**Outcome:** Students will be able to identify various types of control valve assemblies and components, explain how they function, and critical operational requirements and considerations (e.g., sizing, application, performance, etc.). Students will demonstrate their ability to inspect and perform basic control valve troubleshooting.

**Lecture:** Lecture to review:

1. What is a control loop?
   1. What is a control valve?
2. Control valve nomenclature:
   1. Control valve components:
      1. Valve body
      2. Actuator
      3. Positioner
3. Basic control valve types
   1. First segregation:
      1. Sliding stem vs. rotary
   2. Second segregation:
      1. Sliding stem: Utility service vs. Heavy duty vs. Specials
   3. Third segregation:
      1. Rotary: E-disc (BFV) vs. E-Plug vs. Ball vs. Specials
4. Sliding stem vs. rotary comparison
   1. Pressure class
   2. Pressure drop
   3. Temperature
   4. Characteristic
   5. Fluid compatibility
5. Valve trim
6. Inherent valve characteristic
7. Control valve Shutoff
   1. ANSI/FCI Standards
8. Control valve actuation
   1. Actuator function
   2. Actuator types
      1. Pneumatic S&D vs. Pneumatic Piston
9. The Positioner
   1. Types
   2. Function
10. Valve sizing overview
    1. Liquid sizing
       1. Basic sizing equation
       2. Choked flow
    2. Gas/vapor sizing
       1. Basic sizing equation
       2. Choked flow.
11. Valve considerations
    1. Cavitation
    2. Flashing
    3. Erosion
    4. Noise
12. Operator considerations
    1. Performance

**Demo(s):**

1. Small equipment lab
2. Control valve demonstrator stations
   1. Globe valve operation
   2. Ball valve operation
3. Control valve cutaway
4. Control valve disassembly/reassembly

**Lab:**

1. HOT Unit (GRHS)
2. Basic control valve troubleshooting
   1. Air leaks
   2. Loss of air
   3. Stiction

**Homework:**

1. CVHB Chapters 1-6 & 8
2. Fundamentals of Process Control Theory
   1. Murrill
   2. Unit 7

**Documentation:**

1. Control Valves .ppt
2. Emerson Control Valve Handbook.
3. Fundamentals of Process Control Theory
   1. Murrill
   2. Unit 7

**Assessment:**

1. Homework
2. Lab Work
3. Lab Safety
4. Hands-on observation
5. Quiz(s) & Final Exam