

# POWER CONVERSION AND CONTROL, CAPSTONE CERTIFICATE

The Power Conversion and Control capstone certificate addresses the learning goals of practicing engineers by providing further study with senior, highly respected faculty in the UW–Madison College of Engineering. Engineers are able to gain specialized expertise, including technical knowledge of power electronics, drives, and controls. The capstone certificate also provides a pathway for students wishing to apply for admission to the university's online Master of Science: Electrical Engineering named option in Power Engineering.

The capstone certificate was developed in response to needs identified by more than 80 corporate sponsors of the renowned Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC) (<http://www.wempec.wisc.edu/>).

The capstone certificate is completely online to accommodate working professionals. It is designed for completion in three consecutive terms.

Further details, including current tuition and costs, are provided on the program's website (<https://epd.wisc.edu/online-degrees/power-conversion-and-control-certificate/>). Program curriculum can be found here (p. 2).

## HOW TO GET IN

### HOW TO GET IN APPLICANT REQUIREMENTS

- A **BS degree** from a program accredited by the Accreditation Board for Engineering and Technology (ABET) or the equivalent.\*
  - A BS in electrical engineering is recommended.
  - Students who do not have a BS in electrical engineering need to have completed fundamental coursework in electrical engineering including circuit theory, Fourier analysis, AC circuit analysis using complex impedances, transfer function analysis and evaluation including Bode plots, transformer equivalent circuits, piecewise continuous analysis of nonlinear circuits, and magnetic theory.
- 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.
- International degree-seeking applicants must demonstrate English proficiency by providing official results of an English proficiency exam. Scores must be within two years of the anticipated start of enrollment.
  - TOEFL: 92 internet (iBT)
  - IELTS: 7.0
  - Duolingo English Test: 125

\* Equivalency to an ABET-accredited program: Applicants who do not have bachelor's degree from an ABET-accredited program may also qualify for admission to the program. Such applicants must have a BS in science, technology, or a related field with sufficient coursework and professional experience to demonstrate proficiency in engineering practice.

### ADMISSION

**Applications are accepted for admission to all three terms (fall, spring, summer).**

- Fall deadline: August 1st
- Spring deadline: December 1st
- Summer deadline: June 1st

The admissions process has been designed to conduct a holistic review of likely success in the program. Decisions are based on academic and professional background.

Note: Adult Career and Special Student Services (ACSSS) is the admitting office for all University Special students. However, the department offering the Capstone Certificate program makes the final admission decision upon review of all applicant materials.

### APPLICATION STEPS

1. Email the graduate admissions staff stating your intent to apply to the Power Conversion and Control capstone certificate program. Attach a current resume or CV to the Intent to Apply email: [studentservices@interpro.wisc.edu](mailto:studentservices@interpro.wisc.edu)
  - a. Your resume/CV should include at least:
    - i. Educational history (including GPA, awards and honors received).
    1. Professional work experience (including specific details on your engineering experience, technical training, and responsibilities).
2. Submit an online application for admission (<http://continuingstudies.wisc.edu/advising/apply.htm>) as a University Special student, selecting UNCS Capstone Certificate and the program: Power Conversion and Control. This application is received and processed by ACSSS with final decision held for approval from the specific capstone certificate coordinator.
3. Following steps outlined by the program (<https://interpro.wisc.edu/online-degrees/power-conversion-and-control-certificate/how-to-apply-pcccc/>), request transcripts of all previous college work and two letters of recommendation.
  - a. For the two (2) letters of recommendation, use the Download Recommendation Form.
    - i. The recommenders should send the statement directly to [studentservices@interpro.wisc.edu](mailto:studentservices@interpro.wisc.edu). At least one letter should be from your current or previous direct supervisor. Academic references are acceptable for applicants who have been out of school less than five years.

### ENROLLMENT

After a decision has been made, the admissions committee chair will contact applicants by email to inform of the decision.

Admitted students receive a formal letter of admission to UW–Madison from Adult Career and Special Student Services along with general enrollment information. Additional detail is provided on the ACSSS

enrollment page (<http://continuingstudies.wisc.edu/advising/enroll-special.htm>).

## REQUIREMENTS

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#### GRADE REQUIREMENTS

- Students must complete all courses with a minimum GPA of 2.00 to continue to the next class.

#### REQUIRED COURSES

Students must complete 9 credits from the curriculum below.

Code	Title	Credits
E C E 411	Introduction to Electric Drive Systems	3
E C E 412	Power Electronic Circuits	3
E C E 427	Electric Power Systems	3
E C E 504	Electric Machine & Drive System Laboratory	3
E C E 511	Theory and Control of Synchronous Machines	3
E C E 512	Power Electronics Laboratory	3
E C E 711	Dynamics and Control of AC Drives	3
E C E 712	Solid State Power Conversion	3
E C E/M E 732	Dynamics of Controlled Systems	3
M E 446	Introduction to Feedback Control	3

### MINIMUM REQUIREMENTS FOR CAPSTONE CERTIFICATE COMPLETION

- Students must earn a minimum grade of C in each course used to meet Capstone Certificate requirements.
- Courses in which a student elects the pass/fail or audit option will not count toward completion of Capstone Certificate requirements.
- All of the Capstone Certificate credits must be earned "in residence" (which includes on campus and distance-delivered courses) at UW-Madison.
- All of the Capstone Certificate credits must be earned while enrolled in the Capstone Certificate program.

Individual Capstone Certificate programs may have additional requirements for completion, which will be listed above as/if applicable.

## LEARNING OUTCOMES

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1. Analyze how torque and speed are controlled in the major classes of electric machines.
2. Evaluate how power electronics is used to perform electrical power conversion from one form into another.
3. Complete preliminary designs of automatic controlled systems using power electronics circuits.