

OpsControl Engineering Course OBJECTIVES

On completion of the course, the student will:

1. Understand the purpose and operation of common automatic control devices that are found aboard ships and in shore side industry.
2. Be familiar with standard C-A-P-S (Controller, Actuator, Process & Sensor) Terminology
3. Be familiar with the hardware and software used in industrial control.
4. Be able to read a variety of standard Electronics and Control System Diagrams
5. Be prepared to troubleshoot and repair basic control system faults.

OpsControl C-A-P-S TOPIC LIST

1. Fundamentals of Automatic Control
2. Automatic Controls Methods
 1. ON-OFF Control
 2. Sequential Control
 3. Proportional-Integral-Derivative (PID) Control
 4. Programmable Logic Control
3. Sensors and Measurement
 1. Temperature
 2. Pressure
 3. Flow Rate
 4. Level
 5. Speed
 6. Flame Sensors
 7. Combustion Properties
 8. Explosive Gases
 9. Relative Humidity
 10. Salinity
 11. Dissolved Oxygen
4. Transmitters and Control Signals
 1. Electrical
 2. Pneumatic
 3. Digital
5. Controller Mechanisms
 1. Pneumatic
 2. Electrical
 3. Digital
6. Final Control Elements (Acuators)
 1. Pneumatic Operators
 2. Hydraulic Servomotors
 3. Electric Servomotor

Extensive Online Textbook Resources from ATP: American Technical Publishers

@

<https://www.atplearning.com/product/1670/instrumentation-and-process-control>



AMERICAN TECHNICAL PUBLISHERS
Career and Technical Training Materials

Search by title, author, ISBN

View Cart | 0 item(s): \$0.00 | Login

Products eProducts About ATP Contact

Home > Electrical > Instrumentation and Process Control

Construction

- Electrical**
- AC/DC Principles
- Applied Codeology Navigating the NEC®
- Applied Grounding and Bonding
- Building Automation Control Devices and Applications
- Building Automation System Integration with Open Protocols
- Circuit Breakers: A Technician's Guide to Low- and Medium-Voltage Circuit Breakers
- Commercial and Industrial Wiring
- Conduit Bending and Fabrication
- Digital Multimeter Principles
- Electrical Motor Controls for Integrated Systems
- Electric Motor Drive Installation and Troubleshooting
- Electrical Principles and Practices
- Electrical Safety: A Practical Guide to OSHA and NFPA 70E®
- Electrical System Design and Application Using Volts Software
- Electrical Systems Based on the 2014 NEC®
- Electrical Systems Based on the 2011 NEC®
- Electrical Systems for Facilities Maintenance Personnel
- Energy Auditing for Industrial Facilities
- Instrumentation and Process Control**
- Textbook
- Workbook



Instrumentation and Process Control ATP eTextbook

6th Edition
ISBN: 978-0-8269-3442-0
By: Franklyn W. Kirk, Thomas A. Weedon, Philip Kirk

Textbook: 691 pages, 557 illustrations
Download Size: 26.5 MB
eReader: Adobe Digital Editions

Instrumentation and Process Control is a comprehensive resource that provides a technician-level approach to instrumentation used in process control. With an emphasis on common industrial applications, this textbook covers the four fundamental instrumentation measurements of temperature, pressure, level, and flow, in addition to position, humidity, moisture, and typical liquid and gas measuring instruments. Fundamental scientific principles, detailed illustrations, descriptive photographs, and concise text are used to present the following instrumentation topics:

- Process control and factory automation measurement instruments and applications
- Control valves and other final elements
- Digital communication systems and controllers
- Overview of control strategies for process control
- Safety systems and installation in hazardous locations
- Systems approach to integration of instruments in process control

Instructor Resources are available for this title [Click here](#) to learn more.

For additional resources, [click here](#) to access the ATPeResources.com web page for this product.

Please Follow These Steps Before Downloading ATP eTextbook....

1. Download and Open Adobe Digital Editions 

WEBSITE MATERIALS:

Textbook

Workbook

Answer Key

Online Instructor Resources

Premium Powerpoint® Presentations

Assessments

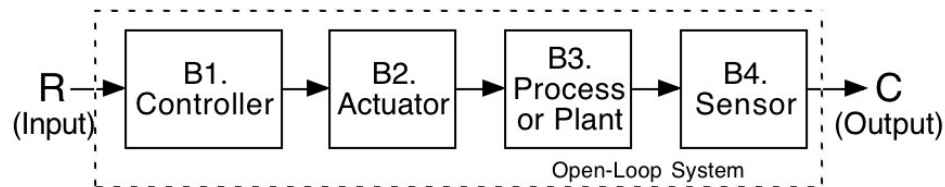
Instructional Guide

ATP eTextbook

ECI (EN-3212)- Electronics & Computer Integration

ECI uses the textbook previously used for Instrumentation & Control: Curtis Johnson's "Process Control Instrumentation Technology". Using the first eight chapters, students are exposed to most of the electronic hardware components and systems in use in both analog and digital worlds. The C-A-P-S diagram below is used to introduce students to the concept of block-diagram systems, and the input/output relationships of most industrial electronic components. Electronic hardware components are defined first by electronic function as one of the following:

