Course Learning Outcomes: First Course on Power Electronics

1. Describe the role of Power Electronics as an enabling technology in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc.
2. Identify a switching power-pole as the basic building block and to use Pulse Width Modulation to synthesize the desired output.
3. Design the switching power-pole using the available power semiconductor devices, their drive circuitry and driver ICs and heat sinks. You will be able to model these in PSpice.
4. Learn the basic concepts of operation of dc-dc converters in steady state in continuous and discontinuous modes and be able to analyze basic converter topologies.
5. Using the average model of the building block, quickly simulate the dynamic performance of dc-dc converters and compare them with their switching counterparts.
6. Design controllers for dc-dc converters in voltage and peak-current mode.
7. Design, using simulations, the interface between the power electronics equipment and single-phase and three-phase utility using diode rectifiers and analyze the total harmonic distortion.
8. Design the single-phase power factor correction (PFC) circuits to draw sinusoidal currents at unity power factor.
9. Learn basic magnetic concepts, analyze transformer-isolated switch-mode power supplies and design high-frequency inductors and transformers.
10. Learn basic concepts of soft-switching and their applications to dc-dc converters, compact fluorescent lamps (CFL) and induction heating.
11. Learn the requirements imposed by electric drives (dc and ac) on converters and synthesize these converters using the building block approach.
12. Understand, simulate and design single-phase and three-phase thyristor converters.
13. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.

Textbook: First Course on Power Electronics, Ned Mohan, Year 2007, www.MNPERE.com.