Department of Electrical and Electronic Engineering, California State University, Sacramento

EEE 148 Power Electronics Laboratory, *1 unit*
Spring 2017, Section 1, Call No. 36157, Tues 12:00 – 2:40 P.M., Riverside Hall, Room 3017

Course Content: Solid state applications in power control. Diodes, rectifiers (solid state and three phase), thyristors. Principle of phase controlled rectifications, single phase and three phase converters. Power factor improvement. Three phase Pulse Width Modulation (PWM). AC voltage controllers. PSICE modeling. Strong design emphasis. EMTP modeling. LabVIEW graphics simulation. Microprocessor control of power electronics systems. UPS systems, power supplies, power quality monitoring.

Prerequisite: EEE 108, EEE 130
Co-requisite: EEE 146 Power Electronics lecture

Textbook: ***Power Electronics***, Daniel Hart, 2011, McGraw-Hill
                    ISBN: 978-0-07-338067-4

Lab Manual: The lab materials are available on the course ECS Moodle site:
https://moodle2.ecs.csus.edu/

Required Equipment: During the course you will need your own personal protoboard.

Instructor: Russ Tatro   Office: Riverside 5030
                    email: rtatro@csus.edu   Website: www.csus.edu/indiv/t/tatror
                    Office Phone: 278-4878
                    Office Hours: See my website for current office hours.

Grading: The pre-lab assignments, laboratory reports and attendance are the basis for the grade in this lab.

Lab		Report
1	Power-Pole Board	
2	Buck Converter	15
3	MOSFET Switching	15
4	Boost Converter	15
5	Buck-Boost Converter	15
6	Flyback Converter	15
7	Forward Converter	15
8	Single Phase Inverter	10
	Total points	100

Attendance: On-time lab attendance is mandatory. Unexcused tardiness or absence will result in score reductions for the weekly assignments. Attendance will be noted for every lab session.

     Late: 15 minutes = -5 points
             30 minutes or more but still attended the lab = -20 points

     Unexcused absence: One week long lab = -90% for each occurrence
                          Two week long lab = -45% for each occurrence

Grading Policy: Grades may be curved at the instructor's discretion. The class average will be in the C+ range. Typical grades ranges are:

       "A" - 90 and above   "C" - 70 - 79   F – Below 60

       "B" - 80 – 89   "D" - 60 - 69

Late pre-lab and report score deductions - when **advance** permission not granted.

3 days	-30%	Submit three days after report due by close of EEE office.
≥ 7 days	-70%	Grossly late reports accepted until May 12, 2017 by close of EEE office.

Plagiarism Policy: All reports for this laboratory are prepared individually. It is expected and encouraged that students help each other with the concepts and the data gathering/analyzing stages of the lab. However, the report is an individual effort. The standards of the university on plagiarism are published and will be enforced. See CSUS policy: http://www.csus.edu/umanual/student/UMA00150.htm On the first occurrence of potential plagiarism, the reports involved will receive minus the value of the lab report points. I have no way of knowing which report was the "master" and which was the "copy". Both reports will receive the minus score. On a second occurrence, the reports will be submitted to Academic Affairs for disciplinary action.

Room 3017 – Notes on equipment and policies
1. No food or drink in the lab. The equipment is way too expensive to risk damage by lunch.
2. Please clean your station before departing the lab. Replace all cables, parts and portable equipment to the proper places.
3. The test and measurement equipment in the lab was donated by Agilent and Tektronix. The user guides and manuals are posted on the course website.
4. Each individual should buy a good quality proto-board. Bring the proto-board to every lab period.
5. Test devices and parts will be supplied to the lab team. Please return useable parts to the proper bins and destroy damaged/unusable parts.

General Notes
1. The lab report should be a professionally written document. All equations in the lab report must be neatly hand written or typed using an equation editor such as MathType, the Microsoft Equation Editor or other appropriate software. Non-mathematically formatted equations submitted on lab reports will receive a point deduction.

    For example: $v_0(t) = v_i(t)\dfrac{R_2}{R_1 + R_2}$ and <u>not</u> v0(t)=vi(t)R2/(R1+R2).

2. There are many deadlines in the lab schedule. Pay attention to the schedule and meet the deadlines!
3. Please report any broken test equipment, scope probe or test lead immediately to the instructor. We have spares on hand and will fix the problem as quickly as possible.
4. Please report any difficulties you encounter with the lab computers or software. While it is usually "operator error", you may have found a unique error that needs fixing.

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Week	DATE:	Lab	TOPICS:
1	01-24	Lab 0	Multisim/PSpice Review and PE Lab Introduction
2	01-31	Lab 1	Power-Pole Board Familiarization
3	02-07	Lab 2	Buck Converter
4	02-14	Lab 2 continued	Buck Converter
5	02-21	Lab 3	Switching Characteristic of MOSFET and Diodes Lab 2 report due at the start of the lab period
6	02-28	Lab 4	Boost Converter
7	03-07	Lab 5	Buck-Boost Converter Lab 3 report due at the start of the lab period.
8	03-14	Lab 5 continued	Lab 4 report due at the start of the lab period.
9	03-21		Spring Break
10	03-28	Lab 6	Flyback Converter Lab 5 report due at the start of the lab period.
11	04-04	Lab 6 continued	
12	04-11	Lab 7	Forward Converter Lab 6 report due at the start of the lab period.
13	04-18	Lab 7 continued Start Lab 8	Finish Lab 7 and start Lab 8 as soon as possible.
14	04-25	Lab 8	Single Phase Inverter Lab 7 report due at the start of the lab period.
15	05-02	Lab 8 continued	Single Phase Inverter project – continued Pre-Lab 8 assignment due at start of lab – team assignment
		Lab 8 continued	Commercial inverter devices demonstration by instructor Continue to work on your inverter circuit
16	05-09	Lab 8 Presentation	Lab 8 report due at the start of lab - team assignment. Presentation - each lab team will present their findings and their working circuit to the lab during a 15 minute presentation.
17			Finals Week – No lab meeting