

All starting stipends are uniform for the various forms of aid in the ECE Department. Cost-of-living increases are generally given annually and in the PhD program the Department provides uniform stipend increases corresponding to progression through the academic program, e.g., passing the PhD Qualifying Examination and passing the General Examination.

In order for a student to qualify for the first incremental stipend the student must satisfy 4 criteria:

1. Have a Master's degree (waived if admitted to direct B.S-to-PhD. program).
2. Be admitted to the Ph.D. program.
3. Pass the Ph.D. Qualifier.
4. File a **Ph.D. Plan of Study**.

In order for a Ph.D. student to get their second incremental increase, they must have passed their Candidacy Examination. The raise for each increase will become effective on the

quarter following the completion of these requirements. The deadline for all requirements is the Wednesday of the tenth week preceding your quarter of increase. Department policy requires any graduate student who receives financial aid via fellowships or associateships to refrain from outside employment. It is felt that a commitment to academic studies and research/teaching leaves no time for additional duties which may jeopardize the student's degree goals.

### ***11.3 Terms of Appointments***

Initial offerings of Fellowships, GRA's, and GTA's are always made via a formal letter of offer from the department chair and request for acceptance or declination by a stated date. These letters detail the source of funding, the duties involved, the stipend and tuition waiver, and the duration of the appointment. Follow-on appointments are usually made with similar letters, though in the case of GRA's very often less formal oral statements of continuing support are made to the student by the faculty or laboratory providing the support. Continuing GTA appointments are made by formal letters of offer.

Evaluation of performance of GRA's is made by the supporting faculty members or laboratory. These are usually informal reviews with oral feedback to the student. A similar evaluation of GTA's is made by the Associate Chair for Instruction who incorporates into the review rankings and comments made by students in the quarterly student evaluation forms.

Should a student be given an unsatisfactory performance evaluation he or she is usually made aware of the dissatisfaction and if performance is not improved, termination of the student's appointment can be made before its original termination date. This happens rarely.

Graduate student grievances are usually initially brought to the attention of the Chair of Graduate Studies who will seek information from both sides of the problem. If an accommodation cannot be found at that level, grievances can be carried to the Chair of the Electrical and Computer Department.

Benefits, other than a monthly stipend and fee waiver, usually do not accompany an appointment as Fellow, GRA, or GTA. In individual cases the department or the supporting faculty may provide conference and travel costs for a student, and a few industrial fellowships allow such expenses.

Fellowships and GRA appointments are usually 12 month appointments, with no vacation time between quarters. The student is expected to arrange for time off with his advisor/support faculty and to compensate accordingly. For example, it is common for halftime GRA students to work full time for the early part of the Christmas break in order to be with their families over the Christmas-New Year week. Appointment as a GTA requires the student to be on duty from the first day of class to the day of commencement. The student is free to do as he or she wishes during the periods between quarters.

## 12. EQUIPMENT AND COMPUTING FACILITIES

The Electrical and Computer Department has a variety of computing labs serving the needs of graduate students in their research and academic instruction. Most of these computers are part of the Learning Technology Fee (LTF) provided labs.

ECE accounts are created automatically each quarter for all students enrolled in an ECE course. LTF labs are located in DL517, DL557, DL817, and CL260. All labs have 24-hour access using your OSU BuckID card. DL557 is a Red Hat Enterprise Linux lab with such software packages as Mentor Graphics, Cadence, Matlab, LaTeX and many GNU packages. The other labs run MS Windows and contain other packages licensed for use with ECE courses.

Many faculty and laboratories also have workstations and/or PCs for their students' use. For access to private computers, please talk to your lab administrator or have your advisor send Site an email message. Almost all of the computers are tied into the ECE network which in turn has full access to the Internet. ECE has an on-site computing facilities staff to provide system maintenance and support. They can be reached at [site@ece.osu.edu](mailto:site@ece.osu.edu). More information about computing in ECE can be found on the department's web server:

<http://www.ece.osu.edu/computing>

Additionally, the university runs their own IT support group. OSU's Office of Information Technology (OIT) serves as the campus' central computing organization including the [name.number@osu.edu](mailto:name.number@osu.edu) mail servers and the OSU Wireless network. Some useful links:

OIT General Information - <http://oit.osu.edu/>

OSU Wireless - <http://osuwireless.osu.edu/>

Site Licensed Software - [http://www.oit.ohio-state.edu/site\\_license/](http://www.oit.ohio-state.edu/site_license/)

Buckeye Secure - <http://buckeyesecure.osu.edu/>

BuckeyeBar: Walk-In Technical Consultation - <http://8help.osu.edu/3461.html>

The OIT Helpdesk can be reached by calling 688-HELP or by sending email to [8help@osu.edu](mailto:8help@osu.edu). They also have a web site at <http://8help.osu.edu/>.

## 13. MISCELLANEOUS

### *13.1 Departmental Colloquia and Seminars*

During the academic year, the ECE. Department and other departments host many colloquia given by visiting scholars from industry and academia as well as by our own faculty and students. Each graduate student is urged to form the habit of attending as many of these colloquia as possible, certainly in his or her area of interest but also those which might broaden horizons. All such events are posted in advance in our department's web page and other locations around the department.

### ***13.2 Office Assignments and Keys***

The department would like to provide office space for all graduate students. However, in recent years this has been impossible due to the limited space available. The following priority will be used to allocate the available offices:

1. Graduate Teaching Associates,
2. Graduate Research Associates,
3. University, U.S. corporate and government fellowship students,
4. Other graduate students and visiting scholars.

At times it may be necessary to ask students to change offices but every attempt will be made to keep such disruptions to a minimum. Office assignments are handled by Prof. George Valco.

Graduate students with offices may obtain keys to their offices. Graduate students without offices may obtain keys to their research laboratory rooms upon the recommendation of their advisor when there is a need. All students use their OSU BuckID cards at the keycard readers to access the building. Keys are obtained by request by filling out a **Key Request** form available from the front desk. (There are two forms, one to obtain keys for Drees Laboratory and one to obtain keys for Caldwell Laboratory.) This form should be completed and signed by the faculty member responsible for the room in question. The key request form should then be presented in person to Mr. William Thalgott, Room 015 Caldwell Laboratory, (see map included – page 34) during normal working hours, Monday through Friday.

### ***13.3 Change of Address***

It is very important that any change of address be reported immediately to the Registrar's office. As a safety measure, report any change of address to the Graduate Student Counselor, Bruce W. O'Keefe (205 Drees Laboratory, [okeefe@ece.osu.edu](mailto:okeefe@ece.osu.edu)). Save yourself a lot of unnecessary grief by letting us know your most recent address!

# Basement of Caldwell Laboratory

