

# El Paso Community College

## Syllabus

### Part II

## Official Course Description

<b>SUBJECT AREA</b>	<u>Heating, Ventilation, and Air Conditioning</u>
<b>COURSE RUBRIC AND NUMBER</b>	<u>HART 1445</u>
<b>COURSE TITLE</b>	<u>Gas and Electric Heating</u>
<b>COURSE CREDIT HOURS</b>	<u>4     3     :     3</u> Credits   Lec                      Lab

### I. Catalog Description

Studies the procedures and principles used in servicing heating systems including gas fired furnaces and electric heating systems. **(3:3). Lab fee.**

### II. Course Objectives

#### A. Unit I. Gas Furnaces

1. Identify different types of gas furnaces and their application.
2. Identify the controls used in gas furnaces.
3. Identify and repair gas furnaces.
4. Install, inspect, and repair gas furnaces.
5. Perform maintenance on gas furnaces.
6. Isolate, remove, and replace heating components.
7. Verify overall equipment performance
8. Report unsafe equipment to the customer.
9. Document equipment model and serial number.
10. Evaluate work environment and correct unsafe conditions.
11. Analyze delta T.
12. Explain sequence of operations of a furnace.
13. Perform gas leak and CO tests.
14. Identify fuel type and convert natural gas to propane (LP).
15. Identify heat rise as per installation and operation manual (IOM).
16. Ensure proper rating of equipment for altitude.
17. Perform natural gas-to-LP (liquid propane gas) conversions.
18. Verify proper venting.
19. Verify CFM (cubic feet per minute) with delta temperature.
20. Troubleshoot gas valves.
21. Identify and troubleshoot four-way valves.

#### B. Unit II. Electrical Heating Systems

1. Identify the different types of electrical heating systems.
2. Identify components of electrical heating systems.
3. List common failures of electrical heating systems.
4. Install, troubleshoot, and repair electrical heating systems.
5. Verify overall equipment performance.

- C. **Unit III. Air to Air Heat Pump**
1. Describe a heat pump.
  2. List the components of a heat pump.
  3. Describe a four-way reversing valve.
  4. List the various heat sources for a heat pump.
  5. Compare the concepts of electric heating and heat pump heating.
  6. Determine by the line temperatures whether a heat pump is in the cooling or the heating mode.
  7. Describe the control sequence on an air-to-air heat pump.
  8. Describe techniques being used to improve the efficiency of heat pump systems.
  9. Discuss recommended preventive maintenance procedures for heat pump systems.
  10. Discuss recommended connection on a heat pump thermostat.
  11. Compare the concept between conventional and nonconventional heat pumps.
  12. Troubleshoot and diagnose heat pump failures.
- D. **Unit IV. Geothermal Heat Pump**
1. Describe open- and closed-loop geothermal heat pump systems.
  2. Explain how water quality affects an open-loop system.
  3. Compare the series and parallel flow configuration in geothermal heat pump systems.
  4. Explain the different system fluids and heat exchanger materials.
  5. Describe different geothermal well types and water sources for heat pumps.
  6. Explain some of the most common service problems with geothermal heat pump systems.
  7. Diagnose and explain system failures.
- E. **Unit V. Hydronic Heat**
1. Describe a basic hydronic heating system.
  2. List four heat sources commonly used in hydronic heating systems.
  3. Discuss the reason why air should be eliminated from hydronic heating systems.
  4. Describe the function of the air cushion or expansion tank.
  5. Explain the operation of a circulating pump.
  6. Comprehend the importance of limit controls and low water cut offs.
  7. Describe the importance of a relief valve.
  8. Sketch various types of loop hydronic systems
  9. Comprehend the benefits of primary and secondary piping.
  10. Describe the function of mixing valves.
  11. Diagnose and explain system troubleshooting technique.
- L. **Unit VI. Other Professional Skills**
1. Demonstrate safe driving skills.
  2. Avoid damaging customer's property.
  3. Demonstrate courteous behavior.
  4. Display professional appearance, apply multi-tasking skills, and perform proper housekeeping during and after job.
  5. Resolve customer's complaint in a tactful manner.
  6. Provide initial courtesy call, forecast arrival of parts or equipment for the job, and follow up with a courtesy call.
  7. Maintain eye contact with customer and introduce yourself appropriately.
  8. Demonstrate proper body language and empathy for the customer's situation.
  9. Organize and inventory service vehicle.
  10. Document problem accurately by writing legible reports and compile warranty information.

### III. THECB Learning Outcomes (WECM)

1. Identify various types of system applications.
2. Perform charging, recovery, and evacuation procedures of an installed system.
3. Perform component and part diagnostics and replacement.
4. Perform system maintenance.

### 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

Will constitute 30% of 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.

## **VII. Title IX and Sex Discrimination**

Title 9 (20 U.S.C. 1681 & 34 C.F.R. Part 106) states the following "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving Federal financial assistance." The Violence Against Women Act (VAWA) prohibits stalking, date violence, sexual violence, and domestic violence for all students, employees and visitors (male and female). If you have any concerns related to discrimination, harassment, or assault (of any type) you can contact the Assistant to the Vice President for Student and Enrollment Services at 915-831-2655. Employees can call the Manager of Employee Relations at 915-831-6458. Reports of sexual assault/violence may also be reported to EPCC Police at 915-831-2200.