San José State University
College of Engineering, Electrical Engineering Department
EE-238, Advanced Power Electronics, Sec 01, Spring, 2018

Course and Contact Information

Instructor:	Mohamed Badawy
Office Location:	ENG 361
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Email:	mohamed.badawy@sjsu.edu
Office Hours:	Thursdays: 6 pm – 7:15 pm
Class Days/Time:	Tuesday & Thursdays: 7:30 pm – 8:45 pm
Classroom:	Eng-401
Prerequisites:	Graduate Standing or Instructor Consent

Course Format

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas Leaning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the messaging system through MySJSU at http://my.sjsu.edu to learn of any updates.

Course Description

Advanced study of switching regulators in power management, including energy conversion topologies, state space averaging techniques, assessing voltage mode/current mode control strategies to embedded hardware. Study of the non-ideal characteristics of power electronic converters and the development of modern efficient power electronic configurations. Applications include photo-voltaic/solar grid-tied inverters, active power factor correction systems, electric vehicles, battery management system, etc.…

Course Goals

To teach graduates students an advanced power electronics knowledge. The knowledge they learn may allow them to work on various power electronic research topics during their studies and to supply the demand of power electronic engineers in the Silicon Valley and in various growing industries.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. Understand different switch mode power supply configurations and analyze their operation modes.
2. Analyze continuous/discontinuous conduction modes in DC/DC converters.
3. Use circuit averaging, state space modeling and other modeling techniques to represent the switched mode converters.
4. Determine the steady state behavior of the switching regulators based on mathematical models.
5. Apply classical and modern control techniques on the switched mode converters.

6. Learn design techniques for practical power electronic projects.
7. Review power electronic literature and criticize it constructively.

Required Texts/Readings

- Class notes/handouts.

Other Readings

- "Fundamentals of Power Electronics" latest Edition, by Robert W. Erickson, and Dragan Maksimovic.
- "Digital Control of High-Frequency Switched-Mode Power Converters", by Luca Corradini, Dragan Maksimović, Paolo Mattavelli, and Regan Zane.
- "Principles of Power Electronics" latest Edition by John G. Kassakian, Martin F. Schlecht, and George C. Verghese.

Other technology requirements / equipment / material

- Matlab/Simulink is needed for the homework assignments. A schematic/PCB software tool might also be needed for the project. All the needed software packages are available in the Power Electronic lab (EE-317), however, the students are encouraged to get their own educational copies.

Course Requirements and Assignments (Required)

- There will be two exams and no final for this course.
- There will be one paper presentation, where every group will be assigned a paper to read, review, criticize and present to the class.
- There will be one project, where every student will be assigned a project to work on and write a report on it by the end of the class.
- There will be 4-5 homework assignments for this course.
- There will be quiz assignments and class exercises (for credit) during the class.
- All the assignments are aligned with the aforementioned course learning outcomes.

Grading Information

Midterms	25 %
Homework	35 %
Paper presentation	15 %
Project	15 %
Quiz & class exercises	10 %

Determination of Grades

>96%	A+
>92%	A
>88%	A-
>84%	B+
>80%	B
>76%	B-
>72%	C+
>68%	C
>64%	C-
>60%	D+
>56%	D
>52%	D-
<52%	F

There will be extra credit for class interaction, and for some special assignments.

Late assignment will be credited up to 50% of the full assignment credit (late assignments are accepted up to 48 hours after the assignment due).

Classroom Protocol

Students are encouraged to attend the class on time. Interaction in the classroom between the students and the instructor or between the students and their peers (while solving problems) is highly encouraged.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/"

EE Department Honor Code

The Electrical Engineering Department will enforce the following Honor Code that must be read and accepted by all students. "I have read the Honor Code and agree with its provisions. My continued enrollment in this course constitutes full acceptance of this code. I will NOT:

- Take an exam in place of someone else, or have someone take an exam in my place.
- Give information or receive information from another person during an exam.
- Use more reference material during an exam than is allowed by the instructor.
- Obtain a copy of an exam prior to the time it is given.
- Alter an exam after it has been graded and then return it to the instructor for re-grading.
- Leave the exam room without returning the exam to the instructor."

Measures Dealing with Occurrences of Cheating:

- Department policy mandates that the student or students involved in cheating will receive an "F" on that evaluation instrument (paper, exam, project, homework, etc.) and will be reported to the Department and the University.
- A student's second offense in any course will result in a Department recommendation of suspension from the University.

EE-238 / Advanced Power Electronics, Spring 2018, Course Schedule

Course Schedule (subject to changes based on the flow of the class and the students feedback)

Week	Date	Topics, Readings, Assignments, Deadlines
Revision on Power Electronic Converters		
1	Thursday 01/25/2018	Revision on Switched Mode Converters
2	Tuesday 01/30/2018	
2	Thursday 02/01/2018	
3	Tuesday 02/06/2018	
Modeling of Switched Mode Power Converters		
3	Thursday 02/08/2018	Circuit Averaging of Switched Mode Converters
4	Tuesday 02/13/2018	
4	Thursday 02/15/2018	
5	Tuesday 02/20/2018	
5	Thursday 02/22/2018	
6	Tuesday 02/27/2018	
6	Thursday 03/01/2018	State Space Averaging of Switched Mode Converters
7	Tuesday 03/06/2018	
7	Thursday 03/08/2018	
Continuous Control		
8	Tuesday 03/13/2018	Analog Control of Switched Mode Converters
8	Thursday 03/15/2018	
9	Tuesday 03/20/2018	
9	Thursday 03/22/2018	

Week	Date	Topics, Readings, Assignments, Deadlines
10	Tuesday 03/27/2018	Campus Closed (Spring Recess)
10	Thursday 03/29/2018	
11	Tuesday 04/03/2018	Revision Session
11	Thursday 04/05/2018	Exam 1
Discrete Modeling and Control		
12	Tuesday 04/10/2018	Discrete Models of Switched Mode Converters
12	Thursday 04/12/2018	
13	Tuesday 04/17/2018	Digital Control of Switched Mode Converters
13	Thursday 04/19/2018	
14	Tuesday 04/24/2018	
Accurate Modeling		
14	Thursday 04/25/2018	Losses in Switched Mode Converters
15	Tuesday 05/01/2018	Accurate Models of Switched Mode Converters
15	Thursday 05/03/2018	Exam 2
Presentations and Project Demonstration		
16	Tuesday 05/08/2018	*Students Presentations*
16	Thursday 05/10/2018	*Students Presentations*
17	Thursday 05/17/2018	*Students Presentations* *Project Reports Due* *Final Meeting at 7:45 pm*