ISET-1450: HEATING VENTILATION AIR CONDITIONING/ REFRIGERATION I

Cuyahoga Community College

Viewing: ISET-1450 : Heating Ventilation Air Conditioning/Refrigeration I

Board of Trustees:
May 2023

Academic Term:
Fall 2023

Subject Code
ISET - Integrated Systems Engineering

Course Number:
1450

Title:
Heating Ventilation Air Conditioning/Refrigeration I

Catalog Description:
Learn the basics of refrigeration, heat transfer, and thermodynamics HVAC/R applications. This course covers modern HVAC/R systems including their major components, controls, different duct work designs, combustion, HVAC/R blueprint reading, refrigerants, working fluids, and energy management systems.

Credit Hour(s):
2

Lecture Hour(s):
1

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
None.

Outcomes

Course Outcome(s):
A. Apply maintenance and troubleshooting procedures to heating/air conditioning and refrigeration systems using OSHA safety standards.

Objective(s):
a. Identify safety procedures.
b. Employ lock-out/tag-out.
c. Interpret mechanical drawings for heating and cooling systems.

Course Outcome(s):
C. Categorize and select refrigerants and refrigerant oils for proper applications in accordance with OSHA and EPA safety standards.

Objective(s):
a. Identify types and properties of refrigerants and refrigerant oils.
b. Apply OSHA and EPA safety considerations.
c. Identify test, inspection and measurement procedures for oils.

Course Outcome(s):

B. Install, maintain, and repair refrigeration and air conditioning systems.

Objective(s):

a. List preventive maintenance requirements.
b. Demonstrate troubleshooting techniques.
c. Explain the operation of refrigeration and air conditioning system control devices.
d. List the types and components of control systems.
e. Discuss principles of control device operation.
f. Demonstrate testing and calibration of control devices.
g. Employ set up and installation techniques for controls.
h. Apply troubleshooting and preventive maintenance of control systems.
i. Recognize different types of compressors and components.
j. Discuss the theory of thermodynamics.
k. Explain the principles of refrigeration.
l. Discuss the operation of a heat pump.
m. Set-up and installation.
n. Identify tools, test equipment, and measurement devices for calibration, installation, and repair.

Course Outcome(s):

D. Install, repair, and maintain heating and ventilating systems.

Objective(s):

a. Identify different types and components of heating and ventilation systems.
b. Discuss the principles of operation for combustion heating.
c. Discuss set up and installation.
d. Identify and apply preventive maintenance and troubleshooting techniques.

Course Outcome(s):

E. Select appropriate fuels for specific applications in accordance with OSHA/EPA safety regulations.

Objective(s):

a. List types of fuel.
b. Identify and apply OSHA and EPA safety considerations for fuel usage and storage.
c. Identify temperature and pressure characteristics for fuels.
d. Discuss environmental considerations.

Methods of Evaluation:

a. Completion of homework assignment
b. Written and/or verbal quizzes covering homework and in class demonstrations
c. In class demonstration of procedures and methods
d. Final exam

Course Content Outline:

a. CONCEPTS
    i. Ohm's Law
    ii. Matter and Energy
    iii. Calibration techniques
    iv. Control circuit principles and applications for HVAC systems
    v. Compressors types, components, and applications
    vi. Overcurrent Protection
    vii. AC Basic Principles

viii. Principles of Refrigeration
ix. Types and properties of Refrigerants
x. Meters
xi. Principles of control device operation
xii. Air Distribution
xiii. Condensers
xiv. Flowcharting
xv. Troubleshooting techniques
xvi. Correct applications for tools
xvii. Electric motor characteristics for HVAC installations and applications
xviii. Theory of Thermodynamics
xix. Safety (codes)
xx. Lock-Out/Tag-out procedures
xxi. OSHA and EPA Standards for storage, disposal, and applications of refrigerants and fuels
xxii. Preventive maintenance requirements
xxiii. heat pump operation
xxiv. Types and components of HVAC systems
xxv. Operating principles for combustion heating
xxvi. Fuel Characteristics
xxvii. Environmental factors

b. SKILLS
i. Installing HVAC systems
ii. Installing, maintaining, and troubleshooting control systems for HVAC
iii. Testing, inspecting and calibrating HVAC systems
iv. Reading instrumentation (meters)
v. Troubleshooting (fundamentals)
vi. Creating troubleshooting flow charts
vii. Refrigerant charging
viii. Safety rule application
ix. Sheet metal applications
x. Interpreting schematics and drawings
xi. Interpreting local codes and ordinances
xii. Locating additional resources for materials & troubleshooting
xiii. Identifying measuring and hand tools for specific jobs.
xiv. Utilizing proper fastening techniques.
xv. Following maintenance procedures

c. ISSUES
i. Networking
ii. EPA (Environmental considerations)
iii. Safe installations
iv. Design for future growth
v. Taking a concept and applying it
vi. Troubleshooting

Resources

Whitman, William, Johnson, William and Tomczyk, John. *Refrigeration and Air Conditioning Technology.* 1st ed. Thomson Learning, 1999.

McQuiston, C. *Heating, Ventilating, and Air Conditioning Analysis and Design*. 6th ed. Hoboken, NJ: Willey Publishing, 2004.

Andrew D Althouse, Carl H Turnquist, Alfred F Bracciano. *Modern Refrigeration and Air Conditioning*. 21st. Goodheart-Wilcox, 2019.

Carter Stanfield, David Skaves. *Fundamentals of HVACR*. 3rd. New York NY: Pearson, 2016.

Eugene Silberstein. *Refrigeration & Air Conditioning Technologies*. 9th . Boston MA: Cengage, 2020.

Resources Other

a. Amatrol Software

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