Syllabus for EEL 4242C / EEE 5317C

Power Electronics I

Fall, 2017

Part A - Course Outline

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

Prerequisites: Electronics Circuits EEE 3308

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

Lab experiment TI-PMLK documents can be accessed from: TI website

Evaluation: Homework

Lab performance and assignments

One Midterm Exam (closed book) including lab problems

One Final Exam (closed book) including lab problems

Two Projects (the 2nd project is a group project)

Quizzes (closed book)

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

Topics: (1) Basic power converter operation principles: volt-second balance and charge balance.

(2) Steady-state converter modeling and analysis, switch realization and transformer-isolated converters

(3) AC modeling of converters using averaged methods, small-signal transfer functions, and classical feedback loop design

(4) Buck, Boost and Buck-boost converter design

(5) Power electronics lab experiments for basic power converter topologies

Class schedule:

150 minutes of lecture / week

120 minutes of Lab class / 2 weeks

Part B – General Course Information and Policies

Instructor: Dr. Shuo Wang

Lab TA: Matthew Griessler (mgriessler@ufl.edu)

Grading TA: Yanwen Lai, (laiyw124@ufl.edu)

Office: NEB 533

Phone: 352-392-4691

Email: shuo.wang@ece.ufl.edu

Classroom: PSY 0130

Lab room: NEB 213B

Office Hours: 10:30AM-11:30AM Wednesday and Friday or by appointment

Grading:
- 20% Homework and Quizzes
- 15% Midterm Exam (closed book)
- 25% Final Exam (closed book)
- 20% Projects (10%, 10%)
- 20% Lab assignments

For graduate students, they will be given extra problems and assignments. Final grades will be curved separately.

Schedule: Lecture: 1:55PM-2:45PM, Monday, Wednesday and Friday

Lab: TBD

Homework: All homework and lab assignments have been assigned in syllabus. Homework will be collected at the beginning of the class on the due date; late homework will not be accepted.

Attendance: It is very important to attend every class as important material for homework, quizzes, exams and projects will usually be covered in these classes.

If you missed quizzes, there is no makeup quizzes unless you have special conditions.

Exams: One midterm examination will be given in a lecture period. The final examination will be given on Dec 14, 10:00AM-12:00PM, PSY 0130.

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.
g. Final answer "**Boxed**" where appropriate.

Preliminary Course Outline and Schedule

Week, dates	Section	Topics	Homework (* for graduate student only)
1 8/21,8/23, 8/25	Chapter 1	Introduction	
	Chapter 2	V-t balance, Q balance, small ripple approx.	
	Chapter 2	Output voltage ripple and inductor current ripple	
2 8/28,8/30, 9/1	Chapter 2	Examples	
	Chapter 5	Principle of discontinuous conduction mode (DCM) Buck converter example	
	Chapter 5	Boost converter example	
3 9/4,9/6,9/8	Chapter 3	Power converter DC transformer model	Homework 1 due (problems 2.5, 2.7, 2.8)
	Chapter 3	Equivalent circuit modeling and input port model	
	Chapter 4	Switch applications	Homework 2 due (problems 5.1)
4 9/11,9/13, 9/15	9/11	Finish Saber tutorial at home	Class does not meet due to an academic travel
	Chapter 4	Switch realization examples	
	Chapter 4	Semiconductor device brief review	9/15, Homework 3 due (problems 3.1, 3.2, 3.8*)
5 9/18, 9/20,9/22	Chapter 4	Switching power losses	
	Chapter 4	Switching power losses	
	9/22	**Quiz 1 Chapter 2, 3 and 5**	**1:550PM-2:45PM**
6	Chapter 6	Flyback converter	

9/25, 9/27,9/29	Chapter 6	Forward converter	10/4, Homework 4 due (problems 4.1, 4.2, 4.3*)
	Chapter 7	Average, perturbation and small signal model	
7 10/2,10/4, 10/6	10/2,10/4		Class does not meet on 10/2 and 10/4 due to an IEEE conference
	Chapter 7	Average, perturbation and small signal model	
8 10/9, 10/11,10/13	Chapter 7	Small signal model examples	10/11, homework 5 due (problem 6.11)
	Chapter 7	Pulse width modulator	**10/13, Project 1 due**
9 10/16, 10/18,10/20	Chapter 8	Bode plots	
	Chapter 8	Bode plots	10/20, homework 6 due (problem 7.1,7.2)
10 10/23, 10/25,10/27	10/23	**Midterm Exam (Chapter 2 –Chapter 7)**	**1:55PM-2:45PM**
	Chapter 8	Bode plots	10/25, Project 2 assigned
11 10/30, 11/1,11/3	Chapter 8	Bode plots	Ph.D. student Yiming Li will teach (I will leave for an IEEE conference)
	Chapter 8	Graphical construction of impedances and transfer functions	
12 11/6, 11/8,11/10	Chapter 9	Negative feedback's effects on transfer functions	
		Quiz 2, Chapter 8	11/10, homework 7 due (8.1, 8.2, 8.16)
13 11/13, 11/15,11/17	Chapter 9	Stability analysis, Controller design	
	Chapter 9	Measurement of loop gains	
14 11/20, 11/22,11/24	Chapter 9	Project 2 and Magnetics theory	
	Thanksgiving Break (11/22, 11/24)		
15 11/27, 11/29,12/1	Chapter 13	Magnetics theory, inductor design	11/29, homework 8 due (9.2, 9.5)
	Chapter 14	Inductor design	
16 12/4, 12/6	Chapter 15	Transformer design	**Project 2 due on Dec 12**
17 12/14		**Final Exam (Chapter 8-9, Chapter 13-15) (Dec 14, 10:00AM-12:00PM)** Turn off all electronics devices, remove everything except a pen and a calculator from your desk	