WESTERN IOWA TECH COMMUNITY COLLEGE
Course Syllabus

Term:
Course Number and Section: BPT 114 ___
Course Title: Instrumentation I
Semester Hours: 2.00
Meeting time/location:
Instructor:
Phone: 712.274.8733 Ext.
E-mail: @witcc.edu
Office Location:
Office Hours:

COURSE DESCRIPTION AND PREREQUISITES/COREQUISITES:

This course is designed to provide the student with an introduction to basic process and continuous process control. This course teaches two of the most common types of process control systems, flow and liquid level, and the basic concepts on which other systems are based. Students will learn to calibrate, adjust, install, operate, and connect process control systems in industrial applications thus broadening their employment opportunities. Topics include, but are not limited to, feedback, modes, characteristics, variables, instrumentation and connections.

Prerequisite: None
Corequisite: None

REQUIRED TEXTBOOKS/MATERIALS

COURSE OBJECTIVES

The course will provide information which should enable the student to:

1. Describe the variables and steps that are part of any controlled process
2. Discuss the way a feedback control loop works
3. Understand the roles of sensors, transmitters, and final control elements in the control process
4. Explain the functions of single loop control processes and several common advanced control processes
5. Describe the modes of control
6. Explain where each mode is used
7. Describe the effect that each mode of control has on final control elements
8. Compare the effects of band and gain on control response
9. Define "process" as used in modern industrial plants
10. Describe the forms of energy
11. Identify different temperature scales
12. Recognize how heat and heat transfer affect fluid processes
13. Match process measurement terms with definitions
14. Describe operational principles of pressure, level, temperature, and flow
15. Recognize advantages and disadvantages of different types of equipment that measure pressure, level, temperature and flow
16. Recognize how pressure, level, temperature, and flow are measured
17. Identify construction and operation of different types of thermometers
18. Interpret information provided on a P & ID
19. Identify symbols and lines used on a P & ID
20. Trace a simple loop on a P & ID
21. Recognize organizational sections of the loop diagram
22. Identify symbols and reference information provided on the loop diagram
23. Trace a signal on an electronic or pneumatic loop diagram
24. Identify characteristics of digital control systems
25. Recognize features of instrumentation diagrams
26. Interpret information contained in three types of instrumentation diagrams
27. Recognize the importance of mechanical connections in instrumentation and control loops
28. Describe uses for and installation of seals, tubing and fittings
29. Identify procedures for silver soldering
30. Describe good work practices that will minimize equipment down time

31. Recognize operating characteristics of different conductors, splices and cables
32. Describe how to install electrical connections in instrumentation and control loop systems
33. Trace an electrical signal
34. Identify general safety concepts of intrinsic safety and intrinsically safe system

CONTENT OUTLINE:

I. Introduction to Control Schematics
   A. Basic control system schematics
   B. Seven rules for reading and creating schematics
   C. Symbols used in most schematics
II. Creating Schematics
   A. Creation of a schematic from a wiring diagram or component arrangement
   B. Use of the schematic to understand system's components
   C. Use of the schematic to understand operation
III. Electrical Lockout
   A. Basic principles of lockout
   B. Common lockout circuits
   C. Lockout conditions
IV. Electrical Lockout
   A. Use of schematics to design electrical control systems
   B. Troubleshooting of custom and standard control system designs
   C. Modification of existing systems to meet changing requirements
V. Energy Management
   A. Energy management functions in electrical controls
   B. Use of timers and relay logic to control energy management
   C. Design of a basic energy management system based on a de-energized circuit
   D. Flexibility in energy management design
VI. Electronic Controls
   A. Schematics reading
   B. Troubleshooting complex control systems
   C. Flow charts to troubleshoot electronic modules
VII. Responsive Systems
   A. Multiple switch circuits
   B. Time delay devices
   C. Design elements for responsive controls

COMPETENCIES:

At the conclusion of the course the student will be able to:
1. Interpret the basic concepts of process control
2. Differentiate between the principles of single feedback loop and advanced loop controls
3. Recognize the fundamental principles of controllers in instrument control systems
4. Relate the basics of process systems, their characteristics and variables, types of energy, various temperature scales, and heat transfer methods
5. Identify the characteristics and measurement techniques for the process control variables to include pressure, level, temperature and flow
6. Locate the symbols found on process and instrumentation diagrams
7. Describe the organizational sections, symbols and reference information provided on a loop diagram
8. Demonstrate basic digital control concepts, including terminology, symbols, and designations found on process instrumentation diagrams
9. Explain the importance of sound mechanical connections, including fittings, wiring and tubing, to the process measurement and control of instrumentation systems