Fall 2015

ENEE 4543

Ebrahim Amiri

University of New Orleans

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ENEE 4543 Power Electronics (Fall 2015)

Instructor: Ebrahim Amiri,
Email: eamiri@uno.edu
Phone: (504) 280-6180
Office Hours: 835 EN Build, T, TH 10:30 to 12:30
Classroom 316 EN Build, T, TH 12:30 to 1:45

Required Textbook:

Prerequisite:
- Electrical Circuits
- Electronics

Course Content
- Overview of electric and magnetic circuit concepts, power semiconductor switches (Diode, MOSFET, and IGBT), and computer simulation tools (Chapters 1-4).
- AC-to-DC Converters (Single-phase and Three –phase Rectifiers) (Chapters 5-6)
- DC-to-DC Converters (Buck, Boost, Buck-Boost, Full-Bridge Converters) (Chapter 7)
- DC-to-AC Converters (Single-phase and Three –phase PWM Inverters) (Chapter 8)
- Resonance converters (soft-switching techniques –ZCS and ZVS actions) (Chapter 9)

Course Learning Outcomes
Students should be able to:
- Describe the role of Power Electronics as an enabling technology in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc.
- Learn the interface between the power electronics equipment and single-phase and three-phase utility using diode rectifiers and define the total harmonic distortion.
- Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes and be able to interpret basic converter topologies.
- Learn the Single-phase and Three –phase PWM Inverters and their principle of operation.
- Learn basic concepts of soft-switching and their applications to dc-dc converters

Topics and Tentative Schedule:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Dates</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syllabus and introduction.</td>
<td>Aug. 20</td>
<td></td>
</tr>
<tr>
<td>Fundamental concepts (Electric Circuit and Power Electronics)</td>
<td>Week 1</td>
<td></td>
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<tr>
<td>Power Semiconductor Switches (Diode, MOSFET, and IGBT)</td>
<td>Week 2-3</td>
<td></td>
</tr>
<tr>
<td>AC-to-DC Converters (Single-phase and Three –phase Rectifiers)</td>
<td>Week 4-5</td>
<td></td>
</tr>
<tr>
<td>DC-to-DC Converters (Buck, Boost, Buck-Boost, Full-Bridge Converters)</td>
<td>Week 6-7</td>
<td></td>
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</tbody>
</table>
Oct. 8: Midterm test 1.
Oct. 15-16: Mid-semester break
Week 9-10-11: DC-to-AC Converters (Single-phase and Three – phase PWM Inverters)
Week 12-13: soft-switching techniques – ZCS and ZVS actions
Nov. 24: Midterm test 2
Nov. 26-27: Thanksgiving Holiday
Week 15: Overview of the PWM Inverters
Dec. 10: Final Exam

Grading

<table>
<thead>
<tr>
<th>Test 1</th>
<th>AC-DC and DC-DC converters</th>
<th>20 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 2</td>
<td>DC-AC, resonant converters</td>
<td>20 %</td>
</tr>
<tr>
<td>Final</td>
<td>Comprehensive</td>
<td>40 %</td>
</tr>
<tr>
<td>Homework</td>
<td></td>
<td>20 %</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100 %</td>
</tr>
</tbody>
</table>

Grades will be assigned as follows:

- $90 \leq p \leq 100$: grade A
- $80 \leq p < 90$: grade B
- $70 \leq p < 80$: grade C
- $60 \leq p < 70$: grade D

Attendance Policy:
Each unexcused absence after the first three will automatically decrease the final score by 0.5%.
Students who cannot make a class should contact the instructor in advance, or bring a justification document (doctor’s notice etc).

Student conduct
Students are expected to be on time and submit their original homework & assignments.

Academic Integrity:
Academic integrity is fundamental to the process of learning and evaluating academic performance. Academic dishonesty will not be tolerated. Academic dishonesty includes, but is not limited to, the following: cheating, plagiarism, tampering with academic records and examinations, falsifying identity, and being an accessory to acts of academic dishonesty. Refer to the Student Code of Conduct for further information. The Code is available online at http://www.studentaffairs.uno.edu.

Accommodations for Students with Disabilities:
It is University policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities should contact the Office of Disability Services as well as their instructors to discuss their individual needs for accommodations. For more information, please go to http://www.ods.uno.edu.