

Course code	Course Name	L-T-P - Credits	Year of Introduction
EE334	Power Electronics and Drives Lab	0-0-3-1	2016
<b>Prerequisite:</b> EE305 Power electronics			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>Impart practical knowledge for the design and setup of different power electronic converters and its application for motor control</li> <li>Simulate the various power electronics converters, AC drives and DC drives.</li> </ul>			
<b>List of Exercises/Experiments:</b> ( 12 experiments are mandatory)			
<b>HARDWARE EXPERIMENTS:</b> <ol style="list-style-type: none"> <li>Static characteristics of SCR Aim: Determine latching current, holding current and static characteristics of SCR</li> <li>R and RC firing circuits Aim: Design and set up R and RC firing circuits and observe waveforms across load resistance and SCR</li> <li>UJT Trigger circuit with Single phase controlled Rectifier Aim: Design &amp; Set up UJT Triggering Circuit and observe waveforms across load resistance, SCR, capacitance and pulse transformer output.</li> <li>Line Synchronised Triggering Circuits Aim: Design and set-up line synchronized Ramp Trigger and Digital Trigger circuits and observe the waveforms</li> <li>Static characteristics of MOSFET Aim: Plot the characteristics of a Power MOSFET</li> <li>AC Voltage Controller using TRIAC Aim: Set a 1-phase AC voltage controller &amp; observe waveforms across load resistance, TRIAC and capacitor for different firing angles</li> <li>Single Phase fully Controlled SCR Bridge circuit Aim: Set up a 1-phase full converter with RL load &amp; with and without freewheeling diode</li> <li>Single-phase half bridge/full bridge inverter using power MOSFET/IGBT Aim: Design and set up a single phase half-bridge/full-bridge inverter and observe the waveforms across load and firing pulses.</li> <li>Single-phase sine PWM inverter with LC filter Aim: Design and set up a single phase sine PWM inverter with LC filter using microcontroller</li> <li>Chopper controlled DC motor Aim: Control the speed of a DC motor using a step-down chopper</li> <li>Speed control of 3-phase induction motor Aim: Control the speed of 3-phase induction motor using V/f control</li> <li>IGBT based three phase PWM Inverter Aim: Set up a 3-phase PWM Inverter with RL load and observe the waveforms</li> <li>Closed Loop Control of Single Phase Fully Controlled Rectifier Aim: Design and set-up a closed loop control circuit for a 1ph Fully Controlled Rectifier such that it keeps the load voltage constant irrespective of the load variations (use R load)</li> </ol>			
<b>SIMULATION EXPERIMENTS:</b> <ol style="list-style-type: none"> <li>Simulation of 1-phase fully-controlled and half-controlled rectifier fed separately excited DC motor Aim: Simulate 1-phase fully-controlled and half-controlled rectifier fed SEDC motor and observe the speed, torque, armature current, armature voltage, source current waveforms and find the THD in source current and input power factor.</li> </ol>			

15. Simulation of closed loop speed control of DC motor with different control schemes (PID, hysteresis current control, Fuzzy, ANFIS etc)
16. Simulation of open loop or closed loop speed control of 3-phase induction motor using V/f control and using sine PWM
17. Design and simulation of buck, boost and buck-boost converters
18. Simulation of Dual Converter – 4 quadrant operation – separately excited DC motor
19. Simulation of Regenerative Braking – Bidirectional Power Transfer
20. Simulation of Switched Mode Rectifiers – keeping load voltage constant irrespective of line and load variations – closed loop circuit simulation

**Minimum of EIGHT hardware experiments and FOUR simulation experiments from the above list are to be done**

**Expected outcome.**

- Students will be able to design, setup and analyse various power electronic converters and apply these converters for the implementation of various motor control applications.

**Text Book:**

- 1) L. Umanand, *Power Electronics – Essentials & Applications*, Wiley-India
- 2) Mohan, Undeland, Robbins, *Power Electronics, Converters, Applications & Design*, Wiley-India
- 3) Muhammad H. Rashid, *Power Electronics Circuits, Devices and Applications*, Pearson Education

