SYLLABUS

DATE OF LAST REVIEW: 02/2013

CIP CODE: 46.0302

SEMESTER: Departmental Syllabus

COURSE TITLE: HVAC Systems

COURSE NUMBER: ELET0240

CREDIT HOURS: 2

INSTRUCTOR: Departmental Syllabus

OFFICE LOCATION: Departmental Syllabus

OFFICE HOURS: Departmental Syllabus

TELEPHONE: Departmental Syllabus

EMAIL: KCKCC issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE (S): None

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC TEC bookstore http://www.kckccbookstore.com, for the required texts for your particular class.

COURSE DESCRIPTION:

This is a beginning course in heating, ventilation and air conditioning technology that is appropriate for HVAC majors and other interested students. Upon successful completion of this course, the student should be able to identify the function of the basic components of an air-conditioning system. Topics will include heat laws, refrigerants, oils and refrigeration cycles of residential and light commercial systems. In the lab, students will design, assemble and operate a working refrigeration system. Competencies will include brazing, wiring, evacuating and charging a system. The student will be required to provide ANSI Z87 safety glasses and may be expected to provide other basic hand tools and/or equipment.
METHOD 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. Fundamentals of Refrigeration Theory
   A. Define temperature.
   B. Make conversions between Fahrenheit and Celsius scales.
   C. Describe molecular motion at absolute zero.
   D. Define the British thermal unit.
   E. Describe heat flow between substances of different temperatures.
   F. Explain the transfer of heat by conduction, convection and radiation.
   G. Define sensible heat, latent heat and specific heat.
   H. State atmospheric pressure at sea level and explain why it varies at different elevations.
   I. Describe two different types of barometers.
   J. Explain psig and Pisa as they apply to pressure gages.

II. Matter and Energy
   A. Define matter.
   B. List the three states in which matter is commonly found.
   C. State two forms of energy important to the air conditioning (heating and cooling) and refrigeration industry.
   D. Define horsepower.
   E. Convert horsepower to watts.
   F. Convert watts to British thermal units.

III. Refrigeration and Refrigerants
   A. State three reasons why ice melts in ice boxes.
   B. Describe the term “a ton of refrigeration”.
   C. Describe the basic refrigeration cycle.
   D. Explain the relationship between pressure and the boiling point of water or other liquids.
   E. Describe the function of the evaporator or cooling coil.
   F. Explain the purpose of the compressor.
   G. Describe the function of the condensing coil.
   H. State the purpose of the metering device.
   I. List refrigerants commonly used in residential and light commercial refrigeration and air conditioning systems.
J. List four characteristics to consider when choosing a refrigerant for a system.

IV. System Charging
   A. Describe how refrigerant is charged into systems in the vapor and the liquid states.
   B. Describe system charging using two different weighing methods.
   C. State the advantage of using electronic scales for weighing refrigerant into a system.
   D. Describe two types of charging devices

V. Evaporators and the Refrigeration Systems
   A. Define high-, medium-, and low-temperature refrigeration.
   B. Determine the boiling temperature in an evaporator.
   C. Identify different types of evaporators.

VI. Condensers
   A. Explain the purpose of the condenser in a refrigeration system.
   B. Describe the differences in operating characteristics between water-cooled and air-cooled systems.
   C. Describe the basics of exchanging heat in a condenser.
   D. Explain the difference between a tube within a tube-coil type condenser and a tube within a tube-serviceable condenser.
   E. Describe a cooling tower.
   F. Explain the relationship between the condensing refrigerant and the condensing medium.

VII. Compressors
   A. Explain the function of the compressor in a refrigeration system.
   B. Describe compression ratio.
   C. Explain the difference between a hermetic compressor and semi-hermetic compressor.
   D. Describe the various working parts of reciprocating and rotary compressors.

VIII. Expansion Devices
   A. Describe the three most popular types of expansion devices
   B. Describe the operating characteristics of the three most popular expansion devices.
   C. Describe how the three expansion devices respond to load changes.

EXPECTED LEARNER OUTCOME:

A. The student will be able to draw the basic refrigerant system, labeling components, pipes and wires.
B. The student will be able to demonstrate an understanding for simple and complex electrical circuits using basic electrician’s math, commonly used electrical terms and Ohm’s Law.

C. The student will be able to measure and calculate system/compressor efficiency.

D. The student will be able to fabricate a soldering and brazed tubing project using Cu and Al tubing.

E. The student will be able to examine tubing project joints at 300 psi and test for leaks.

F. The student will be able to test and evaluate temperatures, pressures and superheat of an operating refrigeration trainer.

G. The student will be able to fabricate a soldering and brazed tubing project using Cu and Al tubing.

H. The student will be able to fabricate a soldering and brazed tubing project using Cu and Al tubing.

COURSE COMPETENCIES:
Upon successful completion of this course:

The student will be able to draw the basic refrigerant system, labeling components, pipes and wires.

1. The student will be able to identify each major component of the refrigeration system.
2. The student will be able to explain the function of each component.
3. The student will be able to explain the high and low side cycle.
4. The student will be able to explain the power requirements.

The student will be able to demonstrate an understanding for simple and complex electrical circuits using basic electrician’s math, commonly used electrical terms and Ohm’s Law.

5. The student will be able to explain power needs for the compressor.
6. The student will be able to explain power needs for the condenser fan motor.
7. The student will be able to explain low voltage control circuit.

The student will be able to measure and calculate system/compressor efficiency.

8. The student will be able to determine high pressure with gauges.
9. The student will be able to determine low pressure with gauges.
10. The student will be able to determine adequate pressure with gauges.

The student will be able to fabricate a soldering and brazed tubing project using Cu and Al tubing.

11. The student will be able to use silver solder for brazing.
12. The student will be able to use propane cylinder for heating.
13. The student will be able to use a torch for brazing.
The student will be able to examine tubing project joints at 300 psi and test for leaks.

14. The student will be able to inspect tubing for restrictions.
15. The student will be able to inspect tubing for severe bends.
16. The student will be able to pressurize tubing for leaks.
17. The student will be able to inspect tubing for moisture.

The student will be able to test and evaluate temperatures, pressures and superheat of an operating refrigeration trainer.

18. The student will be able to analyze pressure and temperature reading.
19. The student will be able to determine superheat differential.

The student will be able to wire different electrical circuits to compressors.

20. The student will be able to wire according to manufacturer's schematic.

The student will be able to evacuate and charge basic refrigeration systems with refrigerant.

21. The student will be able to use a vacuum pump.
22. The student will be able to recover the refrigerant.

ASSESSMENT OF LEARNER OUTCOME:
Student progress is evaluated by means that include, but limited to exams, written assignments, and class participation.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome anytime.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff that is free of bigotry and discrimination. Kansas City Kansas Community College is committed to providing a multicultural education and environment that reflects and respects diversity and that seeks to increase understanding.

Kansas City Kansas Community College offers equal educational opportunity to all students as well as serving as an equal opportunity employer for all personnel. Various laws, including Title IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination be administered without regard to race, color, age, sex, religion, national origin, physical handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the Director of the Academic Resource Center at (913) 288-7670 V/TDD.