

# Graduate Student Handbook



DEPARTMENT OF  
**Electrical and  
Computer Engineering**  
UNIVERSITY OF WISCONSIN-MADISON

For students admitted for Fall 2016 or thereafter  
*Updated June 2016*

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# Welcome to the Electrical and Computer Engineering Department at the University of Wisconsin – Madison

Welcome to the ECE graduate program!

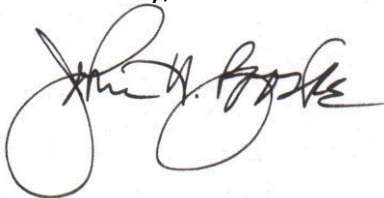
This booklet contains a summary of academic requirements that need to be satisfied as well as a variety of related information about pursuing your graduate degree at the Electrical and Computer Engineering (ECE) department, University of Wisconsin - Madison. This handbook should also answer most of your day-to-day questions concerning the routine operation of the ECE Department. A PDF version of this handbook may be downloaded online at <http://www.engr.wisc.edu/department/electrical-computer-engineering/>. Information about general guidelines for the graduate program at UW-Madison can be found in the Graduate School webpage (<http://www.grad.wisc.edu/>).

The requirements listed in this version of handbook will be applicable to ECE graduate students entering our program in Fall 2014 and thereafter. Graduate students that entered prior to Fall 2014 may petition to the ECE Graduate Committee to have specific department requirements applied to their record should the requirements differ from what are listed in previous versions of this handbook.

We have attempted to make degree requirements flexible enough to accommodate a wide range of study and research objectives. If you find that your particular situation is not adequately covered in this booklet, or if for any reason you feel your case warrants deviation from a particular rule, the ECE graduate program staff at the Student Services Center (ref. Chapter 2 of this handbook) can provide you with more details and help you identify the relevant entities within the ECE department to help with your case.

We hope you find your stay in Wisconsin both challenging and instructive.

Sincerely,

A handwritten signature in black ink, appearing to read "John H. Booske", with a large, stylized loop at the end.

John Booske,  
Professor and Chair

## 2.0 Student Services

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### Student Services Center Mission, Vision, and Objectives

**Mission Statement:** The Student Services Center within the College of Engineering at the University of Wisconsin-Madison provides support to both undergraduate and graduate students. In our 1150 and 1147 Engineering Hall offices, we support undergraduate students who are declared Civil Engineering, Computer Engineering, Electrical Engineering, or Geological Engineering majors and graduate students studying Civil and Environmental Engineering, Electrical Engineering, or Geological Engineering.

**Vision:** The vision of the Student Services Center within the College of Engineering at the University of Wisconsin-Madison is to: (1) be, and be recognized as, an effective and efficient student services center for both the students and the academic programs that we serve; (2) provide quality academic advising in partnership with the student's faculty advisor; and (3) continually ask ourselves "is this good for our students?"

**Objectives:** The Student Services Center within the College of Engineering at the University of Wisconsin-Madison will strive to attain its vision by...

- ...creating a welcoming, inclusive, and supportive learning environment for students
- ...providing services of the highest quality that help students to develop and enrich their academic abilities, personal aspirations, and professional goals
- ...facilitating students' entry into and success within graduate programs
- ...continually improving the recruitment and retention of engineering students by enhancing the COE's interaction with: (1) UW-Madison students, programs, and student service organizations and (2) prospective students.
- ...supporting and collaborating with the student organizations that serve students
- ...recruiting, supporting, and retaining the best undergraduate and graduate students, especially women and underrepresented groups
- ...assessing and evaluating the dual advisor model being piloted by the
- ...collaborating with faculty and the appropriate advising and curriculum committees within each program to help students achieve their academic goals
- ...providing student feedback to the faculty and appropriate committees within each program
- ...streamlining administrative processes amongst the Civil and Environmental Engineering, Electrical and Computer Engineering, and Geological Engineering programs

### ECE Student Services Staff:

<b>Michael Radloff</b> <a href="mailto:radloff2@wisc.edu">radloff2@wisc.edu</a> <i>ECE Graduate Student Services</i>	1147 Engineering Hall	Phone: (608) 890-2756
<b>ECE Graduate Admissions</b> <a href="mailto:ecegradadmission@engr.wisc.edu">ecegradadmission@engr.wisc.edu</a>	1147 Engineering Hall	
<b>Stacy Harnett</b> <a href="mailto:sharnett@wisc.edu">sharnett@wisc.edu</a> <i>ECE undergraduate advising</i>	1147 Engineering Hall	Phone: (608) 890-4594
<b>Cesar Martinez</b> <a href="mailto:cdmartinez@wisc.edu">cdmartinez@wisc.edu</a> <i>ECE undergraduate advising</i>	1147 Engineering Hall	Phone: (608) 890 - 4648
<b>Daryl Haessig</b> <a href="mailto:haessig@wisc.edu">haessig@wisc.edu</a> <i>Online MS Power Degree graduate student services</i>	1150 Engineering Hall	Phone: (608) 262-8819
<b>Mary Possin</b> , <a href="mailto:mcpassin@wisc.edu">mcpassin@wisc.edu</a> <i>Student Services Coordinator &amp; Supervisor; CEE undergraduate advising</i>	1150 Engineering Hall	Phone: (608) 890-2075

## 2.1 Introduction to the Electrical and Computer Engineering (ECE) Department

## 2.2 Important People to Know

### Department Administration

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**John Booske**

[http://directory.engr.wisc.edu/ece/faculty/booske\\_john](http://directory.engr.wisc.edu/ece/faculty/booske_john)

*Department Chair & Professor*

2416 Engineering Hall (EH) | 608.890.0804 | [booske@engr.wisc.edu](mailto:booske@engr.wisc.edu)

**John Gubner**

[http://directory.engr.wisc.edu/ece/faculty/gubner\\_John](http://directory.engr.wisc.edu/ece/faculty/gubner_John)

*Department Vice Chair & Professor*

*TA Coordinator*

3615 EH | 608.263.1471 | [John.Gubner@wisc.edu](mailto:John.Gubner@wisc.edu)

**Yu Hen Hu**

[http://directory.engr.wisc.edu/ece/faculty/hu\\_yu](http://directory.engr.wisc.edu/ece/faculty/hu_yu)

*Graduate Recruitment, Admissions, & Funding Chair & Professor*

3625 EH | 608.262.1073 | [hu@engr.wisc.edu](mailto:hu@engr.wisc.edu)

**Luke Mawst**

[http://directory.engr.wisc.edu/ece/faculty/mawst\\_luke](http://directory.engr.wisc.edu/ece/faculty/mawst_luke)

*Graduate Committee Chair & Professor*

4617 EH | 608.263.1705 | [mawst@engr.wisc.edu](mailto:mawst@engr.wisc.edu)

**Lori Burrow**

[http://directory.engr.wisc.edu/ece/staff/burrow\\_lori](http://directory.engr.wisc.edu/ece/staff/burrow_lori)

*Academic Department Manager*

2422 EH | 608.262.8272 | [burrow@engr.wisc.edu](mailto:burrow@engr.wisc.edu)

**Alyssa Greiber**

[http://directory.engr.wisc.edu/ece/Staff/Greiber\\_Alyssa/](http://directory.engr.wisc.edu/ece/Staff/Greiber_Alyssa/)

*ECE Communications & Event Coordinator*

2436 EH | 608.262.1073 | [alyssa.greiber@wisc.edu](mailto:alyssa.greiber@wisc.edu)

**Kathy Hall**

[http://directory.engr.wisc.edu/ece/Staff/Hall\\_Kathleen/](http://directory.engr.wisc.edu/ece/Staff/Hall_Kathleen/)

