

AC R010L: INTRODUCTION TO AIR CONDITIONING AND REFRIGERATION I LAB

Originator
aainsworth

College

Oxnard College

Discipline (CB01A)

AC - AirConditioning&Refrigeration

Course Number (CB01B)

R010L

Course Title (CB02)

Introduction to Air Conditioning and Refrigeration I Lab

Banner/Short Title

Intro Air Con & Ref I Lab

Credit Type

Credit

Start Term

Fall 2021

Formerly

ENVT R010L

Catalog Course Description

This course develops competency in the hands-on troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for refrigeration. It is recommended as a first semester course for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lecture course (AC R010), this class targets the service technician who wishes to develop refrigeration troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

Taxonomy of Programs (TOP) Code (CB03)

0946.00 - *Environmental Control Technology (HVAC)

Course Credit Status (CB04)

D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)

C (Not transferable)

Course Basic Skills Status (CB08)

N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)

C - Clearly Occupational

Course Cooperative Work Experience Education Status (CB10)

N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)

Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)

N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)

Y - Not Applicable

Course Noncredit Category (CB22)

Y - Credit Course

Funding Agency Category (CB23)

Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)

1 - Program Applicable

General Education Status (CB25)

Y - Not Applicable

Support Course Status (CB26)

N - Course is not a support course

Field trips

May be required

Grading method

Letter Graded

Alternate grading methods

Credit by exam, license, etc.

Does this course require an instructional materials fee?

No

Repeatable for Credit

No

Is this course part of a family?

No

Units and Hours

Carnegie Unit Override

No

In-Class

Lecture

Minimum Contact/In-Class Lecture Hours

17.5

Maximum Contact/In-Class Lecture Hours

17.5

Activity

Laboratory

Minimum Contact/In-Class Laboratory Hours

52.5

Maximum Contact/In-Class Laboratory Hours

52.5

Total in-Class**Total in-Class****Total Minimum Contact/In-Class Hours**

70

Total Maximum Contact/In-Class Hours

70

Outside-of-Class**Internship/Cooperative Work Experience**

Paid

Unpaid

Total Outside-of-Class**Total Outside-of-Class****Minimum Outside-of-Class Hours**

35

Maximum Outside-of-Class Hours

35

Total Student Learning**Total Student Learning****Total Minimum Student Learning Hours**

105

Total Maximum Student Learning Hours

105

Minimum Units (CB07)

2

Maximum Units (CB06)

2

Student Learning Outcomes (CSLOs)**Upon satisfactory completion of the course, students will be able to:**

- | | |
|---|---|
| 1 | Students will be able to physically demonstrate the ability to form, solder, and silver braze copper piping systems. |
| 2 | Students will be able to identify, troubleshoot, and remedy poorly-operating HVAC systems based on a learned understanding of optimal operating conditions compared to actual operating conditions. |
| 3 | With assistance from the instructor, students will evacuate, recover, and recharge refrigerant in systems. |

Course Objectives**Upon satisfactory completion of the course, students will be able to:**

- | | |
|---|--|
| 1 | Form, solder, and silver braze copper piping systems. |
| 2 | Evacuate, recover, and recharge refrigerant in systems. |
| 3 | Troubleshoot and repair poorly-operating systems based on a learned understanding of optimal operating conditions compared to actual operating conditions. |
| 4 | Perform various safety checks and procedures required for working in the air conditioning and refrigeration trade. |

Course Content

Lecture/Course Content

1. Safety
 - a. Safe use of hand tools used in the HVACR industry
 - b. Recognizing the safety issues related to using refrigerants
2. Operating Conditions
 - a. Pressure-temperature relationships
 - b. Reading and operating refrigeration manifold gauges
 - c. Setting low pressure cut-out switches
 - d. Setting regulating controls
3. Piping and Charging
 - a. Flaring copper
 - b. Swaging copper
 - c. Identifying fittings used in the HVACR industry
 - d. Soft soldering techniques
 - e. Silver soldering techniques
 - f. Safe operation of propane and oxy-acetylene torches
 - g. Vacuum pumps: service and operation
 - h. Using charging scales
 - i. Operating recovery systems
 - j. Estimating correct system charge
4. Expansion Devices
 - a. Measuring/ calculating superheat
 - b. Setting thermostatic expansion valves

Laboratory or Activity Content

The 10L lab class affords students an opportunity to get "hands on" experience/ training in the following.

