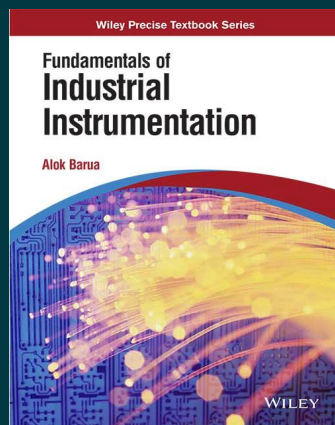




Fundamentals of Industrial Instrumentation

By Alok Barua

Paperback

9788126528820

₹999.00

Pages: 344

Description

This textbook introduces Instrumentation devices in a way sufficiently complete so that the reader acquires an ability to make meaningful measurement of three important process parameters - temperature, pressure, flow - as well as other mechanical and chemical parameters. The book offers a comprehensive coverage of instrumentation and its practical implementation with an excellent balance of theoretical concepts and engineering practice. Any instrumentation system is incomplete without signal conditioning circuits and for this purpose one full chapter is devoted to various signal conditioning circuits. The book is designed for a one-semester course in Industrial Instrumentation or Instrumentation Devices.

About the Author

Alok Barua

Alok Barua

Table of Contents

Chapter 1: Introduction

1.1 Introduction

1.2 Process Instrumentation System

1.3 Instrument Characteristics

Chapter 2: Dynamic Characteristics

Learning Objectives

2.1 Introduction

2.2 Zero-Order Instrument

2.3 First-Order Instrument

2.4 Second-Order System

Problems

Chapter 3: Strain, Load, and Torque Measurement

Learning Objectives

3.1 Introduction

3.2 Strain Gauge

3.3 Load Cell

3.4 Cantilever Beam Type Load Cell

3.5 Intelligent Load Cells

3.6 Torque Measurement

Problem

Chapter 4: Temperature Sensors

Learning Objectives

4.1 Introduction

4.2 Thermistor

4.3 Thermocouple

4.4 Resistance Thermometer

Problems

Chapter 5: Displacement Measurement

Learning Objectives

5.1 Introduction

5.2 Potentiometer

5.3 Linear Variable Differential Transformer (LVDT)

5.4 Capacitive Transducers

Problems

Chapter 6: Pressure Sensors

Learning Objectives

6.1 Introduction

6.2 Bourdon Gauge

6.3 Bellow Gauge

6.4 Diaphragm Pressure Transducer

6.5 Low Pressure Measurement

Problems

Chapter 7: Flowmeter

Learning Objectives

7.1 Introduction

7.2 Differential Pressure Flowmeters

7.3 Orifice Meter

7.4 Flow Nozzle/Dall Tube/Venturi Meter

7.5 Pitot Tube

7.6 Elbow Meter

7.7 Rotameter

7.8 Weir

7.9 Variable Reluctance Tachogenerator

7.10 Turbine Flowmeter

7.11 Electromagnetic Flowmeter

7.12 Ultrasonic Flowmeter

7.13 Hot-Wire Anemometer

Problems

Chapter 8: Flapper-Nozzle System

Learning Objectives

8.1 Introduction

8.2 Application as a Displacement Measuring Device

8.3 Static Sensitivity

8.4 Force Balance Differential Pressure Transmitter

8.5 Flapper Nozzle with Air Relay

8.6 Current-to-Pressure (I/P) Transducer

Chapter 9: Signal Conditioning Circuits

Learning Objectives

9.1 Active Filters

9.2 Single Amplifier Filter

9.3 Negative Feedback Circuits

9.4 Inductors Simulator

9.5 Low-Pass Filter

9.6 High-Pass Filter

9.7 Band-Pass Filter

9.8 State Variable Filter

9.9 Sample-and-Hold Circuit

9.10 Logarithmic Amplifier

9.11 Antilogarithmic Amplifier

9.12 Analog Switch

9.13 Analog Multiplexer and Demultiplexer

Chapter 10: Piezoelectric Sensors

Learning Objectives

10.1 Introduction

10.2 Piezoelectric Phenomenon

10.3 Piezoelectric Materials

10.4 Piezoelectric Transducers

10.5 Measuring Circuit

10.6 Piezoelectric Accelerometers

10.7 Unimorph

10.8 Bimorphs

10.9 Actuator Stacks

10.10 Sandwich Piezoelectric Transducers

10.11 Pyroelectricity

10.12 Limitations of Piezoelectric Materials

Chapter 11: Ultrasonic Sensors

Learning Objectives

11.1 Introduction

11.2 Analysis

11.3 Equivalent Circuit of the Transmitter

11.4 Transmission of Ultrasound

11.5 Measurement of Ultrasound

11.6 Special Application

Chapter 12: Measurement of Magnetic Field

Learning Objectives

12.1 Principle of Measurement of Magnetic Field

12.2 Hall Effect

Problems

Chapter 13: Optoelectronic Sensors

Learning Objectives

13.1 Photoconductivity

13.2 Photocurrent

13.3 The Semiconductor Photodiode

13.4 Sensors Based on Optical Fibre

Chapter 14: pH and Viscosity Measurement

Learning Objectives

14.1 Introduction to pH

14.2 Why is pH Measurement Important?

14.3 pH Probe

14.4 Measurement of Viscosity

Problem

Chapter 15: Dissolved Oxygen Sensors

Learning Objectives

15.1 Introduction

15.2 Dissolved Oxygen Sensing

15.3 Principle of Operation of Polarographic Electrode

15.4 Principle of Operation of Galvanic Electrode

15.5 Limitations of Single-Layer Electrode Model

15.6 Design of Electrodes

15.7 Details of Some Commercially Available DO₂ Sensors

15.8 Electrode Metals

15.9 Electrolytes in DO₂ Probe

15.10 Membrane

15.11 Signal Conditioning Circuits

15.12 General Design Considerations

15.13 Calibration of DO₂ Sensors

Chapter 16: Gas Chromatography

Learning Objectives

16.1 Introduction

16.2 Different Methods in Chromatography

16.3 Basics of Chromatography

16.4 Liquid Chromatography

Chapter 17: Pollution Measurement

Learning Objectives

17.1 Introduction

17.2 Sample Collection

17.3 Aerosol Contaminants

17.4 Gaseous Contaminants

17.5 Carbon Monoxide Detection

17.6 NO_x Measurement

17.7 Sulphur Dioxide Analyzer

17.8 Ozone Detection

17.9 Detection of Hydrocarbons

17.10 Air Quality Index

17.11 Measurement and Calculation

Chapter 18: Smart Sensors

Learning Objectives

18.1 Integrated, Smart, and Intelligent Sensors

18.2 Logical Function

18.3 Integration of Signal Processing

18.4 Self-Calibrating Micro Sensors

18.5 Self-Testing of Smart Sensors

18.6 Multisensing

18.7 Communication

18.8 Applications of Smart Sensors

Bibliography

Solutions to Problems

Objective Type Questions and Answers

Appendix I: Tables for Orifice Meter and Venturimeter

Appendix II: Thermocouple Tables

Index

To purchase this product, please visit:

<https://www.wileyindia.com/fundamentals-of-industrial-instrumentation.html>



Scan to buy