

# ATPF-2155: AIR CONDITIONING INSTALLATION AND CONTROLS

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## Cuyahoga Community College

### Viewing: ATPF-2155 : Air Conditioning Installation and Controls

**Board of Trustees:**

2015-12-03

**Academic Term:**

Spring 2019

**Subject Code**

ATPF - Applied Ind Tech - Pipefitters

**Course Number:**

2155

**Title:**

Air Conditioning Installation and Controls

**Catalog Description:**

Course covers different types of air conditioning systems and related controls. In addition, installation and system balancing and troubleshooting mechanical problems are addressed.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

## Requisites

**Prerequisite and Corequisite**

Departmental approval: admission to Pipefitter's Apprenticeship program.

## Outcomes

**Course Outcome(s):**

Examine the various types of air conditioning (A/C) systems and discuss the components of each.

**Objective(s):**

1. Identify the different types of A/C units.
2. List the components of A/C units and explain the function of each.
3. Discuss the different types of A/C duct work and assess the advantages/disadvantages of each.
4. Identify the tasks required for A/C installation.
5. Explain the extended plenum system and discuss the respective purpose.
6. List and define the terms related to A/C systems.
7. Differentiate between packaged equipment and split A/C units.

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**Course Outcome(s):**

Discuss the importance of proper balancing of A/C systems.

**Objective(s):**

1. Explain system pressure with respect to A/C systems.
  2. Explain the relationship between the air handler with respect to air volume and balance.
  3. Describe the different methods of balancing A/C systems.
  4. Calculate the volume of air being delivered using velocity and cross sectional areas.
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**Course Outcome(s):**

Describe the control sequence for an A/C system, explain the electrical applications and the respective air management components.

**Objective(s):**

1. Explain the hierarchy of the control sequence.
  2. Justify the order of operation with respect to control sequencing.
  3. Differentiate between operational and safety controls.
  4. Describe the electrical applications with respect to the cooling system.
  5. Examine electrical diagrams and interpret schematics using symbols, loads and power sources.
  6. Describe the different thermostats used for temperature sensing and system activation.
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**Course Outcome(s):**

Demonstrate the ability to troubleshoot problems with respect to cooling systems.

**Objective(s):**

1. Select the proper instruments used for diagnosing mechanical problems in A/C systems.
  2. List and describe common symptoms for over charged A/C units.
  3. Explain the effects of humidity on cooling systems.
  4. Evaluate air management controls using voltmeters.
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**Methods of Evaluation:**

1. Class participation
2. Quizzes
3. Tests
4. Final exam

**Course Content Outline:**

1. Air conditioning systems
  - a. Types
    - i. Water cooled
    - ii. Air cooled
    - iii. Split
  - b. Components
    - i. Blower motor
      1. Air distribution
      2. Climate management
    - ii. Condensing unit
      1. Heat removal
      2. Refrigerant control
    - iii. Evaporator
      1. Conditioned air
      2. Humidity control
    - iv. Filter drier
    - v. Condenser motor
      1. Coil
      2. Air movement
  - c. Duct work
    - i. Types
      1. Sheet metal
      2. Fiber glass
      3. Insulated
      4. Flexible
    - ii. Function
    - iii. System
      1. Transitions
      2. Plenums
      3. Adapters/boots
      4. Turning veins

- 5. Main trunk
      - 6. Branch lines
    - iv. Supplied air
    - v. Return air
  - d. Installation tasks
    - i. Equipment layout
    - ii. Safety review
      - 1. Equipment
      - 2. Personnel
    - iii. Equipment placement
    - iv. Air distribution
    - v. System energizing
  - e. Plenum
    - i. Purpose
      - 1. Air collection
      - 2. Temperature management
    - ii. Extended
      - 1. Trunk
      - 2. Square
      - 3. Round
    - iii. Delivery
      - 1. Reducing
      - 2. Perimeter loop
  - f. Terminology
    - i. Plenum
    - ii. A/C system
    - iii. Split unit
    - iv. Duct
      - v. Cross sectional area
      - vi. Schematic
      - vii. Control sequencing
    - viii. Air handler
    - ix. Balance
    - x. Loads
  - g. Packaged equipment
    - i. Roof top unit
    - ii. Commercial
    - iii. Size
  - h. Split unit
    - i. External
    - ii. Interior
    - iii. Size
2. System balancing
- a. Method
    - i. Air measuring
    - ii. Calculation
    - iii. Air function charts
    - iv. Dampers
  - b. Calculations
    - i. Area
      - 1. Duct size
      - 2. Room dimensions
    - ii. Room air balance
    - iii. Averages
    - iv. Traversing
  - c. Pressure system
    - i. Fan speed
    - ii. Motor size
    - iii. Friction loss

- d. Air handler
  - i. Furnace
  - ii. Cooling unit
  - iii. Coils
- e. Air volume
  - i. Balance
  - ii. Speed
- 3. A/C controls
  - a. Control sequence
    - i. Thermostat
    - ii. Blower motor
    - iii. Valve
    - iv. Switches
      - 1. High
      - 2. Low
  - b. Order of operation
  - c. Controls
    - i. Operational
      - 1. Thermostat
      - 2. Fan relay
      - 3. Disconnect
    - ii. Safety
      - 1. High/low limits
      - 2. Thermocouple
      - 3. Overload switch
      - 4. Relays
      - 5. Compressor overload
  - d. Electrical applications
  - e. Diagrams and schematics
    - i. Symbols
    - ii. Loads
    - iii. Power source
  - f. Thermostats
    - i. Types
      - 1. Bi metal
      - 2. Indoor
      - 3. Outdoor
    - ii. Function
      - 1. Air management
      - 2. Temperature control
      - 3. Activation
- 4. Troubleshooting
  - a. Instruments
    - i. Voltmeter
    - ii. Refrigeration gages
    - iii. Ohm meter
    - iv. Leak detector
  - b. Over charge systems
    - i. Line sweat
    - ii. Suction pressure readings
    - iii. Freeze up
  - c. Humidity
    - i. Comfort
    - ii. Static electricity
    - iii. Bacterial growth
    - iv. Dryness

- i. Air management control
  - 1. Building automated system
  - 2. Voltmeter
- 5. .

## Resources

Althouse, Turnquist and Bracciano. *Modern Refrigeration and Air Conditioning*. 4th edition. Goodheart-Willcox Co., South Holland, Illinois, 1979.

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R. Jesse Phagan. *Applied Mathematics*. 4th edition. Goodheart-Wilcox Co./Tinley Park, IL, 2010.

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Thomas W. Frankland. *Pipe Trades*. Current edition. Glencoe/McGraw-Hill, New York, New York, 1969.

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## Resources Other

<http://www.free-ed.net/sweethaven/MechTech/Refrigeration/coursemain.asp?lesNum=4&modNum=1>

<http://physics.about.com/od/glossary/g/heat.htm>

<http://www.refrigerationbasics.com/1024x768/definitions1.htm>

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