EE 435 **Dr. Famouri** **Spring Semester 2015**

EE 435: Power Electronics. Credit 3 hr. PR: EE 335, EE 355, EE 356 or consent.

Objectives: This course is designed to provide juniors, seniors and graduates an understanding of application of power semiconductor components and devices to power system problems.

Outcomes: Application of power semiconductor components and devices to power system problems (EE Program Outcomes 3) power control, conditioning, processing and switching. Course supplemented by simulation and design projects, presentation and laboratory problems. (EE Program Outcomes 5)

Textbook: M.H. Rashid, Power Electronics: Circuits, Devices, and Applications, 4th edition, Pearson Prentice-Hall, 2013.

Reference: N. Mohan, Power Electronics: A First Course, John Wiley & Sons, 1st edition, 2012.
N. Mohan, T.M. Undeland, and W.P. Robbins, Power Electronics: Converters, Applications and Designing, John Wiley & Sons, 2nd edition, 1995.

Instructor: Dr. Famouri (ESB 747)
Tel: 293-9689 E-Mail: *pfamouri@wvu.edu*

Office Hours: Scheduled: MWF 11:00-12:00 AM; or by appointment; however, I have an open-door policy, my office's door is always open when I am in to answer your questions.

Course website: **www.csee.wvu.edu/~famouri/ee435** .
MATLAB and Power Electronics toolbox will be used in this course.

Lecture Topics

1. ***Introduction*** (1 week)
   - A. Review of basic RLC circuits including ideal diode
   - B. Simple half-wave rectifier
   - C. Freewheeling or shoot through diode

2. ***Power electronic devices*** (3 weeks)
   - A. Operation characteristics
   - B. Control
   - C. Protection
   - D. Heating
   - E. Application to passive circuits

3. ***AC - DC converters*** (3 weeks)
   - A. Uncontrolled rectifiers
     - a. Single phase & three phase
     - b. Performance
   - B. Phase-controlled converters
     - a. Single phase & three phase
     - b. Performance & control

4. ***DC - DC converters*** (4 weeks)
   - A. Step-down Choppers
     - a. Continuous-current analysis
     - b. Discontinuous-current analysis
   - B. Step-up Choppers
     - a. Continuous-current analysis
   - C. Commutation techniques
   - D. Control

5. ***AC - AC converters*** (1 week)
   - A. Voltage controllers
     - a. Pulse-burst-modulation
     - b. Phase control
   - B. Cycloconverters
   - C. Control

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6. ***DC - AC converters (Inverters)*** (3 weeks)
   A. Classification
   B. Single phase
   C. Three phase
   D. Commutation techniques
   E. Control

EE 435 Grading Policy

Homework, simulation, and design problems will be assigned, collected and graded. Some assignments require you to work in a team setting and present your work to the class.

Student will have a major design project due at the end of the semester. At mid-term students should show a significant progress toward the completion of their project. There will be a class presentation on student projects.

The overall grade will be computed as follow:

Homework	10%	
Midterm	25%	
Design Project/ MATLAB Software Simulation		35%
Presentation	5%	
Final Exam	25%	
	100%	

Unless the performance or circumstances associated with a particular student indicate otherwise, the final grade in the course will be based on the exam average according to the following scale:

A	90 - 100
B	80 - 89
C	70 - 79
D	60 - 69
E	59 ↓

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.