Instructor: Dr. Issa Batarseh
Office: EN-III 204
Office Hours: M 11:45 - 12:45 PM
W 2:00-4:00PM (150 University Towers – Research Park)
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Class Hours: MW 10:30-11:45 AM
Class Room: ENG2 103 (FEEDS Room)


References:

Catalog Description:
Principles of power electronics, power semiconductor devices, switch-mode dc-dc converters, power losses, converter dynamics, stability and control design.

Objective:
The objective of this course is to present the principles of power electronics and its applications. This includes power electronics circuits, power semiconductor devices, and converter topologies. The student will learn analysis and design techniques for switch-mode converters using the buck, boost, and buck-boost topologies. The course will emphasize complex theoretical analysis and computer simulation tools as course project.

Prerequisites:
Electronic Circuits - EEL 4309.

Course Content:
Engineering Design: 1 credit hours
Engineering Science: 2 credit hours

Homework:
Homework will be assigned at various times throughout the semester and should be turned in via email on the due date.

Covered Topics:

*Introduction (Chapter 1)*
1.1 What is Power Electronics?
1.3 The Need for Power Conversion
1.4 Power Electronics Systems
1.5 Applications of Power Electronics
1.6 Future Trends
Switching Concepts and Overview of Power Semiconductor Devices (Chapter 2)
  2.1 The Need for Switching in Power Electronic Circuits
  2.2 Switching Characteristics
  2.4 Types of Switches
  2.5 Available Semiconductor Switching Devices
  2.6 Comparison of Switching Devices
  2.7 Future Trends in Power Devices
  2.8 Snubber Circuits

Switching Circuits, Power Computations and Component Concepts (Chapter 3)
  3.1 Diode Switching Circuits
  3.2 Basic Power and Harmonic Concepts for Sinusoidal and Non-sinusoidal Waveforms

Non-isolated DC-DC Converters (Chapter 4)
  4.1 Power supply applications
  4.2 DC-DC Converter Topologies-Continuous Conduction Mode (CCM)
  4.3 DC-DC Converter Topologies-Discontinuous Conduction Mode (DCM)
  4.4 Non-ideal Effects
  4.5 Switch Utilization Factor

Isolated DC-DC Converters (Chapter 5)
  Buck- and Boost-derived isolated DC-DC converters.
  Power supply applications

Converter Dynamics and Control (Additional Material if time permits)

Homework: Homework assignments will be based on the textbook by the instructor.

Project: Each student will be required to choose a topic and submit 10 to 15 pages report at the end of the semester. You may select any topic in power electronics, provided it has appreciative level of theoretical complexity and must have simulation results to prove theory. Any simulation software is acceptable. However, list of suggested topics will be given to you later on in the course. This class project is important assignment and will carry 20% of the final grade.

Grading: (2) In Class-Exams 2x20%
  Final 30%
  Class Project 20%
  Homework 10%
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  100%

Student Academic Activities:

As of Fall 2014, all faculty members are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete the following academic activity by the end of the first week of classes, or as soon as possible after adding the course, but no later than August 27. Failure to do so will result in a delay in the disbursement of your financial aid.

For more info, please visit:
http://teach.ucf.edu/support/

ABET Course Learning Outcomes and Expected Performance Criteria:
**Outcome 1:**
A passing student will be able to analyze power semiconductor devices and their applications. Performance Criteria: 70% correct score in midterm exam 1.

**Outcome 2:**
A passing student will be able to analyze switching circuits, their operation mechanism and power consumption. Performance Criteria: 70% correct score in midterm exam 1.

**Outcome 3:**
A passing student will be able to analyze and design non-isolated dc-dc converters, CCM and DCM modes, non-ideal converters, fourth-order converters. Performance Criteria: 70% correct score in midterm exam 2.

**Outcome 4:**
A passing student will be able to calculate the power losses of switching converters and estimate the conversion efficiency. Performance Criteria: 70% correct score in final exam.

**Outcome 5:**
A passing student will be able to analyze the dynamics of switching converters, perform frequency analysis and design stable closed loop control. Performance Criteria: 70% correct score in final exam.