Lesson 1: History and Overview

Topics
- Introduction; Development of Computers in Process Control; Business Computer Experiments; Supervisory Control and Data Acquisition (SCADA); Microprocessor-Based Instruments; Distributed Control; Personal Computers; Programmable Logic Controllers; Artificial Intelligence, Expert Systems, and Fuzzy Logic; Integrated Control Systems

Objectives
- Discuss the history of the application of computers to continuous and batch process control.
- Describe the function of an RTU in a SCADA system.
- Describe the development of distributed control systems from microprocessor-based instruments, including programmable logic controllers.
- Compare the hardware, operating systems, software, and applications of a PC with a household VCR.
- Compare the concepts of artificial intelligence, expert systems, and fuzzy and crisp logic.

Lesson 2: Small Computers in Process Control

Topics
- Small Computers; Smart Sensors and Transmitters; Smart Signal Conditioners; Smart Final Control Elements; Special Instruments; Microprocessor-Based Panelboard Instruments; Single-Loop Controllers; Multiloop Controllers; Networks; Microprocessor-Based Indicator Circuits; Microprocessor-Based Recorders; Programmable Logic Controllers; Integrated Control Systems; Personal Computers

Objectives
- Describe the various kinds of small computers used in process control.
- Explain how a "smart" device differs from its conventional counterpart.
- Discuss the similarities between microprocessor-based instruments and conventional instruments and list several advantages of microprocessor-based instruments.
- Describe the roles of two kinds of PCs (programmable controllers and personal computers) in process control.

Lesson 3: DCS Architecture

Topics
- Importance of Distributed Control Systems; Distributed Control System Hardware; Workstations; Remote Processing Units; Host/Guest Computers; Transmission System; Distributed Control System Software; Distributed Control System Reliability; Peripherals; What is Fieldbus?

Objectives
- Describe the elements of a typical workstation.
- Discuss the functions of remote processing units and host/guest computers in DCSs.
- Compare star, hub, and ring network topologies and token-passing, contention, and polling protocols.
- Explain why today’s DCS users must be more computer literate than previously.
- Discuss ways of calculating and ensuring DCS reliability.
- Describe the functions of six typical DCS peripherals.
- List advantages and disadvantages of all-digital process control systems, such as fieldbus.

Lesson 4: DCS Configuration and Operation

Topics
- Setting Up Distributed Control Systems; Configuration; Hierarchical Displays; DCS Model TPC-284; Preparation for Configuration; Configuring Operating Displays; Configuring Auxiliary Displays; Operation

Objectives
- Describe the basics of a simple configuration process.
- Discuss the preparatory steps required for configuration.
- Describe a typical hierarchical display arrangement and discuss the progression of the configuration process from level to level.
- Discuss the automatic configuration of auxiliary displays.
- Discuss the DCS functions for which the operator is and is not responsible.

Lesson 5: Systems and Application Integration

Topics
- The Scope of Integration; Total Business Integration; Discrete Processes and Manufacturing Systems; Flexible Manufacturing and Materials Control; Statistical Process Control; Integration of Continuous and Batch Processes

Objectives
- Discuss the development of integration in industry.
- Describe how continuous and discrete processes fit into the concept of total business integration.
- Describe the purposes of MAP and OSI.
- Discuss the functions of CAD, CADD, CAE, CAM, and cell control in discrete processes.
- Discuss the importance of FMS, MRP, JIT, and MMS in today’s integrated industrial plant.
- Explain how SPC ensures quality control in open-loop processes.
- Discuss the advantages of integrating batch, continuous, and discrete processes throughout a plant.