*Office Manager*

2420 EH | 608.262.3840 | [kathy.hall@wisc.edu](mailto:kathy.hall@wisc.edu)

### Computer Printing Services

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**Steve Manthey**

*Computer Printing Technician*

2415 EH | 608.262.5793 | [duplicating@engr.wisc.edu](mailto:duplicating@engr.wisc.edu)

## Financial Services

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**Amy Terpening**

*Payroll & Benefits Specialist*

2438 EH | 608.263.4279 | [amy.terpening@wisc.edu](mailto:amy.terpening@wisc.edu)

**Dwight Redders**

*Financial Specialist*

2440 EH | 608.262.3841 | [redders2@wisc.edu](mailto:redders2@wisc.edu)

**Renee Starks**

*Grants and Contract Specialist*

2442 EH | 608.262.3842 | [starks@engr.wisc.edu](mailto:starks@engr.wisc.edu)

**Todd J. Hollister**

*Associate Director of Development*

2413 EH | 608.308.5357 | [todd.hollister@supportuw.org](mailto:todd.hollister@supportuw.org)

## Keys

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**Kathy Hall**

*Office Manager*

2420 EH | 608.262.3840 | [kathy.hall@wisc.edu](mailto:kathy.hall@wisc.edu)

## Student Services Center Staff

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**Michael Radloff**

*ECE Graduate Student Services Coordinator*

1147 EH | 608.890.2756 | [radloff2@wisc.edu](mailto:radloff2@wisc.edu)

**Daryl Haessig**

*Online MS-Power Degree Student Services Coordinator*

1150 EH | 608.262.8819 | [haessig@wisc.edu](mailto:haessig@wisc.edu)

**Mary Possin**

*Supervisor of Student Services Center and Academic Advisor*

1150 EH | 608.890.2075 | [mcpossin@wisc.edu](mailto:mcpossin@wisc.edu)

## Wendt Commons: Teaching and Learning, Information, Media

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**Laura Schmidli**

*Liaison Librarian to ECE*

213A Wendt Commons | 608.890.4621 | [laura.schmidli@wisc.edu](mailto:laura.schmidli@wisc.edu)

*Teaching and Learning Services*

411 Wendt Commons | 608.265.1178 | [tls@engr.wisc.edu](mailto:tls@engr.wisc.edu)

*Engineering Media Services*

1712 EH | 608.890.3325 | [ems@engr.wisc.edu](mailto:ems@engr.wisc.edu)



## 2.3 Department of Electrical and Computer Engineering Policies and Information

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### Academic Conduct

The ECE Department assumes that all students possess high academic integrity. This means that all homework and exams are solely the product of the student whose name appears on the paper and that it truthfully represents work completed by the student. Students who fail to maintain this standard are subject to disciplinary action according to the University of Wisconsin Administrative Code UWS 14, found online at: <https://students.wisc.edu/doso/docs/UWS14.pdf>. For more information, contact the Division of Student Life, <http://students.wisc.edu/>.

### Address Changes

It is extremely important to keep your contact information up-to-date. Address changes should be made at your **MyUW** account

### Advisors

All students must have a faculty course (academic) advisor. Faculty contact information for the major areas of study are listed online at <http://directory.engr.wisc.edu/ece/faculty/>.

### Building Access and Keys

Building keys for outside doors and offices are issued to those graduate students who have been assigned desk or lab space. Other students may receive keys, if they obtain written permission from a supervising faculty member. A deposit of \$5 is required for each key; all keys must be returned or renewed each semester. Students needing keys should see staff in Room 2420 Engineering Hall. The building is open from 7:00 a.m. to 10:00 p.m. Monday through Friday and 7:00 a.m. to Noon on Saturday. The building is closed on Sundays and football Saturdays.

### Building Manager

Report any maintenance problems in Engineering Hall to David Downing [djdowning@wisc.edu](mailto:djdowning@wisc.edu) or (608) 417-9886. In case of an emergency, dial 911.

### Computing Facilities

Computer Aided Engineering (CAE) has many facilities. See <http://www.cae.wisc.edu/> for details.

### Desk Space

See faculty advisor for information on desk space.

### Division of Information Technology (DoIT) (<http://www.doit.wisc.edu/>)

The Division of Information Technology (DoIT) provides a variety of technology services to the University of Wisconsin-Madison, as well as limited service to UW System and other State entities. Their services span desktop-to-server-to-mainframe computing, networks, telecommunications, Internet connectivity, administrative and academic systems, security, instructional technology, plus many support services.

### Division of Information Technology (DoIT) Help Desk (<http://kb.wisc.edu/helpdesk/>)

The Division of Information Technology (DoIT) Help Desk plays a key role in helping DoIT fulfill its strategic direction, "Provide Outstanding Delivery of Technology Services." The Help Desk is committed to customer service excellence by making support services readily available 24 hours a day, providing an excellent online knowledgebase and well-trained professional staff to answer your questions, and by continuously looking for ways to improve and expand services.

### **ECE Copy Center**

ECE operates duplicating machines in Room 2415. This facility is managed by the Duplicating and Supplies Manager and is used exclusively for department administration, instruction, and research. **DUPLICATING MACHINES ARE NOT FOR PERSONAL USE.** Normally, only students who have research assistantships and teaching assistantships are given a key and required code numbers. Other students must use local photocopy shops or copiers in the libraries.

### **ECE Directory**

Those students who have appointments in ECE or anywhere else on campus will be included in the directory for that semester.

### **Email**

Most ECE information is sent by email. All incoming students are issued an Office 365 @wisc.edu email account. This email account must be kept activated and cleaned out at all times.

### **Engineering Career Services (ECS)**

ECS staff provides resources and expertise in the areas of career exploration, resume writing, interviewing skills, co-ops, internships, and full-time jobs. ECS provides services to MS and PhD students. They offer assistance in skills assessment and transitioning from student to professional, including negotiating offers. In addition, we connect employers with University of Wisconsin-Madison engineering students through their on-line myECS recruiting system (for resume access), Fall and Spring Career Connection career fairs and on-campus interviews. For more information visit the ECS website: [www.go.wisc.edu/myecs](http://www.go.wisc.edu/myecs).

### **Enrollment in Courses**

You will receive an invitation to enroll email from the Office of the Registrar. Please enroll for courses at your assigned time. If you do not, courses might close or be cancelled. Please seek course advice from faculty advisors before enrolling. Information on courses offered in ECE can be found at: <http://courses.engr.wisc.edu/ECE/>.

### **Financial Support: Financial support is available through a variety of appointments.**

- 1) Research Assistantships: Students should contact professors in their area of interest. Professors decide whom they will appoint on their research grants.
- 2) Teaching Assistantships: Current graduate students may apply to teaching assistantship or hourly grader positions at the ECE TA/grader portal: <https://www.aims.wisc.edu/tagrader/Default.aspx> Non-native English speakers are required to pass the SPEAK Test <http://www.english.wisc.edu/esl/speak.htm> at the English as a Second Language Program on campus. Students wishing to take the SPEAK Test should contact the Student Services Center at 1147 Engineering Hall to register for the exam.
- 3) Project Assistantships: There are a few project assistant opportunities on campus. Announcements of openings are posted on TA/PA bulletin boards in Engineering Hall and on the UW Job Center Web Page. <http://www.jobcenter.wisc.edu/>
- 4) Fellowships: Information concerning fellowships is sent to graduate students through email and may also be available through in the Student Services Office in 1147 Engineering Hall.
- 5) Grader Positions: Current graduate students may apply to teaching assistantship or hourly grader positions at the ECE TA/grader portal: <https://www.aims.wisc.edu/tagrader/Default.aspx>.



### **Grants Information Collection**

The Memorial Library has a Grants Information Collection. This library collection of print and on-line resources assists students in finding external funding, grants, scholarships and fellowships. Students may make individual appointments with the grants librarian to customize their fellowship search. Please visit <http://grants.library.wisc.edu> for more information.

### **Mailboxes**

All graduate students are assigned mailboxes outside the ECE Department Office, 2420 Engineering Hall. All students should check to see if their names are listed. Students should report missing names to the staff in 2420 Engineering Hall. The mailbox names are re-organized at approximately the third week of every semester. Students should check their boxes daily for university and department information. Personal mail should be sent to home addresses. Student mailboxes will be emptied of any remaining materials after each semester.

