

# € TRAINING

Industrial Planer and Designs





## Industrial Planer and Designs

### Introduction:

This training program is a comprehensive training focusing on industrial planning and design principles. It equips participants with the skills to create efficient layouts for manufacturing facilities, enhancing workflow and resource management to meet industry standards and boost productivity.

### Program Objectives:

At the end of this program, participants will be able to:

- Understand sensor and transducer principles.
- Use hands-on approach for system investigation.
- Gain confidence in measurement techniques.
- Learn Process Control concepts.
- Share knowledge through discussions.
- Master PID control tuning.
- Apply techniques to solve complex measurement tasks.
- Evaluate, select, design, build, and calibrate systems.

### Targeted Audience:

- Plant Management Personnel.
- Engineers from all disciplines.
- Processing Control Technicians.
- Instrumentation Artisans.
- Supervisors.
- People involved in Projects, People dealing with Instrumentation Equipment Selection.
- Representatives from the Safety Department and the Purchasing Departments.

### Program Outlines:

## Unit 1:

### Introduction to Sensors, Transducers, and Instrumentation Systems:

- Introduction to Sensors, Transducers, and Instrumentation Systems.
- Terms and definitions associated with Instrumentation systems, including: Maximum error, hysteresis, repeatability, sensitivity, resolution, span, response time.
- Process Variables: Mass flow, volumetric flow rate, pressure, viscosity, turbidity.

## Unit 2:

### Strain, Pressure, and Flow Measurement:

- Principle of Strain Measurement - tension, compression, stress, strain, Young's modulus.
- Principles of Pressure measurement: Diaphragms, bellows, capacitive devices, fiber optic pressure measurement techniques.
- Principles of flow measurement:
- Reynolds number.
- Invasive types: Coriolis Flowmeter, Differential Pressure type flowmeters.
- Orifice plate, Venturi tube, flow nozzle, Dall flow tube.
- Electromagnetic flowmeters.

## Unit 3:

### Temperature, Level, and Non-Invasive Ultrasonic Measurement Techniques:

- Temperature scales.
- Principles of Temperature measurement: Resistance temperature detectors RTDs, thermistors, thermocouples, radiation pyrometers.
- Principles of Level measurement: Single point and continuous, Direct and indirect, Ultrasonic techniques, capacitive techniques, pressure techniques.
- Principles and applications of Ultrasonic techniques for non-invasive measurement: Doppler shift and transit techniques, ultrasonic flowmeters.

## Unit 4:

### Introduction to Process Control Engineering:

- Control Strategies.
- Block diagram representation, control components.
- Servomechanisms and Regulators.
- Open and closed-loop systems, negative feedback NFB.
- Transfer Functions, 1st and 2nd order systems, transfer functions and Closed Loop systems.
- Control actions: ON/OFF, two-step, proportional, integral, derivative, PID control.

## Unit 5:

### Tuning PID Controllers:

- Stability, system response.
- Bode plot, Nyquist plot.
- Load disturbances and offset.
- Empirical methods of setting Controllers: Open-loop reaction curve method Ziegler-Nichols.
- Default and typical settings.
- Closed-loop continuous cycling method Ziegler-Nichols.
- Fine-tuning.