

## ELEG 5533 - POWER ELECTRONICS AND MOTOR DRIVES

- Catalog data: ELEG 5533 POWER ELECTRONICS AND MOTOR DRIVES  
3 credit hours
- Fundamentals of power electronics, diode bridge rectifiers, inverters, general concepts on motor drives, induction motor drives, synchronous motor drives, and dc motor drives. Students may not receive credit for both ELEG 4533 and 5533. Prerequisite: Graduate standing or ELEG 3224 and ELEG 3304.
- Textbook: *Power Electronics: Converters, Applications and Design*. Ned Mohan, Tore Underland and William Robins, Third Edition, John Wiley.
- Multiple application notes available under the directory “Additional Notes”
- References: *Power Electronics: Circuits, Devices and Applications*. Muhammad Rashid, Prentice Hall, 1988.
- Learning Objectives: The students will learn about (1) selecting the proper power semiconductor device for a given application of power electronics, (2) extracting information from manufacturer datasheets, (3) calculating the conduction and switching losses, (4) analysis of electromechanical systems, and (5) designing gate drivers and simple thermal management systems.
- Coordinator: Juan Carlos Balda, University Professor.
- Prerequisites by topic:
  1. Basic knowledge of electric machines.
  2. Basic knowledge of diode and transistor circuits.
- Prerequisites: ELEG 3304 and ELEG 3224
- Topics:
- *Chapter 1: Power Electronic Systems (1 class period)*
  - *Chapter 3: Review of Basic Electrical and Magnetic Circuit Concepts (3 class periods)*
  - *Chapter 2: Overview of Power Semiconductor Devices (3 class periods)*
  - *Chapter 22: Power MOSFETs (4 class periods)*
  - *Chapter 25: Insulated Gate Bipolar Transistors (3 class periods)*
  - *Chapter 12: Introduction to Motor Drives (2 class periods)*
  - *Chapter 14: Induction Motor Drives (4 class periods)*
  - *Chapter 15: Synchronous Motor Drives (2 class periods)*
  - *Chapter 28: Gate Driver Circuits (1 class period)*
  - *Chapter 29: Thermal Management (1 class period)*
  - *Additional Topics Related to Motor Drives (2 class periods)*
- Computer Usage: Homework assignments requiring the use of PSPICE® and/or Matlab/Simulink™. You could access these packages remotely at one of the servers of the

department of Electrical Engineering. For directions, please, contact Mr. Daniel Klein at [eleghelp@uark.edu](mailto:eleghelp@uark.edu).

Laboratory work: None

Course Grading:

A	[100% to 90%]
B	< 90% to $\geq$ 80%]
C	< 80% to $\geq$ 70%]
D	< 70% to $\geq$ 60%]
F	< 60% to 0%]

Final grades may be curved depending on class average.

The homework assignments may be based on PSpice® or Matlab/Simulink™; being proficient in these software packages is extremely important for any power electronic engineer. Thus, you should dedicate to solving homework assignments the required amount of time. They will be your principle method of really learning the course material.

It will be considered academic dishonesty if you copy or plagiarize another student's work for a given assignment. "As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail." "Each University of Arkansas student is required to be familiar with and abide by the University's 'Academic Integrity Policy' which may be found at <http://provost.uark.edu/>. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor." Please, refer to [www.ieee.org/about/whatis/code.html](http://www.ieee.org/about/whatis/code.html) for the IEEE Code of Ethics.

## **TENTATIVE SCHEDULE FOR ELEG 5533 – SPRING 2017 8W1**

**January 17 to March 7 2017**

The lectures that you are watching were taped in the spring 2016, so the dates referred to the taping of a lecture are for the spring 2016. Ignore any homework deadline or test date given in the tapes. The relevant deadlines are given below.

### Homework Assignment Tentative Deadlines

- The first homework assignment on "Power Semiconductor Devices" is due on Friday January 24 2017. It covers the material on Chapter 2.
- The second homework assignment on Chapter 25 is due on Friday February 10 2017.
- The third homework assignment on Chapter 12 is due on Monday February 13 2017.
- The fourth homework assignment on Chapter 14 is due on Wednesday February 22 2017.
- The fifth homework assignment on Chapter 15 is due on Friday March 3 2017.

### Test Tentative Deadlines

You need to schedule the tests with your proctor within the dates given below; the actual date and time will depend on your time availability and that of your proctor. Tests are closed book and closed notes; you can have a formula sheet with ONLY equations from the textbook or class notes. No solved problems, no graphs, nothing except equations.

- Test 1 covers Chapters 2, 3 and 22; that is, lecture taped from January 19 2016 to the lecture taped on February 18 2016 (note that concepts of Chapter 29 are used to reinforce concepts of Chapters 2 and 22).  
**This test should be taken between February 2 and 3 2017.**
- Test 2 covers Chapters 25 and 12; that is from the lecture taped on February 25 2016 to the beginning of the lecture taped on March 15 2016.  
**This test should be taken between February 16 and 17, 2017.**
- Test 3 covers Chapter 14; that is from the remainder of the lecture taped on March 15 2016 to the lecture taped on April 21 2016 (note that concepts of Chapter 8 are used to reinforce concepts of Chapter 14 and later on Chapter 15).  
**This test should be taken between February 26 and 28, 2017.**
- Test 4 covers Chapter 15; that is from the lecture taped on April 28 2016 to the lecture taped on May 5 2016 (note that concepts of Chapter 8 are used to reinforce concepts of Chapter 15).  
**This test should be taken between March 6 and 7, 2017.**

### General rules applicable to tests

You must get a proctor for your tests. A proctor could be your manager, someone in Human Resources, a community college providing proctoring services, etc. The proctor must be approved by Dr. Balda that must be provided with the proctor's name, telephone number and email by January 20 2017.

Tests are closed book, closed notes.

You are allowed to bring a formula sheet with equations in the textbook, in the slides or any application note/additional note used in the course. You cannot have solved problems, figures, graphs or any other information – only equations. The formula sheet needs to be submitted with your test solution.

Students will have a week from the date a test is given back to ask for a grade change.