### **Parking**

For parking information, go to [www.fpm.wisc.edu/trans](http://www.fpm.wisc.edu/trans).

### **Payroll**

All funded graduate students must contact the Payroll and Benefits Specialist in 2438 Engineering Hall as soon as they arrive on campus. Many payroll and insurance forms need to be completed before students can be placed on the payroll or be covered by insurance. These benefits have early deadlines. Graduate students with at least a 33.3% appointment are eligible for university health insurance programs and tuition remission.

### **Travel**

Graduate students are sometimes provided with funding by a supervising professor for travel to conferences. Before making travel arrangements, students must see the Financial Specialist in room 2440 Engineering Hall. This is necessary to eliminate the possibility of incurring unexpected expenses, which cannot be covered by university funds.

### **Wendt Commons**

The [Engineering Learning Center](#), [Engineering Media Services](#) and [Wendt Library](#) are consolidated under the name "Wendt Commons." Location: 215 N. Randall Avenue. Website: <http://wendt.engr.wisc.edu/>.

### **Teaching and Learning Services**

Teaching and Learning Services (TLS) utilizes a range of educational professionals to provide a single place to connect faculty, instructors, TAs, graduate students and tutors with services and resources related to teaching and learning. The TLS group includes information professionals from the library (liaison librarians), learning technologists, IT professionals, instructional designers, and project coordinators. Services include pedagogical and instructional design consultations, assistance with course management systems, guidance on integrating online learning technologies, and collaboration on innovative education grants. If you aren't sure where to go or what to do, TLS is a great place to start. Email: [tls@engr.wisc.edu](mailto:tls@engr.wisc.edu) or Telephone: (608) 265-1178

### **Engineering Media Services**

Engineering Media Services maintains the media equipment in many of the College of Engineering conference rooms, classrooms, and labs. They also offer a variety of services and hands-on help to the engineering community. Website: <http://www.engr.wisc.edu/services/ems/> Email: [ems@engr.wisc.edu](mailto:ems@engr.wisc.edu). Telephone: (608) 263-3163. Location: 1712 Engineering Hall.

**Library and Information Services**

Wendt Commons Library connects students and researchers to high quality information and user-centered services anytime, anywhere. Resources include books (both in print and electronic), journals, standards, patents and government documents. Services include literature review consultations, article and book delivery, equipment checkout, new publication alerts, citation management, data management, and publishing/copyright assistance. Website:

<http://wendt.library.wisc.edu/> Email: [askwendt@engr.wisc.edu](mailto:askwendt@engr.wisc.edu). Telephone: (608) 262-3493. The librarian for Electrical and Computer Engineering graduate students is Laura Scmidli & Anne Glorioso ([laura.scmidli@wisc.edu](mailto:laura.scmidli@wisc.edu); 608.890.4621 & [anne.glorioso@wisc.edu](mailto:anne.glorioso@wisc.edu); 608.265.9217).

**Writing Center** (<http://www.wisc.edu/writing>)

The University of Wisconsin-Madison's Writing Center serves undergraduate students, returning students, graduate students, dissertators, English as a Second Language (ESL) students, faculty, staff, and teaching assistants. Please refer to

<http://www.wisc.edu/writing/AboutUs/DoForYou.html> for additional information about the Writing Center's services.

**Course Offerings & Syllabi**

The ECE Department does have a tentative plan for course offerings for future semesters. This future course offerings plan may help students plan their individual curriculums. However, it is important to note that this course offering plan is tentative and subject to change per semester and per the department's resources to run the course. You can find this future course offering plan here: <https://docs.google.com/spreadsheets/d/1CUETMGMkhtTKB5GI7JaHo2t-3oh3xVGYMNWbUogf8do/edit#gid=0>

Similarly, you may find syllabi for the department's courses available here to learn more about courses you are interested in taking:

<https://uwmadison.box.com/s/64b9mwys3yrdneb2jj77w2crrfwzp7or>

## 2.3.1 Policy on Sexual Harassment

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Sexual harassment is a community concern. When sexual harassment occurs, it degrades the quality of work and education at the University of Wisconsin-Madison. It erodes the dignity and productivity of the individuals involved and diminishes the quality, effectiveness, and stature of the institution. It can occur in any university setting (an office, a classroom, a university program). Each of us has a collective responsibility not to harass others and to act responsibly when confronted by the issue of sexual harassment, thereby promoting an environment that better supports excellence in teaching, research, and service. (Taken from: <http://www.oed.wisc.edu/sexualharassment/index.html>)

### What is Sexual Harassment?

Unwelcome sexual advances, requests for sexual favors, and verbal or physical conduct of a sexual nature constitute sexual harassment when submission to such conduct is a condition of employment, academic progress, or participation in a university program; or submission to or rejection of such conduct influences employment, academic or university program decisions; or the conduct interferes with an employee's work or a student's academic career, or creates an intimidating, hostile or offensive work, learning, or program environment.

### Key Points About Sexual Harassment

- Differences in power or status can be a significant component in sexual harassment. A person who seems to acquiesce to sexual conduct may still experience tangible action harassment or hostile environment harassment if the conduct is unwelcome.
- Harassment can occur between men and women or between members of the same gender.
- Sexual harassment may or may not involve a tangible injury (e.g., economic loss, lowered grades). A sexually harassing environment, in and of itself, may constitute a harm.
- Individuals in positions of authority are responsible for ensuring that employees, students or others do not harass. In an academic or program setting, offenders can be faculty, instructors, lecturers, teaching assistants, coaches, tutors, or fellow students or program participants.
- The person filing a sexual harassment charge does not have to be the person harassed but could be anyone significantly harmed by the harassing conduct.
- Some behavior that is not in violation of university policy may, nonetheless, be unprofessional under the circumstances. Consequences of such unprofessional behavior may include poor performance evaluations or possible discipline.

### What to do if you feel you've been sexually harassed:

- Seek advice. Consult your department chair, another divisional resource person, the Office of Equity and Diversity (<http://www.oed.wisc.edu/>), or another campus resource to discuss options for resolution.
- You may choose to seek informal resolution or file a sexual harassment complaint. You may find more information on filing a complaint at <http://www.oed.wisc.edu/dishar.html>.
- For additional information, please visit: <http://www.oed.wisc.edu/sexualharassment/do.html>.

### For more information on discrimination against students and other resources:

- Discrimination Complaints Policies & Procedures: <http://www.oed.wisc.edu/discrimination-against-students.htm>
- Cases of suspected child abuse and/or neglect: [http://oed.wisc.edu/documents/UW-Madison\\_Policy\\_on\\_Child\\_Abuse\\_and\\_Neglect.pdf](http://oed.wisc.edu/documents/UW-Madison_Policy_on_Child_Abuse_and_Neglect.pdf)

## 3.0 Requirements for the M.S. Degree

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### 3.1 Degree Credit Requirement

UW-Madison Graduate School policy states that the M.S. degree requires at least 30 credits of courses (300 level or above, no audits or pass-fail) completed as a graduate student at UW-Madison: <http://grad.wisc.edu/acadpolicy/#minimumgraduatedegreecreditrequirement>

The ECE department requires 30 credits for an M.S. degree (see sections 3.2.1 – 3.2.3 below) and does **not** count ECE 300-level courses toward M.S. or Ph.D. requirements.

### 3.2 ECE MS Degree Options

There are three distinct “options” or plans of study, from which students must choose in order to fulfill the requirements for the ECE M.S. degree: Thesis, Project, and Course.

#### 3.2.1 Thesis Option

To fulfill the requirements of the Thesis Option, the student must earn **30 graduate credits**, attained with acceptable grades as defined in Section 7. Of these 30 credits, at least 15 must be in ECE Courses 400-level or higher, and at least 15 must be in courses numbered 700 or higher. Only graduate courses, namely those courses listed or approved for listing in the Graduate School Bulletin are applicable for graduate credit, with the exceptions that 300-level ECE courses and ECE 702 are not acceptable. ECE 890 and 990 are not applicable to the M.S. degree.

