# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**

Dundigal, Hyderabad – 500043

**Electrical and Electronics Engineering**

## List of Laboratory Experiments

| POWER ELECTRONICS LABORATORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Course Code** | **Category** | **Hours / Week** | | | **Credits** | **Maximum Marks** | | |

| **Course Code** | **Category** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
|---|---|---|---|---|---|---|---|---|
| **AEEC21** | **Core** | - | - | 3 | 1 | 40 | 60 | 100 |

| **Contact Classes: Nill** | **Tutorial Classes: Nill** | **Practical Classes: 45** | **Total Classes:45** |
|---|---|---|---|
| **Branch: EEE** | **Semester: V** | **Academic Year: 2023-24** | **Regulation: UG20** |

**Course overview:**

This course is to provide a practical learning environment for students and researchers to understand the principles of power electronics. The laboratory enables hands-on learning experiences, allowing students to build, test, and troubleshoot power electronic circuits and systems. Power electronics is widely used in motor drives for controlling the speed and torque of electric motors. This is essential in various industries, including manufacturing and transportation.

**Course objectives:**

I. The fundamental of power electronics concepts, including semiconductor devices, power semiconductor switches, and basic converter topologies.

II. The circuit design, simulation power electronic circuits and systems using appropriate software tools

III. The design analysis of prototype power electronic circuits using power diodes, thyristors, transistors, and integrated circuits.

**Course outcomes:**

CO 1: Understand the operation of SCR, MOSFET and IGBT for obtaining static voltage - current characteristics.

CO 2: Utilize the forced commutation circuits and gate firing circuits for turning off and on of the SCR.

CO 3: Analyze the input and output waveforms of controlled rectifier circuits for determining the output voltages.

CO 4: Construct the various inverter circuits for direct current to Alternating current conversion.

CO 5: Demonstrate the performance characteristics of ac-to-ac converters for getting variable output voltage using hard ware and modern tools.

CO 6: Develop the chopper circuits for measuring output voltage and current.

| WEEKS | EXPERIMENT NAME | CO |
|---|---|---|
| **WEEK – I** | **SCR, MOSFET AND IGBT** | **CO1** |
| | Study the characteristics of SCR, MOSFET and IGBT. | |
| **WEEK – II** | **GATE FIRING CIRCUITS** | **CO2** |
| | Study the operation of gate firing circuits of SCR | |
| **WEEK – III** | **HALF CONTROLLED CONVERTER** | **CO1** |
| | Study the performance characteristics of single-phasehalf-controlled converter with R and RL loads.. | |
| **WEEK – IV** | **FORCED COMMUTATION CIRCUITS** | **CO4** |
| | Plot the characteristics of forced commutation circuits (Class A, Class B, Class C, Class I and Class E). | |
| **WEEK – V** | **FULLY CONTROLLED BRIDGE CONVERTER** | **CO3** |
| | Study the characteristics of single phase fully controlled bridge converter with R and RL loads | |
| **WEEK – VI** | **SERIES INVERTER** | **CO3** |

| | Study the characteristics of single-phase series inverter with different loads. | |
|---|---|---|
| **WEEK – VII** | **PARALLEL INVERTER** | **CO4** |
| | Study the characteristics of single-phase parallel inverter with different loads. | |
| **WEEK –VIII** | **AC VOLTAGE CONTROLLER** | **CO4** |
| | Plot the characteristics of Single-phase AC voltage controller with R and RL loads. | |
| **WEEK - IX** | **DUAL CONVERTER** | **CO4** |
| | Study the characteristics of single-phase dual converter with R and RL loads. | |
| **WEEK - X** | **CYCLO CONVERTER** | **CO5** |
| | Study the characteristics of single phase cycloconverter with R and RL loads. | |
| **WEEK - XI** | **THREE PHASE CONVERTERS** | **CO6** |
| | Plot the characteristics of three phase half converter with R and RL loads. | |
| **WEEK - XII** | **MOSFET BASED CHOPPERS**. | **CO6** |
| | Study the principle of operation of step-down chopper using MOSFET. | |
| **WEEK - XIII** | **SIMULATION OF THREE PHASE FULL CONVERTER AND PWM INVERTER** | **CO6** |
| | Simulation of three phase full converter and PWM inverter with R and RL loads by using MATLAB. | |
| **WEEK - XIV** | **SIMULATION OF BUCK – BOOST CHOPPER** | **CO6** |
| | Simulation of boost, buck, buck boost converter with R and RL loads by using MATLAB. | |