

AC R010: INTRODUCTION TO AIR CONDITIONING AND REFRIGERATION

Originator

aainsworth

College

Oxnard College

Discipline (CB01A)

AC - AirConditioning&Refrigeration

Course Number (CB01B)

R010

Course Title (CB02)

Introduction to Air Conditioning and Refrigeration

Banner/Short Title

Intro to Air Con & Ref

Credit Type

Credit

Start Term

Fall 2021

Formerly

ENVT R010

Catalog Course Description

This course develops competency in the theoretical 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 lab course (AC R010L), this course targets the service technician who wishes to develop 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

52.5

Maximum Contact/In-Class Lecture Hours

52.5

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

52.5

Total Maximum Contact/In-Class Hours

52.5

Outside-of-Class**Internship/Cooperative Work Experience****Paid****Unpaid****Total Outside-of-Class****Total Outside-of-Class****Minimum Outside-of-Class Hours**

105

Maximum Outside-of-Class Hours

105

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

157.5

Total Maximum Student Learning Hours

157.5

Minimum Units (CB07)

3

Maximum Units (CB06)

3

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

- | | |
|---|--|
| 1 | Recognize each of the components and accessories used in refrigeration systems and define the function of each. |
| 2 | Estimate the correct operating temperature and pressure of refrigeration or air conditioning equipment given specific variables. |
| 3 | Identify potential problems based upon comparison of actual operating conditions to estimated correct operating conditions. |

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

- | | |
|---|--|
| 1 | Recognize each of the components and accessories used in refrigeration systems, and state the function of each. |
| 2 | Estimate the correct operating temperatures and pressures of different applications of refrigeration and air conditioning equipment. |
| 3 | Identify potential problems based upon comparison of actual operating conditions to estimated correct operating conditions. |

- 4 State how each of the major components is controlled.
- 5 Explain how various equipment failures will impact the operating temperatures and pressures in the system.

Course Content

Lecture/Course Content

1. Refrigeration Cycle
 - a. Definitions
 - b. Vapor compression
2. System Components
 - a. Compressors
 - b. Condensers-receivers
 - c. Evaporators
 - d. Metering devices
 - e. Cycle controls
3. Accessories
 - a. Filter driers, valves
 - b. Piping
 - c. Oils and refrigerants
4. Service Procedures
 - a. Checking compressor windings
 - b. Determining the correct refrigerant charge
 - c. Determining the set points for pressure controls
5. Troubleshooting
 - a. Determining potential mechanical faults based on system pressures

Laboratory or Activity Content

None

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

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):

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

Distance Education

Demonstrations

Group discussions

Lecture

Describe specific examples of the methods the instructor will use:

- Classroom lecture and equipment demonstrations: Actual refrigeration system components are displayed during the lecture pertaining to those components. Service procedures are demonstrated, giving the student the background to actually perform these procedures in the lab course.

- Class discussion, including problems encountered by students presently working in the field is encouraged. Often students are working in the air conditioning field so their experiences/ questions stimulate class discussions on issues related to both commercial and residential systems.

Representative Course Assignments

Writing Assignments

Students complete written homework that consists of end-of-chapter questions, and solving problems presented during the class. These questions and problems include being able to draw a basic refrigeration system, label the components and identify the change in state of refrigerant as it passes through the system.

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 assigned chapters from the text including end of chapter questions.

Students are provided with handouts and/or links to websites throughout the semester.

Outside Assignments

Representative Outside Assignments

Reading: Students are assigned chapters from the text including end of chapter questions. Students are provided with handouts and/or links to websites throughout the semester.

Writing: Students complete written homework that consists of end-of-chapter questions, and solving problems presented during the class. These questions and problems include being able to draw a basic refrigeration system, label the components and identify the change in state of refrigerant as it passes through the system.

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

Description

Carter Stanfield and David Skaves (2017). *AHRI Fundamentals of HVACR* (3rd). Saddle River Pearson. 9780134016

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (51%–99% online)

Hybrid (1%–50% online)

100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Frequent discussions will be used. Instructor will post a discussion topic such as "Describe the relationship between a refrigerant's temperature and its pressure" with expectations that each student will post a reply. In addition, each student will be expected to post a response to at least two of their classmates posts on the topic.
E-mail	Email to be used as a means to share information including study materials/tools.
Other DE (e.g., recorded lectures)	Frequent use of recorded lectures pertaining to various aspects of air conditioning and refrigeration.
Face to Face (by student request; cannot be required)	Face to face interactions will be offered to students needing help and for major exams.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Regular use of asynchronous discussion boards encourages various types of interaction and critical thinking skills among all course participants. Questions and topics posed will allow students to discuss, compare and contrast, identify, and analyze elements of the course outcomes. Students will be required to respond to one another with substantive comments with the intent of creating a dialog. Other discussion boards may be used for Q&A and general class discussion by students and instructor to facilitate student success and strengthen student learning outcomes.
E-mail	E-mail, class announcements and various learning management system tools such as "Message Students Who" and "Assignment Comments", will be used to regularly communicate with all students on matters such as clarification of class content, reminders of upcoming assignments and/or course responsibilities, to provide prompt feedback to students on coursework to facilitate student learning outcomes, or to increase the role of an individual educator in the academic lives of a student. Students will be given multiple ways to email instructor through both the learning management system inbox and faculty provided email accounts.
Face to Face (by student request; cannot be required)	The instructor will hold weekly, scheduled office hours either in person or via-web conferencing, for students to be able to meet and discuss course materials or individual progress. Students can request additional in-person or web conferencing meetings with faculty member as needed. Faculty may encourage online students to form "study groups" in person or online.

Other DE (e.g., recorded lectures)	Faculty will use a variety of ADA compliant tools and media integrated within the learning management system to help students reach SLO competency. Tools may include: <ul style="list-style-type: none"> • Recorded Lectures, Narrated Slides, Screencasts • Instructor created content • OC Online Library Resources • Canvas Peer Review Tool • Canvas Student Groups (Assignments, Discussions) • 3rd Party (Publisher) Tools (MyOpenMath) • Websites and Blogs • Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)
Synchronous Dialog (e.g., online chat)	Instructor will provide a set time each week where they will be available for synchronous chat and be available in the discussion board and can answer questions in live time.
Video Conferencing	Video tools such as ConferZoom can be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Recordings of all live sessions will be made available within the LMS. Video Conferences will be used to facilitate SLOs and student-to-student group meetings will also be encouraged.
Telephone	Students can request for instructor to call or vice versa in order to answer one-on-one questions about course material or student progress.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Frequent discussions will be used. Instructor will post a discussion topic such as "Describe the relationship between a refrigerant's temperature and its pressure" with expectations that each student will post a reply. In addition, each student will be expected to post a response to at least two of their classmates posts on the topic.
E-mail	Email to be used as a means to share information including study materials/tools.
Other DE (e.g., recorded lectures)	Frequent use of recorded lectures pertaining to various aspects of air conditioning and refrigeration.

Examinations**Hybrid (1%–50% online) Modality**

Online
On campus

Hybrid (51%–99% online) Modality

Online
On campus

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

CCC000314248

DOE/accreditation approval date

MM/DD/YYYY