Syllabus for EEL6935

Power Electronics II

Fall, 2015

Part A - Course Outline

Description: 3 hours credit

Power Electronics II

Prerequisites: Introduction to Power Electronics   EEL4930/EEE5317


978-0792372707

2) Instructor's Powerpoint slides

Evaluation: Homework

Quizzes (closed book)

Projects

No Exams

Homework: Homework will be collected at the beginning of the class on the due date

Objective: Power converter topology, magnetic design, soft switching technique, modeling and control for three phase power converter and inverter

Topics: (1) Single phase power electronics circuit topology
(2) Magnetic design for switched-mode applications
(3) Resonant and soft switching converters
(4) Introduction to three phase power electronics
(5) Introduction to modeling and control for three phase power electronics

Class schedule: 150 minutes/week

Contribution of course to meet the professional component of EE ABET requirement:

This course prepares students to work professionally in the area of power electronics systems and control

Relationship to EE program objectives and outcomes:

This course contributes to Electrical program outcomes that develop student with:

A. An ability to apply knowledge of mathematics, science, and engineering.

E. An ability to identify, formulate, and solve engineering problems.

G. An ability to communicate effectively

K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
Performance Criteria:

1. Students will demonstrate the ability to design and model single phase power electronics systems for different circuit topologies.
2. Students will demonstrate the ability to design and model simple three phase power converters / inverters for different applications.

Course Content:

   Engineering Science 50%
   Engineering Design 50%

Relationship to Other Courses:

This is a very important required upper-division course for electrical engineers in all power electronics related areas.

**Part B – General Course Information and Policies**

Instructor: Dr. Shuo Wang
Office: NEB 533
Phone: 352-392-4691
Email: shuo.wang@ece.ufl.edu

Classroom: CHE0316
Office Hours: 9:30AM-11:30AM, every Monday or by appointment

Grading: 20% Homework
     10% Quizzes (closed book)
     70% Projects

Schedule: Tuesday 1:55-2:45PM, Thursday: 1:55-2:45PM, 3:00-3:50PM.

Homework: Homework is due one week after it is assigned
           Homework will be collected at the beginning of the class on the due date
           Late homework will not be accepted
           If you missed quizzes, there is no makeup quizzes.

Exams: As an upper level course, there is no exams

Submission Requirement: a. Name, assignment number, date submitted on each page.
                         b. Neat circuits with appropriate labels
                         c. List of given values.
                         d. List of starting conditions and equations.
                         e. Development of equations that will yield final values.
                         f. Numerical substitution into final equations.
Course material:
All course materials including syllabus, slides, homework, homework solutions, projects and your grades etc. will be posted in Canvas:
https://lss.at.ufl.edu/
Please continuously check Canvas to get updated information.

Preliminary Course Outline and Schedule

<table>
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<tr>
<th>Week</th>
<th>Section</th>
<th>Topic</th>
<th>Assignment (homework will be added later)</th>
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<tbody>
<tr>
<td>1</td>
<td>08/25</td>
<td>1.1 Power converter topology basics</td>
<td>8/27 has no classes</td>
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| 2     | 9/1,3    | 1.2 Full bridge and half bridge converters  
1.3 Forward converter |                                             |
| 3     | 9/8,10   | 1.4 Push-pull converter  
1.5 Isolated boost converter |                                             |
| 4     | 9/15,17  | 1.6 Flyback converter  
1.7 Boost Power Factor Correction converter | 9/22 and 9/24 have no classes  
9/17: Homework 1 Due (6.1,6.5 and 6.9) |
| 5     | 9/29,10/1| 2.1 Magnetic design basics  
2.2 Transformer modeling |                                             |
| 6     | 10/6,8   | 2.3 Magnetic Core loss  
2.4 Winding AC loss | Quiz 1 (week 1-4), 10/6 |
| 7     | 10/13,15 | 2.4 Magnetic devices  
3.1 Inductor design |                                             |
| 8     | 10/20,22 | 3.2 Design examples  
4.1 Transformer design basics | Quiz 2 (week 5-7), 10/22 |
| 9     | 10/27,29 | 4.2 Design examples  
5.1 Resonant converter basics |                                             |
| 10    | 11/3,5   | 5.2 Series resonant converter  
5.3 Parallel resonant converter | Quiz 3 (week 7-8), 11/5 |
| 11    | 11/10,12 | 6.1 Soft switching basics  
6.2 Zero current switching | Quiz 4 (week 8-9), 11/12 |
| 12    | 11/17,19 | 6.3 Zero voltage switching  
7.1 Three phase power switch modeling | Quiz 5 (week 9-10), 11/19 |
| 13    | 11/24, 12/1| 7.2 Vector representation of three phase variables  
7.3 Average model of voltage source inverter | Quiz 6 (week 11-12), 12/1 |
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| 14 12/3, 8 | 7.4 7.5 | Average model of current source inverter  
Small signal models for VSI and CSI |
| 15 | 7.6 7.7 | PWM modulation technique  
Space vector modulation for VSI and CSI |