INTRODUCTION TO COE AND ECE

Ph.D. students in the College of Engineering (COE) are among an elite group of people who have chosen to advance their education at one of the premier engineering colleges in the country. The academic programs in UW–Madison’s College of Engineering are highly ranked and our faculty are widely recognized as leaders in their fields. Here you will find a community in which you will excel. You will find faculty, staff, and peer students who are supportive and committed to your success. You will find rigorous coursework that will prepare you to achieve your goals. You will experience an environment highly conducive to collaboration—and you will meet faculty with a broad range of research interests and connections both on campus and around the world.

In partnership with our students, it is the mission of the ECE Department to:

• Educate and inspire future leaders who contribute to society through the creation, application, and transfer of electrical and computer engineering knowledge.

• Expand knowledge through research into new technologies, design methods, and analysis techniques.

• Serve the state of Wisconsin, our nation, and the world with electrical and computer engineering expertise.

PH.D. IN ELECTRICAL ENGINEERING

The ECE Ph.D. degree program emphasizes creative and original approaches to solving problems. Our laboratory facilities provide opportunities for research in a wide range of fields associated with electrical and computer engineering, including: computer architecture; computer design; machine learning; mobile systems; nanofabrication and microelectronics; signal processing; biological and biomedical systems; microwave devices, circuits, and antennas; computational electromagnetics; photonics and optics; wireless networks and systems; plasmas and controlled fusion; and electric machines, power systems, and power electronics. Students have the opportunity to pursue and perform Ph.D. research within interdisciplinary cooperative projects.

When applying for the ECE Ph.D. program, students are required to choose a specific area of interest from one of the four sub-disciplines of research in the Department, although the decision is not binding: applied physics, computing, information systems, and power.

The ECE doctoral program provides in-depth training in research and allows students multiple opportunities to publish, especially with the student’s own final research thesis. The doctoral program involves: a study phase with course requirements in the student’s major area of study, as well as supplementary areas and a minor area; a qualifying exam that establishes the student’s suitability to continue with their Ph.D.; a preliminary examination in which the student describes their proposed dissertation research; and, finally in culmination, the presentation and oral defense of an original research thesis. All ECE Ph.D. students are required to earn a doctoral minor, either a distributed minor involving courses from multiple departments, or an external minor entirely in a different department. Typical minor programs draw upon the expertise of mechanical engineering, computer sciences, math, or physics, but students may choose other areas as well. The ECE Ph.D. program typically requires five years of study beyond the bachelor’s degree, although the exact time to degree completion varies depending on research progress.

Students with a bachelor’s degree may apply directly to the ECE Ph.D. program. Ph.D. students also have the opportunity to earn a Research M.S. along the way to their Ph.D.

For more information on this specific degree plan, please visit the ECE website (https://www.engr.wisc.edu/department/electrical-computer-engineering/academics/doctor-philosophy-electrical-engineering).

ADMISSIONS

Please consult the table below for key information about this degree program’s admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program’s website. Graduate admissions is a two-step process between academic programs and the Graduate School. Applicants must meet the minimum requirements (https://grad.wisc.edu/apply/requirements) of the Graduate School as well as the program(s).

Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/apply).

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>This program does not admit in the spring.</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>This program does not admit in the summer.</td>
</tr>
<tr>
<td>GRE (Graduate Record Examinations)</td>
<td>Required.*</td>
</tr>
<tr>
<td>English Proficiency Test</td>
<td>Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (<a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a>).</td>
</tr>
<tr>
<td>Other Test(s) (e.g., GMAT, MCAT)</td>
<td>n/a</td>
</tr>
<tr>
<td>Letters of Recommendation Required</td>
<td>3</td>
</tr>
</tbody>
</table>

* Applicants who have earned, or will be earning before starting the program, a bachelor’s degree from UW-Madison are exempt from submitting a GRE test score.

An applicant must have a bachelor’s degree from a regionally accredited U.S. institution or a comparable degree from an international institution. International applicants can find specific information for their country on the Graduate School Admission Requirements (http://grad.wisc.edu/admissions/requirements) page. The department welcomes applications from scientific, engineering, and mathematical disciplines other than ECE.

