Syllabus for ECE 469, Power Electronics Laboratory
Fall Semester, 2017

Instructor: Prof. Arijit Banerjee, arijit@illinois.edu
Lectures: Monday 11:00 am - 11:50 am, TBD ECE Building
Course TAs: Dipanjan Das, Phuc Huynh, Jeffrey Zhu, Jason Galtieri

All lab sessions are in 4024 ECE Building

Lab Session AB2: Tuesday 9:00am-11:50am TAs: TBD
Lab Session AB3: Wednesday 12:00pm-2:50pm TAs: TBD
Lab Session AB4: Wednesday 3:00pm-5:50pm TAs: TBD

Course Website: http://courses.engr.illinois.edu/ece469
Notebook: Must be bound, with pre-printed page numbers. Several types meeting these requirements are available in each of the bookstores.

Purpose: To learn how to design, build, test, and debug power conversion circuits. This course supplements analysis tools presented in ECE 464 with practical design and measurement experience.

Experiments: (See course calendar for lab schedule and report submission deadline)

Experiment #0: Demonstration and introduction to lab
Experiment #1: Basic Rectifier Circuits
Experiment #2: AC-DC Conversion, Part I
Experiment #3: AC-DC Conversion, Part II
Experiment #4: DC-DC Conversion, Part I: One-Quadrant Converters
Experiment #5: DC-DC Conversion, Part II: Converters for Motor Drives
Experiment #6: DC-AC Conversion, Part I: Voltage-Sourced Inverters
Experiment #7: DC-AC Conversion, Part II: Pulse-Width Modulation Inverters
Experiment #8: Real Components, Part I: Models for Real Capacitors and Inductors
Experiment #9: Real Components, Part II: Switching Devices and Gate Drive Circuits
Experiment #10: PWM Generation and Control
Experiment #11: PWM Signal Generation with PI Control

Lab Reports: Based on the above experiments you would need to write and submit six experimental reports: one each for Exp #0, Exp #1-#3, Exp #4-#5, Exp #6-#7, Exp #8-#9, and Exp #10-#11.

Grading: Grading is on an absolute scale. Weightings are as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
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<tbody>
<tr>
<td>Pre-labs</td>
<td>10%</td>
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<tr>
<td>Report #0</td>
<td>5%</td>
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<tr>
<td>Report #1</td>
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<td>Report #2</td>
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<td>Report #5</td>
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<tr>
<td>Design Project Report</td>
<td>30%</td>
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<tr>
<td>Final presentation</td>
<td>5%</td>
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<tr>
<td>Notebook and in-lab work</td>
<td>5%*</td>
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Total: 100%

*In addition, notebook effort is reflected in report grades.
The plus and minus system will be used, and grades are assigned on an absolute scale as follows:

A 88% and up  (A- 88-90%)
B 78% to 87% (B + 85-87%,  B- 78-80%)
C 67% to 77% ( C+ 75-77%,  C- 67-69%)
D 55% to 66% (D + 64-66%,  D- 55-57%)

I reserve the right to adjust these numbers downward (in your favor), but they will not increase.

**Additional Course Information**

1. The first pages of the Lab Manual discuss lab reports and other important issues.

2. Assignments:

a. When you enter each lab session, bring your completed pre-lab assignment to turn in. These are there to help you prepare for the experiment and the report. In some cases, a pre-lab assignment will be handed out in class, in place of the assignment described in the lab manual. They are due as the lab starts. Since they are intended as advance preparation, late pre-labs are not accepted for grade. This includes late arrivals.

b. Record data, observations, and about anything relevant, in your lab notebook. This should be a log of lab activity, as well as a complete data record. Your notebook must be bound, and must have pre-printed page numbers. Loose data sheets are not acceptable. Plots, copies of commercial data sheets, or other extra information should be taped or pasted into the notebook. The notebook must be kept in ink.

c. Reports. See the lab report template on the webpage for details. Except for the final design project report, these must not exceed 7 single-spaced, double-column pages total. Reports are to be done individually, using your group data. In each experiment, there are Study Questions to help guide your discussion. Reports are due at the end of your lab period during the week shown on the Schedule. Late reports are penalized 5% per calendar day.

d. Design Project. After Experiment #9, groups will be assigned specifications relating to the design, assembly, and testing of a complete power supply or power electronic circuit. The final results will be presented briefly in class through an oral presentation with slides. The design report covers more lab effort than others, and should be more complete to reflect this. Reports are due during Finals Week. Please see course calendar.

3. **A key suggestion:** Pace yourself. If you work on your report over a couple of weeks as the experiments proceed, you will find the effort to be quite manageable. This is especially important during the design project.