

Program: <b>Diploma in Electronics Engineering / Electronics and Communication Engineering</b>	
Course Code: <b>5048</b>	Course Title: <b>Industrial Automation Lab</b>
Semester: <b>5</b>	Credits: <b>1.5</b>
Course Category: <b>Program Core / Elective</b>	
Periods per week: <b>3 (L:0, T:0, P:3)</b>	Periods per semester: <b>45</b>

### Course Objectives:

- To provide hands-on training to construct electric power converters and controllers using power semiconductor switching devices.
- To develop PLC ladder programs to realize real time applications.

### Course Prerequisites:

Topic	Course code	Course name	Semester
Experiment with electronic components	2039	Fundamentals of Electrical & Electronics Engineering Lab	2
Electric circuits and network theorems	3041	Electric Circuits & Networks	3
Amplifiers and oscillators	3047	Electronic Circuits Lab	3
Logic circuits	3048	Digital Electronics Lab	3

### Course Outcomes:

On completion of the course, the students will be able to:

CO <sub>n</sub>	Description	Duration (Hours)	Cognitive level
CO1	Design various gate triggering methods for SCR	12	Applying
CO2	Construct controlled rectifiers and power controlling circuits using power semiconductor switching devices	9	Applying
CO3	Implement power converter circuits using Power Semiconductor Switching Devices	9	Applying
CO4	Develop PLC ladder program for an application	12	Applying
	Lab Exam	3	

**CO-PO Mapping:**

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3	3						
CO4	3		3	3			

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

**Course Outline:**

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	<b>Design various gate triggering methods for SCR</b>		
M1.01	Plot V-I characteristics of SCR	3	Applying
M1.02	Design single phase control using resistance triggering circuit and 1) plot the waveform across the load and SCR 2) find the maximum firing angle	3	Applying
M1.03	Design single phase control using RC triggering circuit and 1) plot the waveform across the load and SCR 2) find the maximum firing angle	3	Applying
M1.04	Design single phase control using UJT triggering circuit and 1) plot the waveform across the load and SCR 2) find the maximum firing angle	3	Applying
CO2	<b>Construct controlled rectifier and power controlling circuits using power semiconductor switching devices</b>		
M2.01	Construct a single-phase control rectifier using SCR with resistive load and 1) find minimum firing angle 2) find maximum firing angle	3	Applying
M2.02	Construct an illumination control circuit using DIAC and TRIAC.	1.5	Applying
M2.03	Construct an SCR-based DC motor speed control circuit.	1.5	Applying

M2.04	Design a time delay relay circuit using UJT and SCR.	3	Applying
	Lab Exam 1	1.5	
<b>CO3</b>	<b>Implement power converter circuits using Power Semiconductor Switching Devices</b>		
M3.01	Construct an oscillator circuit using DIAC and plot the waveform.	3	Applying
M 3.02	Implement an emergency lamp and a battery charger circuit using SCR	3	Applying
M3.03	Implement an inverter circuit using BJT and plot the waveform.	3	Applying
<b>CO4</b>	<b>Develop PLC ladder program for an application</b>		
M4.01	Write simple programs using PLC ladder diagram instruction sets	6	Applying
M4.02	Implement application circuits using PLC	3	Applying
	Open Ended Experiment	3	Applying
	Lab Exam 2	1.5	

### **\*\* - Suggested Open Ended Projects**

(Not for End Semester Examination but compulsory to be included in Continuous Internal Evaluation. Students can do open ended experiments as a group of 3-5. There should be no duplication in experiments between groups. This is mainly for the purpose of continuous internal evaluation. Students should prepare a separate report on open ended experiment of their choice.)

Example:

Home Security System – Burglar’s Alarm

Automatic Door

Automatic Vehicle Collision Prevention System

Chopper circuit using SCR

### **Text /Reference:**

<b>T/R</b>	<b>Book Title/Author</b>
T1	Industrial Electronics and Control - S K Bhattacharya, S Chatterjee.
T2	Programmable logic controllers - Frank D Petruzella
R1	Introduction to Programmable Logic Controllers - Gary Dunning - 3rd Edition - Delmar

R2	<a href="http://www.nptel.ac.in/courses/108105066/PDF/L-1(SSG)(PE)%20((EE)NPTEL).pdf">http://www.nptel.ac.in/courses/108105066/PDF/L-1(SSG)(PE)%20((EE)NPTEL).pdf</a>
R3	Power Electronics – P S Bimbhra

### Online Resources:

Sl.No	Website Link
1	<a href="http://fac.ksu.edu.sa/sites/default/files/lab-manual_v3.pdf">http://fac.ksu.edu.sa/sites/default/files/lab-manual_v3.pdf</a>
2	<a href="http://www.eee.griet.ac.in/wp-content/uploads/2014/12/PLC-Lab-Manual.pdf">http://www.eee.griet.ac.in/wp-content/uploads/2014/12/PLC-Lab-Manual.pdf</a>
3	<a href="http://onlinemas.weebly.com/uploads/6/3/9/4/6394050/lab_manual_shafeeq.pdf">http://onlinemas.weebly.com/uploads/6/3/9/4/6394050/lab_manual_shafeeq.pdf</a>
4	<a href="http://gnindia.dronacharya.info/EEE/Downloads/Labmanuals/Power-Electronics-Lab-Manual.pdf">http://gnindia.dronacharya.info/EEE/Downloads/Labmanuals/Power-Electronics-Lab-Manual.pdf</a>
5	<a href="https://www.watelectronics.com/how-to-program-the-programmable-logic-controllers/">https://www.watelectronics.com/how-to-program-the-programmable-logic-controllers/</a>