Admission Requirements:

• A grade point average of 3.0 (4.0 basis) is the minimum requirement for admission consideration. Applicants from an international institution must demonstrate strong academic achievement comparable to a 3.0. The Graduate School will use your institution’s grading scale. Please do not convert your grades to a 4.0 scale.
• A submitted online application is required, consisting of:
  • your resume/CV;
  • a statement of purpose (see the guidelines (https://grad.wisc.edu/apply/prepare) provided by the Graduate School);
  • an uploaded transcript; and
  • payment of the one-time application fee of $75.
    • This fee is nonrefundable. It can be paid by credit card (MasterCard or Visa) or debit/ATM card. By Wisconsin state law, this fee can only be waived or deferred through the conditions outlined by the Graduate School (https://grad.wisc.edu/apply/fee-grant).
  • Applicants must also obtain three letters of recommendation for consideration.

  • Graduate Record Exam (GRE) general test scores are required for all applicants. Please send your scores electronically via ETS to institution code 1846. UW undergraduate students, specifically those who have a B.S. degree in electrical engineering or computer engineering, may be exempt from the GRE requirement. Please inquire with the E C E Graduate Admissions Team at ecegradadmission@engr.wisc.edu.
  • Applicants whose native language is not English must provide an English proficiency score. There are a few situations in which applicants are exempt from this requirement. Please see the Graduate School’s English Proficiency Requirement (https://grad.wisc.edu/apply/requirements), which also lists the exemptions and required method of delivery.

The application deadline for fall is December 15 of the year prior to starting the program (example: December 15, 2018, for fall 2019). There are no spring or summer admission cycles. Only completed applications, including supportive materials, by the application deadline are guaranteed consideration. Please note that it is highly advised to take the GRE and TOEFL/IELTS tests well in advance of the deadline to ensure time for receiving and processing the scores.

If you have any admissions questions, please contact the E C E Graduate Admissions team at ecegradadmission@engr.wisc.edu.

**FUNDING**

**GRADUATE SCHOOL RESOURCES**

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

**PROGRAM RESOURCES**

Ph.D. students entering the program in Fall 2019 or later will receive a financial support package at the time of admission that may include some combination of research and teaching assistantships, internal and external fellowships, and other sources.

**RESEARCH ASSISTANTSHIPS**

Students should contact professors in their area of interest. Professors decide whom they will appoint on their research grants.

**TEACHING ASSISTANTSHIPS AND GRADER POSITIONS**

Current graduate students may apply for teaching assistantships or hourly grader positions via the ECE TA/Grader Portal (https://www.aims.wisc.edu/tagrader/Default.aspx). Students currently holding a research assistant or fellowship position that are interested in teaching assistant positions should discuss options with their research advisor before applying.

Non-native English speakers are required to pass the SPEAK Test (http://www.english.wisc.edu/esl/speak.htm) through the English as a Second Language Program on campus. Students wishing to take the SPEAK Test should contact the ECE TA Coordinator via e-mail to register for the exam.

**PROJECT ASSISTANTSHIPS**

There are project assistant opportunities on campus. Announcements of openings are posted on TA/PA bulletin boards in Engineering Hall and on the UW Job Center webpage (http://www.jobcenter.wisc.edu).

**FELLOWSHIPS**

Information concerning fellowships is sent to graduate students through email from the department, faculty, and/or the Graduate School.

**REQUIREMENTS**

**MINIMUM GRADUATE SCHOOL REQUIREMENTS**

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/requirements), in addition to the program requirements listed below.

**MAJOR REQUIREMENTS**

**MODE OF INSTRUCTION**

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Mode of Instruction Definitions**

**Evening/Weekend:** These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

**Online:** These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

**Hybrid:** These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

**Accelerated:** These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.
CURRICULAR REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Credit Requirement</td>
<td>51 credits</td>
</tr>
<tr>
<td>Minimum Residence Credit Requirement</td>
<td>32 credits</td>
</tr>
<tr>
<td>Minimum Graduate Coursework Requirement</td>
<td>Half of degree coursework (26 credits out of 51 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide.</td>
</tr>
<tr>
<td>Overall Graduate GPA Requirement</td>
<td>3.00 GPA required</td>
</tr>
</tbody>
</table>

Other Grade Requirements

1. A grade of B or better in any graduate course is acceptable. A grade of S in E C E 790 Master's Research or Thesis, E C E 890 Pre-Dissertation Research and E C E 990 Research or Thesis is acceptable.
2. A grade of BC in an E C E course is acceptable, provided the total cumulative GPA for graduate E C E courses is greater than or equal to 3.00.
3. A grade of C or lower in an E C E course is not acceptable.
4. A grade of BC or lower in an independent study course (E C E 699 Advanced Independent Study or E C E 999 Advanced Independent Study) or a grade of U in Research or Thesis (E C E 790, E C E 890 or E C E 990) is not acceptable.
5. A grade of BC or C in a non-E C E course is acceptable only if approved by the Graduate Committee.
6. If students are unable to complete coursework 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.

