PLCs & AUTOMATION(404185)

Teaching Scheme:
Lectures: 3 Hrs/ Week

Examination Scheme:
In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- Ability to recognize industrial control problems suitable for PLC control
- An over view of technology of advanced topics such as SCADA, DCS Systems, Digital Controller, CNC Machines.
- The ability to select the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach.

Course Outcomes:

After successfully completing the course students will be able to

- Understand PLC architecture, PLC addressing concepts.
- Develop PLC ladder programs for simple industrial applications.
  Design Automation systems for industrial applications.

Unit I : Process Control & Automation 6L

Process control principles, Servomechanisms, Control System Evaluation, Analog control, Digital control, Types of Automation; Architecture of Industrial Automation Systems, Advantages and limitations of Automation, Effects of modern developments in automation on global competitiveness.

Unit II : Transmitters and Signal Conditioning 6L

Need of transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, 2-Wire & 3-Wire transmitters, Analog and Digital signal conditioning for RTD, Thermocouple, DPT etc , Smart and Intelligent transmitters

Unit III : Controllers and Actuators 6L

PID Controller, Cascade PID control, Microprocessor Based control, PAC (Programmable automation controller), Mechanical switches, Solid state switches, Electrical actuators: Solenoids, Relays and Contactors, AC Motor, VFD, energy conservation schemes through VFD, DC

Motor, BLDC Motor, Stepper Motor, Servo Motor, Pneumatic and hydraulic actuators.

Unit IV : PLC and Human Machine Interface (HMI) 6L

Functions of PLC, Advantages, Architecture, working of PLC, Selection of PLC, Networking of PLCs, Ladder Programming, Interfacing Input and Output devices with PLC, PLC based automated systems. High frequency inputs. PLC programming standard IEC61131, Soft PLC techniques. **IT Interfaces required:** for ERP, MIS, MES. **Supporting Applications interfaces**: RFID, Barcode, Vision Systems**. HMI:** Block Diagram, Types, Advantages, Applications.

Unit V : SCADA & Distributed control system

Elements of SCADA, Features of SCADA, MTU- functions of MTU, RTU- Functions of RTU, Applications of SCADA, Communications in SCADA- types & methods used, Mediums used for communication, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS.

Unit VI : Automation and CNC (Computer Numeric Control) Machines

Introduction of CNC Machines: Basics and need of CNC machines, NC, CNC and DNC (Direct NC) systems, Structure of NC systems, Applications of CNC machines in manufacturing, Advantages of CNC machines.

Industrial Communication: Devicenet, Interbus , Device network: Foundation Fieldbus -H 1, HART, CAN, PROFIBUS-PA, Control network: ControlNet, FF-HSE, PROFIBUS-DP, Ethernet, TCP/IP.Panel Engineering for Automation

Text Books

1. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education
2. Madhuchhanda Mitra, Samarjit Sen Gupta, "Programmable Logic controllers and Industrial Automation"; Penram International Publishing India Pvt. Ltd
3. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

Reference Books

1. John W. Webb, Ronold A Reis, "Programmable Logic Controllers, Principles and Applications"; 5th Edition, Prentice Hall of India Pvt. Ltd
2. Kilian, "Modern control technology: components & systems, Delmar 2nd edition.
3. Bela G Liptak, *Process software and digital networks*, 3rd edition, 2002.
4. Pollack. Herman, W & Robinson., T. "Computer Numerical Control", Prentice Hall. NJ.
5. Pabla, B.S. & Adithan, M. "CNC Machines", New Age Publishers, New Delhi