Of the 30 credits, a minimum of 3 and a maximum of 9 credits must be in ECE 790 (Master’s Research or Thesis). These ECE 790 credits are applicable toward both the 15 ECE credit requirement and the 700-level requirement. The combined number of credits in ECE 790, ECE 699, and ECE 999 (Advanced Independent Study) applied toward the degree may not exceed 9.

Each student who elects the Thesis Option is required to perform research in consultation with a faculty advisor. At the conclusion of the research program, a thesis must be prepared. The thesis must: 1) conform to Graduate School and library formats; 2) be approved by the advisor; 3) (if required by your advisor) be filed with the Memorial Library where it is catalogued and stacked for future reference; and 4) an electronic copy must be sent to the ECE Graduate Student Services Coordinator, who will deposit it into Minds@UW, Department of Electrical and Computer Engineering Thesis Collection. The Minds@UW system will provide a permanent URL, safe long-term archiving and is indexed by Google, Google Scholar and other specialty academic search engines.

At the conclusion of the thesis, all grades of P (Progress) and I (Incomplete) in ECE 790 are changed to either S (Satisfactory) or U (Unsatisfactory) by the advisor. In the final semester the student is required to check in at the ECE Graduate Student Services Office to apply for a degree warrant by the announced deadline. The MSEE Course Approval Form is available in the Graduate Student Services office or online:

[https://www.engr.wisc.edu/app/uploads/2016/01/ECEGradMSEECourseApprovalForm\\_with\\_DH\\_edits.pdf](https://www.engr.wisc.edu/app/uploads/2016/01/ECEGradMSEECourseApprovalForm_with_DH_edits.pdf)

### 3.2.2 Project Option

The Project Option consists of the same credit and course requirements as the Thesis Option. Under this option, the student must perform a research project in consultation with a faculty advisor. At the conclusion of the project, a report is prepared. The research project is generally more limited in scope than a thesis and typically is not awarded as many credits. The report need not conform to Graduate School and library formats, but it must be typewritten. The student's advisor must approve the report. No library or Minds@UW copy is required (see section 3.2.1), but may be requested by the faculty. In the final semester, the student is required to check in at the ECE Graduate Student Services Office to apply for a degree warrant by the announced deadline. The MSEE Course Approval Form is available in the Graduate Student Services office or online at:

[https://www.engr.wisc.edu/app/uploads/2016/01/ECEGradMSEECourseApprovalForm\\_with\\_DH\\_edits.pdf](https://www.engr.wisc.edu/app/uploads/2016/01/ECEGradMSEECourseApprovalForm_with_DH_edits.pdf)

### 3.2.3 Course Option

The Course Option consists of **30 credits of graduate level courses**, as defined in Section 3.1, and attained acceptable grades as described in Section 7. Of these, at least 15 credits must be in ECE courses 400-level or higher, at least 15 credits must be in courses numbered 700 or higher, **AND** at least 9 credits must be in ECE courses numbered 700 or higher. At most, 6 credits may be in ECE 699 or ECE 999. ECE 702, 790, 890, and 990 are not counted as part of these 30 credits. No thesis or project is required.

The student is strongly encouraged to seek faculty guidance in designing a course program for this option. In particular, students should be aware that faculty in certain areas are unwilling to supervise Ph.D. students who have not written a Master's thesis. A student who intends to pursue a Ph.D. should check with faculty in the area in which his or her main interests lie.

In the final semester the student is required to check in with the ECE Graduate Student Services Office to apply for a degree warrant by the announced deadline. Students may use the MSEE Course Approval form to check credits, level and breadth requirements. This form must be completed and signed by the student's advisor and the Graduate Committee chair in order for the completion of degree. The MSEE Course Approval Form is available in the Graduate Student Services office or online at:

[https://www.engr.wisc.edu/app/uploads/2016/01/ECEGradMSEECourseApprovalForm\\_with\\_DH\\_edits.pdf](https://www.engr.wisc.edu/app/uploads/2016/01/ECEGradMSEECourseApprovalForm_with_DH_edits.pdf)

### 3.3 ECE 600 Seminar Requirement

All on-campus ECE graduate students must register for ECE 600 during their first semester of graduate studies. MS-degree seeking students must take 2 credits of ECE 600 in the Fall semester of which they are entering the program. Due to the additional credits, ECE 600 will count towards the 30 credits required by the MS degree.

The purpose of ECE 600 is to expose students in their first semester of graduate school to various areas within ECE and to areas outside of ECE to which ECE has or could have connections, e.g., biotechnology, physics, mathematics, business, software. Electrical and Computer Engineering is very interdisciplinary in nature, and so it is important that students be aware of state-of-the-art research in areas other than their own.

### 3.4 Fundamentals Requirement

All graduate students seeking an M.S. degree in Electrical and Computer Engineering are responsible for demonstrating proficiency in four out of the five areas of undergraduate study: Electrodynamics, Circuit Analysis, Signals and Systems, Electronics, and Digital Systems. The list of corresponding ECE core course numbers are 220 or 320, 230, 330, 335 or 340, and 352.

Proficiency of a core area is defined as taking an equivalent core course at an EE, ECE or CE department of an ABET-accredited institute and receiving a grade equivalent to a B or better.

A student who is deemed proficient in fewer than four of the five core areas will be required to take corresponding undergraduate courses during the first academic year in the MSEE program and receive a grade B or above to establish proficiency in that area. Alternatively, a student may choose to take the fundamental examination during the first two semesters in the MSEE program in the deficient core areas and pass the examination to establish proficiency. Students who fail to demonstrate proficiency in at least four out of the five core areas by the end of the second semester will not be granted an M.S. degree.

### ***Fundamentals Exam***

The M.S. Fundamentals Examination is administered on a Saturday morning about halfway through each of the Fall and Spring semesters. The exam is composed of five separate parts, each consisting of two problems related to a single course. Each student is allowed to take any of the five parts he or she chooses during the first and second semesters of graduate study. Different parts may be taken in different semesters; any part may be attempted in both semesters. Copies of past examinations may be available from the Student Services staff in 1147 Engineering Hall when students sign up to take the exam.

A student who has twice either failed or not attempted the part of the exam corresponding to that course, and needs to show proficiency in that area to complete the four-out-of-five-area requirement, must take the course at UW-Madison and receive at least a B prior to graduation. Taking the same course more than once is permitted. For added flexibility, the student may choose to substitute ECE 320 for ECE 220, or ECE 335 for ECE 340, or both.

## **3.5 English Competency for Non-Native English Speakers**

Effective written and oral communication is vital for a successful academic career. International students whose native language is not English will be required to take the **English as a Second Language Assessment Test (ESLAT)**, offered by the English as a Second Language (ESL) Program.

The ESLAT must be taken as soon as the student arrives at the university. The test is offered in the Fall and Spring during the week before the beginning of instruction. For more information, see the ESL home page at <http://www.english.wisc.edu/esl/international-students-placement.htm>

Based on ESLAT performance, specific ESL courses may be recommended. These courses **must** be taken and passed within 12 months of the ESLAT. Otherwise, the student will not be permitted to register during the third semester after entering the graduate program. Any ESL courses numbered 300 or above can be counted towards graduate degree requirements but not toward ECE course requirements. Completion of ESLAT and recommended courses are also a requirement for graduation of an international student whose native language is not English.

Students are exempt from taking the ESLAT if:

- English is the exclusive language of instruction at the undergraduate institution; **or**
- they have earned a degree from a regionally accredited U.S. college or university not more than 5 years prior to the anticipated semester of enrollment; **or**
- they have completed at least two full-time semesters of graded course work, exclusive of ESL courses, in a U.S. college or university, or at an institution outside the U.S. where English is the exclusive language of instruction, not more than 5 years prior to the anticipated semester of enrollment.

