

**Semester-II, Paper-1**  
**DISTRIBUTED CONTROL SYSTEM**

**Teaching Scheme**

Lecturers: 4 Hrs / week  
Practical: 2 Hrs / week

**Examination Scheme**

Theory: 100 marks  
Term work: 25 marks  
Practical: 25 marks

**Unit 1.**

(10 Hrs, 20 Marks)

Plant Automation and Control Systems Strategy, Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, Performance criteria and Safety Systems.

**Unit 2.**

(10 Hrs, 20 Marks)

Applications of PLC's, Specifications of advanced PLC's, Input speed modules, modular controller, High speed counter, Remote input-output scanner, Communication module, limit switches, scan time, watchdog timer, PLC programmer and its features, programming instructions, input output timer counter, bit comparison FIFO LIFO branch instructions etc. System configuration hardware, system sizing and selection, wiring diagram, PLC installation, Interfacing to PC, Multiprogramming languages like ladder diagram, Structured text, Sequential flow chart, Instruction language, Functional block diagram, State diagrams etc Development of ladder diagram, for Industrial applications.

**Unit 3.**

(10 Hrs, 20 Marks)

DCS- Basic Packages Introduction, analog control, direct digital control, distributed process control, DCS configuration with associated accessories, control console equipment, control unit (Relay Rack mounted equipments), local control units, attributes of DCS & DCS Flow sheet symbols. DCS System Integration I/O hardware stations, Set-point station control, Supervisory Computer Tasks & configurations, system integration with PLCs and computers, Human Machine Interface for process monitoring and control, Introduction to expert systems, and Statistical Process Controls.

**Unit 4.**

(10 Hrs, 20 Marks)

Instrumentation Standard Protocols, HART Protocol, frame structure, programming, implementation examples, Benefits, Introduction, Advantages and Limitations of Fieldbus, FDS configuration, Comparison with other fieldbus standards including Device net, Profibus, Controlnet, CAN, Industrial Ethernet, MAP and TOP.

**Unit 5.**

(10 Hrs, 20 Marks)

Industrial applications of PLC, SCADA, DCS and open systems for following plants; Cement plant, Thermal power plant, Steel Plant, Glass manufacturing plant, Paper and Pulp plant.

**References:**

1. Instruments Engineers Handbook Vol-II, Process Control 3rd Edition 1995, "Bela G, LIPTAK", Chilton
2. Distributed computer control for Industrial Automation, "Popovic and Bhatkar", Dekker.
3. Computer-based Industrial Controls, "Krishan Kant", PHI.
4. Applications of computers in Process Control, "Considine".
5. Modern Control Techniques for the process industries, "T.HTsai , J.W Lane", Mareet Dekkar, N.Y 1986.
7. Digital Control System, "Iserman".
8. Programmable logic controller, "J.D.Otter", ( PHI).
9. Industrial Programmable controller, "Huges", ( ISA).

**List of Experiments:**

1. Interfacing of Various input and output devices to PLC.
2. Interfacing of PLC with SCADA software's (ONSPEC, Wonderware, Indusoft, Elipse etc).
3. Development of PLC programming using Structured text.
4. Development of PLC programming using Sequential Flow chart.
5. Development of PLC programming using Functional flow chart.
6. Interfacing of PLC with DCS.
7. Study of various Data communications techniques in DCS.
8. Develop Temperature control system using DCS and SCADA.