

Program : <b>Diploma in Electrical and Electronics Engineering</b>	
Course Code : <b>6038</b>	Course Title: <b>Industrial Automation Lab</b>
Semester : <b>6</b>	Credits: <b>2.5</b>
Course Category: <b>Program Core</b>	
Periods per week: <b>4 (L:0 T:1 P:3)</b>	Periods per semester: <b>60</b>

### Course Objectives:

- To understand microcontroller and its programming methods.
- To summarize the interfacing of peripherals with microcontroller.
- To summarize the applications of PLC modules in electrical engineering.

### Course Prerequisites:

Topic	Course code	Course name	Semester
Knowledge of motor drives		Dc machines	3
		Induction machines	4
Starters for induction motor		Industrial Electrical Engineering Lab	4
Knowledge of electronics		Analog & Digital Circuits	3
Basics of computer knowledge		Introduction to IT System Lab	1

### Course Outcomes:

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

CO <sub>n</sub>	Description	Duration (Hours)	Cognitive Level
CO1	Develop simple assembly language programs for 8051 microcontroller	17	Applying
CO2	Develop assembly language programs to interface the microcontroller with the peripherals.	12	Applying

CO3	Develop simple ladder programs for a standard PLC	12	Applying
CO4	Develop ladder programs for various applications and interface I/O devices with the PLC modules.	15	Applying
	Lab Exam	4	

**CO-PO Mapping:**

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

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

**Course Outline:**

Module Outcome	Description	Duration (Hours)	Cognitive level
CO1	<b>Develop simple assembly language programs for 8051 microcontroller</b>		
M1.01	Identify the Pin details of 8051 microcontroller	3	Understanding
M1.02	Familiarize with Instruction set of 8051	5	Understanding
M1.03	Summarize different menus available in simulator IDE software and practice their use.	1	Understanding
M1.04	Develop simple assembly language programs execute and verify the result for the following; <ul style="list-style-type: none"> <li>1. Various arithmetic operations.</li> <li>2. Various data transfer operations.</li> <li>3. Finding the largest value</li> <li>4. BCD to Hex conversion</li> </ul>	8	Applying
CO2	<b>Develop Assembly language programs to interface the microcontroller with the peripherals.</b>		

M2.01	Develop an assembly language programme to interface LEDs through port 1 including time delay. (i) LED (ii) Switch	3	Applying
M2.01	Develop an assembly language programme to control (a) Relay (b) Buzzer	3	Applying
M2.01	Develop an assembly language programme to control (a) Stepper Motor (b) DC Motor	6	Applying
	Lab Exam 1	2	
<b>CO3</b>	<b>Develop simple ladder programs for a standard PLC</b>		
M3.01	Explain the block diagram of a PLC based system and distinguish its major components and functions.	3	Understanding
M3.02	Familiarize ladder programming and instruction set of a standard PLC	5	Understanding
M3.03	Familiarize a standard PLC kit and software	1	Understanding
M3.04	Develop simple ladder programs and verify the result 1. Various ON/OFF control with and without delay 2. Various logic gates	2	Applying
<b>CO4</b>	<b>Develop ladder programs for various applications and interface I/O devices with the PLC modules.</b>		
M4.01	Develop a ladder program and verify the result of (a) stair case light control (b) godown light control	6	Applying
M4.02	Develop a ladder program and verify the result of a godown light control	3	Applying
M4.03	Develop a ladder program and verify the result of a direct on Line (DOL) starter	3	Applying
M4.05	Develop a ladder program and verify the result of a Star-delta starter.	3	Applying
	Lab Exam 2	2	

**Text / Reference:**

T/R	Book Title/Author
R1	Dunning, G., Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 97814018842602.
R2	Jadhav, V. R., Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 97881740922813.
R3	Petruzella, F.D., Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 97800710673864.
R4	Hackworth, John; Hackworth, Federic, Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN : 97801306071885.
R5	Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN : 97801306189006.
R6	Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 97881879721747.
R7	Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 9781936007097

**Online Resources:**

Sl.No	Website Link
1	<a href="https://nptel.ac.in/courses/108105062/">https://nptel.ac.in/courses/108105062/</a>
2	<a href="https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod3.pdf">https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod3.pdf</a>
3	<a href="https://nptel.ac.in/courses/108/106/108106022/">https://nptel.ac.in/courses/108/106/108106022/</a>
4	<a href="https://www.youtube.com/watch?">https://www.youtube.com/watch?</a>

**Suggested Open-ended Experiments:**

Students can do open ended experiments as a group of 3-5. There is no duplication in experiments in between groups. This is mainly for the purpose of continuous internal evaluation. Students should prepare a separate report on an open ended experiment of their choice.

Example : Develop a water level control circuit using PLC