## 4.0 Power Engineering at a Distance MS Degree

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In collaboration with Engineering Professional Development (EPD), the ECE department offers an online MSEE degree in power engineering. All courses except one intersession course (see section 4.4) are offered at a distance (online).

### 4.1 Requirements

Off-campus students seeking an MS degree in electrical engineering must meet all general MS degree requirements. Students may work on the thesis or project while off campus, but **must keep in contact with their faculty advisor**. For more information, students should contact:

#### Student Services

<https://epd.wisc.edu/online-degrees/>

Engineering Professional Development

Ms. Daryl Haessig

733 Extension Building | 432 N. Lake St. | [haessig@wisc.edu](mailto:haessig@wisc.edu) | 608.262.8819

### 4.2 Program Requirements

Please refer to section 3.0 of the Graduate Handbook for an explanation of the MS requirements. Distance students and on-campus students must meet the same degree requirements.

### 4.3 On-Campus Intersession Course Requirement

A minimum of one three-week, on-campus intersession course in ECE must be taken **with any of the graduate program options (i.e., Thesis, Project, or Course)**.

### 4.4 Seminar Requirement

Students may fulfill the ECE seminar requirement (see ECE 600) through equivalent substitutions. More information on the ECE 600 requirement for distance students can be found here:

<http://go.wisc.edu/ECE600>

### 4.6 Fundamentals Requirement

All distance students must fulfill the ECE Fundamentals requirement (see above, section 3.4). Off-campus students may take the Fundamentals Examination(s) with a proctor, but proctored exams must be taken at the same time as the on-campus exams are administered. Please email Daryl Haessig if you want to take a proctored Fundamentals Examination.

Please contact the ECE Graduate Student Services Office with questions about Fundamentals.



## 5.0 Requirements for the Ph.D. Degree

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### 5.1 Residence Requirement

The Ph.D. degree requires at least 51 credits of graduate level courses (300-level or above, no audits or pass-fail) taken as a graduate student. At least 32 credits must be taken at UW-Madison. <http://grad.wisc.edu/acadpolicy/#minimumgraduatedegreecreditrequirement>

ECE 702, 890, and 990 may be applied toward partial fulfillment of this requirement.

### 5.2 ECE Course Requirements

The **Primary Area Course Requirement**<sup>1</sup> consists of a list of University of Wisconsin Courses specified by each of the graduate research areas (see Section 6 for details). These courses must be taken in the same specialty area that the student declares when registering for the Ph.D. Qualifying Examination. After the student takes the Qualifying Exam and achieves Advance Graduate Standing, a different specialty area may be chosen only with the approval of the ECE Graduate Committee. **A grade point average of 3.3 or higher must be achieved for all courses used to satisfy the primary area requirement.** A special primary area course program tailored for a student whose interests do not lie within a single area requires approval by the student's advisor and the ECE Graduate Committee at least one year before the Preliminary Examination. **Research and independent study courses cannot be used to satisfy the primary area course requirement.** Courses used to fulfill the Primary Area requirements cannot be used to fulfill other PhD course requirements. The Primary Area Course Approval form is available in Room 1147 Engineering Hall or online at: <https://www.engr.wisc.edu/department/electrical-computer-engineering/academics/ece-admission-forms/>.

The **Secondary Area Course Requirement**<sup>2</sup> consists of a minimum of six credits of University of Wisconsin ECE courses numbered 700 or higher outside the student's primary area. Secondary area courses need not be in the same ECE specialty area, and cannot be used to satisfy the student's PhD minor program. **No research courses can be used to satisfy this requirement.** ECE 702 may not be used for this purpose. **The secondary area courses must be achieved with a grade point average of 3.25 or higher.** Up to six credits of the secondary area courses may be substituted with other graduate-level courses if approved by the student's advisor and the ECE graduate committee following submission of a coherent course plan that justifies the substitution. The Secondary Area Course Approval form is available in Room 1147 Engineering Hall or online at: <https://www.engr.wisc.edu/department/electrical-computer-engineering/academics/ece-admission-forms/>.

#### 5.2.1 Seminar Requirement

In order to promote student professional development, all on-campus ECE graduate students are expected to register for ECE 600 during their first year of graduate studies. PhD-degree seeking students must take 2 credits of ECE 600 in the Fall semester of which they are entering the program and 2 credits of ECE 600 in the following Spring semester. This requirement must be done in the PhD student's first year. Due to the additional credits, these four credits of ECE 600 will count towards the 51 credits required by the PhD degree.

The purpose of ECE 600 is to expose students in their first two semesters of graduate school to various areas within ECE and to areas outside of ECE to which ECE has or could have connections, e.g., biotechnology, physics, mathematics, business, software. Electrical and

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<sup>1</sup> Courses used to satisfy this requirement may not be used to satisfy other Ph.D. course requirements.

<sup>2</sup> Note that it is not required that all 6 credits be in the same area to satisfy this requirement.

Computer Engineering is very interdisciplinary in nature, so it is important that students be aware of state-of-the-art research in areas other than their own. Additionally, the Spring semester section of ECE 600 will have an emphasis to assist PhD students in their studies.

### 5.3 Minor Requirement

Supplementary to the major ECE field of study, each ECE Ph.D. candidate is required to complete a minor course requirement. Typical minor fields for ECE students are non-ECE Engineering disciplines, Computer Science, Mathematics, Physics, Physiology, and Statistics.

The minor, whether in a single department (Option A) or distributed in two or more departments including ECE (Option B), is designed to represent a coherent body of work, and should not simply involve an after-the-fact ratification of a number of courses. Upon completion of all minor courses, a copy of the approved Minor Agreement Form must be placed in the student's file.

To satisfy Option A, a student must earn at least nine credits from a single degree program outside the ECE department and satisfy the requirements of the minor department.<sup>3</sup> The minor department may require more than 10 credits--many require 12 credits. Check with the minor department before taking courses. A grade point average of at least 3.0 must be achieved for each minor course. Approval of the courses for the Option A minor is certified by the minor department. A course cross-listed with the ECE Department may be used for the minor only if the course is staffed by the minor department; at most one such course may be used, and this course cannot be applied to any other Ph.D. requirement of the ECE Department.

To satisfy Option B, a student must earn at least nine graduate credits in two or more departments, and can include ECE course work not used for any other Ph.D. course requirement. A grade point average of at least 3.0 must be achieved for each minor course. A planned program, approved by the student's advisor, must be submitted to the designated ECE Graduate Committee representative for approval. Three credits must be numbered 700 or higher in each of at least two of the Option B departments. The Option B minor form may only be submitted to the student's file after all approved courses are satisfactorily completed.

Ph.D. students from other UW-Madison graduate programs who wish to earn a minor degree in ECE are required to complete a minimum of 9 credits of ECE courses numbered 400 or above, approved by the ECE department with grades of B or better. In addition, at least three of these credits must be earned in courses numbered 700 or above. At most, one course cross-listed with the student's major program may be counted toward the minor credits provided such a course is taught by ECE faculty. Moreover, such a course cannot be applied to satisfy the student's major requirements. No examinations are required other than those given in the courses.

Approval forms for the Minor Requirement are available from the Graduate Student Services office or online at: <https://www.engr.wisc.edu/department/electrical-computer-engineering/academics/ece-admission-forms/>

### 5.4 Getting a Master's Degree Along the Way

Students initially admitted to Ph.D. programs may pursue a Master's Degree in the ECE department or in another department along the way.

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<sup>3</sup> The minor department may require more than 10 credits - many require 12 credits. Check with the minor department before taking courses.

#### 5.4.1 Getting an ECE Master's Degree Along the Way

Students initially admitted to the ECE Ph.D. program who then decide to also pursue an MS degree in ECE must meet the Fundamentals Requirement (see Section 3.6). However, they are allowed to make two attempts at passing the Fundamentals Exam at any time rather than restricted to the first two semesters of study.

