## Module 1: Practical Instrumentation for Automation and Process Control

Nominal duration: 6 weeks (72 hours total time commitment)

This time commitment includes the preparation reading, attendance at each webinar (1 hour plus 15-30 minutes for discussion), and the time necessary to complete the assignments and further study.

### Module Purpose

This module covers the specification, design, installation, commissioning and troubleshooting of instrumentation systems used for the measurement of pressure, level, temperature and flow in industrial plants. It applies to Engineers and Technicians involved in the design, installation, commissioning and/or maintenance of Instrumentation systems used for Process Control (Process Automation).

### Pre-Requisites Module, Units / Co-Requisites

N/A

### Assessment Strategy

To evaluate the achievement of the learning outcomes; written assignments, group projects and practical exercises are set.

### Summary of Learning Outcomes

1. Demonstrate understanding of the methods of measuring pressure, level, temperature and flow in a plant environment
<table>
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<tr>
<th>Learning Outcome 1</th>
<th>Demonstrate understanding of the methods of measuring pressure, level, temperature and flow in a plant environment</th>
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| **Assessment Criteria** | 1.1 Examine the fundamental principles and technologies applied for pressure measurement, with specific reference to:  
(a) principles of operation  
(b) sources  
(c) transducers  
(d) typical specifications  
(e) installation procedures  
(f) testing and commissioning issues  
1.2 Examine the fundamental principles and technologies applied for level measurement, with specific reference to:  
(a) principles of operation  
(b) sources  
(c) transducers  
(d) typical specifications  
(e) installation procedures  
(f) testing and commissioning issues  
1.3 Outline the fundamentals of the following level measurement techniques:  
(a) measurement with sight glasses  
(b) measurement with buoyancy tape systems  
(c) ultrasonic measurement  
(d) radiation measurement  
(e) electrical measurement  
(f) density measurement |
1.4 Examine the fundamental principles and technologies applied for *temperature* measurement, with specific reference to:
   (a) principles of operation
   (b) sources
   (c) transducers
   (d) typical specifications
   (e) installation procedures
   (f) testing and commissioning issues

1.5 Outline the fundamentals of the following *temperature* measurement devices:
   (a) thermocouples
   (b) RTDs
   (c) thermistors
   (d) liquid-in-glass
   (e) pyrometers

1.6 Examine the fundamental principles and technologies applied for *flow* measurement, with specific reference to:
   (a) principles of operation
   (b) sources
   (c) transducers
   (d) typical specifications
   (e) installation procedures
   (f) testing and commissioning issues
## 1.7 Outline the fundamentals of the following flow measurement techniques:

- (a) differential pressure
- (b) open channel flow
- (c) oscillatory flow
- (d) magnetic flow
- (e) positive displacement
- (f) ultrasonic measurement
- (g) mass flow

### Delivery mode

A combination of asynchronous and synchronous e-learning delivery comprising a judicious mix of interactive online web conferencing, simulation (virtual labs) software, remote online labs, online videos, PowerPoint slides, notes, reading and study materials (in PDF, HTML and Word format) accessed through the Moodle Learning Management System (LMS).