Introduction to Power Electronics

EEE 5317C   Section 0001-0002
Class Periods: Tuesday Period 7: 1:55 PM - 2:45 PM;
Thursday Period 7, 8: 1:55 PM – 2:45 PM; 3:00 PM – 3: 50 PM
Location: LAR 0330
Academic Term: Fall 2022

Instructor:
Dr. Shuo Wang
Email Address: shuo.wang@ece.ufl.edu
Office Phone Number: 352-392-4691
Office Hours: to be decided by TAs: Qinghui Huang, Han Wu and Yanwen Lai

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website or emails
TA are in charge of labs, office hours and grading
- TA: Yanwen Lai, laiyw124@ufl.edu,
- TA: Qinghui Huang, qinghuihuang@ufl.edu,
- TA: Han Wu, hanwu@ufl.edu

Course Description
Circuit topologies, analysis, design and simulation of electronic circuits such as power supplies, and motor drives.

Course Pre-Requisites / Co-Requisites
Electronics Circuits, EEL 3308

Course Objectives
(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

Materials and Supply Fees
N/A

Required Textbooks and Software
- Title: Fundamentals of Power Electronics
- Author: R. Erickson
- Springer, 2nd Ed,
- ISBN 978-0792372707
- Lab source link:
  https://university.ti.com/faculty/teaching-materials-and-classroom-resources/ti-based-teaching-kits-for-analog-and-power-design/power-management-lab-kit-series

  Free student version simulation software Simplis download link will be provided in the class

  Lab location: NEB 0213B

Recommended Materials
- N/A

Course Schedule

Week, dates	Chapter	Topics	Homework and Labs
1 8/25	Chapter 1 Chapter 2	Introduction, V-t balance, Q balance, small ripple approx.	
2 8/30, 9/1	Chapter 2	Output voltage ripple and inductor current ripple	
	Chapter 2	Chapter 2 review and Examples	9/1, Chapter 2 homework assigned,
3 9/6, 9/8	Chapter 3	Power converter DC transformer model	
	Chapter 3	Power converter DC transformer model	9/8, Chapter 2 homework due
4 9/13, 9/15	Chapter 3	Equivalent circuit modeling and input port model	
	Chapter 3	Chapter 3 review and Examples	9/15, Chapter 3 homework assigned
5 9/20, 9/22	Chapter 5	Principle of discontinuous conduction mode (DCM) Buck converter example	
	Chapter 5	Boost converter example	9/22, Chapter 3 homework due
6 9/27, 9/29	Chapter 4	Switch applications and realization	9/27, Chapter 5 homework assigned
	Chapter 4	Switch applications and realization	
7 10/4, 10/6	Chapter 4	Switch realization examples	10/4, Chapter 5 homework due
	Chapter 4	Chapter 4 review and Examples	10/6, Chapter 4 homework assigned
8 10/11, 10/13	Chapter 7	Average modeling	
	Chapter 7	Perturbation, linearization and small signal model	10/13, Chapter 4 homework due
9 10/18, 10/20	**10/18**	**Midterm Exam (Chapter 2 –Chapter 5)**	**1:55PM-3:50PM**
	Chapter 7	Pulse Width Modulator	
10 10/25, 10/27	Chapter 7	Chapter 7 Review and Examples	10/25, Chapter 7 homework assigned
	Chapter 8	Bode plots	10/27, Project assigned
11 11/1, 11/3	Chapter 8	Analyzing converter transfer function using bode plots	11/1, Chapter 7 homework due
	Chapter 8	Graphical construction of impedances and transfer functions	
12 11/8, 11/10	Chapter 8	Chapter 8 Review and Examples	11/8, Chapter 8 homework assigned

	Chapter 9	Negative feedback's effects on transfer functions, loop gain Loop gain analysis, stability	
13 11/15, 11/17	Chapter 9	Compensator	11/15, Chapter 8 homework due
	Chapter 9	Compensator design to achieve stability	
14 11/22,	Chapter 9	Compensator design examples	
			11/24, holiday
15 11/29, 12/1	Chapter 9	Compensator design examples	11/29, Chapter 9 homework assigned
	Chapter 9	Chapter 9 Review and Examples	
16 12/6		Final exam and project guidelines	12/6, Chapter 9 homework due
12/11			12/11, Project due
12/15		**12/15, Final Exam (Chapter 6-Chapter 9) (10:00AM-12:00PM)** **Location: classroom**	

There will be 4 Labs and they will be assigned separately by TAs in Canvas.

Attendance Policy, Class Expectations, and Make-Up Policy
Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation. Additional information can be found here: https://gradcatalog.ufl.edu/graduate/regulations/

Evaluation of Grades
Homework Sets (7)	10 each	20%
Labs (4)	10 each	20%
Midterm Exam	100	20%
Final Exam	100	20%
Project	100	20%
Total		100%

Grading Policy
Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

Students Requiring Accommodations
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code ([https://sccr.dso.ufl.edu/process/student-conduct-code/)](https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.ufl.edu.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints: *https://distance.ufl.edu/state-authorization-status/#student-complaint*.