#### 5.4.2 Getting a Master's Degree in Another Department Along the Way

Courses taken in a minor department for the ECE minor requirement may be used toward a master's degree in the minor department if the ECE and the minor departments agree.

### 5.5 Ph.D. Qualifying Examination

All enrolled ECE students intending to pursue a Ph.D. are required to take the Ph.D. Qualifying Examination. A student must complete at least one semester of full-time graduate course work before taking the examination. All graduate students must take the examination no later than the fourth semester after admission to the ECE Graduate Program (summers not included). If a second attempt is required, it must occur no later than the fifth semester after admission. If a student leaves the department (e.g. to work between M.S. and Ph.D. degrees), the time spent away from study will not count as part of the four semesters. In addition, one extra semester will be allotted for every two semesters the student is away, leaving the student with at most four semesters after returning to take the exam the first time. These rules apply to every graduate student, including those who initially pursue an M.S. degree. The Qualifying Examination is given twice a year, during the fall and spring semesters. **Only enrolled ECE graduate students are allowed to participate in the Ph.D Qualifying Exams.**

The Qualifying Examination is a general examination that places emphasis on a student's ability to reason, formulate and solve problems, apply basic engineering and analytical skills, and communicate effectively. Special emphasis is placed on the student's area of specialization.

A committee of three ECE professors, selected by the Graduate Committee, will examine each student. Two examiners are chosen from the student's area, and one is chosen from one of the remaining areas. No faculty should be serving on a student's exam committee more than once whenever possible.

Because part of the test will examine communication skills, students who have difficulty conversing in English are advised to take the necessary steps toward improvement in spoken English prior to taking the Qualifying Examination.

The detailed structure of the Ph.D. Qualifying Examination is as follows:

- 1) Upon registration for the exam, the Graduate Committee selects three examiners for each student as follows.
  - a) First, two faculty are chosen from the student's specialty area. Specialty areas are listed in Section 6.
  - b) Next, one examiner is chosen from those faculty who are not part of the student's primary area.

Generally, one committee will examine all students in a particular area. If there are a large number of students in a particular area taking the exam in a given semester, more than one committee may be needed to accommodate all the students. In this case students will be assigned to one of the area's committees.

- 2) Students must contact the examiners and arrange convenient times for taking the various parts of the exam. Rooms reservations can be made through the ECE department office.
- 3) The entire exam is held within a two-week period designated by the Graduate Committee. The examination period is announced at the beginning of each semester.
- 4) The format for the exam is as follows. The committee will assign a scholarly paper for the student to read and review, and that will form the basis of presentation to the committee. The paper will be assigned at least 10 days prior to the examination. During the oral exam, the student should be prepared to give a 15 minute presentation on the paper. The remainder of the exam will be a question and answer session. The questions should determine the student's competency in primary area material. The questions may address the student's review of the paper, but are not limited to the paper. The committee will also assess the student's communication skills.
- 5) Each faculty members independently grades the exam, turning in a grade of either Excellent, Pass, Marginal, or Fail. Note: the student does not learn the results of his or her exam. Faculty should not inform the student of his or her grade, and the student should not ask.
- 6) Grades are tabulated for each student at the end of the examination period and are forwarded to the Graduate Committee. The grades become part of the student's case for achieving Advanced Graduate Standing.
- 7) No student may take the exam more than twice.

## **5.6 Advanced Graduate Standing (AGS)**

AGS is the departmental designation for official permission to pursue a Ph.D. degree. The Graduate Committee grants AGS. The process of evaluation for AGS is based on: 1) the student's performance on the Ph.D. Qualifying Examination; 2) performance in graduate courses; and 3) letter of recommendation from the student's research advisor. Any additional supporting material (such as publications) the student wishes to provide is also welcome. With regard to condition 2), although a grade point average of 3.3 is the minimum requirement for satisfaction of the Primary Area and Secondary Area Course Requirements, a substantially higher overall GPA in graduate course work is usually required before AGS is granted.

Each student is automatically evaluated for AGS after taking the Ph.D. Qualifying Examination. Notification of the outcome of the review is made by e-mail. If a student is turned down at the first AGS review, he or she is notified of the reasons with an indication of how and to what extent the student's chances of receiving AGS in the future can be improved. Typically, such a student is required to retake the Qualifying Exam. No student is reviewed for AGS more than twice. A student who is turned down for AGS a second time will be dropped from the Ph.D. program.

## **5.7 English Competency Requirement**

Non-native speakers of English who enroll in the Ph.D. program must take the ESLAT test on arrival at the university and then take any recommended courses based on the exam results. In addition, if a student's advisor believes that his or her technical writing ability needs improvement, the student may be required to undertake remedial work. See Section 3.5.

## 5.8 Preliminary Examination

Every Ph.D. student is required to pass the Preliminary Examination. Before taking the Preliminary Exam, the student must first achieve Advanced Graduate Standing (AGS) and satisfy the English Competency Requirement. All Incomplete (I) grades must be cleared prior to requesting the Preliminary Warrant. Grades of Progress (P) in ECE 890 are acceptable. After completion of the preliminary exam, the ECE 890 grade must be cleared, and the student should register for three (3) credits of ECE 990 in future semesters.

The Preliminary Examination is a detailed examination covering the proposed research leading to the Ph.D. thesis. The purpose of the exam is to ascertain the capability of the student to perform the proposed research and the quality and appropriateness of the project. The examination is generally oral and is administered by a committee convened by the student with the approval of the student's research advisor. The committee consists of no less than three (but preferably five) members, at least two of which must be selected from the ECE Department<sup>4</sup>. Some minor departments require that a representative from their department serve on the committee.

It is the student's responsibility to request a copy of the Preliminary Examination Warrant from the Student Services staff, at least four weeks prior to the date of the examination. The ECE Staff should be kept apprised of any changes in scheduling of room or time of the exam. There is no limit to the number of times a student may take the Preliminary Examination.

## 5.9 Dissertator Status

As soon as a student has passed all the requirements for the Ph.D. degree (except completion of the dissertation), the student is classified as a Dissertator. Specifically, the student must:

- 1) Take the Ph.D. Qualifying Examination;
- 2) Be awarded Advanced Graduate Standing;
- 3) Have completed 32 graduate credits at UW-Madison;
- 4) Satisfy the Primary Area Course Requirement;
- 5) Satisfy the Secondary Area Course Requirement;
- 6) Satisfy the Minor Requirement;
- 7) Satisfy the English Competency Requirement;
- 8) Satisfy the ECE 600 Seminar Requirements;
- 9) Pass the Preliminary Examination.

**A Dissertator must be continuously registered for three credits each semester** (including the summer sessions) until the Ph.D. is obtained. Ordinarily, a Dissertator registers for ECE 990, Research or Thesis. Registration must be maintained every semester, regardless of whether the student is performing research on or off campus. In addition, Dissertators who are Research Assistants or who are using university facilities must also register for summer sessions. Failure to satisfy the continuous registration requirement results in loss of Dissertator status. All the requirements for dissertator status must be completed by the Friday before the first day of classes for the semester in which the student first registers as a Dissertator.

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<sup>4</sup> The graduate school does not monitor prelim committees, but does restrict degree committees. See the footnote under [Final Oral Examination](#).

### 5.10 Final Oral Examination

An oral examination is required in defense of the completed Ph.D. dissertation. The examination is administered by a committee appointed by the Dean of the Graduate School, upon recommendation by the student's research advisor. The committee must consist of five or more members of the graduate faculty<sup>5</sup> and is chaired by the student's advisor. At least one and no more than three members must be chosen from outside the ECE Department. **A student must provide copies of their Ph.D. thesis to defense committee members at least two weeks prior to the scheduled defense.**

The Final Examination cannot be taken until all other requirements for the Ph.D. have been satisfied, including being eligible to receive Dissertator Status. The student's record must be cleared of all Incomplete and Progress "P" grades (ECE 990 grades can be cleared after the student has successfully defended their dissertation).

