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Course Name

Instrumentation & Control Systems for Industrial Machinery

Sector Name

Instrumentation & Controls

Document Type

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Instrumentation & Control Systems for Industrial Machinery

Course Introduction

In today's modern industrial plant, continuous machine monitoring is an essential requirement in terms of protecting personnel, protecting the environment, and protecting the plant equipment itself.

Machine monitoring encompasses a wide range of technologies, ranging from supervisory control, interlocking, and sequential control implemented through the programmable logic controller; closed-loop digital control; and modern Smart instrumentation. Machine monitoring not only encompasses the conventional measurement of pressure and temperature but also less well-known measurements, including vibration, thermography, tribology, and analytical xerography.

This workshop, **PRACTICAL** Instrumentation and Control Systems for Industrial Machinery, is designed to provide engineers and technicians with the basic theoretical and practical understanding of a wide range of modern technologies and how these can be applied to optimize their systems in terms of safety, flexibility, and costs.

Instrumentation & Control Systems for Industrial Machinery

Target Audience

- ✓ Control & Instrumentation Engineer
- ✓ Controls Technologist
- ✓ Instrumentation Technician / Systems Control Tech
- ✓ Senior Control & Instrumentation Engineer
- ✓ Maintaining Equipment Engineer
- ✓ Facilities I&E / Controls Engineer
- ✓ Offshore Instrumentation Engineer

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Learning Objectives

- ✓ Recognize the impact of modern Instrumentation
- ✓ Appreciate the major Technologies used in the Measurement of Temperature and Pressure
- ✓ Evaluate and select the appropriate Instrumentation System
- ✓ Install the process Equipment correctly
- ✓ Understand the fundamentals of Process Control
- ✓ Fully comprehend the effects of proportional, integral, and derivative control
- ✓ Recognize the effect of different Control Algorithms on loop Tuning Performance
- ✓ Understand basic serial Communications
- ✓ Appreciate the role of the final Control Element in a Control Loop
- ✓ Predict cavitation and flashing. Pick the Optimum Valve and Actuator Combination
- ✓ Avoid incorrect Valve and Actuator Installation Practices
- ✓ Appreciate the differences between Inherent and installed Characteristics
- ✓ Pick the Optimum Valve-Actuator Combination
- ✓ Understand Potential Failure Analysis and the PFA tree
- ✓ Value the principles of Risk Analysis

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Course Outline

✓ **01 Day One**

Module (01) Smart Instrumentation

- ✓ Temperature
 - ✓ Basic principles
 - ✓ Scales
 - ✓ Expansion systems
 - ✓ Thermocouples
 - ✓ Resistance thermometry
 - ✓ Thermistors
 - ✓ Radiation thermometry
 - ✓ Thermal imaging
 - ✓ Installation considerations
- ✓ Pressure
 - ✓ Basic principles
 - ✓ Bourdon tubes
 - ✓ Bellow elements
 - ✓ Diaphragm elements
 - ✓ Electrical displacement sensors
 - ✓ Digital communications & HART protocol

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Course Outline

✓ 02 Day Two

Module (02) Digital Control

- ✓ ON/OFF control
- ✓ Proportional control
- ✓ Proportional band vs. proportional gain
- ✓ Proportional offset
- ✓ Reset
- ✓ Integral action
- ✓ Integral windup
- ✓ Stability
- ✓ Bode plot
- ✓ NYQUIST plot
- ✓ Derivative action
- ✓ PID control
- ✓ Control algorithms
- ✓ Load disturbances and offset
- ✓ Speed, stability, and robustness
- ✓ Basic principles of tuning
- ✓ Open loop reaction curve method (Ziegler-Nichols)
- ✓ Default and typical settings
- ✓ Closed loop continuous cycling method (Ziegler-Nichols)
- ✓ Fine-tuning
- ✓ Tuning for different applications

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Course Outline

✓ **03 Day Three**

Module (03) PLCs and SCADA Systems

- ✓ Fundamentals principles
- ✓ CPU
- ✓ Memory
- ✓ Digital I/O modules
- ✓ Analog I/O modules
- ✓ PLC programming
- ✓ Analog control
- ✓ SCADA systems
- ✓ Field-level Instrumentation and control
- ✓ Communication Systems

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Course Outline

✓ **04 Day Four**

Module (04) Control Valves and Actuators

- ✓ Basic theory
- ✓ Choked flow
- ✓ Flashing and cavitation
- ✓ Valve design
- ✓ Control valve characterization
- ✓ Actuators
- ✓ Positioners
- ✓ Valve testing
- ✓ Calibration

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Course Outline

✓ 05 Day Five

Module (05) Predictive Maintenance

- ✓ Potential Failure Analysis (PFA tree)
- ✓ Fault mechanism analysis (FMEA and FMECA)
- ✓ Risk analysis
- ✓ Maintenance Strategies
- ✓ Predictive maintenance technologies
- ✓ Thermography,
- ✓ Tribology
- ✓ Vibration Analysis
- ✓ Analytical xerography

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Instrumentation & Control Systems for Industrial Machinery

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
June 21, 2027	June 25, 2027	5 days	4250.00 \$	UAE , Dubai
Sept. 7, 2026	Sept. 11, 2026	5 days	4950.00 \$	Spain , Barcelona
Nov. 8, 2026	Nov. 12, 2026	5 days	4250.00 \$	KSA , Jeddah
March 15, 2027	March 19, 2027	5 days	4250.00 \$	UAE , Abu Dhabi

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