


Instrumentation: Functional elements of a measurement system; Sensors for temperature, flow, velocity, linear distance, level, pressure, force, pH measurement; Control valve sizing and selection; Control signal transmission and related industry standards; Study of piping instrument diagram (P&ID); Basic components of Data acquisition system, Error analysis and calibrations.

Dynamic Modeling: Review of conservation and constitutive laws of energy systems and dynamic modeling; Linearization ODEs, Review of Laplace Transform, evaluate transfer function and input-output model; Analysis of first and second order systems – graphical and optimization fit, State-space modelling.

Controller Design: Basics of feedback control; P, PI, and PID controller design, tuning, and troubleshooting; Frequency response analysis and control system design, Stability analysis; Basics of cascade control; fuzzy logic, control structure.

Automation: Introduction of PLC, PLC Hardware, Definitions of Allen-Bradley conditional inputs and outputs, I/O configuration, Programming Terminals and Peripherals, Application of PLC in Automation, Automation system components, Industrial communications, Continuous control, overview of SCADA and DCS systems; Microcontroller basics, classification, basic Architecture, memory, registers, I/O ports.

 Ref Book → Process Dynamics and Control, 4th Ed. by Dale.E. Seborg, Professor, Chemical Engineering, University of California, US.

Part I - The Instrumentation

Part II - The Process by Mostafizur Rahaman, Lecturer, ESE, KUET

Chapter 1 - System: The Component (1)

1.1 Process

1.2 Controller

Chapter 2 - Process: The ODE Model (2)

2.1 Balance Equations

2.2 Process Modeling

Chapter 3 - Process: The TF Model

3.1 Standard Form (3, 4)

3.2 Gain-Time Constant (5)

3.3 Zero-Pole Form (6)

3.4 Matrix Form (6)

Chapter 4 - Process: The SS Model (6)

4.1 Single Input Single Output Sys.

4.2 Multiple Input Multiple Output Sys.

Chapter 5 - Process: The Empirical Model (6)

5.1 Regression

5.2 Classification

Part III - The Controller by Mostafizur Rahaman, Lecturer, ESE, KUET

Chapter 1 - Feedback Controller

1.1 Define Controller (8)

1.2 Controller Response Analysis (11)

1.3 Controller Design and Tuning (14)

Chapter 2 - Feedforward Controller

2.1 Define Controller (15)

2.2 Particular Example

Chapter 3 - Advance Controller (16)

3.1 Cascade Control

3.2 Fuzzy Control

Part IV - The Automation