

## Course Name: Operation, Monitoring & Control of Electric Machines and Industrial Processes

Reference Code: ELEC 102

### About the course:

Instrumentation and Process Control involve a wide range of technologies and sciences and they are used in many applications. Examples range from the control of heating, cooling and hot water systems in homes and offices to chemical and automotive instrumentation and process control. This training course is designed to cover all aspects of electric motors and industrial instrumentation, such as sensing a wide range of variables, the transmission and recording of the sensed signal, controllers for signal evaluation, and the control of the manufacturing process for a quality and uniform product

### Course Objective:

By the end of this training course, participants will be able to:

- Understand the principles of operation and control variables of electric machines
- Learn modern techniques to control the response of electric machines and industrial plant equipment
- Analyze possible faults and associated safety measures
- Realize the application of sensors and actuators in control systems
- Understand the role of SCADA and PLC controllers in industrial processes and utility networks.

#### Kingdom of Saudi Arabia

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Tel.: 00966133308334

## Who Should attend?.

- Project engineers/managers
- Mechanical engineers
- Electrical engineers
- Process engineers
- Planning engineers/managers
- Asset engineers/managers

## Course Methodology:

This training course is designed to be a hands-on, stimulating experience. The training course is highly interactive with many discussion and practice sessions.

- ☑ Relevant computer simulations and videos .
- ☑ Copies of all presentation material.
- ☑ Variety of Learning Methods.
- ☑ Pre-test and final test.
- ☑ Case Study
- ☑ Training Groups.
- ☑ Presentation.
- ☑ Lectures

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## Course Outline:

### Day One: Electric Motors, Generators and Variable Speed Drives

- Principles of rotating machines (motors & generators)
- Different types of AC and DC machines
- Control of machine parameters (speed, torque, loading, efficiency, power factor)
- Stalling of motors, motor start-up and braking techniques
- Motor protection, safety requirements and precautions
- Variable speed drive (VSD)

### Day Two: Instrumentation & Monitoring of Process Variables

- Valves, flanges, tanks, and piping systems
- Process flow diagram (PFD) and process & instrumentation diagram (P&ID)
- Pressure & level control devices and applications
- Temperature & flow control devices and actuators
- Servo mechanism
- Stepper motors

### Day Three: Process Controllers and their Applications

- Instrumentation/control of process variables (static & dynamic Transfer Function)
- Automatic control (sensors, actuators, control status and error)
- Open loop vs. closed loop controllers
- Analogue vs. digital controllers
- Batch process control vs. continuous process control
- Analogue signal conditioning (linearization, filtering)

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#### Day Four: Electronic Controllers and Amplifiers

- Operational amplifier (op-amp) circuits and applications
- On-off controller, Proportional (P) controller, Integral (I) controller
- PI & PID controllers
- Schmitt trigger
- Clipper vs. clamper circuits
- Transistor operation and configurations (CB, CE, and CC)

#### Day Five: SCADA & PLC Systems, COMMS Protocols and DCS

- SCADA system structure (field devices, master station, RTUs, data processing)
- Programmable logic controller (PLC), ladder logic programming
- Distributed control system (DCS)
- Basics of PLC, Ethernet & TCP/IP
- SCADA protocols (DNP3, 60870, 61850)
- Network topologies

**Time: 08:00 AM -03:00 PM Numbers of hours: 35 Hours**

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