GUJARAT TECHNOLOGICAL UNIVERSITY

POWER ELECTRONICS (24)
POWER ELECTRONICS PRACTICE-I
SUBJECT CODE: 2152406
B.E. 5th SEMESTER

Type of course: Engineering Science (Power Electronics)

Prerequisite: 1) 2132404: Principles of Power Electronics
2) 2142405: Analog Electronics & its Applications
3) 2142406: Digital Electronics & its Applications

Rationale: This subject focuses on practical skill development required for doing practical work using combined knowledge of the subjects studied during previous semester

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
0	0	2	2	0	0	0	50	30	20	100

Course Outcome:

After studying this course, the students should be able to:

1. Design simple circuits like signal processing, filtering, gate driver, monostable, astable, bistable multivibrator, V/F, F/V converter etc.
2. Prepare schematic diagram using EDA tools
3. Design PCB for the simple circuit
4. Soldering and desoldering components
5. Identify component packages
6. Understand datasheet
7. Test the circuit developed.
8. Writing a small report (5-10 pages) for the work they have done with test report (Use LATEX for preparing report)

Laboratory Work:
Objectives: The laboratory work is aimed at putting the theory learnt in class in practice and to show that the results are matched with theory closely. In this context, following are the core objectives for laboratory work of this subject.

Directions for Laboratory work:
At the starting of the semester, students should be grouped. Each group should consist of 3 or 4 students. Each group should be given one circuit for designing. Also, they should be instructed to complete the work in following steps.

1. Identify the function of the circuit
2. Based on function, identify the basic components to be used

3. Study the datasheets of the components
4. Prepare the schematic and carry out design calculations
5. Implement the circuit through bread board and test its functionality
6. Prepare final schematic through EDA tools
7. Design PCB
8. Prepare PCB
9. Implement the circuit on PCB and test the same
10. Prepare report for the circuit (using LATEX)

List of Design Based (DP)/Open Ended Problems:

Sample list of circuits to be designed

1. Design gate driver circuit for Half bridge circuit
2. Design isolated gate driver circuit
3. Design V/F converter
4. Design F/V Converter
5. Design current measurement circuit (using shunt, Current Transformer, Hall Effect Transducer)
6. Design voltage measurement circuit
7. Design astable multivibrator circuit
8. Design bistable multivibrator circuit
9. Design instrumentation amplifier circuit
10. Design precision rectifier circuit
11. Design OPAMP based amplifier circuit for different frequency band
12. Design digital counter circuit (eg binary counter, BCD counter, Gray Code counter)
13. Design of digital multiplexer
14. Design of Programmable Gain Data Amplifier
15. Design of ALU and its control circuit

Major Equipment:

- Bread board, Function Generator, AC & DC Power Supply, Oscilloscope, Multimeter etc.
- Consumable Items: Various Power Semiconductor Switches, Various Control ICs, Various Ferrite Cores, Copper Wires for Inductors & Transformers, Soldering Iron, Desoldering Pump, Electronics Toolkit, etc.

List of Open Source Software/learning website:

Open Source Software:

- Fritzing (http://fritzing.org/home/)
- TINA-TI for circuit simulation (http://www.ti.com/tool/tina-ti)
- OSCAD for CAD application (http://www.oscad.in/downloads)
- Multisim for circuit simulation (http://www.ni.com/multisim)
- http://sourceforge.net/projects/ktechlab/
- http://www.cburch.com/logisim/

Web-based tools for design:

- www.st.com
- www.nxp.com

- www.irf.com
- www.infineon.com
- www.ti.com
- www.vishay.com
- www.linear.com
- http://india.ni.com
- http://www.cosmoferrites.com
- http://www.tdk.com
- http://en.tdk.eu
- http://www.tdk.com/design-tools.php
- http://www.smps.us/smpsdesign.html
- http://www.poweresim.com
- www.snubberdesign.com
- https://www.circuitlab.com/editor

Open source for Math Tools:
- http://maxima.sourceforge.net
- www.scilab.org
- www.sagemath.org
- www.gnu.org/software/octave/

Learning website:
- http://www.datasheetcatalog.com
- http://nptel.iitm.ac.in/courses.php
- http://ocw.mit.edu
- http://www.smpstech.com
- http://www.ni.com/white-paper/14676/en/
- http://www.irf.com/product/_/N~1nje1m
- http://www.allaboutcircuits.com/vol_3/chpt_3/4.html
- http://www.deltapowersolutions.com/en/tps/rectifiers.php
- http://www.electrical-engineering-portal.com