Assessments and Examinations

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 E C E Seminar Requirements;
9. Pass the Preliminary Examination.

Language Requirements

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.

Doctoral Minor/Breadth Requirements

All doctoral students are required to complete coursework in a primary area, a secondary area, and one or more minor areas. Students are expected to consult with their advisors concerning minor/breadth requirements.

REQUIRED COURSES

Students choose from one of eight graduate research areas for their Primary Area:

Automatic Control Systems

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>E C E 717</td>
<td>Linear Systems</td>
<td>3</td>
</tr>
<tr>
<td>E C E 817</td>
<td>Nonlinear Systems</td>
<td>3</td>
</tr>
<tr>
<td>E C E 821</td>
<td>Optimal Control and Variational Methods</td>
<td>3</td>
</tr>
</tbody>
</table>

Select 6 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>E C E 719</td>
<td>Optimal Systems</td>
</tr>
<tr>
<td>E C E/M E 739</td>
<td>Advanced Robotics</td>
</tr>
<tr>
<td>E C E/CBE/ MATH 777</td>
<td>Nonlinear Dynamics, Bifurcations and Chaos</td>
</tr>
<tr>
<td>E C E 901</td>
<td>Special Topics in Electrical and Computer Engineering</td>
</tr>
<tr>
<td>MATH 521</td>
<td>Analysis I</td>
</tr>
</tbody>
</table>

Select 3 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>E C E 730</td>
<td>Modern Probability Theory and Stochastic Processes</td>
</tr>
</tbody>
</table>

1 These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Biomedical Engineering

At least 12 credits of E C E 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 E C E 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 ANAT&PHY 335 Physiology, B M E/CBE 510 Introduction to Tissue Engineering, B M E/CBE 520 Stem Cell Bioengineering, ZOOLOGY/PSYCH 523 Neurobiology, ZOOLOGY 570 Cell Biology, and BIOCHEM 501 Introduction to Biochemistry.

These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Communications, Machine Learning, and Signal Processing

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 521</td>
<td>Analysis I</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose 9 credits from the following:

- ECE 729 Theory of Information Processing and Transmission
- ECE 730 Modern Probability Theory and Stochastic Processes
- ECE 734 VLSI Array Structures for Digital Signal Processing
- ECE 735 Signal Synthesis and Recovery Techniques
- ECE 736 Wireless Communications
- ECE 738 Advanced Digital Image Processing
- ECE 761 Mathematical Foundations of Machine Learning
- ECE 830 Estimation and Decision Theory
- ECE/COMP SCI 861 Theoretical Foundations of Machine Learning

Credits from ECE 901 Special Topics in Electrical and Computer Engineering can be applied toward the 9-credit requirement with advisor approval.

These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Computer Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 18 credits from the following list:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- ECE 453 Embedded Microprocessor System Design (Must take one of these.)
- or ECE 454 Mobile Computing Laboratory  
- or ECE 554 Digital Engineering Laboratory
- ECE 537 Communication Networks
- ECE 551 Digital System Design and Synthesis
- ECE/COMP SCI 552 Introduction to Computer Architecture (Must take this class.)
- ECE 553 Testing and Testable Design of Digital Systems
- ECE 555 Digital Circuits and Components
- ECE 556 Design Automation of Digital Systems

Must include at least 2 courses from below:

- ECE/COMP SCI 707 Mobile and Wireless Networking
- ECE/COMP SCI 750 Real-time Computing Systems
- ECE 751 Embedded Computing Systems
- ECE/COMP SCI 752 Advanced Computer Architecture I
- ECE 753 Fault-Tolerant Computing
- ECE/COMP SCI 755 VLSI Systems Design
- ECE/COMP SCI 756 Computer-Aided Design for VLSI
- ECE/COMP SCI 757 Advanced Computer Architecture II
- ECE 901 Special Topics in Electrical and Computer Engineering

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. An exemption may not be used to satisfy the requirement for two courses at the 700-902 level.

