

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	Minor in Industrial Automation (Inter-disciplinary) Offered by B.Tech. in Electronics and Instrumentation Engineering
Semester:	VI
Course Code:	3EI107ME24
Course Title:	Factory Automation
Course Type:	Core Course - III under Minor (Interdisciplinary)
Year of introduction:	2024-25

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

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| 1. understand the fundamental principles of PLC, HMI, VFD and servo controller | (BL2) |
| 2. develop codes for PLC, HMI and Servo Controller using standard programming techniques | (BL3) |
| 3. select the controller and actuator for various applications | (BL4) |
| 4. build an application-oriented project program and screen design. | (BL4) |

Contents

		Teaching hours (Total 45)
Unit-I	Introduction Components of Machine Control, PLC, Human Machine Interface (HMI), Servo controllers and Drive system.	05
Unit-II	Programmable logic controller and HMI Introduction of PLC and Human machine Interface (HMI) system, Standard function block of PLC, Programming languages, PLC and HMI interfacing, Communication methods, software tool.	10
Unit-III	Sensors and control devices Optical Encoders – Incremental & Absolute Encoder, Serial Encoder Communication, Detection Sensors – Limit, Proximity, Photoelectric, Ultrasonic, Concept of Sinking & Sourcing, Pushbuttons, Selector switches, Motor Control Circuit Devices.	10
Unit-IV	AC drives Basics of Inverter, Power & signal connections, Mode of operations, Parameters Settings, industry emulated exercises on Variable Frequency Drive with three phase induction motor, single loop PID position control, Cascaded loop with feed forward control, software tool.	10
Unit-V	Servo controller Motion profile, servo controller basic, type of servo controller, servo motor, programming of motion controller and PLC Functionality, Single Axis and Multi Axis control, software tool, Case study.	10

Self Study:

The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

Suggested Reading/References:

1. Killian, Modern Control Technology : Components & Systems, Delmar Publication,
2. Hakan Gurocak, Industrial Motion Control, Wiley Publication
3. Frank Petruzzola, Programmable Logic Controllers, Tata Mc-Graw Hill Edition
4. John W. Webb, Ronald A. Reis, Programmable Logic Controllers Principles and Applications, PHI publication

Suggested List of Experiments:

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| 1. Overview and demonstration of PLC, HMI and Servo Controller. | (02 Hrs) |
| 2. Introduction of PLC hardware | (02 Hrs) |
| 3. Hardware integration and HMI programming | (02 Hrs) |
| 4. Interfacing of sensors and actuators with controller | (02 Hrs) |
| 5. Understand the Variable frequency drive | (02 Hrs) |
| 6. PLC and VFD interface and parameter control | (02 Hrs) |
| 7. Understand the basics of the Servo controller system | (02 Hrs) |
| 8. Parameter setting and single axis control of servo system | (02 Hrs) |
| 9. Project - I | (04 Hrs) |
| 10. Project – II | (04 Hrs) |

L = Lecture, T = Tutorial, P = Practical, C = Credit