1. Safety
 - a. Safe use of hand tools used in the HVACR industry
 - b. Recognizing the safety issues related to using refrigerants
2. Operating Conditions
 - a. Pressure-temperature relationships
 - b. Reading and operating refrigeration manifold gauges
 - c. Setting low pressure cut-out switches
 - d. Setting regulating controls
3. Piping and Charging
 - a. Flaring copper
 - b. Swaging copper
 - c. Identifying fittings used in the HVACR industry
 - d. Soft soldering techniques
 - e. Silver soldering techniques
 - f. Safe operation of propane and oxy-acetylene torches
 - g. Vacuum pumps: service and operation
 - h. Using charging scales
 - i. Operating recovery systems
 - j. Estimating correct system charge
4. Expansion Devices
 - a. Measuring/ calculating superheat
 - b. Setting thermostatic expansion valves

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Laboratory activities
Objective exams
Other (specify)
Projects
Problem-Solving Assignments
Quizzes

Other

Textbook Assignments

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
Computer-aided presentations
Class discussions
Demonstrations
Lecture

Describe specific examples of the methods the instructor will use:

- Classroom lectures that include technical demonstrations of service procedures used in the air conditioning and refrigeration field. These demonstrations are followed by having the student perform the task to gain proficiency. All tasks are practiced on actual air conditioning and refrigeration systems used in the industry.
- Reading and answering questions from chapters in the textbook provides students with information pertaining to various aspects of service procedures used in the air conditioning and refrigeration field and a means to check their comprehension of the information.
- Frequent quizzes are used to stimulate student discussion. These include but are not limited to techniques for setting low pressure controls, safety switches and determining if an air conditioning or refrigeration system is properly charged and in good operating condition.
- Class discussions, including problems encountered by students working in the air conditioning and refrigeration industry, are encouraged. Their experiences and questions stimulate class discussions on issues related to both commercial and residential systems. In addition, discussions relating to faults on the air conditioning and refrigeration trainers, that mimic actual systems faults, are shared with the entire class.

Representative Course Assignments

Writing Assignments

Students complete written homework that consists of chapter questions and solving problems, pertaining to air conditioning and refrigeration systems, presented during the class.

Critical Thinking Assignments

Students will be assigned problems describing specific mechanical conditions for various types of systems with the expectation of using logic and reasoning to identify if a fault exists and if one exists, formulate a plan to correct the fault.

Reading Assignments

Students are asked to read the chapter assigned in order to more thoroughly understand the concepts, pertaining to air conditioning and refrigeration systems, presented in the class.

Service manuals, specific to certain air conditioning and refrigeration systems, are made available for students to acclimate them to actual field service work conditions.

Skills Demonstrations

Students will be expected, at a minimum, to demonstrate the ability to:

Physically demonstrate the ability to form, solder, and silver braze copper piping systems.

Identify, troubleshoot, and remedy poorly-operating HVAC systems based on a learned understanding of optimal operating conditions compared to actual operating conditions.

Evacuate, recover, and recharge refrigerant in systems under supervision by an instructor.

Other assignments (if applicable)

Students complete lab exercises that provide hands on experience of tasks commonly performed in the air conditioning and refrigeration field.

Outside Assignments

Representative Outside Assignments

Reading: Students are assigned chapters in the text and handouts provided by the instructor. Service manuals, specific to certain air conditioning and refrigeration systems, are made available for students to acclimate them to actual field service work conditions.

Writing: Students complete written homework that consists of chapter questions and solving problems, pertaining to air conditioning and refrigeration systems, presented during the class.

Other: Students complete lab exercises that provide hands on experience of tasks commonly performed in the air conditioning and refrigeration field.

Articulation

Comparable Courses within the VCCCD

ENVT R010L - Intro. Air Con & Ref I Lab

District General Education**A. Natural Sciences****B. Social and Behavioral Sciences****C. Humanities****D. Language and Rationality****E. Health and Physical Education/Kinesiology****F. Ethnic Studies/Gender Studies****CSU GE-Breadth****Area A: English Language Communication and Critical Thinking****Area B: Scientific Inquiry and Quantitative Reasoning****Area C: Arts and Humanities****Area D: Social Sciences****Area E: Lifelong Learning and Self-Development****CSU Graduation Requirement in U.S. History, Constitution and American Ideals:****IGETC****Area 1: English Communication****Area 2A: Mathematical Concepts & Quantitative Reasoning****Area 3: Arts and Humanities****Area 4: Social and Behavioral Sciences****Area 5: Physical and Biological Sciences****Area 6: Languages Other than English (LOTE)****Textbooks and Lab Manuals****Resource Type**

Textbook

DescriptionCarter Stanfield and David Skaves (2017). *AHRI Fundamentals of HVACR* (3rd). Saddle River Pearson. 9780134016**Primary Minimum Qualification**

AIR COND/REFRIG/HEATING

Review and Approval Dates**Department Chair**

09/04/2020

Dean

09/06/2020

Technical Review

10/14/2020

Curriculum Committee

10/14/2020

Curriculum Committee

12/09/2020

CCCCO

MM/DD/YYYY

Control Number

CCC000287026

DOE/accreditation approval date

MM/DD/YYYY