ECE 5025: Power Electronics: Devices, Circuits, and Applications

Course Description

Provides an introduction to power electronic conversion principles. Analytical techniques will be developed through the study of widely used converter circuits.

Prior Course Number: 624, 724
Transcript Abbreviation: Power Electronics
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Junior, Senior, Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 3020 (323), or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.
Exclusions: Not open to students with credit for 624, 724, or 844.
Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Provide an introduction to power electronics conversion principles
Master analytical techniques through the study of an array of power electronics circuit topologies
Be competent with typical circuit simulation tools
Be exposed to contemporary energy related issues

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Applications, fundamental rules	3.0							
Buck, boost converters	3.0							
Fly-back, fly-forward converters	3.0							
Power semiconductor devices	3.0							
Gate drive, busbar, and snubber circuits	3.0							
High power DC choppers	3.0							
Poly-phase rectifiers	6.0							
Switching matrix description of power converters	3.0							
Duality and generic power converters	3.0							
PWM converters	3.0							
Space vector modulation method	3.0							
Optimizing utility interface with power converters	3.0							
Power conditioners and uninterrupted power supplies	3.0							

Grades

Aspect	Percent
One Midterm (30%) and one Final (35%)	65%
Homework	25%
Quizzes	10%
Written papers	0%

Representative Textbooks and Other Course Materials

Title	Author
Power Electronics: Converters, Applications and Design	Mohan, Undeland, and Robbins

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
**	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
**	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

Changed course description, prereqs, and exclusion to match university version.
Corrected typo in text, 4/3/12.

Update course goals 5/14/14 BLA

Prepared by: Betty Lise Anderson