Syllabus for EEL 4242C / EEE 5317C

Power Electronics I

Fall, 2018

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, 2nd Ed, ISBN #: 978-0792372707

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

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 after every two chapters (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

Lab: please see lab schedule table

Part B – General Course Information and Policies

Instructor: Dr. Shuo Wang

Lab TA: Matthew Griessler (mgriessler@ufl.edu), Le Yang (yanglemike@ufl.edu)

Grader: Juntao Yao (juntaoyao@ufl.edu)

Office: NEB 533

Phone: 352-392-4691

Email: shuo.wang@ece.ufl.edu

Classroom: Larsen 0310

Lab room: NEB 213B

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

Grading:

20% 10 homework assignments (10%) and Quizzes (10%)

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: 3:00PM-3:50PM, Monday, Wednesday and Friday

Lab:

Undergraduate students:
Wednesday | Period 11 - E1 (6:15 PM - 8:10 PM)
Wednesday | Period E2 - E3 (8:20 PM - 10:10 PM)
Thursday | Period 2 - 3 (8:30 AM - 10:25 AM)
Graduate students:
Tuesday | Period 11 - E1 (6:15 PM - 8:10 PM)
Friday | Period 2 - 3 (8:30 AM - 10:25 AM)

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 10, 10:00AM-12:00PM, Larsen 0310.

Labs: There will be approximately six labs (may vary). Each lab will have a lab report due the week after the lab is taken. For example, if you are in the Monday lab, the lab report will be due before midnight the following Monday. In addition, several questions on the final exam will be lab related.

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 8/22,8/24,	Chapter 1	Introduction	
	Chapter 2	V-t balance, Q balance, small ripple approx.	
2 8/27,8/29, 8/31	Chapter 2	Output voltage ripple and inductor current ripple	
	Chapter 2	Examples	
	Chapter 5	Principle of discontinuous conduction mode (DCM) Buck converter example	
3	Chapter 5	Boost converter example	

9/5,9/7	Chapter 3	Power converter DC transformer model	9/5, Homework 1 due (problems 2.5, 2.7, 2.8)
4 9/10,9/12, 9/14	Chapter 3	Power converter DC transformer model	
	9/12	**Quiz 1, Chapter 2 and 5**	**3:00PM-3:50PM**
	Chapter 3	Equivalent circuit modeling and input port model	Finish simulation tutorial at home 9/12, Homework 2 due (problems 5.1)
5 9/17, 9/19,9/21	Chapter 4	Switch applications	
	Chapter 4	Switch applications	
	Chapter 4	Switch realization examples	9/21, Homework 3 due (problems 3.1, 3.2, 3.8*)
6 9/24, 9/26,9/28	9/24	**Class does not meet due to a conference**	
	9/26	**Class does not meet due to a conference**	
	Chapter 4	Semiconductor device overview	
7 10/1,10/3, 10/5	10/1	**Quiz 2, Chapter 3 and 4**	10/1, Homework 4 due (problems 4.1, 4.2, 4.3*)
	Chapter 6	Flyback converter (skip forward converter)	10/3, Project 1 assigned
	Chapter 7	Average modeling	
8 10/8, 10/10,10/12	Chapter 7	Perturbation, linearization and small signal model	
	Chapter 7	State Space Averaging	10/8, Homework 5 due (problem 6.4)
	Chapter 7	Pulse Width Modulator	
9 10/15, 10/17,10/19	Chapter 8	Bode plots	10/15, homework 6 due (problem 7.1,7.2)
	10/17	**Quiz 3, Chapter 6 and 7**	**3:00PM-3:50PM,**
	Chapter 8	Midterm exam guidelines and Bode plots	10/19, Project 2 assigned, **Project 1 due**
10 10/22, 10/24,10/26	10/22	**Midterm Exam (Chapter 2 –Chapter 7)**	**3:00PM-3:50PM**
	Chapter 8	Bode plots	
	Chapter 8	Analyzing converter transfer function using bode plots	
11 10/29, 10/31	Chapter 8	Graphical construction of impedances and transfer functions	
	Chapter 8	Examples	
12 11/5, 11/7,11/9	Chapter 9	Negative feedback's effects on transfer functions, loop gain	
	Chapter 9	Loop gain analysis, stability	
	Chapter 9	Compensator	11/9, homework 7 due (8.1, 8.2, 8.16)
13	Chapter 9	Compensator design to achieve stability	

11/14, 11/16	Chapter 9	Measurement of loop gains	
14 11/19	Chapter 13	Magnetic theory fundamentals	11/19, homework 8 due (9.2, 9.5)
	Thanksgiving Break (11/21, 11/23)		
15 11/26, 11/28,11/30	11/26	**Quiz 4, Chapter 8 and 9**	**3:00PM-3:50PM**
	Chapter 13	Magnetic theory fundamentals	
	Chapter 13	Magnetic theory fundamentals	
16 12/3, 12/5	Chapter 13	Magnetic theory fundamentals	12/3, Homework 9 due (13.1, 13.3, 13.5*)
	Chapter 14, 15	Inductor and transformer design basics	12/5, Homework 10 due (13.10) **Project 2 due on Dec 5**
17 12/10		**Final Exam (All chapters) (Dec 10, 10:00AM-12:00PM)** Location: Larsen 0310, Turn off all electronics devices, remove everything except a pen and a calculator from your desk	

The three main types of power electronics devices (i.e., rectifiers, dc-to-dc converters, and inverters) are discussed in detail in the lectures. For each device, the ideal circuit is discussed along with different circuit topologies to provide a wide range of practical uses. By learning how rectifiers, dc-to-dc converters, and inverters are designed, you will learn the fundamentals for designing your own power electronics devices, such as POWER ELECTRONICS. 7th Sem E&C. ARUNKUMAR G M.Tech. Lecturer in E&C Dept.,. Sri Taralabalu Power Electronics,Daniel W. Hart.pdf. 494 PagesÂ·2009Â·11.92 MBÂ·13,509 Downloads. Introduction 1. 1.1 Power Electronics 1. 1.2 Converter Classification 1. 1.3 Power Electronics ...Â Condra Chair of Excellence in Power Electronics. The University of Tennessee 150 papers, 21 U.S Modern How to Win Every Argument.