ELECTRICAL ENGINEERING, PH.D.

The Department of Electrical and Computer Engineering (ECE) has facilities for graduate study and research leading to the master of science (M.S.) degree and the doctor of philosophy (Ph.D.) degree in electrical engineering. The master’s program emphasizes the enhancement of professional knowledge and research techniques. The doctorate is a research degree emphasizing creativity and original approaches to problem-solving in electrical and computer engineering. The regulations of the Graduate School and the department must be followed to complete the requirements for each degree.

Graduate courses are offered in all basic areas of electrical engineering. The following eight specializations can be pursued in depth: automatic control systems; biomedical engineering; communication and signal processing; computer engineering; electromagnetic fields and waves; energy and power systems; plasmas and controlled fusion; solid state electronics and photonics.

Laboratory facilities provide opportunities for research in biomedical computing; computer-aided engineering; computer architecture; data acquisition and simulation; digital control and instrumentation; digital engineering; digital microprocessors; digital signal processing; medical instrumentation; microelectronics and integrated-circuit fabrication; microwave devices, circuits, and antennas; photonics and optics; plasmas and controlled fusion; rotating electric machines and power electronics; speech processing; thin-film devices; VLSI systems; and x-ray lithography.

Power engineering courses are offered both on campus and online. The M.S. in electrical engineering, named option: power engineering is an online degree that includes a full curriculum of courses covering both the theory and applications of power electronics, electric machines, adjustable-speed drives, power systems, and alternative energy through electrical and computer engineering. A companion online M.S. program is also offered in mechanical engineering. Please visit the Department of Engineering Professional Development’s website (https://epd.wisc.edu/online-degree/electrical-engineering-power-engineering) for information regarding the online M.S. degree.

There are opportunities for research at both M.S. and Ph.D. levels.

FUNDING

Prospective students should see the program website for funding information.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirements) in addition to the requirements of the program.

DOCTORAL DEGREES

Ph.D.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT:

51 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

32 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT

Half of degree coursework (26 out of 51 total credits) must be completed in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: 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.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE

With program approval, up to 7 credits 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.

PRIOR COURSEWORK REQUIREMENTS: 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.

CREDITS PER TERM ALLOWED

15 credits

PROGRAM-SPECIFIC COURSES REQUIRED

Two semesters of graduate seminars are required.

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.
OVERALL GRADUATE GPA REQUIREMENT

3.00 GPA required.

OTHER GRADE REQUIREMENTS

1. A grade of B or better in any graduate course is acceptable. A grade of S in ECE 790 Master’s Research or Thesis, ECE 890 Pre-Dissertation’s Research and ECE 990 Research or Thesis is acceptable.

2. A grade of BC in an ECE course is acceptable, provided the total cumulative GPA for graduate ECE courses is greater than or equal to 3.00.

3. A grade of C or lower in an ECE course is not acceptable.

4. A grade of BC or lower in an independent study course (ECE 699 Advanced Independent Study or ECE 999 Advanced Independent Study) or a grade of U in Research or Thesis (ECE 790, ECE 890 or ECE 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 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.

PROBATION POLICY

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 incompletes 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

New students must declare an advisor by the end of the second week of classes in the first semester.

ASSESSMENTS AND EXAMINATIONS

Qualifying and preliminary examinations are required.

TIME CONSTRAINTS

The qualifying exam must be taken in the fourth semester of study. The preliminary examination must be passed in the fourth year of study.

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 by require 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.

LANGUAGE REQUIREMENTS

No language requirements.

ADMISSIONS

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

A grade point average of 3.0 (4.0 basis) is the minimum requirement for admission consideration. Submission of three letters of recommendation, a statement of purpose, an uploaded transcript, and the Graduate Record Exam (GRE) general test scores is required for all applicants to the on-campus degree programs. International students may need to also submit English Proficiency test scores. More information on admission to the ECE graduate program can be found here (https://epd.wisc.edu/online-degree/electrical-engineering-power-engineering/#/admission).

The ECE department uses an online application process (http://grad.wisc.edu/apply).

Students interested in pursuing the online M.S. degree must complete the capstone certificate in power conversion and control offered by the Department of Engineering Professional Development. More information on this certificate and other admission requirements can be found here (http://epd.wisc.edu/online-degree/electrical-engineering-power-engineering/#/admission).

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS

- demonstrate an ability to synthesize knowledge from a subset of the biological, physical, and social sciences to help frame problems critical to the future of their discipline.
- conduct original research.
• demonstrate an ability to create new knowledge and communicate it to their peers.

**PROFESSIONAL CONDUCT**

• fosters ethical and professional conduct.

### PEOPLE

**Faculty:** Professors Booske (chair), Gubner (vice-chair), Anderson, Barmish, Boston, Botez, DeMarco, Hagness, Hitchon, Hu, Jahns, Jiang, Knezevic, Lesieutre, Lipasti, Ma, Mawst, Nowak, Ramanathan, Sayeed, Sethares, Shohet, van der Weide, Vanveen, Venkataramanan, Wendt; Associate Professors Behdad, Davoodi, Milenkovic, Morrow, Willett; Assistant Professors Han, Kats, Lessard, Li, Ludois, Yu, Zhang