Power Electronics

Graduate Capstone Certificate and Master of Science in Electrical Engineering

BEST ONLINE PROGRAMS U.S.News & WORLD REPORT GRAD ENGINEERING 2023

Advance your career in the growing field of power electronics and electric machines from a best online graduate program as ranked by *U.S. News and World Report*.

What You Learn

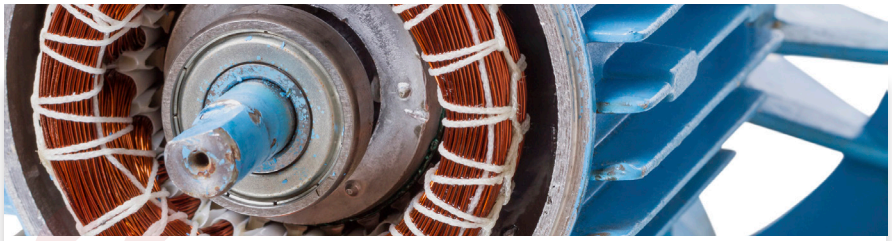
- Learn the latest technology in power electronics, electric machines, actuators, sensors, drives, motion control and drive applications.
- Learn from distinguished and internationally renowned faculty from the Department of Electrical and Computer Engineering and the Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC).
- Tailor your experience to fit your specific career goals and interests through technical elective courses

Where & How You Learn

Where Online; start in summer, fall, or spring.

How Start by completing a 9-credit certificate program in Power Conversion and Control (PCC). With successful completion of this Certificate and a minimum GPA of 3.3, you may apply to the online MS degree in Power Engineering. The PCC credits are applied to the 30-credit master's degree requirement.

Labs online during summer months.



> **Getting exposure to some highly technical topics in the field of power electronics that I would not have had the time or resources to pursue on my own. Now that I have a baseline, I'm able to bring it back to industry and continue building on it.**
>
> *Nathan Gustafson,*
> *Senior Electrical Engineer - Milwaukee Tool*

Apply Now!

Visit **go.wisc.edu/Power**

At a Glance

Delivery: Online

Credits: 30 graduate credits

Time Frame: 1 year for the PCC Certificate, an additional 2-3 years for the MS degree in Power Engineering, depending on the number of classes taken each term

Tuition: Resident and non-resident: $1,600 per credit

Typical Curriculum

Required Courses, PCC Certificate

- Introduction to Electric Drive Systems
- Power Electronic Circuits
- Automatic Controls

Core ECE MS Curriculum: Power Engineering

- Electric Machine and Drive System Lab *or* Power Electronics Lab
- Dynamics and Control of AC Drives
- Solid State Power Conversion

Typical Electives

- Electric Power Systems
- Computer Control of Machines and Processes
- Utility Application of Power Electronics

Questions?

For more information on admission requirements, how to apply, tuition and financial aid or other questions, contact:

Justin Kyle Bush, Graduate Advisor
608-262-0468
gradadmissions@interpro.wisc.edu

Interdisciplinary Professional Programs
COLLEGE OF ENGINEERING
UNIVERSITY OF WISCONSIN–MADISON

Sample Plan of Study

		Course Number	Course Title	Credits
Power Conversion and Control (PCC) Certificate				
Fall 1		ECE411	**Introduction to Electric Drive Systems**	3
Spring 1		ECE412	**Power Electronic Circuits**	3
Summer 1		ME446	**Automatic Controls**	3
Core ECE MS Curriculum: Power Engineering[2]				
Fall 2		ECE712	**Solid State Power Conversion**	3
Spring 2		ECE711	**Dynamics and Control of AC Drives**	3
Summer 2		ECE504[3]	**Electric Machine and Drive System Lab**	3
	OR	ECE512[4]	**Power Electronics Lab**	
Technical Electives[5]				
Fall 3		ECE713	**Electromagnetic Design of AC Machines**	3
Spring 3		ECE427	**Electric Power Systems**	3
	OR	ECE/ ME739	**Advanced Robotics**	
Summer 3		ECE714[4,6]	**Utility Application of Power Electronics**	3
Fall 4		ME746	**Dynamics of Controlled Systems**	3
	OR	ME747[7]	**Advanced Control of Machines and Processes**	

