**Outcome:** Students will be able to identify the various process loop types (e.g., self-regulating, integrating, inverse, etc.) and demonstrate their ability to calculate and articulate the loop’s critical characteristics (e.g., gain, deadtime, the time constant, etc.). The students will be introduced the Simtronics Process Simulator to reinforce their student’s understanding of loop types and characteristics

**Lecture:** Lecture to review:

1. Process type.
   1. Self-regulating
   2. Nonself-regulating (integrating)
   3. Direct action
   4. Inverse action
2. Process characteristics (Dynamics)
   1. Gain (kc)
   2. Deadtime
   3. Time constants
      1. T63
      2. T98
   4. Response orders (e.g.,1st, 2nd, etc.)
   5. Capacitance
   6. Resistance
3. ISA symbology

**Demo(s):**

1. Computer lab
   1. Introduction to the Simtronics Simulator
   2. Navigating Simtronics
2. Hot Unit (GRHS)
   1. Navigating the DCS system
      1. Overview
      2. Area displays
      3. Loop detail windows
         1. Auto/Man/Cascade
         2. SP/PV/CO
         3. Adjusting Settings
   2. Navigating the data historian
   3. Bump testing process loops

**Lab:**

Location: HOT Unit (GRHS)

1. Bump test process loops
   1. Level, temperature, and flow loops
   2. Observe responses
   3. Calculate loop characteristics
      1. The Loop gain (kc)
      2. The Deadtime (if any)
      3. The time constant (T63)

Location: Simtronics Lab

1. Simtronics SPM-1100 Process Loop Characteristics
   1. All four models
      1. Exercise #1 Normal Operation
         1. Practice navigating the system
         2. Reinforce understanding of process characteristics
         3. Place the processes in manual and bump the processes by making changes to the controller output and observe process response(s).
         4. Document your observations.
      2. Exercise #2 Cold Startup
         1. Practice starting up models per procedure

**Homework:**

1. Fundamentals of Process Control Theory
   1. Murrill
   2. Units 1, 2, & 8
2. Practice navigating Simtronics
   1. Navigating process schematic pages
   2. Changing setpoints
   3. Switching from auto to manual
   4. Manipulating controller output
   5. Switching back to auto
   6. Responding to alarms
3. Practice loop bump testing
4. Develop new startup procedure for all four process types that reduce startup time and does not produce process alarms.

**Documentation:**

1. Process types & dynamics .ppt
2. Fundamentals of Process Control Theory
   1. Murrill
   2. Units 1, 2, & 8
3. Simtronics
   1. SPM-1100 Operators manual

**Assessment:**

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