

EE463 POWER ELECTRONICS – I

EXPERIMENT 1

INTRODUCTION & POWER SEMICONDUCTOR DEVICE CHARACTERIZATION

WARNING !

- Always remember that you are working with voltages and currents which may be hazardous to human life. Do not touch live contacts! If you need to connect, disconnect equipments/wires, shut off the system, and complete the work, and then re-start. While checking connections, use one hand only.
 - Before moving on to the next experimental step, make sure that main supplies are switched off and the autotransformers are set to 0% output.
 - Pay attention to team-work and coordination. Do not energize your circuits unless you are sure that no one is touching/checking the connections.
 - For the experiments involving energy storage devices such as capacitors, make sure that you discharge the energy storage element before leaving laboratory.
 - If you feel uncomfortable or you are unsure of the circuit you constructed, ask your assistant for help.
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1.1 OBJECTIVE

The main objective of the experiment is getting familiar with the equipment of power electronics laboratory. A series of simple tests regarding diode and thyristor characteristics will also be conducted.

1.2 EQUIPMENT LIST

Basically the following components are required for carrying out the experiment:

Component /Instrument	Qty.	Specifications
R1 Rheostat	1	26 Ω , 6.5 A
R2 Rheostat	1	215 Ω , 2 A
Autotransformer	1	240 V, 8 A
Oscilloscope	1	TPS2024 with four isolated channels
“T” Thyristor to be characterized	1	2N5207 (22A, 1200V)
“D” Diode to be characterized	1	S60-600 7950 (60A, 600V)
DC Power Supply	2	40V 5A
Digital Multimeter	2	

1.3 PROCEDURE

1.3.1 Getting familiar with the oscilloscope

By providing an appropriate voltage to a resistor, observe its voltage and current waveforms. Make the necessary calibrations for the voltage and current probes of the oscilloscope. Explore trigger settings. Try setting the XY view from the Display button.

1.3.2 Getting familiar with the power supply

Simply provide voltage from the supply to the resistor. Try setting different maximum limits for the supply's voltage and current output. See how the power supply obeys the limits when you deliberately try to exceed them.

1.3.3 Diode ON state characteristics

Enable a current flow of 0 to 4.5 Amps through a diode and record the voltage drop with respect to the current via a multimeter. Fill the table below.

I_{DIODE}	0.5A	3A	4.5A
V_{DROP}			

1.3.4 Diode Full VI Characteristics

By providing an AC voltage, see the full VI characteristics of the diode on the oscilloscope screen (while it is on XY view).

1.3.5 Thyristor Turn-On

By providing AC voltages with different peak values, find the required level of gate signal (in mA) for the thyristor to turn on and fill the table below.

V_{PEAK}	20V	60V	120V	200V
I_{GATE}				

1.3.6 Thyristor Full VI Characteristics

Repeat Part 1.3.4 for the thyristor case. Make sure a sufficient amount of gate signal is provided.