

Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

Semester VII

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Course Code	2IC701
Course Title	Process Automation

Course Outcomes (CO):

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

1. discuss the fundamentals of programmable logic controller
2. design program using standards programming languages
3. illustrate the SCADA, HMI, DCS and industrial networking
4. develop an application orientated project using PLC

Syllabus

**Teaching
Hours**

UNIT 1: Introduction

Process automation, history of automation, application area of PLC, HMI, SCADA and DCS.

02

UNIT 2: Programmable Logic Controller

Introduction, Importance of PLC, Type of PLC's and basic architecture of CPU, Different modules of PLC, Programming standards, software tools for PLC Programming, IEC standards for Programming language of PLC., Ladder programming, Instructions set of PLC.

10

UNIT 3: Advanced Programming Languages

Programming of PLC using structured text, Instruction list, Function block diagram, Sequential Flow chart.

10

UNIT 4: Human Machine Interface

Introduction of HMI, Screens Design, Mapping of Variables, Software tools for HMI design, Case studies.

05

UNIT 5: Supervisory Control & Data Acquisition

Introduction of SCADA, Selection criteria of SCADA, Hardware selection for SCADA, Communication protocols, DNP3, MODBUS, Profibus, Industrial Ethernet overview,

12

TCP/IP overview.

UNIT 6: Distributed Control System

06

Evolution of DCS, Design and specification architecture, merits and demerits, Direct digital control, supervisory control and distributed digital control system, Evolution of hierarchical system structure.

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:

Laboratory Work will consist of minimum 10 experiments based on the above syllabus.

References:

1. Frank D. Petruzella, Programmable logic controller, Tata-McGraw Hill publication
2. John W. Webb and Ronald A. Reis, Programmable Logic Controllers: Principles and Applications, PHI Publication
3. W. Boltan, Programmable Logic Controllers, Elsevier Publication
4. John R. Hackworth and Frederick D. Hackworth Jr., Programmable Logic Controllers Programming methods and application, Pearson Publication
5. Stuart A. Boyer, SCADA: Supervisory control and data acquisition system, ISA Publication
6. Ronald L Krutz, Securing SCADA system, Wiley Publication
7. Bela G. Liptak, Instrument Engineers' Handbook: Process Software and Digital Networks, CRC Press
8. Steve Mackay, Edwin Wright, Deon Reynders, and John Park, Practical Industrial Data Networks: Design, Installation and Troubleshooting, Elsevier Publication