[1] Listed courses and schedule are subject to change
[2] Must apply for admission to MS program with a minimum GPA of 3.3 in the PCC Certificate
[3] Offered even-year summers
[4] Offered odd-year summers
[5] Total of Five 700-level Courses Required
[6] Prerequisite for ECE714 is ECE427
[7] Prerequisite for ME747 is ME447

Flexible Curriculum
In-Depth Technical Knowledge
Start Summer, Fall, or Spring

Learn more at **go.wisc.edu/Power**

Required Courses, PCC Certificate

Introduction to Electric Drive Systems
Learn the basic theory underlying the analysis and design of adjustable-speed drive systems employing power electronic converters and AC or DC machines. Learn the basic concepts of torque and speed control in both DC and AC machines, including variable-frequency operation of induction and synchronous machines, field-oriented control, and more.

Power Electronic Circuits
In this introduction to the basic power electronic devices, you will study and analyze fundamental power conditioning converters. Course material will cover piecewise linear, uncontrolled circuits; power electronic devices; and AC/DC, DC/DC, AC/AC, and resonant converters.

Automatic Controls
This course provides a comprehensive understanding of single input, single output (SISO) continuous closed-loop control system analysis and design. Discrete (computer) control also is introduced including analysis in the z domain.

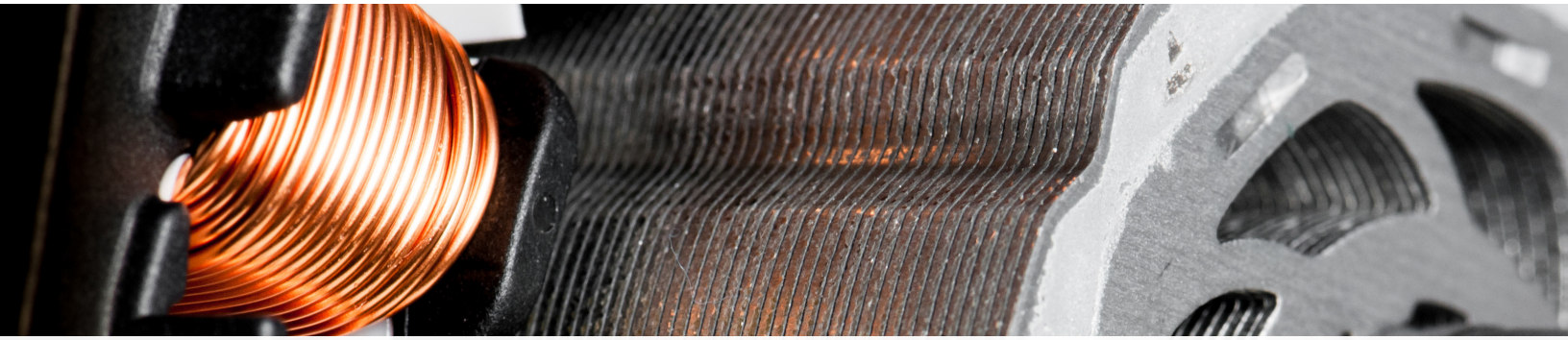
Core ECE MS Curriculum: Power Engineering

Electric Machine and Drive System Lab
This laboratory course consists of a series of experiments exploring the steady-state and dynamic performance of electric machines in combination with power electronic converters. Learn techniques for parameter measurement and performance evaluation of induction, PM synchronous, and switched reluctance machine drives, including exercises to compare predicted and measured performance characteristics. This is a three-week summer course offered in even years. Campus attendance is required.

Power Electronics Lab
This laboratory introduces the measurement and simulation of important operating characteristics related to power electronic circuits and power semiconductor devices. Emphasis will be given to devices, circuits, gating methods, and power quality. This is a three-week summer course offered in odd years. Campus attendance is required.

Dynamics and Control of AC Drives
This course covers the development and application of techniques needed to analyze and control the dynamic performance of AC machine drive systems using power electronic converters. Content includes d-q rotating reference frame modeling of AC machines and power converters needed for closed-form analysis and simulation of both AC induction and synchronous machines, leading to exploration of high-performance control techniques including current regulation, field orientation control, and direct torque control.

Solid State Power Conversion
Learn systematic analytical techniques to critically study the design and control of power converters of various topologies and functions. You will also receive a brief introduction to EMI analysis and mitigation techniques.



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