POWER ELECTRONIC SIMULATION LAB (Skill Course Lab-II)

Preamble:

This lab course is introduced to facilitate design and implementation of closed loop control of power converters. This lab course also helps in harmonic analysis of power converters. **Learning objectives:**

- 1. To study the closed loop control of various converters
- 2. To analyze the performance of PWM techniques
- 3. To control the speed of DC motors fed through power electronic converters
- 4. To study the closed loop control of DC-to-DC converters

Note: Any eight of the following experiments are to be conducted

- 1. Simulation of cosine firing scheme for three-phase converter with varying firing angle.
- 2. Closed loop control of single phase half wave rectifier
- 3. Closed loop control of 12-pulse rectifier.
- 4. Close loop speed control of Induction Motor using v/f control.
- 5. Speed Control of DC motor using three phase fully controlled bridge converter
- 6. Simulation of chopper fed DC motor drive
- 7. Speed control of cyclo-converter fed Induction motor.
- 8. Simulation of doubly fed induction generator (DFIG) with PI controller.
- 9. Closed loop control of Boost Converter.
- 10. Closed loop control of Buck Converter.

Note: Any two of the following experiments are to be conducted

- 1. Harmonic analysis of single-phase AC Voltage controller with RLE load.
- 2. Simulation of three-phase PWM inverter using SVPWM.
- 3. Simulation of solar PV Generators with MPPT and battery storage in micro-grids
- 4. Closed loop control of D.C. Motor using PI-Fuzzy Logic Controller
- 5. Speed control of DC motor using single phase fully controlled converter.

Learning Outcomes:

- 1. Demonstrate the effect of various control schemes.
- 2. Assess the performance of converter fed AC motors in closed loop.
- 3. Validate the performance of converter fed DC motors in closed loop.
- 4. Distinguish between conventional and converter fed drives.
- 5. Analyze the harmonic content in converter fed loads.
- 6. Assess the performance of converters for various simulation configurations.

Text books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press. Indian Edition is available:—Standard Publications, 2001.

Reference books:

- 1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
- 2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma,Wiley.