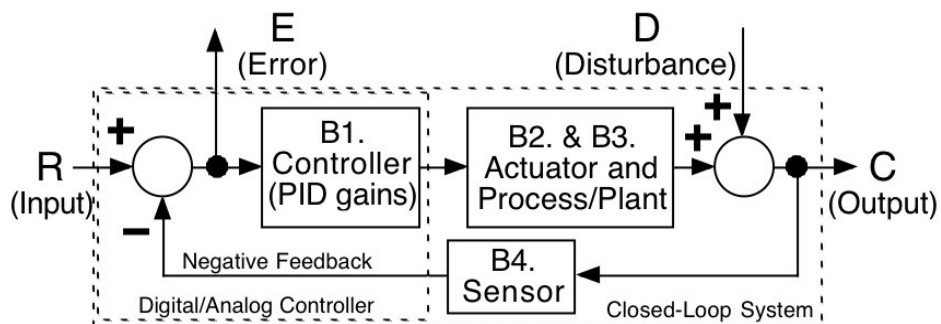
1) a Controller, 2) an Actuator, or 3) a Sensor, as related to a Process, Plant or system.



ECI-Electronics: The C-A-P-S Model; the open-loop Block Diagram that defines major components of Electronic Hardware, and the relationship between the electrical signals.

INC (EN-3606)- Instrumentation & Controls

Modern digital controllers are primarily implemented in software and require more advanced dynamic system models; real-time signals are integrated through programs like Matlab/Simulink (introduced in INC) using C-language-like .m files. The INC class takes the component block diagram from ECI (shown above), and adds the complexity of a closed-loop, multi-input, multi-output, PID controller (shown below). In this case, the system dynamics are essential to design, and the INC class introduces controller performance parameters based on: 1) Stability, 2) Speed of Response, and 3) Dynamic Accuracy.



INC-Controls: The Closed-loop Block Diagram for Instrumentation & Controls. INC uses transfer functions to study the more advanced concepts of dynamic modeling and multi-input, multi-output, proportional-integral-derivative (PID) control systems.

Section One – Introduction to Instrumentation

Chapter 1: Instrumentation Overview

Chapter 2: Fundamentals of Process Control

Chapter 3: Piping and Instrumentation Diagrams

Section Two – Temperature Measurement

Chapter 4: Temperature, Heat, and Energy

Chapter 5: Thermal Expansion Thermometers

Chapter 6: Electrical Thermometers

Chapter 7: Infrared Radiation Thermometers

Chapter 8: Practical Temperature Measurement and Calibration

Section Three – Pressure Measurement

Chapter 9: Pressure

Chapter 10: Mechanical Pressure Instruments

Chapter 11: Electrical Pressure Instruments

Chapter 12: Practical Pressure Measurement and Calibration

Section Four – Level Measurement

Chapter 13: Mechanical Level Instruments

Chapter 14: Electrical Level Instruments

Chapter 15: Ultrasonic, Radar, and Laser Level Instruments

Chapter 16: Nuclear Level Instruments and Weigh Systems

Chapter 17: Practical Level Measurement and Calibration

Section Five – Flow Measurement

Chapter 18: Fluid Flow

Chapter 19: Differential Pressure Flowmeters

Chapter 20: Mechanical Flowmeters

Chapter 21: Magnetic, Ultrasonic, and Mass Flowmeters

Chapter 22: Practical Flow Measurement

Section Six – Analyzers

Chapter 23: Gas Analyzers

Chapter 24: Humidity and Solids Moisture Analyzers

Chapter 25: Liquid Analyzers

Chapter 26: Electrochemical and Composition Analyzers

Section Seven – Position Measurement

Chapter 27: Mechanical and Proximity Switches

Chapter 28: Practical Position Measurement

Section Eight – Transmission and Communication

Chapter 29: Transmission Signals

Chapter 30: Digital Numbering Systems and Codes

Chapter 31: Digital Communications

Chapter 32: Industrial Networks

Chapter 33: Wireless Systems

Chapter 34: Practical Transmission and Communication

Section Nine – Automatic Control

Chapter 35: Automatic Control and Process Dynamics

Chapter 36: Control Strategies

Chapter 37: Controller Tuning

Chapter 38: Digital and Electric Controllers

Section Ten – Final Elements

Chapter 39: Control Valves

Chapter 40: Regulators and Dampers

Chapter 41: Actuators and Positioners

Chapter 42: Variable-Speed Drives and Electric Power Controllers

Section Eleven – Safety Systems

Chapter 43: Safety Devices and Equipment

Chapter 44: Electrical Safety Standards

Chapter 45: Safety Instrumented Systems

Section Twelve – Instrumentation and Control Applications

Chapter 46: General Control Techniques

Chapter 47: Temperature Control

Chapter 48: Pressure and Level Control

Chapter 49: Flow Control

Chapter 50: Analysis and Multivariable

Control Answers - Appendix - Glossary - Index - Supplemental topics

ONLINE Chapter 51: Pneumatic Transmission

ONLINE Chapter 52: Control Principles of Electricity