

# MSE-468 Instrumentation and Control

**Credit Hours: 2-0**

**Pre-requisites: Nil**

## Course Description

This multi-disciplinary course will cover the principles, techniques, and industrial applications of instrumentation and control systems. The students will learn different measurement systems, industrial automation, and practical applications.

## Course Contents

- Basic Concepts about instrumentation and process control.
- Pressure Measurement: Pressure units, Manometers, Diaphragms, Bellows, Bourden Tubes, Secondary transducers (strain gauge and LVDT).
- Temperature Measurement: Introduction and units. Liquid Expansion Thermometers (Mercury in Glass, Liquid in glass), Bimetallic strip Thermometers, Pressure-Spring thermometers, Resistance Temperature Detectors, thermistors, Thermocouples. Pyrometers.
- Level Measurement: Differential Pressure, Displacer, Bubbler, Capacitance, Conductance, Ultrasonic.
- Flow Measurement: Head type flow meters (Orifice plate, Venturi tube, pilot tube) Rotameter, Anemometers, Electromagnetic flow meters, Mechanical Meter (turbine type), Ultrasonic type flowmeter.
- Weight, force, stress, and strain measurement.
- Introduction to process control: Process Control, Definitions of the Elements in a Control Loop, Units and Standards, Instrument Parameters, Control types.

## Weekly Plan

Week	Topics
1	An introduction to process-control concepts and the elements of a process-control system
2	Basic Concepts about instrumentation and process control
3	Pressure Measurement: Pressure units, Manometers, Diaphragms
4	Bellows, Bourden Tubes, Secondary transducers (strain gauge and LVDT).

5	Temperature Measurement: Introduction and units. Liquid Expansion
6	Thermometers (Mercury in Glass, Liquid in glass), Bimetallic strip
7	Thermometers, Pressure-Spring thermometers, Resistance Temperature Detectors, thermistors, Thermocouples. Pyrometers
8	Weight, force, stress, and strain measurement
9	<b>Mid-Semester Exams</b>
10	Level Measurement: Differential Pressure, Displacer, Bubbler
11	Flow Measurement: Head type flow meters (Orifice plate, Venturi tube, pilot
12	tube) Rotameter, Anemometers, Electromagnetic flow meters, Mechanical
13	Meter (turbine type), Ultrasonic type flowmeter.
14	Introduction to process control: Process Control, Definitions of the Elements
15	in a Control Loop, Units and Standards, Instrument Parameters, Control types
16	Revision
17-18	<b>End Semester Exams</b>

### Course Outcomes

At the end of the course, students will be able to:

- Analyse major instruments used for pressure measurement.
- Differentiate between different temperature measurement instruments and select an appropriate one for a particular application.
- Evaluate different level, flow, weight, and stress measurement techniques.
- Examine the components of process control systems, including control loops, units, and standards.

### Suggested Books

- Fundamentals of Industrial Instrumentation and Process Control by W. C. Dunn. 2nd ed. McGraw Hill Professional (2018)
- Process Control Instrumentation Technology by C. D. Johnson. Pearson/ Prentice Hall, (2006)
- Instrumentation and Control Systems by W. Bolton. 3rd ed. Newness (2021)