These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

Electromagnetic Fields and Waves

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose 12 credits from the following:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- ECE 545 Advanced Microwave Measurements for Communications
- ECE 547 Advanced Communications Circuit Design
- ECE 740 Electromagnetic Theory (Strongly recommended)
- ECE 742 Computational Methods in Electromagnetics
- ECE 744 Theory of Microwave Circuits and Devices
- ECE 748 Linear Waves
- ECE/N/E/PHYSICS 749 Coherent Generation and Particle Beams
- ECE 841 Electromagnetic Radiation and Transmission
- ECE/PHYSICS 848 Nonlinear Waves
- ECE 901 Special Topics in Electrical and Computer Engineering (no more than 2 semesters can be used to fulfill this requirement.)

These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.
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**Energy and Power Systems**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>E C E 411</td>
<td>Introduction to Electric Drive Systems</td>
<td>3</td>
</tr>
<tr>
<td>E C E 412</td>
<td>Power Electronic Circuits</td>
<td>3</td>
</tr>
<tr>
<td>E C E 427</td>
<td>Electric Power Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose 12 credits from the following list:

- E C E 504 Electric Machine & Drive System Laboratory
- E C E 511 Theory and Control of Synchronous Machines
- E C E 512 Power Electronics Laboratory
- E C E 711 Dynamics and Control of AC Drives
- E C E 712 Solid State Power Conversion
- E C E 713 Electromagnetic Design of AC Machines
- E C E 714 Utility Application of Power Electronics
- E C E 723 On-Line Control of Power Systems
- E C E 731 Advanced Power System Analysis

Students with strong interdisciplinary interests (e.g., control, reliability, materials, optimization techniques, numerical methods, electromagnetics, 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: E C E 512 is not regularly scheduled.

These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

**Solid State Electronics and Photonics**

Choose at least 12 credits from the following:

- E C E 434 Photonics
- E C E 445 Semiconductor Physics and Devices
- E C E 466 Electronics of Solids
- E C E 536 Integrated Optics and Optoelectronics
- E C E 541 Analog MOS Integrated Circuit Design
- E C E 542 Introduction to Microelectromechanical Systems
- E C E 548 Integrated Circuit Design
- E C E 549 Integrated Circuit Fabrication Laboratory
- E C E 601 Special Topics in Electrical and Computer Engineering
- E C E 741 Semiconductor Diode Lasers and other Optoelectronic Devices
- E C E 743 High-Power Diode Lasers and Amplifiers
- E C E 745 Solid State Electronics
- E C E/PHYSICS 746 Quantum Electronics
- E C E 845 Transport in Semiconductor Devices
- E C E 901 Special Topics in Electrical and Computer Engineering

Of these, at least 3 credits must be earned in courses level 400-602 and at least 6 credits must be earned in courses level 700-901

These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

**Secondary Area Course Requirement**

The Secondary Area Course Requirement consists of a minimum of six credits of University of Wisconsin E C E courses numbered 700 or higher outside the student's primary area. Secondary area courses need not be in the same E C E specialty area, and cannot be used to satisfy the student's Ph.D minor program. No research courses can be used to satisfy this requirement, but E C E independent study may with justification. E C E 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 E C E graduate committee following submission of a coherent course plan that justifies the substitution. The Secondary Area Course Approval form is available in online at: https://
The Graduate School Handbook (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

**MAJOR-SPECIFIC POLICIES**

**GRADUATE PROGRAM HANDBOOK**

The Graduate Program Handbook (https://www.engr.wisc.edu/department/electrical-computer-engineering/academics/ece-graduate-student-handbooks) is the repository for all of the program's policies and requirements.

**PRIOR COURSEWORK**

**Graduate Work from Other Institutions**

With program approval, students are allowed to count graduate coursework from other institutions toward the minimum graduate degree credit requirement and the minimum graduate coursework (50%) requirement. No credits from other institutions can be counted toward the minimum graduate residence credit requirement. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

**UW–Madison Undergraduate**

With program approval, up to 7 credits from UW–Madison numbered 400 or above can be counted toward the minimum graduate degree credit requirement. Up to 7 credits of ECE courses numbered 700 or above can be counted toward the minimum graduate coursework (50%) requirement. No credits can be counted toward the minimum graduate residence credit requirement.

