

El Paso Community College
Syllabus
Part II
Official Course Description

SUBJECT AREA	<u>Heating, Ventilation and Air Conditioning</u>								
COURSE RUBRIC AND NUMBER	<u>HART 1403</u>								
COURSE TITLE	<u>Air Conditioning Control Principles</u>								
COURSE CREDIT HOURS	<table border="0" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><u>4</u></td> <td style="text-align: center;"><u>3</u></td> <td style="text-align: center;"><u>:</u></td> <td style="text-align: center;"><u>3</u></td> </tr> <tr> <td style="text-align: center;">Credits</td> <td style="text-align: center;">Lec</td> <td></td> <td style="text-align: center;">Lab</td> </tr> </table>	<u>4</u>	<u>3</u>	<u>:</u>	<u>3</u>	Credits	Lec		Lab
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Credits	Lec		Lab						

I. Catalog Description

Studies basic HVAC and refrigeration controls: troubleshooting of controls components; emphasizes the use of wiring diagrams to analyze high and low voltage circuits; reviews Ohm's law as applied to air conditioning controls and circuits. **Prerequisite: HART 1401. (3:3). Lab fee.**

II. Course Objectives

A. Unit I. Basic Electrical Thermostats

1. Identify and name three types of thermostats.
2. Identify parts of different types of thermostats.
3. List the operating characteristics in three types of thermostat.
4. Install and diagnose problems in three types of thermostats.

B. Unit II. Relays

1. Identify four types of motor starting relays.
2. Read and Draw a ladder schematic for each type of starting relay.
3. Install and diagnose problems in four types of relays.
4. Identify and explain the operating theory of solenoid valves.
5. Troubleshoot, adjust, repair or replace solenoid valves.

C. Unit III. Protective Devices

1. Identify six different types of over current protection devices.
2. Describe the operation of each type of over current protection devices.
3. List the National Electrical Code requirements pertaining to fuses and circuit breakers.
4. Identify and describe five different types of electrical system protection devices.
5. Identify and describe four different types of pressure-actuated protection and control devices.
6. Replace, adjust, and diagnose problems in fifteen types of protection devices.
7. Service motor starters, and motor controls.
8. Diagnose electronic control module.

D. Unit IV. Capacitors

1. Discuss the role of capacitors in the operation of motors.
2. Identify and describe two types of capacitors.
3. List the factors to be considered when replacing capacitor.
4. Draw a ladder schematic for different capacitor-relay combinations.
5. Replace and diagnose problems in four capacitor-relay combinations.

- E. **Unit V. Wiring Diagrams**
1. Identify the two most common types of wiring diagrams.
 2. List the characteristics of each type of wiring diagram.
 3. Identify the symbols used in drawing wiring diagrams.
 4. Draw wiring diagrams for five different types of equipment.
 5. Performing basic pipe bending (electrical metal tubing).
 6. Check operation of electric heater sequencer.
- F. **Unit VI. Domestic Refrigeration Fundamentals**
1. Identify the different types of domestic refrigeration equipment and their basic components.
 2. Demonstrate the transportation and installation of refrigeration equipment.
 3. Make necessary leveling and cabinet adjustments.
- G. **Unit VII. Sealed System**
1. Identify the sealed system components of domestic refrigeration equipment and their basic components.
 2. List the functions of sealed system components.
 3. Diagnose and repair sealed system components.
- H. **Unit VIII. Domestic Refrigeration Defrost and Electrical Controls**
1. List the function and identify defrost heaters.
 2. List the function and identify other types of heaters.
 3. Explain the purpose of electrical controls.
 4. List the different types of defrost system.
 5. Diagnose and repair defrost and electrical control failures.
- I. **Unit IX. Mechanical Servicing of Domestic Refrigerators**
1. List the common mechanical system failures and show how to detect them.
 2. Replace or repair mechanical components.
- J. **Unit X. Troubleshooting Domestic Refrigerators**
1. Diagnose and repair domestic refrigeration problems.
 2. Charge a system to manufacturers specifications.
 3. Service Domestic Refrigerators.
 4. Verify overall equipment performance.
- K. **Unit XI. Domestic Refrigerator Ice Makers**
1. Identify the different types of icemakers.
 2. List the problems of different types of icemakers.
 3. Identify water valves and their components.
 4. Install a refrigerator equipped with an ice maker.
 5. Troubleshoot and repair domestic refrigerator ice makers and associated components.
- G. **Unit XII. Fundamentals of Window Air Conditioners**
1. Describe the function of a window air conditioner.
 2. Identify window air conditioner parts.
 3. List electrical systems design characteristics, voltage, and amperage requirements.
 4. Identify window air conditioners from data plate information.
- H. **Unit XIII. Window Air Conditioner Repair**
1. Install a window air conditioner.
 2. Diagnose and repair different types of window air conditioners.
 3. Perform heat load calculations.
 4. Service window air conditioners.
 5. Verify overall equipment operation.

6. Describe service to customer.

F. Unit XIV. Safety

1. Use personal protective equipment.
2. Practice ladder safety.
3. Ensure that equipment is properly grounded.
4. Identify lock out/tag out procedures.

III. THECB Learning Outcomes (WECM)

1. Test, repair, and/or replace HVAC-related electrical and control components, wiring and equipment.
2. Read, draw, and interpret high and low voltage control circuits.
3. Identify system operations and components along with charging of hermetically sealed systems.

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. There would be two set of quizzes; these grades will constitute 30% of the final grade.

C. Lab Assignments - 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.

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.