Students must request the Final Examination Warrant from the Student Services Office, Room 1147 Engineering Hall, at least three weeks prior to the date of the examination. The Student Services office must be notified of the student's examination date, time, and other defense details AT LEAST one week prior to the examination. There is no limit to the number of times a student may take the Final Oral Examination.

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<sup>5</sup> Academic staff may serve as one of the five members. An emeritus professor may serve as one of the five members within one year of retirement. If an emeritus professor has been retired more than one year but less than two years, the chair of the committee (advisor) can request (with an explanation) that the graduate school allow the emeritus professor to serve as one of the five members. Otherwise, the graduate school will probably suggest that the emeritus professor serve as a sixth member of the committee.

## 6.0 Ph.D. Primary Area Course Requirement

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The eight areas within the ECE Department have established the following Primary Area Course Requirements for their Ph.D. students:

### 6.1 Automatic Control Systems

- Professors: Barmish, DeMarco, Lesieutre, Lessard, Sethares
- Requirement: ECE 717, 817, 821, at least six credits from list (1), and at least 3 credits from list (2).
- (1) ECE 719, 739, 777, 818, 901, Math 521
- (2) ECE 730, Math 831

### 6.2 Biomedical Engineering

- Professors: Booske, Hagness, Hu, Jiang, Ma, Milenkovic, Nowak, Shohet, Van Veen, van der Weide, Willet (Lu)
- Requirement: At least 12 credits of ECE courses, only 3 of which may be at the 600-level or below and at least 3 credits of coursework in the biological sciences at the 300 level or higher. The specific course plan must be approved by a committee of three ECE faculty from Biomedical Engineering area, which may include the advisor. Courses that are cross-listed with Electrical and Computer Engineering are not eligible to satisfy the biological sciences requirement. Examples of suitable biological sciences courses include Physiology 335, Neuroscience 524, BME 510, BME 520, Zoology 523, Zoology 570, and Biochem 501.

### 6.3 Communications and Signal Processing

*(Includes: machine learning, optimization, image processing, information theory, coding theory, detection, estimation, networks)*

- Professors: Boston, Gubner, Hu, Jog, Lessard, Loh, Milenkovic, Nowak, Papailiopoulos, Sayeed, Sethares, Van Veen, Willett (Lu)
- Requirement: ECE 729, 730, 735, 830, Math 521, and at least three credits selected from the following list: ECE 532, 533, 537, 539, 641, 734, 736, 738, 842, and 901.

### 6.4 Computer Engineering

- Professors: Davoodi, Hu, Kim, Li, Lipasti, Morrow, Ramanathan, Zhang
- Requirement: At least eighteen credits selected from the following list: ECE 453, 537, 551, 552, 553, 554, 555, 556, 707, 750, 751, 752, 753, 755, 756, 757, and 901. The selected courses must include 552 and at least one of 453 or 554; at least two of the courses must be numbered 700-901. A student may be exempted from up to six credits of this requirement by use of: 1) equivalent courses taken as an undergraduate student; 2) equivalent courses taken as a graduate student elsewhere; or 3) other relevant courses not listed. Exemptions must be approved by the student's advisor. Courses used for exemption may not be used to satisfy other Ph.D. degree requirements such as the Secondary Area Course Requirement or the Minor Requirement. Exemption may not be used to satisfy the requirement for two courses at the 700-901 level.



## 6.5 Electromagnetic Fields and Waves

- Professors: Anderson, Behdad, Booske, Hagness, Hitchon, Kats, Shohet, van der Weide, Wendt
- Requirement: At least twelve credits selected from the following list: ECE 545, 547, 740, 742, 744, 748, 749, 841, 848, and 901. No more than two semesters of ECE 906 can be used to fulfill this requirement. ECE 740 is considered to be the core course for this area and is strongly recommended.

## 6.6 Energy and Power Systems

- Professors: DeMarco, Jahns, Lesieutre, Ludois, Sarlioglu, Venkataramanan
- Requirement: ECE 411, 412, 427 (or equivalents—these courses are often taken by students as part of their undergraduate curriculum), 12 credits from the list below, with a minimum of 9 credits in courses numbered 700 or above, selected from the following list, consistent with the student's focus of research and approved by the student's academic advisor: ECE 504, 511, 512, 711, 712, 713, 714, 723, 731.
- Students with strong interdisciplinary interests (e.g.,: control, reliability, materials, optimization techniques, numerical methods, electro-magnetics, energy policy, thermal issues, electric transportation, wind energy) may take up to a maximum of 6 credits in a related area upon approval by their academic adviser. Note: ECE 512 is not regularly scheduled.

## 6.7 Plasmas and Controlled Fusion

- Professors: Anderson, Hitchon, Shohet, Wendt
- Requirement: ECE 525, and three credits selected from the following list: NEEP 526, ECE 527, or 528, and at least one of the following courses: ECE 724, 725, 726, 748, 848, and 908.

## 6.8 Solid State Electronics and Photonics

- Professors: Botez, Hitchon, Jiang, Kats, Knezevic, Ma, Mawst, Shohet, van der Weide, Yu
- Requirement: At least 18 credits selected from the following list: ECE 434, 445, 466, 536, 541, 542, 544, 548, 549, 601, 602, 741, 743, 745, 746, 845, 901, 913. Of these, at least 6 credits must be earned in courses level 500-602 (of which no more than 3 credits can be earned in 601 and 602 combined, and only for special topics within the SSEP area, at the discretion of the student's advisor), and at least 9 credits must be earned in courses level 700-913.

## 7.0 Criteria for Grade Acceptability for Advanced Degrees

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- 1) A grade of B or better in any graduate course is acceptable. A grade of “S” in ECE 790, 890 and 990 is acceptable.
- 2) A grade of BC in an ECE classroom course is acceptable, provided the total cumulative GPA for graduate ECE classroom courses is greater than or equal to 3.00.
- 3) A grade of C or lower in an ECE classroom course is not acceptable.
- 4) A grade of BC or lower in an independent study course (ECE 699 or ECE 999) or a grade of U in Research or Thesis (ECE 790, 890 or 990) is not acceptable.
- 5) A grade of BC or C in a non-ECE course is acceptable only if approved by the Graduate Committee.
- 6) If students are unable to complete course work by the end of the term, an instructor may enter a temporary grade of I for incomplete. If students have not resolved all incompletes by the end of the next fall or spring term in which they are enrolled, they are considered in bad standing by the Graduate School; however, the instructor may impose an earlier deadline. If not resolved within this time period, the grade is considered unsatisfactory and will remain an “I” unless changed to a final grade by the instructor. An unresolved I grade lapses to a grade of PI after five years. Students may be placed on probation or suspended from the Graduate School for failing to complete the work and receive a final grade in a timely fashion. Outstanding incompletes must be resolved before a degree is granted. Please see the Graduate School policy on Incompletes:  
<http://grad.wisc.edu/acadpolicy/#incompletes>

## 8.0 Recommended Progress Toward Advanced Degrees

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Permission for an M.S. or Ph.D. student in Electrical and Computer Engineering to continue in the Graduate School is contingent upon progress toward a degree at a rate that is satisfactory to the Department of Electrical and Computer Engineering. These regulations apply to all graduate students, with or without appointments. Part-time students may make progress at a slower rate; their rate of progress is evaluated on a case-by-case basis.

A full-time student who meets the requirements listed below, within the time intervals indicated, is deemed to be making satisfactory progress toward the M.S. or Ph.D. degree. A full-time student who fails to meet these requirements may be denied permission to continue in the Graduate School. The ECE Graduate Committee may permit departures from this schedule upon recommendation of the student's major advisor.

The following list summarizes acceptable progress for a graduate student entering with only a B.S. degree and pursuing both an M.S. and a Ph.D. Appropriate modifications should be made for students either entering with an M.S., or pursuing just an M.S. or Ph.D. The following guidelines should not be interpreted as a Schedule of Classes for the average student; most students find it practical and desirable to progress more rapidly than is outlined here.