With program approval, students may count up to 7 credits of undergraduate coursework from a bachelor of science degree in Electrical Engineering, Computer Engineering, Electrical and Computer Engineering, Electrical Engineering and Computer Science, or Computer Science from an ABET-accredited program at other institutions (not UW–Madison) toward fulfillment of minimum degree requirements.

Graduate School policy is that courses numbered 300 or above may be counted towards the minimum graduate degree credit requirement and courses numbered 700 or above may be counted towards the minimum graduate coursework (50%) requirement. No credits from other institutions can be counted toward the minimum graduate residence credit requirement. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

The department also accepts undergraduate credit from non-UW ABET-accredited institutions. See policy language above for details.

**UW–Madison University Special**

With program approval, students are allowed to count up to 9 credits of coursework numbered 400 or above taken as a UW–Madison University Special student toward the minimum graduate residence credit requirement, and the minimum graduate degree credit requirement. Courses numbered 700 or above taken as a UW–Madison Special student toward the minimum graduate coursework (50%) requirement. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

**PROBATION**

Students must be in good academic standing with the Graduate School, their program, and their advisor. The Graduate School regularly reviews the record of any student who received grades of BC, C, D, F, or I in graduate-level courses (300 or above), or grades of U in research and thesis. This review could result in academic probation with a hold on future enrollment, and the student may be suspended from graduate studies.

The Graduate School may also put students on probation for incomplete grades not cleared within one term. All incomplete grades must be resolved before a degree is granted.

The status of a student can be one of three options:

1. Good standing (progressing according to standards; any funding guarantee remains in place).
2. Probation (not progressing according to standards but permitted to enroll; loss of funding guarantee; specific plan with dates and deadlines in place in regard to removal of probationary status).
3. Unsatisfactory progress (not progressing according to standards; not permitted to enroll, dismissal, leave of absence or change of advisor or program).

A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full time) the student may be dismissed from the program or allowed to continue for 1 additional semester based on advisor appeal to the Graduate School.

**ADVISOR / COMMITTEE**

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 four or more members of the graduate faculty and is chaired by the student’s advisor. At least one committee member must be from outside the ECE department and field, and at least two committee members must be from within the ECE Department. Students must designate at least three members of their committee to be readers of their dissertation. 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 dissertation 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 Graduate Student Services Office, 3182 Mechanical Engineering, 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.

CREDITS PER TERM ALLOWED
15 credits

TIME CONSTRAINTS
The qualifying exam must be taken in the fourth semester of study. The preliminary examination must be taken no later than 3 semesters after the student has received advanced graduate standing.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

OTHER
Funding is not guaranteed and applicants should be prepared to fund their degree. The department awards a limited number of research assistantships, teaching assistantships, project assistantships, and fellowships each year. All applications are automatically considered for department funding.

PROFESSIONAL DEVELOPMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING RESOURCES
UW-Madison, the College of Engineering, and ECE have an abundance of professional development opportunities for students to take advantage of in order to better prepare themselves for internships and job positions during and following their education. First of all, the ECE Department strongly encourages students to utilize the UW-Madison Graduate School’s professional development resources (https://grad.wisc.edu/professional-development). Additionally, ECE provides unique opportunities throughout the year for students to attend and participate in various lectures, workshops, and trainings. The ECE Graduate Student Association (GSA) also organizes professional development opportunities for fellow students. Students are made aware of events and opportunities via email and other media communications.

LEARNING OUTCOMES

1. Demonstrate an extraordinary, deep understanding of mathematical, scientific, and engineering principles in the field.
2. Demonstrate an ability to formulate, analyze, and independently solve advanced engineering problems.
3. Apply the relevant scientific and technological advancements, techniques, and engineering tools to address these problems.
4. Recognize and apply principles of ethical and professional conduct.
5. Demonstrate an ability to synthesize knowledge from a subset of the biological, physical, and/or social sciences to help frame problems critical to the future of their discipline.
6. Demonstrate an ability to conduct original research and communicate it to their peers.

PEOPLE

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GRADUATE SCHOOL RESOURCES
Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.
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STAFF
For a listing of current staff members in the Department of Electrical and Computer Engineering, please visit the ECE website (https://directory.engr.wisc.edu/ece/staff).