El Paso Community College
Syllabus
Part II
Official Course Description

SUBJECT AREA	**Heating, Ventilation and Air Conditioning**
COURSE RUBRIC AND NUMBER	**HART 1407**
COURSE TITLE	**Refrigeration Principles**
COURSE CREDIT HOURS	**4 3 : 3** **Credits Lec Lab**

I. Catalog Description

Introduces the refrigeration cycle, heat transfer theory, temperature/pressure relationship, refrigerant handling, refrigeration components and safety. **(3:3). Lab fee.**

II. Course Objectives

A. **Unit I. Matter**
1. Define matter as it relates to refrigeration.
2. List the three states of matter and briefly discuss each.
3. Describe the fundamental structure of an element, a molecule and a compound.

B. **Unit II. Heat**
1. Define heat.
2. Define the term "cold" as it relates to heat.
3. Define latent heat
4. Define sensible heat
5. Define specific heat

C. **Unit III. Application of Latent Heat**
1. Describe how latent heat is used in the refrigeration cycle.
2. Describe how to find latent heat.
3. Calculate the refrigeration tonnage.

D. **Unit IV. Measurement of Temperature**
1. Measure several different temperatures.
2. Define temperature and tell how it differs from heat.
3. Explain how a standard glass stem thermometer works.
4. List the important temperatures on each of the four thermometer scales and describe where each scale is commonly used.

E. **Unit V. Enthalpy**
1. Define enthalpy.
2. Describe the critical temperature and pressure points of a substance.
3. Calculate the enthalpy of different refrigerant.

F. **Unit VI. Heat Transfer and Control**

1. Describe the three means of heat transfer.
2. Explain how heat transfer can be controlled in each of the three types of gauges.

G. Unit VII. Pressure-Its Measurement and Effect on Gases

1. Use Boyle's law to solve problems involving gases.
2. Use Charles' law to solve problems involving gases.
3. Explain Dalton's law.
4. Explain the components of the equation PV=WRT and use the equation to solve problems involving gases.
5. Describe how pressure affects the evaporation of a liquid as it changes to gas.
6. Describe how pressure is measured and give examples of two types of gauges.
7. Utilize pressure/temperature charts

H. Unit VIII. Evaporative Cooling

1. Explain how evaporation cooling is accomplished.
2. Explain the operation of a basic refrigerating apparatus that does not recirculate its refrigerant.

I. Unit IX. A Basic Compression Refrigeration System

1. Explain the operation of a basic compression refrigerating system.
2. List the components of a simple capillary tube refrigeration systems and describe the function of each component.
3. Explain how the flow of refrigeration through the system produces cooling.
4. Identify low, medium, and high temperatures.

J. Unit X. Refrigerant Properties and Diagrams

1. Define refrigeration and identify the five refrigerants used in this discussion.
2. List the thermodynamic and material properties of refrigerants.
3. Discuss the desirable/undesirable characteristics of the properties of these cooling agents.
4. List the components of a basic pressure-heat or Mollier diagram and describe each.
5. Identify the line that corresponds to each of the four components of the system on a plotted pressure-heat diagram.

K. Unit XI. Compressors

1. Describe the compressor's function in the refrigeration system.
2. List the three factors that affect a compressor's volumetric efficiency.
3. List four measurements used to rate compressors and describe what each means.
4. Explain how two types of compressors operate.
5. Explain how lubrication of compressors is accomplished.
6. Define "hermetically sealed unit".
7. Explain how a compressor valve works.

L. Unit XII. Metering Devices

1. Describe the function of a metering device in the refrigeration system.
2. List five types of metering devices.
3. Explain how the three most commonly used metering devices operate.

M. Unit XIII. Evaporators

1. Explain the uses of the three types of evaporator construction.
2. Describe how secondary refrigerant works.
3. Explain the function of an evaporator in the refrigeration system.

N. Unit XIV. Condensers and Receivers

1. Describe the function of a condenser in the refrigeration system.
2. Describe the function of a receiver in the refrigeration system

3. List the three ways condensers can be cooled and describe how each operates.
4. Explain the use of a cooling tower.

O. Unit XV. Tools and Equipment

1. Identify and list the basic tools used in the HVAC industry.
2. Identify and list the basic test equipment used in the HVAC industry.
3. Properly use and care of all tools and test equipment.
4. Prepare required safety documentation.
5. Protect life and property.
6. Comply with federal, state, and local safety codes.
7. Make single and double flare connections.
8. Make and repair soldered and/or brazed tubing connections.
9. Select fittings and make a complete tubing assembly.
10. Make and repair swaged tubing connections.
11. Install and use manifold gauge set.
12. Test for leaks using soap suds, halide torch, and electronic tester.
13. Repair a leak using epoxy compounds.
14. Properly evacuate a system.
15. Pressurize system with nitrogen to detect leaks.
16. Identify automatic pump down liquid line solenoid.
17. Perform manual pump down.
18. Properly use a charging cylinder.
19. Operate oxyacetylene torch and welding equipment.
20. Use proper lifting equipment.
21. Properly operate a recovery unit.
22. Employ proper storage and handling of refrigerants.

P. Unit XVI. Safety

1. Employ proper handling procedures for chemicals.
2. Observe all safety procedures when using oxyacetylene torch and welding equipment.

III. THECB Learning Outcomes (WECM)

1. Identify refrigeration components.
2. Explain operation of the basic refrigeration cycle and heat transfer.
3. Demonstrate proper application and/or use of tools, test equipment, and safety procedures.

IV. Evaluation

A. Challenge Exam

Students who wish to challenge the course should contact the Testing Center and the Division Dean. Challenges must be accomplished before the census cut-off date. Students who previously have received a W or a letter grade for the course are not eligible to challenge the course.

B. Homework Assignments and Quizzes

Students are required to turn in review questions at the end of each unit of the textbook, upon completion of that unit. The students will be given two quizzes ; these grades will constitute 30% of the final grade.

C. Lab Assignments

Will constitute 40% of final grade

D. Final Exam

This exam will constitute 30% of the final grade.

E. Grading Scale:

I = Incomplete
W = withdrew or withdrawn

90-100	A
80-89	B
70-79	C
60-69	D
0-59	F

V. Disability Statement (Americans with Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential. Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024).

VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the Fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.