

## **COURSE SYLLABUS**

<b>LAST REVIEW</b>	Fall 2022
<b>COURSE TITLE</b>	Heat Pump Systems
<b>COURSE NUMBER</b>	HVAC 0203
<b>DIVISION</b>	Career and Technical Education
<b>DEPARTMENT</b>	HVAC
<b>CIP CODE</b>	47.0201
<b>CREDIT HOURS</b>	3
<b>CONTACT HOURS/WEEK</b>	Class: 1                      Lab: 4
<b>PREREQUISITES</b>	HVAC 0100

### **COURSE DESCRIPTION**

**(GREEN TECHNOLOGY)** This course will cover the fundamentals of heat pump systems. This will include reverse-cycle refrigeration, four-way valves, ground source heat pumps, water source heat pumps, air source heat pumps, refrigerant line identification, types of metering devices, and liquid-line accessories. Installation and troubleshooting will also be covered.

### **PROGRAM ALIGNMENT**

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

[https://kansasregents.org/workforce\\_development/program-alignment](https://kansasregents.org/workforce_development/program-alignment)

### **PROGRAM LEARNING OUTCOMES**

1. The student will be able to demonstrate the ability to perform HVAC procedures in a safe manner
2. The student will be able to classify the different needs of equipment and summarize a solution.
3. The student will be able to exhibit a high level of professionalism including appropriate dress, attendance, communication skills and other soft skills necessary.

### **TEXTBOOKS**

<http://kckccbbookstore.com/>

### **METHODS OF INSTRUCTION**

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels,

conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

## **COURSE OUTLINE**

- I. Air Source Heat Pump
  - A. Reverse Cycle Refrigeration
    - 1. Heat Pumps
    - 2. Four way valve
  - B. The Four Way Valve
  - C. Types of Heat Pumps
    - 1. Water to air heat pumps
    - 2. Removing heat from the ground
    - 3. Air to air heat pump
  - D. Metering Devices
  - E. Thermostatic Expansion Valves (TXV)
  - F. Liquid Line Accessories
  - G. Auxiliary Heat
  - H. Balance Point
  - I. Coefficient of Performance (COP)
  - J. Defrost Cycle
    - 1. Initiating the defrost cycle
    - 2. Terminating the defrost cycle
    - 3. Electronic control of defrost
- II. Geothermal Heat Pumps
  - A. Geothermal Heat Pumps Classifications
  - B. Open Loop Systems
  - C. Closed Loop Systems
  - D. Earth Coupled Systems
  - E. Systems Materials and Heat Exchange Fluids

## **COURSE LEARNING OUTCOMES AND COMPETENCIES**

Upon successful completion of this course, the student will:

- A. Demonstrate an understanding of a four way valve.
  - 1. demonstrate reverse refrigerant flow
  - 2. demonstrate whether the unit is in the heating or cooling mode.
  
- B. List the components of a reverse cycle heat pump.
  - 3. Explain an Indoor Coil
  - 4. Explain an Outdoor Coil
  - 5. Demonstrate Bi-flow Filter-Drier
  - 6. Demonstrate a Four-Way Valve
  - 7. Demonstrate Accumulator.
  - 8. Demonstrate a Compressor.
  - 9. Demonstrate the Defrost Cycle.
  - 10. Demonstrate the Outdoor Fan Motor.
  - 11. Demonstrate the Indoor Fan Motor.
  
- C. List the sources of heat for various heat pumps.
  - 12. Explain an Air to air heat pump.
  - 13. Explain a Water to air heat pump.
  - 14. Explain a Ground Source heat pump.
  - 15. Explain a Solar heat source.
  
- D. Demonstrate an understanding of heat pump terminology.
  - 16. Explain Coefficient of Performance (COP)
  - 17. Demonstrate Emergency Heat – Back up source of heat
  - 18. Demonstrate Defrost Cycle – Timed or Temperature
  - 19. Explain Balance Point – Heat loss is greater than heat supplied.
  - 20. Demonstrate Four-Way Valve – Reverses flow of refrigerant in system.
  - 21. Explain Energy Savings – Electricity is cheaper than natural gas.
  
- E. Demonstrate an understanding of coefficient of performance and auxiliary heat.
  - 22. Explain Coefficient of Performance – When a heat pump is pumping in exactly as much heat as the building is leaking out.
  - 23. Explain Coefficient of Performance – for a heat pump is 4 to 1 ratio.
  - 24. Demonstrate Auxiliary heat – A back up source of heat for when the heat pump becomes less efficient.
  - 25. Demonstrate gas heat back up.
  - 26. Demonstrate electric heat back up.
  - 27. Explain propane heat back up.

### **ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES**

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

## **COLLEGE POLICIES AND PROCEDURES**

*Student Handbook*

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

*College Catalog*

<https://www.kckcc.edu/academics/catalog/index.html>

*College Policies and Statements*

<https://www.kckcc.edu/about/policies-statements/index.html>

*Accessibility and Accommodations*

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.