

# Power Electronics Laboratory

Power Electronics is one of a key subject of electrical engineering. Power electronics is of vital importance to understanding of control, conversion and conditioning of power in electrical industries. The power electronics laboratory is actively engaged to reinforce and enhance understanding of the fundamentals of semiconductor switches and power converters. This laboratory deal with practical realization of theory concept related with power electronics. The all experimental set-ups are designed and developed by the institute according to the standards. The power electronics laboratory is equipped with different converters setups like as rectifier, inverter, A.C voltage converter, DC-DC converter, Switching characteristics, BLDC drive and DC motor drive, where students can visualize the basics principles of different converters.



### **Device characteristics kit**

The trainer kit is used to understand the behavior of different power electronics switches. The trainer consists of a SCR/TRIAC characteristics section, MOSFET/IGBT characteristics section, DIAC characteristics section, MOSFET switching section and power device section. Ammeters and voltmeters are connected from outside to observe the behavior of individual switches at varying supply voltage.

### **Gate triggering circuits kit**

The trainer kit is used to understand the latching/turn-on process of different semiconductor switches. The trainer consists of a control supply, DC triggering circuit, R triggering circuit, RC triggering circuit, UJT triggering circuit, SCR power circuit, MOSFET power circuit and MOSFET/IGBT gate driver circuit. Separate CRO or digital signal oscilloscope is used to observe the latching/turn-on process of individual switches. This kit provides conventional to modern triggering technique of switches.

### **Single Phase Inverter Kit**

The trainer kit is used to understand the principle and behavior of single phase inverter which converter DC supply into AC supply. The trainer consists of power circuit of inverter, microcontroller based control circuit, power supply section, load section and protection circuit. All different types of control signals are generated using single control circuit by changing the program of individual switching pulse like square wave, QSW and SPWM. Separate CRO or digital signal oscilloscope is used to observe the behavior of converter.

### **Three Phase Inverter Kit**

The trainer kit is used to understand the principle and behavior of three phase inverter which converter DC supply into AC supply. The trainer consists of power circuit of inverter, microcontroller based control circuit, power supply section, load section and protection circuit. All different types of control signals are generated using single control circuit by changing the program of individual switching pulse like square wave, QSW and SPWM. Separate CRO or digital signal oscilloscope is used to observe the behavior of converter. Three Phase Inveretr behavior can also analyzed at different load condition like R and RL.

### **Single Phase Rectifier Kit**

The trainer kit is used to understand the principle and behavior of single phase rectifier which converter AC supply into DC supply. The trainer consists of power circuit of rectifier, microcontroller based control circuit, power supply section, load section and protection circuit. All different types of control signals are generated using single control circuit by changing the program of individual switching pulse. Single Phase Rectifier behavior can also analyze at different load condition like R and RL. Also understand the function of free-wheeling diode using this trainer kit. Separate CRO or digital signal oscilloscope is used to observe the behavior of converter.

### **Three Phase Rectifier Kit**

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### **Switch mode DC-DC converter kit**

The trainer kit is used to understand the principle and behavior of DC-DC converter which converter fixed DC supply into variable DC supply. The trainer consists of power circuit of DC-DC converter, microcontroller based control circuit, power supply section, load section and protection circuit. Output voltage can be changed by varying duty ratio of switching pulse, is done by control circuit of converter. Continuous conduction mode and discontinuous conduction mode operation also performed for all DC-DC convert using single kit. Separate CRO or digital signal oscilloscope is used to observe the behavior of converter.

### **Three Phase AC Voltage Converter**

The trainer kit is used to understand the principle and behavior of AC voltage converter which converter fixed AC supply into variable AC supply. Same kit is also performed as single phase AC voltage controller also. The trainer consists of power circuit of AC-AC converter, microcontroller based control circuit, power supply section, load section and protection circuit.

Different load connections like star-delta are performed on the same kit. Separate CRO or digital signal oscilloscope is used to observe the behavior of converter.

### **Single Phase Controlled Rectifier Fed Separately Excited DC Motor Drive**

The trainer kit is used to understand the concept to control the speed of separately excited DC motor using single phase controlled rectifier. The trainer consists of power circuit of field and armature side converters, microcontroller based control circuit, power supply section, SEDC motor and speed sensor. Open loop as well as close loop control of separately excited DC motor is performed on the same kit. Separate CRO or digital signal oscilloscope is used to observe the behavior of this drive.

### **Brush Less DC Motor Drive Kit**

The trainer kit is used to understand the basic operation and speed control mechanism of BLDC motor. The trainer consists of voltage source inverter section, BLDC motor, hall sensors, microcontroller based control circuit and power supply. Forward as well as reverse rotation of BLDC motor can be achieved using this drive. Separate CRO or digital signal oscilloscope is used to observe the operation of drive

# Measurement Laboratory



## Trainer Kit for Study of Strain Gauge

Strain Gauge:

If a metal conductor is stretched or compressed, its resistance changes on account of the fact that both the length and diameter of the conductor change. There is also a change in the value of resistivity of the conductor when it is strained and this property is called piezo resistive effect. This is the principle of strain gauge. Strain gauge is a device the electrical resistance of which varies in proportion to the amount of strain in the device. The most widely used gauge is the bonded metallic strain gauge.

This trainer kit is used for study of Strain measurement using strain gauges and cantilever assembly.



### **Trainer Kit for Study of LVDT**

Scientech LVDT 2303 is designed to teach LVDT Characteristics. LVDT (Linear Variable Differential Transformer) is the most widely used inductive transducer for displacement measurement. LVDT is a secondary transducer which converts the displacement directly into an electrical output proportional to the displacement. Scientech 2303 has seven-segment LED display showing displacement in mm with a sensitivity of 10mV/mm in the range of 10mm.



### **Temperature Transducer Trainer Kit**

The most commonly used type of the entire sensor are those which detect Temperature or heat. These types of sensors vary from simple ON/OFF thermostatic devices which control a domestic hot water system to highly sensitive semiconductor types that can control complex process control plants. Temperature Sensors measure the amount of heat energy or even coldness within an object or system, and can "sense" or detect any physical change to that temperature.

This trainer kit is used for study of transducers like digital IC LM-335, Resistive Temperature Detector (RTD), NTC Thermistor, K Type Thermometer.

### **Maxwell's Capacitance Bridge**

This bridge kit is used for measurement of unknown inductance and in some cases unknown capacitance too. It works on AC bridge principle.



### **Wien Bridge Oscillator Trainer Kit**

This trainer kit is utilized for measurement of unknown frequency by using various values of resistances along with use of standard capacitors.

### **Wheatstone Bridge**

This is basic dc bridge use for measurement of unknown resistance by using other standard resistances.





### Universal Bridge Trainer Kit

This trainer kit is used for study of various AC and DC bridges for measurement of unknown inductance, capacitance and resistance.