

# AC R030: AIRSIDE SYSTEMS

**Originator**  
aainsworth

**College**

Oxnard College

**Discipline (CB01A)**

AC - AirConditioning&Refrigeration

**Course Number (CB01B)**

R030

**Course Title (CB02)**

Airside Systems

**Banner/Short Title**

Airside Systems

**Credit Type**

Credit

**Start Term**

Fall 2021

**Formerly**

ENVT R030

**Catalog Course Description**

This course develops competency in the theoretical troubleshooting of air side problems in air conditioning/heating systems through an understanding of the principles of air flow, the properties of air, theory of controls, reading of construction drawings, and calculation of building loads. It is recommended for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lab course (AC R030L), this course targets the service technician who wishes to develop skills in designing and troubleshooting building air conditioning systems and controls. 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 | Calculate heating and cooling loads, for a simple structure, based on the materials of construction used and their designated R-values. |
| 2 | Read construction drawings and correctly identify the various components and their related symbols, used in air distribution systems.   |

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

- |   |  |
|---|--|
| 1 | Describe each of the types of building systems that are used to deliver heating and air conditioning to occupied spaces. |
| 2 | Use a psychrometric chart to calculate heating and cooling loads, required supply air conditions and quantities.         |
| 3 | Read pneumatic control diagrams and explain the sequence of operation.   |
| 4 | Use pneumatic control diagrams to troubleshoot systems with operating problems.  |
| 5 | Read fan curves to select a fan for specified operating conditions.  |
| 6 | Read duct-sizing charts to size ducts for specified air flows.   |

**Course Content****Lecture/Course Content**

1. Psychrometric Chart
  - a. Dry bulb
  - b. Wet bulb
  - c. Absolute humidity

- d. Relative humidity
  - e. Enthalpy
  - f. Dewpoint
  - g. Sensible heat
  - h. Latent heat
  - i. Sensible Heat Ratio
2. Processes
- a. Sensible heating and cooling
  - b. Cooling with dehumidification
  - c. Dessicants
  - d. Spray systems
  - e. Mixing
3. Fans
- a. Axial, centrifugal, propeller fans
  - b. Fan laws RPM, CFM, BHP
  - c. Load calculations
  - d. Transmission
  - e. Infiltration
  - f. Internal loads
  - g. Dehumidification
  - h. Sensible and latent loads
4. Pneumatic Controls
- a. Transmitters
  - b. Thermostats
  - c. Receiver controllers
  - d. Controlled devices
  - e. Sensitivity, proportional band

#### 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, including equipment demonstrations. Actual air flow measurement tools psychrometers, and construction drawings are displayed during the lecture pertaining to those items. Troubleshooting procedures are demonstrated, giving the student the background to actually perform these procedures in the lab class.
- Frequent quizzes and practice problems are used to stimulate student discussion.
- Class discussion, including problems encountered by students presently working in the field, are encouraged.

**Representative Course Assignments****Writing Assignments**

Students complete written homework that consists of end-of-chapter questions, and solving problems presented during the class

**Critical Thinking Assignments**

Students will be assigned problems describing specific system/ space conditions, for various types of room designs, with the expectation of using logic and reasoning to identify if a problem exists and if one exists, formulate a plan to correct the fault. This includes determining which tools/ instruments are needed to assess the space conditions.

**Reading Assignments**

Students are asked to read the chapter assigned in order to understand more thoroughly the concepts presented in the class.

**Outside Assignments****Representative Outside Assignments**

Reading: Students are asked to read the chapter assigned in order to understand more thoroughly the concepts presented in the class.

Writing: Students complete written homework that consists of end-of-chapter questions, and solving problems presented during the class

## **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

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## **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 present a topic such as "Describe the effect adding sensible heat has on relative humidity" 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 will be used to communicate with students including providing study materials/tools.
Face to Face (by student request; cannot be required)	Face to face interactions will be offered to students needing help and for major exams.
Other DE (e.g., recorded lectures)	Frequent use of recorded lectures pertaining to various aspects of the airside portion of air conditioning systems.

### 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"> <li>• Recorded Lectures, Narrated Slides, Screencasts</li> <li>• Instructor created content</li> <li>• OC Online Library Resources</li> <li>• Canvas Peer Review Tool</li> <li>• Canvas Student Groups (Assignments, Discussions)</li> <li>• 3rd Party (Publisher) Tools (MyOpenMath)</li> <li>• Websites and Blogs</li> <li>• Multimedia (YouTube, Films on Demand, 3CMedia, Khan Academy, etc.)</li> </ul>
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 present a topic such as "Describe the effect adding sensible heat has on relative humidity" 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 will be used to communicate with students including providing study materials/tools.
Other DE (e.g., recorded lectures)	Frequent use of recorded lectures pertaining to various aspects of the airside portion of air conditioning systems.

**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**

CCC000280680

**DOE/accreditation approval date**

MM/DD/YYYY