Electrical Engineering: Power Engineering, M.S.

This is a named option in the Electrical Engineering M.S. (http://guide.wisc.edu/graduate/electrical-computer-engineering/electrical-engineering-ms/#text)

The Master of Science Electrical Engineering: Power Engineering program will prepare you for leading-edge positions in industry in the areas of electric power, power electronics, motor drives, and electric machines.

UW-Madison’s Power Engineering master’s degree provides graduate students applicable and theoretical knowledge in power electronics, including alternative energy, through research and study of technological and conceptual innovations in electrical and computer engineering.

The education you receive at UW-Madison is directly applicable to a career in industry and is suitable for a new or recent graduate, as well as experienced professionals who seek the necessary (re)training to change or advance their careers.

UW-Madison’s Department of Electrical and Computer Engineering is recognized for excellence in research, instruction and service to the profession. It ranks among the top electrical and computer engineering departments in national surveys, consistently producing talented graduates whose skills are highly respected throughout the nation and around the world.

The Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC) (https://wempec.wisc.edu) is a UW–Madison technology focus center sponsored by companies holding an interest in electric machines and power electronics. With a mission to provide education, research and service, WEMPEC is a model program demonstrating strong interaction between university and industry.

UW-Madison’s online engineering graduate programs are world-class degree and consistently ranked in the Top 10 online engineering master’s programs by U.S. News & World Report.

Admittance into the Master of Science: Electrical Engineering program requires completion of the Capstone Certificate in Power Conversion and Control. (http://guide.wisc.edu/nondegree/capstone/power-conversion-control-capstone-certificate)

Additional ECE M.S. Degree Options

In addition to the Electrical Engineering M.S. in Power, ECE also offers three other master’s degree programs: the Research (http://guide.wisc.edu/graduate/electrical-computer-engineering/electrical-engineering-ms) program (traditional two-year master’s degree program culminating in a thesis), the Professional (http://guide.wisc.edu/graduate/electrical-computer-engineering/electrical-engineering-professional-ms) program (accelerated, course-based master’s degree program with the opportunity to choose a specialty track), and the program in Signal Processing and Machine Learning (http://guide.wisc.edu/graduate/electrical-computer-engineering/electrical-engineering-ms/electrical-engineering-signal-processing-machine-learning-ms/#text) (accelerated, course-based master’s degree program specifically in the area of Signal Processing and Machine Learning). Please see the respective Guide pages for more information.

Admissions

Graduate admissions is a two-step process between academic degree programs and the Graduate School. Applicants must meet requirements of both the program(s) and the Graduate School. Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/admissions).

Admissions Deadlines

Applications are accepted for admission during the fall and spring terms.

Fall deadline is June 1.

Spring deadline is November 1.

Admissions Requirements

• Completion of the Capstone Certificate in Power Conversion and Control (http://guide.wisc.edu/nondegree/capstone/power-conversion-control-capstone-certificate) with a GPA of 3.3
• A B.S. degree from a program accredited by ABET or the equivalent.* An electrical engineering major is preferred.
• A minimum undergraduate grade point average (GPA) of 3.00 on the equivalent of the last 60 semester hours (approximately two years of work) or a master’s degree with a minimum cumulative GPA of 3.00. Applicants from an international institution must have a strong academic performance comparable to a 3.00 for an undergraduate or master’s degree. All GPAs are based on a 4.00 scale. We use your institution’s grading scale; do not convert your grades to a 4.00 scale.
• Applicants whose native language is not English must provide scores from the Test of English as a Foreign Language (TOEFL). The
minimum acceptable score on the TOEFL is 580 on the written version, 243 on the computer version, or 92 on the Internet version.

- International applicants must have a degree comparable to an approved U.S. bachelor’s degree.

We do not require applicants to submit scores from the Graduate Record Examination (GRE).

## 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

Students in the online Electrical Engineering: Power Engineering program are not permitted to accept tuition-waiving assistantships or seek dual or double degrees.

## REQUIREMENTS

### MINIMUM GRADUATE SCHOOL REQUIREMENTS

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

### NAMED OPTION 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>
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</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>Yes</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.

### CURRICULUM REQUIREMENTS

**Requirements Details**

- **Minimum Credit Requirement**: 30 credits
- **Minimum Residence Credit Requirement**: 16 credits
- **Minimum Graduate Coursework Requirement**: Half of degree coursework must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide.
- **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 E C E 790 Master's 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) is not acceptable.
  5. A grade of BC or C in a non-E C E course is 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**

A thesis, a project, or a specified course sequence must be completed, depending upon which degree plan the student follows.

