

Approved by: Christin Cech

Last updated: 1/14/2025

**Instrumentation and Controls
POWENG-335
Work/Life Experience Portfolio**

Credit for Prior Learning provides students a range of options to earn college credit for what they already know. Students can demonstrate college-level knowledge and competencies from examination, portfolio, to workforce and military.

- 1. Course title, number & credit value:**
 - a. Instrumentation and Controls, POWENG-335, 3 CR
- 2. Course description:**
 - a. This course covers a wide variety of boiler and HVAC controls. Thermostats, pneumatic and electronic controls, and building automation systems, pressure transmitters, thermocouples, and gauges are just some of the instrumentation covered in this class.
- 3. Course Competencies that must be demonstrated:**
 - a. Understanding of a wide variety of boiler and HVAC controls. This will be reflected on a resume and discussion.
- 4. Portfolio requirements that demonstrate competencies. *Note for Resumes: Lead faculty must verify the student's work history via a letterhead mail or phone interview.**
 - a. Resume and a discussion with the Department Chair/Lead Faculty

Course Competencies

1. Define five elements for comfort provided by HVAC systems
Linked Career Essentials
Professionalism - Practice
Assessment Strategies
 - 1.1. Written Product
Criteria
 - 1.1. Learner writes down temperature, humidity, circulation, ventilation, and filtration with 100% accuracy
 - 1.2. Learner writes an example of three requirements of comfort with 80% accuracyLearning Objectives
 - 1.a. Explain the meaning of comfort as it relates to HVAC systems
 - 1.b. Define psychrometrics as it relates to HVAC systems
2. Describe the fundamental properties of thermodynamics
Assessment Strategies

Approved by: Christin Cech

Last updated: 1/14/2025

Instrumentation and Controls
POWENG-335
Work/Life Experience Portfolio

Credit for Prior Learning provides students a range of options to earn college credit for what they already know. Students can demonstrate college-level knowledge and competencies from examination, portfolio, to workforce and military.

-
- 2.1. Oral Presentation
 - Criteria
 - 2.1. Learner explains the first law of thermodynamics with 80% accuracy
 - 2.2. Learner explains the second law of thermodynamics with 100% accuracy
 - Learning Objectives
 - 2.a. Explain how heat transfer occurs
 - 2.b. Explain how heat is measured
 - 3. Identify common boiler classifications
 - Assessment Strategies
 - 3.1. Drawing/Illustration
 - Criteria
 - 3.1. Learner draws a picture of a scotch marine boiler with 80% accuracy
 - 3.2. Learner draws a picture of a watertube boiler with 70% accuracy
 - Learning Objectives
 - 3.a. Describe the design of a firetube boiler as per instructors approval
 - 3.b. Identify The drum in a watertube boiler
 - 4. Describe common boiler accessories used on hot water and steam boilers
 - Assessment Strategies
 - 4.1. Oral Presentation
 - Criteria
 - 4.1. You explain how a centrifugal pump operates with 80% accuracy
 - 4.2. You describe the purpose of a compression tank
 - Learning Objectives
 - 4.a. Explain how an impeller in a centrifugal pump works
 - 4.b. Describe the workings of a compression tank in terms of changing psi
 - 5. Compare common control system components found in heating, cooling, humidification, and ventilation systems.
 - Assessment Strategies
 - 5.1. Oral Presentation
 - Criteria
 - 5.1. You explain how pneumatic thermostats operate with 80% accuracy

Approved by: Christin Cech

Last updated: 1/14/2025

Instrumentation and Controls
POWENG-335
Work/Life Experience Portfolio

Credit for Prior Learning provides students a range of options to earn college credit for what they already know. Students can demonstrate college-level knowledge and competencies from examination, portfolio, to workforce and military.

