ISET-2450: HEATING VENTILATION AIR CONDITIONING/REFRIGERATION II

Cuyahoga Community College

Viewing: ISET-2450 : Heating Ventilation Air Conditioning/Refrigeration II

Board of Trustees:
January 2023

Academic Term:
Fall 2023

Subject Code
ISET - Integrated Systems Engineering

Course Number:
2450

Title:
Heating Ventilation Air Conditioning/Refrigeration II

Catalog Description:
This is a continuation in the study of the basics of refrigeration, heat transfer and thermodynamics in Heating, Ventilation, air Conditioning, and Refrigeration (HVAC/R) applications. Emphasis is placed on the calculation and determination of space heating and cooling loads, experimental work, and hands-on training and preparation to pass the Environmental Protection Agency's (EPA) Proper Refrigerant Practices certification exam. Important topics include: HVAC/R thermodynamics and heat transfer, air conditioning processes, comfort and Indoor Air Quality (IAQ), space heating loads, space cooling load, volumetric flow rates, advanced blueprint readings and systems designs, energy consumption, specifications, and components selections.

Credit Hour(s):
2

Lecture Hour(s):
1

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
ISET-1450 Heating Ventilation Air Conditioning/Refrigeration I, or departmental approval.

Outcomes

Course Outcome(s):

A. Install, repair, troubleshoot, and service Heating, Ventilation, and Air Condition/Refrigeration (HVAC/R) systems.

Objective(s):

a. Demonstrate safe practices of installation, maintenance, and troubleshooting of HVAC/R equipment.
b. Explain the heat balance method.
c. Identify transient conduction heat transfer.
d. Demonstrate the heat balance method.
e. Practice cooling load calculation procedures.
f. Calculate cooling loads.
g. Calculate supply air volume.
h. Examine flow, pumps, and piping design.
i. Discuss fluid flow basics.
j. Discuss different pump characteristics.
k. Identify different pump applications.
l. Examine space heating load.

m. Demonstrate piping system design.
n. Sketch duct and piping systems.
o. Discuss the principles of hydronics.
p. Describe the behavior of jet streams.
q. Discuss circulation fans and their applications.
 r. Identify fan installation requirements.
s. Calculate duct size and volume.
 t. Discuss transmission heat losses and infiltration.
u. Explain auxiliary heat sources.
 v. Identify supply air for space heating.
w. Calculate heating demands.
 x. Examine cooling load principles.
 y. Explain heat gain, cooling load, and heat extraction rate.
 z. Discuss design conditions.

Course Outcome(s):

B. Analyze refrigerant properties to determine correct usage.

Objective(s):
a. Diagram a refrigeration system.
b. Explain a single-stage compression cycle.
c. Categorize refrigerants.
d. Identify commercial refrigeration equipment components.
e. Demonstrate the recovery of refrigerants.
 f. Demonstrate the ability to charge and evacuate an AC system.
g. Review the safety standards for the handling of high-pressure cylinders.
h. Apply proper tools and gauges for HVAC systems.
 i. Explain brazing and solder techniques.
 j. Demonstrate brazing and soldering skills.
k. Recognize and demonstrate troubleshooting procedures.
 l. Identify preventive maintenance procedures.

Course Outcome(s):

C. Comply with EPA regulations when working with refrigerants.

Objective(s):
a. Identify EPA regulations regarding refrigerants.
b. Review EPA regulations for chloroflourocarbon (CFC) licensing.
c. Practice for CFC licensing exam.
d. Explain EPA regulation 608.
e. Explore heat pumps and geothermal heating and cooling systems.
 f. Examine installation techniques for geothermal.
g. Analyze the advantages and disadvantages of heat pumps.

Methods of Evaluation:
a. Completion of homework assignments
b. Written and verbal quizzes covering homework and in-class demonstrations
c. Demonstration of application of procedures and methods
d. Final exam

Course Content Outline:
a. CONCEPTS
   i. Math
   ii. Matter and Energy
   iii. Principles of Heat Pumps
   iv. Geothermal heating and Cooling
   v. Principles of Hydronics
   vi. Properties of Fluids
   vii. Characteristics and applications of pumps
   viii. Cooling Load calculations
   ix. Compressors
   x. British Thermal Units (BTUs)
   xi. Overcurrent Protection
   xii. AC Basic
   xiii. Refrigerants
   xiv. Meters
   xv. Air Distribution
   xvi. Safety (codes)
   xvii. Condensers
   xviii. Flowcharting
   xix. Troubleshooting
   xx. Tools
   xxi. Electric Motors & Pumps
   xxii. Thermodynamics
   xxiii. Convection
   xxiv. Heat Migration and Calculations
b. SKILLS
   i. Diagram cooling and heating systems
   ii. Install piping systems
   iii. Installation Techniques
   iv. Reading instrumentation (meters)
   v. Troubleshooting (fundamentals)
   vi. Creating troubleshooting flow charts
   vii. Refrigerant Charging, recovery, and storage
   viii. Safety rule application
   ix. Sheet metal applications
   x. Brazing and soldering
   xi. Interpreting schematics and drawings
   xii. Interpreting local codes and ordinances
   xiii. Locating additional resources for materials & troubleshooting
   xiv. Identifying measuring and hand tools for specific jobs.
   xv. Discussing proper fastening techniques.
   xvi. Apply Maintenance procedures
   xvii. Calculate heating and air conditions loads
c. ISSUES
   i. Networking
   ii. Safe installations
   iii. Design for future growth
   iv. Taking a concept and applying it
   v. Troubleshooting
   vi. EPA (Environmental Protection Agency)

Resources

Thomson Delmar Learning, ed. *Building Environments, HVAC Systems*. 3rd ed. Delmar Publishers, Inc.Clifton Park, NY, 2020.

McQuiston. *Heating, Ventilating, and Air Conditioning Analysis and Design*. 5th ed. Wiley Publishing,Hobokan, NJ, 2019.

Ronnie J. Auvil. *HVAC and Refrigeration Systems*. 1st ed. Orlando Park, IL: American technical Publishers, 2021.

Resources Other
 a. Amatrol Software

Top of page
Key: 2459