

APSM 157C: INDOOR AIR QUALITY & ENERGY EFFICIENCY

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	2.5
Hours:	35 lecture, 5 laboratory per quarter (40 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- A successful student will be able to consider and calculate environmental factors, including comfort index and enthalpy.
- A successful student will be able to explain the importance of filtration, ventilation, and other indoor air quality solutions.

Description

Students will consider factors of indoor air quality versus energy efficiency, including airflow, filtration, air changes per hour, and humidity. Related HVAC equipment solutions, including economizers and duct system designs will also be discussed. Students will be introduced to typical measurements and requirements.

Course Objectives

The student will be able to:

1. Describe heat/cooling load calculations
2. Consider and calculate environmental factors, including comfort index, enthalpy, degree days
3. Demonstrate understanding and use of psychrometric equipment and charts
4. Understand importance of indoor air quality and requirements for filtration, ventilation, and other solutions
5. Identify factors affecting HVAC equipment sizing and apply to system diagnosis
6. Explain the function of an economizer
7. Install and verify operation of an economizer
8. Troubleshoot/diagnose economizer operation
9. Explain purpose and operation of demand control ventilation

Course Content

1. Heat/cooling load calculations
 - a. Formulas for heat load calculations will be presented and used (Lec and Lab)
2. Consider and calculate environmental factors, including comfort index, enthalpy, degree days
 - a. Perform heating and cooling load calculations on various scenarios (Lec and Lab)
3. Demonstrate understanding and use of psychrometric equipment and charts
 - a. Demonstrate reading and interpretation of psychrometric charts (Lec and Lab)
 - b. Perform actual wet and dry bulb readings; plot on a psychrometric chart (Lec and Lab)
4. Understand importance of indoor air quality and requirements for filtration, ventilation, and other solutions
 - a. Methods of air filtration; types of air filters (Lec and Lab)
 - b. Perform filter changes on actual equipment (Lec and Lab)
5. Identify factors affecting HVAC equipment sizing and apply to system diagnosis
 - a. Troubleshooting procedures that verify the diagnosis of under or over-sized equipment (Lec and Lab)
6. Explain the function of an economizer
 - a. Nomenclature, controls and operation of an economizer (Lec and Lab)
 - b. Economizer components and their functions (Lec and Lab)
 - c. Requirements of economizers in the code and Title 24 (Lec and Lab)
7. Install and verify operation of an economizer
 - a. Install and program an economizer as part of a unit start-up (Lec and Lab)
8. Troubleshoot/diagnose economizer operation
 - a. Troubleshoot an economizer with manipulated failures and provide solutions to correct failures (Lec and Lab)
9. Explain purpose and operation of demand control ventilation
 - a. Purpose, operation, and programming of demand control ventilation (Lec and Lab)
 - b. Install and program demand control ventilation on an HVAC unit (Lec and Lab)
 - c. Measure percentage of outside air on a unit with and economizer controlled by demand control ventilation (Lec and Lab)

Lab Content

1. Students will perform actual wet and dry bulb readings and plot them on a psychrometric chart
2. Students will troubleshoot an economizer with manipulated failures and provide solutions to correct failures
3. Students will install and program demand control ventilation on an actual economizer unit

Special Facilities and/or Equipment

1. Laboratory with sheet metal service tools
2. Personal protective equipment
3. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Results of written quizzes and tests
Responses in class discussions
Comprehensive written final examination
Comprehensive final project
Demonstration of assigned skills to acceptable level per instructor

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Discussion
Demonstration
Lab assignments followed by discussion

Representative Text(s) and Other Materials

Whitman, B., B. Johnson, J. Tomczyk, and E. Silberstein. Refrigeration and Air Conditioning Technology, 8th ed.. 2016.

Auvil, Ronnie J.. HVAC Controls Systems, 4th ed.. 2017.

These are the standard sheet metal textbooks/workbooks used for this course. Although one or more may not be within five years of the required published date, they are the most current books used when teaching this course.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Read sections 35.12, 35.13, and 35.14, regarding the psychometric chart, fresh air, infiltration and ventilation
2. Provide written answers to review questions at the end of section 50.6, "Demand Control Ventilation (DCV)"

Discipline(s)

Sheet Metal or Air Conditioning, Refrigeration, Heating