**Language Requirements**

n/a

### REQUIRED COURSES

Students must complete a professional development assignment equivalent to E C E 610. Students must watch or attend 11 hours of seminars and technical presentations, 8 hours of which must be associated with material outside the power area. Students must submit a plan to their faculty academic advisor for approval no later than two
months prior to the end of the semester in which the student expects to graduate.

Students must take one three-week, on-campus summer laboratory in Madison, Wisconsin. Students may choose from E C E 504 Electric Machine & Drive System Laboratory or E C E 512 Power Electronics Laboratory, which are offered in alternate summers.

Choose 30 credits from the following courses:

<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 (completed during Capstone)</td>
<td></td>
</tr>
<tr>
<td>E C E 412</td>
<td>Power Electronic Circuits (completed during Capstone)</td>
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<tr>
<td>E C E 427</td>
<td>Electric Power Systems</td>
<td></td>
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<tr>
<td>M E 446</td>
<td>Automatic Controls (completed during Capstone)</td>
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<tr>
<td>M E 447</td>
<td>Computer Control of Machines and Processes</td>
<td></td>
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<tr>
<td>E C E 504</td>
<td>Electric Machine &amp; Drive System Laboratory</td>
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</tr>
<tr>
<td>E C E 511</td>
<td>Theory and Control of Synchronous Machines</td>
<td></td>
</tr>
<tr>
<td>E C E 512</td>
<td>Power Electronics Laboratory</td>
<td></td>
</tr>
<tr>
<td>M E/E C E 577</td>
<td>Automatic Controls Laboratory</td>
<td></td>
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<tr>
<td>E C E 699</td>
<td>Advanced Independent Study</td>
<td></td>
</tr>
<tr>
<td>E C E 711</td>
<td>Dynamics and Control of AC Drives</td>
<td></td>
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<tr>
<td>E C E 712</td>
<td>Solid State Power Conversion</td>
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<tr>
<td>E C E 713</td>
<td>Electromagnetic Design of AC Machines</td>
<td></td>
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<tr>
<td>E C E 714</td>
<td>Utility Application of Power Electronics</td>
<td></td>
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<tr>
<td>E C E/M E 739</td>
<td>Advanced Robotics</td>
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<tr>
<td>M E 746</td>
<td>Dynamics of Controlled Systems</td>
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<tr>
<td>M E 747</td>
<td>Advanced Computer Control of Machines and Processes</td>
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</tr>
<tr>
<td>E C E 790</td>
<td>Master’s Research or Thesis</td>
<td></td>
</tr>
</tbody>
</table>

Policies

GRADUATE SCHOOL POLICIES

The Graduate School’s Academic Policies and Procedures (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.

NAMED OPTION-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 five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

UW–Madison Undergraduate 1

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 E C E 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 Engineering and Computer Science, or Computer Science from an ABET-accredited program at other institutions (not UW–Madison) toward fulfillment of minimum degree requirements.

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.

1 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 five or more years prior to admission 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 academic advisor will be assigned to newly-admitted students. Students who want to pursue research must secure a research advisor who matches their research area and agrees to supervise their research. A research advisor is not guaranteed.

**CREDITS PER TERM ALLOWED**

15 credits (most students take 3 credits per term)

**TIME CONSTRAINTS**

Master’s degree students who have been absent for five 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**

Students in the online Power Engineering program are not permitted to accept assistantships.

**PROFESSIONAL DEVELOPMENT**

**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.

**PEOPLE**

**PROFESSORS, ASSISTANT PROFESSORS, AND ASSOCIATE PROFESSORS**

Anderson, David T. (https://directory.engr.wisc.edu/ece/Faculty/Anderson_David)
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Venkataramanan, Giri (https://directory.engr.wisc.edu/ece/Faculty/Venkataramanan_Giri)
Wendt, Amy E. (https://directory.engr.wisc.edu/ece/Faculty/Wendt_Amy)
Yu, Zongfu (https://directory.engr.wisc.edu/ece/Faculty/Yu_Zongfu)

**ADJUNCT PROFESSORS**
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Blasko, Vladimir

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Milicic, Srdjan (https://directory.engr.wisc.edu/ece/Faculty/Milicic_Srdjan)

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Brar, Victor (Physics)
Gupta, Mohit (Computer Sciences)
Hernando, Diego (Radiology)
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Miller, Barton (Computer Sciences)
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Varghese, Tomy (https://directory.engr.wisc.edu/bme/Faculty/Varghese_Tomy) (Medical Physics)

**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).