- 1) 1st calendar year of study:** (12 consecutive months): Take ESLAT if required and take recommended course, if any. Complete 18 credits of advisor-approved graduate courses with a grade of B or better in each course. A grade of BC is also admissible if it is obtained in a course other than ECE 790, 890, or Advanced Independent Study and the student maintains at least a 3.0 ECE grade point average. Complete the ECE 600 seminar requirement. Take the Fundamentals Exam (if required).
- 2) 2nd calendar year of study:** Complete 18 graduate credits with acceptable grades. Complete the M.S. degree. Take Qualifying Exam. Achieve Advanced Graduate Standing.
- 3) 3<sup>rd</sup> calendar year of study:** Complete 18 graduate credits with acceptable grades. Satisfy the ECE Course Requirements.
- 4) 4<sup>th</sup> calendar year of study:** Complete 18 graduate credits with acceptable grades. Satisfy the Minor Requirement. Pass the Preliminary Exam.
- 5) Additional Study:** Enroll as a dissertator for a minimum of three graduate credits each semester and summer session, and continue Ph.D. thesis research.

Each semester the Graduate Committee reviews the progress of all Ph.D. students who have not completed their degree requirements after five years of study. Permission to continue in the Graduate School may be denied if the Graduate Committee determines that it is unlikely that the student can finish the Ph.D. degree in a reasonable period of additional study.

## 9.0 Academic Probation

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Students with marginal or questionable undergraduate records are sometimes admitted on probation. A student is placed on probation at the end of any semester or summer session in which his or her graduate cumulative grade point average falls below 3.0. Removal from probation takes place when the cumulative grade point average becomes 3.0 or better.

While on probation, a Ph.D. student is not eligible to take the Preliminary Examination or the Final Oral Examination. Unusual situations can be handled by appeal to the Graduate Committee Chair. Any student while on probation must earn a grade point average of 3.0 or better every semester or summer session. The Graduate Committee will recommend to the Graduate School that any student who is on probation and obtains a grade point average of less than 3.0 during a semester or summer be dropped from the Graduate School.

ECE 790 or 890 is not considered for the purpose of probation determination. ECE 699 or 999 (Advanced Independent Study) is considered for probation determination only if a grade of BC or lower is attained in that course.

Audit courses or pass/fail courses may not be used to satisfy the full load requirement of probationary students. Students cannot graduate while on probation.

## 10.0 Enrollment Requirements, TA and RA Appointments

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All students using University facilities must be enrolled in university credits according to Graduate School regulations. **Students must be enrolled during the semester in which they graduate.**

The Graduate School enforces enrollment requirements and restrictions for students with Teaching and Research Assistantships. For details, please refer to <http://grad.wisc.edu/acadpolicy/#enrollmentrequirements>

Please note that summer enrollment requirements are different than Fall and Spring rules.

International students have strict enrollment requirements and should consult with an advisor from International Student Services Office <http://iss.wisc.edu/> with questions about their visa regulations.

For TA or RA applications, please refer to section 2.3 “Financial Support.”

## 11.0 Part-Time Study

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Students who are employed full-time elsewhere may elect to pursue a graduate degree on a part-time basis. For these students the timing indicated in certain sections of this booklet may be relaxed on an individual basis by Graduate Committee action. Specific rules of concern are those having to do with minimum progress, the Fundamentals Requirement, and Probation.

Part-time International students should be aware of potential restrictions imposed upon them by their visas and should contact the International Students Services Office.

## 12.0 Special Student Status

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Students enrolled as special students (university special students) are considered non-degree candidates. No currently enrolled graduate degree candidate may enroll as a special student. Prior to beginning a graduate program, an international student may enroll for English 110, 114, 115, 116, 117, 118, 122, 326, 327, 328, 333, and 334 as a special student. Graduate-level work done as a special student prior to enrolling in the Graduate School cannot be counted toward the Graduate School's minimum credit requirement and will not be included in the calculation of the graduate GPA.

However, a department/program may wish to count these credits toward department/program course requirements or, in rare circumstances, appeal to the Graduate School to transfer credits to meet the minimum credit requirements for a graduate degree provided the work was not done to prove admissibility to the Graduate School.

## 13.0 Research Courses and Independent Study Courses

Research courses (ECE 790, 890 and 990) and independent study courses (ECE 699 and 999) are both variable-credit courses, but they are designed for different purposes:

- Research courses are for pursuing research that leads to a master's thesis, a master's project report or a doctoral dissertation.
  - 790: Master's Research or Thesis (M.S. candidates preparing a thesis or project)
  - 890: Pre-Dissertator's Research (Ph.D. students who have *not yet* achieved dissertator status)
  - 990: Research or Thesis (Ph.D. students who *have* achieved dissertator status)
- Independent Study courses are for studying material that is not available as a regular course, or for studying a topic area to aid in pursuing research.

Students are responsible for properly registering for the research course that matches their current status in the graduate program. For example, master's degree candidates pursuing the thesis or project option must stay registered in ECE 790 through the semester/session in which they are awarded the degree. If pursuing research in the semester immediately after an M.S. degree is awarded, a student should then register for ECE 890. Research courses are sometimes confused with independent study courses (ECE 699, 999) for registration purposes. If you are pursuing research that leads to a project report or thesis, ECE 790, 890, or 990 is appropriate.

If you are studying material that is not offered as a regular classroom course, or need to study a topic area to aid you in pursuing your thesis research, then ECE 699 or 999 is appropriate.

ECE 699, 790, 890, 990, and 999 are all authorization courses that require department approval before registration. Forms are available in room 1147 Engineering Hall and online at: <https://www.engr.wisc.edu/departments/electrical-computer-engineering/academics/ece-admission-forms/>. Complete and return as noted before registering.

### 13.1.a. Requesting Course Equivalency for Graduate Credits Taken at Other Universities

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The ECE department recognizes that equivalent **graduate** coursework taken at other institutions may fulfill ECE requirements. **The department offers students the opportunity to fulfill up to 9 credits of ECE course requirements with previous graduate coursework for which they earned a grade of B or better.**

Although equivalent course credits may count toward various specific ECE course requirements, they do **NOT** count as transferred credits toward the minimum number of graduate credits which must be taken at UW-Madison, nor will they appear on the UW-Madison Transcript.

The graduate committee handles course equivalency requests on a case-by-case basis. Students should request course equivalency using the form available in Room 1147 EH or online: <https://www.engr.wisc.edu/departments/electrical-computer-engineering/academics/ece-admission-forms/>. Information required includes a copy of the transcript showing the course which was taken, an official syllabus, a copy of the catalog description for each course, and the name and number of the UW-Madison course the student feels is equivalent. The student must also state for which requirement the equivalent course will be used.

**If the previous credits were part of a completed master's degree, they may be used for doctoral requirements only, not an additional master's.**

**If the previous credits were part of a completed bachelor's degree, they may not be used to fulfill graduate requirements.**

### 13.1.b. UW-Madison Graduate School Requirements for Re-entry students

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If you were enrolled as a graduate student but have had a break in enrollment for a minimum of a fall or spring term, you will need to apply to resume your studies. Please review The Graduate School requirements for re-entry students <http://www.grad.wisc.edu/education/admissions/reentry.html>

**\*\*\*You will also need to follow the ECE department policy for re-entry students.** Before filling out the online application, please ask your previous faculty advisor to contact/e-mail the ECE Graduate Admissions Coordinator. They must verify that they would like the Graduate Admissions Committee to review your application and also verify that they are willing to advise you if you are re-admitted. Please note that the Graduate School does not require you to submit new letters of recommendation to your online application, however, the ECE Graduate Admissions Committee may ask for updated material.

**On the cover:**

Buckingham U. Badger holds up an Electrical & Computer Engineering  
T-Shirt at the department's New Student Welcome event.

*(Photo by Alyssa Greiber)*