

Common Course Numbering System

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Course: PRO 131

Title: Instrumentation II

Long Title: Instrumentation II

Course Description: Introduces the student to switches, relays and annunciator systems and moves on to discuss signal conversion and transmission. Controllers, control schemes and advanced control schemes are covered at a level appropriate for the process technician. The student then moves on to learn about digital control, programmable logic control and distributed control systems before ending the course with a discussion of instrumentation power supplies, emergency shutdown systems and instrumentation malfunctions.

Min Credit: 3

Max Credit:

Course Notes: Entered new course 5/16/06 s@

Origin Notes: CNCC

STANDARD COMPETENCIES:

- I. Recall the types of instrumentation used in the petrochemical and refining industry to monitor and control the process
- II. Be able to identify various types of regulators, switches, relays and enunciator Systems
- III. Define the relevant terms associated with tuning in process control and controllers
- IV. Define, identify, and describe types of control schemes
- V. Match appropriate control schemes to a process
- VI. Define and list different applications of advanced control schemes
- VII. Explain the purpose of digital control
- VIII. Describe the difference between analog and digital controllers
- IX. Define terms associated with Programmable Logic Control (PLC)
- X Describe the operation of a Digital Control System (DCS)
- XI. Explain the function of a multiplexer/demultiplexer
- XII. Explain advantages of a DCS over an analog control system
- XIII. Given a DCS diagram, identify the major components
- XIV. Define terms associated with instrumentation power supply
- XV. Explain the purpose of uninterruptible power supply (UPS) systems
- XVI. Given a diagram, identify components in a UPS system
- XVII. Define the terms associated with emergency shutdown systems, interlocks, and alarms

- XVIII. Given a drawing, picture, or actual device, identify and describe basic shutdown devices
- XIX. Given a PFD and/or P&ID and a legend, locate and identify emergency shutdown devices
- XX. Compare and contrast ESD systems and interlocks
- XXI. Explain methods for testing and resetting ESD systems
- XXII. Discuss different safety policies regarding the bypassing of ESD instruments or devices
- XXIII. Describe the failure modes of the following:
 - A. temperature elements
 - B. thermocouples
 - C. RTDs
 - D. level floats
 - E. flow elements
 - F. pressure elements
 - G. analytical elements
- XXIV. Explain how a control loop will respond to typical malfunctions in the following:
 - A. primary sensing elements
 - B. transmitters
 - C. controllers
 - D. final control elements

TOPICAL OUTLINE:

- I. Review of types of instrumentation used in the petrochemical and refining industry to monitor and control the process:
 - A. indicators
 - 1. transmitters/transducers
 - 2. controllers
 - 3. final control elements
 - 4. control loops.
- II. Pressure regulators, switches, relays, and enunciator systems
- III. Signal transmission and conversion
- IV. Controllers- Part 1
- V. Controllers- Part2
- VI. Control schemes
- VII. Advanced control schemes- Part 1
 - A. Cascaded/Remote Set Point (RSP) control scheme
 - B. Ratio (fractional) control scheme.

- VIII. Advanced control schemes- Part 2
- IX. Introduction to Digital Control
- X Programmable Logic Control
 - A. Definitions
 - B. Purposes
 - C. ¿Ladder logic¿ applications
- XI. Distributed Control Systems (DCS)
 - A. Multiplexer/demultiplexer.
 - B. Advantages of a DCS over an analog control system
- XII. Emergency Shutdown Systems (ESD), Interlocks, and Protective Devices ¿ Part 1
- XIII. Emergency Shutdown Systems (ESD), Interlocks, and Protective Devices ¿ Part 2

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