Supervisory Control and Data Acquisition Systems (SCADA), cont.

MASTER TERMINAL UNITS (MTUs)
- Communications interface
- Configuring a picture of process
- Some simple applications
- Data storage
- Man-machine interface (MMI or HMI)

SCADA APPLICATIONS
- Real time defined
- Accounting and quality of data
- Scanning and communications
- Automatic control
- Advisory applications

OPERATOR INTERFACE
- Security consideration
- Alarming
- Control change screens
- Status screens
- Graphics and trending
- Reports
- Parallel operator interface

SCADA ECONOMICS
- Costs vs. benefits
- Time value of money
- Capital costs
- Training and maintenance
- Reduced capital costs
- Reduced process operating costs
- Improved facility effectiveness

NEXT SCADA IMPROVEMENTS
- Better communications
- Smarter RTUs
- Smarter MTUs
- Local area networks
- External applications

Recommended For
Electronics, automation, instrument, and communication technicians who are or will be involved in SCADA systems

Enrollment Information
Your company is invited to participate in these training programs. For additional information, contact—

PETEX
Houston Training Center
The University of Texas
2700 W. W. Thorne Blvd.
Houston, TX 77073
Tel: 800.687.7052
or 281.443.7144
FAX: 281.443.8722
Email: petexhtc@www.utexas.edu

September, 2009
Instruments and Controls

3.3 CEUs

Length: 4½ Days

**ELECTRICAL REVIEW: CURRENT, VOLTAGE, AND RESISTANCE RELATIONSHIPS**
- Ohm's law
- Series circuits
- Parallel circuits

**TRANSDUCERS AND TRANSMITTERS**
- Electronic transmitters
- P/I, I/P, E/I, etc., transducers
- Conversion concepts (input and output)
- Smart transmitters

**PRACTICAL EXERCISES: OPERATION AND CALIBRATION OF TRANSDUCERS AND TRANSMITTERS**

**PRIMARY SENSING ELEMENTS**
- Process variables
- Typical symbols
- Control problem

**CONTROLLER MECHANISMS**
- Modes of control
- Controlling means

**PRACTICAL PROCESS SITUATIONS**
- Process characteristics
- Demands
- Quarter decay method
- Amplitude ratio of 1 method

**PRACTICAL EXERCISES IN OPERATION OF CONTROLLERS**

**APPLICATION OF CONTROLLED LOOPS**
- Process
- Troubleshooting
- Installation practice

**INTRODUCTION TO MENU-DRIVEN MICROPROCESSOR CONTROLLERS**
- Relevant terms defined
- Microprocessor controller vs. analog electronic/pneumatic controller
- Languages: software/hardware and hardware
- Flexibility: advantage of digital over analog
- Demonstration: configuring controllers

**PRACTICAL EXERCISE: OPERATION AND CONFIGURATION OF MICROPROCESSOR CONTROLLERS**

**CONTROL VALVES**
- Valve operators
- Valve positioners
- Effect of valve characteristics
- Relief valves

**SAFETY ALARMS AND SHUTDOWN MONITORING SYSTEMS**
- Types of shutdown services
- Shutdown accessories
- Shutdown monitoring devices
- Final control element
- Periodic inspection and repair
- Gas detectors
- Flame detectors
- Vibration monitoring

**Introduction to Programmable Logic Controllers**

1.9 CEUs

Length: 2½ Days

**PLC BASICS: ELECTRICAL RELAY CIRCUIT LOGIC VS. PLC RELAY CIRCUIT LOGIC**
- What is a PLC and why do we use them?
- Electrical circuits relay logic controllers (Ohm's law, series, parallel, series-parallel circuits)
- Discrete (Inputs/Outputs) I/O and PLC Relay Logic
- Data or Analog I/O
- Relay ladder logic and schematic relations

**PLC BASICS: HARDWARE COMPONENTS**
- What does the hardware do?
- CPU ratings
- Power supply requirements
- Rack configurations
- Digital I/O
- Analog I/O
- Communication cards

**DISCUSSION OF PLC BASICS: REVIEW OF LOGIC AND HARDWARE**

**PROGRAMMING LANGUAGES AND LOGIC IMPLEMENTATION: LADDER LOGIC PROGRAMMING, INSTRUCTIONS AND COMMUNICATIONS, AND ASSOCIATED APPLICATIONS**
- IEC-1131 industry programming standard
- Instruction list, structured text, function block, ladder logic, and function charts
- Ladder logic instructions
- Timing circuits and logic
- Communications
- PLCs used in SCADA

**DISCUSSION OF PROGRAMMING LANGUAGES AND LOGIC IMPLEMENTATION REVIEW**

**APPLICATION OF PLC EXAMPLE**
- Selection of hardware (CPU, Power Supply, I/O, Communications)
- Wiring and control of devices to a PLC
- Digital I/O labeling and addressing
- Data communications addressing and configuration
- Creating a ladder logic program
- Setting up communications

**Supervisory Control and Data Acquisition Systems (SCADA)**

1.9 CEUs

Length: 2½ Days

**SCADA OVERVIEW**

**INTRODUCTION TO SCADA**
- SCADA definitions
- Applicable processes
- Elements of a SCADA system
- A 2-way system
- A history of SCADA

**REAL TIME SYSTEMS**
- What is “Real Time”? A 2-way system
- Access and M/S
- Where to compute?

**REMOTE CONTROL**
- SCADA limitations
- Remote control
- Safety instrumented systems
- Regulatory requirements

**COMMUNICATIONS**
- SCADA requirements
- Binary and A/D conversion
- LD communications
- System components
- Protocol
- Modems
- Sync or async
- Telephone cable or radio

**RADIO AND WIRELESS**
- Simplex or duplex
- Turn-on time
- Frequencies
- Path studies/variations
- Solar variations
- Reliability/maintenance
- Satellite communications

**REMOTE TERMINAL UNITS (RTUs)**
- Functions of an RTU
- Communications interface
- Protocol detailed
- Monitor discrete signals
- Monitor analog signals
- Monitor pulse count
- Monitor serial signals
- Non-RTU functions

**PROCESS INTERFACE EQUIPMENT**
- Equipment
- Costs
- Maintenance
- Special considerations
- Standardization
- Environmental considerations

**SCADA, cont. on next page**