San José State University
College of Engineering, Electrical Engineering Department
EE-238, Advanced Power Electronics, Sec 01, Spring, 2017

Course and Contact Information

Instructor: Mohamed Badawy

Office Location: ENG 361

Telephone: (408) 924-3924

Email: mohamed.badawy@sjsu.edu

Office Hours: Tuesday & Thursdays: 4:30 pm – 5:45 pm

Class Days/Time: Tuesdays & Thursdays: 6 pm – 7:15 pm

Classroom: Dudley Moorhead Hall 208

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. Analyze the converters efficiency based and non-ideal behavior.
7. Learn and analyze modern power electronic configurations with high efficiency and superior performance.
8. Apply the learned configuration on industrial applications such as solar system, electric vehicles, battery management systems, etc...
9. Learn design techniques for practical power electronic projects.
10. Review power electronic literature and criticize it constructively.

Required Texts/Readings

- Class notes/handouts.
- "Fundamentals of Power Electronics" latest Edition, by Robert W. Erickson, and Dragan Maksimovic.

Other Readings

- "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. The software is available in the Engineering labs, however, the students are encouraged to get their own educational copy.

Course Requirements and Assignments (Required)

- There will be two midterms 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 group will be assigned a project to design, test, debug and present it in a final report.
- 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	40 %
Homework	20 %
Paper presentation	15 %
Project	15 %
Quiz & class exercises	10 %

Determination of Grades

>95%	A+
>90%	A
>85%	A-
>80%	B+
>75%	B
>70%	B-
>65%	C+
>60%	C
>55%	C-
>50%	D+
>45%	D
>40%	D-
<40%	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-238 / Advanced Power Electronics, Spring 2017, Course Schedule

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

Week	Date	Topics, Readings, Assignments, Deadlines
Introduction		
1	Thursday 01/26/2017	Revision on Switched Mode Converters
2	Tuesday 01/31/2017	
2	Thursday 02/02/2017	
Modeling and Control of switched Converters		
3	Tuesday 02/07/2017	Modeling of Switched Mode Converters
3	Thursday 02/09/2017	
4	Tuesday 02/14/2017	
4	Thursday 02/16/2017	
5	Tuesday 02/21/2017	
5	Thursday 02/23/2017	Control Techniques of Switched Mode Converters
6	Tuesday 02/28/2017	
6	Thursday 03/02/2017	
7	Tuesday 03/07/2017	
7	Thursday 03/09/2017	*Midterm 1*
Switched Converters Losses and non-idealities		
8	Tuesday 03/14/2017	Switched Converters Losses and EMI
8	Thursday 03/16/2017	Projects Assignment
Advanced Power Electronic Configurations		
9	Tuesday 03/21/2017	Resonant Converters

Week	Date	Topics, Readings, Assignments, Deadlines
9	Thursday 03/23/2017	Papers Assignment
10	Tuesday 03/28/2017	Campus Closed (Spring Recess)
10	Tuesday 03/30/2017	
11	Tuesday 04/04/2017	Advanced Power Electronic Configurations (Interleaving, multi-level, phase shifted, etc..)
11	Thursday 04/06/2017	
12	Tuesday 04/11/2017	
12	Thursday 04/13/2017	
13	Tuesday 04/18/2017	
13	Thursday 04/20/2017	*Midterm 2*
14	Tuesday 04/25/2017	Industrial Applications of Power Electronic Configurations
14	Thursday 04/27/2017	
Design Techniques for Power Electronic Circuits		
15	Tuesday 05/02/2017	Magnetics & Gate Driver Design
15	Thursday 05/04/2017	
Presentations and Project Demonstration		
16	Tuesday 05/09/2017	*Projects Demonstrations*
16	Thursday 05/11/2017	*Papers Presentations*
17	Tuesday 05/16/2017	*Papers Presentations*
17	Thursday 05/19/2016	*Papers Presentations* *Project Reports Due* *Final Meeting at 5:15 pm*