

# Power Electronics I

Fall, 2019

## Part A - Course Outline

Description: 3 hours credit, Fundamentals of Power Electronics with Lab Experiments

Prerequisites: Electronics Circuits EEE 3308C

Textbook: R. Erickson, Fundamentals of Power Electronics, Springer, 2<sup>nd</sup> Ed, ISBN #: 978-0792372707

Some lectures and homework may come from other sources.

Lab experiment TI-PMLK documents can be accessed from: [TI website](https://university.ti.com/faculty/teaching-materials-and-classroom-resources/ti-based-teaching-kits-for-analog-and-power-design/power-management-lab-kit-series)

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Evaluation: Homework (21%)

Lab performance and assignments (18%)

One Midterm Exam (closed book) (15%)

One Final Exam (closed book) (20%)

Two Projects (7% for Project 1, 12% for Project 2)

Small quizzes which could be at the beginning or before the end of any classes with class attendance check (7%)

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

Objective: (1) Basic power electronics circuit operation

(2) Power converter modeling

(3) Converter control system design

(4) Simple power converter design

(5) Hands on experience in power electronics hardware

Lab experiments:

6 experiments:

1 for lab preparing, 2 for Buck converters, 2 for Boost converters and 1 for Buck-Boost converters

## Part B – General Course Information and Policies

Instructor: Dr. Shuo Wang

TA: Paul Luckey (pluckey@ufl.edu), Andy Yang (andy.yang@ufl.edu)  
and Zhedong Ma (zhedongma@ufl.edu)

Office: NEB 533, Phone: 352-392-4691  
Email: shuo.wang@ece.ufl.edu

Classroom: NEB 0202

Lab room: NEB 0213B

Office Hours: 10:30AM-11:30AM Tuesday and Thursday or by appointments

Lecture Schedule: Tuesday 5:10 PM - 6:00 PM, Thursday: 5:10 PM – 7:05 PM

Lab Schedule: Undergraduate students

Monday | Period 9 - 10 (4:05 PM - 6:00 PM)

Wednesday | Period 11 - E1 (6:15 PM - 8:10 PM)

Wednesday | Period E2 - E3 (8:20 PM - 10:10 PM)

Thursday | Period 7 - 8 (1:55 PM - 3:50 PM)

Friday | Period 10 - 11 (5:10 PM - 7:05 PM)

Graduate students

Tuesday | Period 11 - E1 (6:15 PM - 8:10 PM)

Friday | Period 2 - 3 (8:30 AM - 10:25 AM)

Homework: Late homework will not be accepted unless you have doctor's excuse

Attendance: 10% together with quizzes at random time.

Exams: One midterm examination will be given in a lecture period. The final examination will be given at the time specified by UF class schedule.

Labs: Each lab will have a lab report due one week after the lab.

Submission Requirement:

- Name, assignment number, date submitted on each page.
- Neat circuits with appropriate labels
- List of given values.
- List of starting conditions and equations.
- Development of equations that will yield final values.
- Numerical substitution into final equations.
- Final answer "**Boxed**" where appropriate.

## Preliminary Course Outline and Schedule

(Topics, homework and schedule will be adjusted as needed)

Week, dates	Chapter	Topics	Homework
1 8/20,8/22,	Chapter 1	Introduction	
	Chapter 2	V-t balance, Q balance, small ripple approx.	
2 8/27,8/29	Chapter 2	Output voltage ripple and inductor current ripple	
	Chapter 2	Examples	8/29, Homework 1 assigned
3 9/3,9/5	Chapter 5	Principle of discontinuous conduction mode (DCM) Buck converter example	
	Chapter 5	Boost converter example	9/5, Homework 1 due, Homework 2 assigned
4 9/10,9/12	Chapter 3	Power converter DC transformer model	
	Chapter 3	Power converter DC transformer model	9/12, Finish simulation tutorial at home, Homework 2 due
5 9/17, 9/19	Chapter 3	Equivalent circuit modeling and input port model	9/17, Homework 3 assigned
	Chapter 4	Switch applications	
6 9/24, 9/26	Chapter 4	Switch applications (Possibly a guest lecture from TI)	9/24, Homework 3 due
	Chapter 4	Switch realization examples	9/26, Homework 4 assigned, Project 1 assigned
7 10/1,10/3 No lectures	No Lectures due to an IEEE Conference (You may still have labs)		
8 10/8, 10/10	Chapter 7	Average modeling	10/8, Homework 4 due
	Chapter 7	Perturbation, linearization and small signal model	10/10, Project 1 due
9	Chapter 7	Pulse Width Modulator	10/15, Homework 5 assigned

10/15, 10/17	<b>10/17</b>	<b>Midterm Exam (Chapter 2 –Chapter 5)</b>	<b>5:10PM-7:05PM</b>
10 10/22, 10/24	Chapter 8	Bode plots	10/22, Homework 5 due
	Chapter 8	Bode plots	
11 10/29, 10/31	Chapter 8	Analyzing converter transfer function using bode plots	
	Chapter 8	Graphical construction of impedances and transfer functions	10/31, Homework 6 assigned
12 11/5, 11/7	Chapter 9	Negative feedback's effects on transfer functions, loop gain	
	Chapter 9	Loop gain analysis, stability	11/7, Homework 6 due, Project 2 assigned
13 11/12, 11/14	Chapter 9	Compensator	
	Chapter 9	Compensator design to achieve stability	
14 11/19, 11/21	Chapter 9	Compensator design examples	11/9, Homework 7 assigned
	Chapter 6	Flyback converters (Laptop power adapters)	
15 11/26		Problem Solving Examples	11/26, Homework 7 due
16 12/3		Course Review and Final exam guidelines	12/3, Project 2 due
17 12/11		<b>Final Exam (Chapter 6-Chapter 9) (5:30PM-7:30PM)</b> <u>Turn off all electronics devices, remove everything except a pen and a calculator from your desk</u>	