5.2. Present a 5 minute oral presentation on why humidifiers have normally closed operating valves

Learning Objectives

5.a. Describe the bimetallic element in a pneumatic thermostat with 100% accuracy

5.b. Define the reason for normally closed valves on humidifiers

6. List devices used to correct air pressure and volume in an air compressor system

Assessment Strategies

6.1. Written Product

Criteria

6.1. You describe in writing what type of valve regulates air pressure with 100% accuracy

6.2. You identify a butterfly valve on an air compressor with 100% accuracy

Learning Objectives

6.a. Write a description of a regulating valve as pertaining to air compressors

6.b. Describe in writing the working parameters of a butterfly valve

7. Explain the function of normally open and normally closed dampers and valves.

Assessment Strategies

7.1. Oral Presentation

Criteria

7.1. You describe a heating valve in a cold weather climate to 100% accuracy

7.2. You explain in a five minute presentation the basic function of an air damper

Learning Objectives

7.a. Describe why a heating valves in cold climates will be a normally open valve

7.b. Describe the operation of an air inlet damper on a building air handling unit

8. Describe the operation of a pneumatic thermostat including, bimetallic element, bleedport, and relay.

Assessment Strategies

8.1. Oral Presentation

Criteria

8.1. You clearly demonstrate knowledge of the inside of a pneumatic thermostat with 80% accuracy

Approved by: Christin Cech

Last updated: 1/14/2025

Instrumentation and Controls
POWENG-335
Work/Life Experience Portfolio

Credit for Prior Learning provides students a range of options to earn college credit for what they already know. Students can demonstrate college-level knowledge and competencies from examination, portfolio, to workforce and military.

-
- 8.2. You explain why two different metals are needed on a bimetallic element
Learning Objectives
- 8.a. Describe the parts inside a two pipe pneumatic thermostat
- 8.b. Explain the reason for different coefficients of expansion on a bimetallic element in a pneumatic thermostat
9. List the four steps necessary to calibrate a pneumatic thermostat.
Assessment Strategies
- 9.1. Written Product
Criteria
- 9.1. You write down each step required to calibrate a pneumatic thermostat with 100% accuracy
- 9.2. You explain in writing what calibrating a thermostat accomplishes with 100% accuracy
Learning Objectives
- 9.a. List taking ambient temperature reading, adjusting dial to ambient temperature, setting the branch line pressure to midpoint of spring ranges, and setting dial back to desired setting
- 9.b. Explain that calibration of thermostat increases reliability and efficiency of entire system
10. Describe the operation of a single zone air handling unit control system
Assessment Strategies
- 10.1. Oral Test
Criteria
- 10.1. You state the power supply of a single zone air handling system with 90% accuracy
- 10.2. You explain in a five minute oral presentation the reason why one would use a single zone air handling system
Learning Objectives
- 10.a. Compare a single zone air handling system with a multi zone system
- 10.b. Articulate the reason outside air is used in a single zone system using dampers
11. Explain the operation of electrical control systems in common HVAC applications
Assessment Strategies

Approved by: Christin Cech

Last updated: 1/14/2025

Instrumentation and Controls
POWENG-335
Work/Life Experience Portfolio

Credit for Prior Learning provides students a range of options to earn college credit for what they already know. Students can demonstrate college-level knowledge and competencies from examination, portfolio, to workforce and military.

-
- 11.1. Written Product
 - Criteria
 - 11.1. you complete a quiz on the basic parts of an atom with 90% accuracy
 - 11.2. You identify two types of electrical current with 100% accuracy
 - Learning Objectives
 - 11.a. Define the difference between alternating and direct current
 - 11.b. Differentiate between electrons, protons, and neutrons
 - 12. Explain the operation of an electronic control system
 - Assessment Strategies
 - 12.1. Written Product
 - Criteria
 - 12.1. You successfully complete electronic control systems worksheet with 100% accuracy
 - 12.2. You successfully complete a written quiz with 100% accuracy on N type and P type materials
 - Learning Objectives
 - 12.a. Compare electronic and electric control systems
 - 12.b. Differentiate P type and N type materials relating to electron excess and electron holes
 - 13. Compare central supervisory, central-direct, and distributed direct digital control systems
 - Assessment Strategies
 - 13.1. Oral Presentation
 - Criteria
 - 13.1. You present a five minute oral presentation explaining the difference between supervisory, central-direct, and distributed direct digital control systems
 - 13.2. You choose the most efficient type of control system within 90% accuracy
 - Learning Objectives
 - 13.a. Define supervisory control strategy with 90 % accuracy
 - 13.b. Conclude what control strategy is best for a commercial building