

Course Outline

COURSE: HVAC 205 **DIVISION:** 50 **ALSO LISTED AS:**

TERM EFFECTIVE: Fall 2020 **CURRICULUM APPROVAL DATE:** 06/09/2020

SHORT TITLE: COMMERCIAL REFRIG/ICE MACHINES

LONG TITLE: Commercial Refrigeration and Ice Machines

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
4	18	Lecture:	3	54
		Lab:	3	54
		Other:	0	0
		Total:	6	108

COURSE DESCRIPTION:

This course introduces refrigeration and applications. Topics include defrost methods, safety and operational control, refrigerant piping, refrigerant recovery and charging, and leak testing. This course covers the installation and startup of common commercial refrigeration systems. Topics include display/storage boxes or cases, walk-in systems, and supermarket racks. In addition to that this course introduces the students to commercial ice machines. Emphasis is placed on dispensing machines, ice making equipment, electrical and mechanical operation sequences, control adjustment procedures, preventative maintenance, repair, and installation procedures using a variety of refrigerants and blends. **PREREQUISITE:** HVAC 201 and HVAC 202 with a grade of "C" or better.

PREREQUISITES:

Completion of HVAC 201, as UG, with a grade of C or better.
AND Completion of HVAC 202, as UG, with a grade of C or better.

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity
- 04A - Laboratory - LEH 0.65
- 05 - Hybrid
- 71 - Dist. Ed Internet Simultaneous
- 72 - Dist. Ed Internet Delayed
- 73 - Dist. Ed Internet Delayed LAB
- 73A - Dist. Ed Internet LAB-LEH 0.65

STUDENT LEARNING OUTCOMES:

1. Evaluate and test walk-in and reach-in coolers.

Measure of assessment: demonstration, exam, homework

Year assessed, or planned year of assessment: 2019

Semester: Spring

2. Apply practical thermodynamics to maintain efficient operation of commercial refrigeration systems.

Measure of assessment: demonstration

Year assessed, or planned year of assessment: 2019

Semester: Spring

3. Apply the knowledge required for the EPA certification test.

Measure of assessment: exam, demonstration homework

Year assessed, or planned year of assessment: 2019

Semester: Spring

4. Evaluate commercial refrigeration systems including determining energy savings methods.

Measure of assessment: demonstration, exam, homework

Year assessed, or planned year of assessment: 2019

Semester: Spring

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 06/09/2020

Lecture Content:

9 Hours

Content: EPA (Environmental Protection Agency) Certification Preparation; Ozone Depletion; Types of Refrigerants and their Effect on the Ozone Layer; Recovery, Recycling and Reclaiming Refrigerants; High and Low Pressure Appliances; Clean Air Act Amendments; EPA Universal Technicians Test

Student Performance Objectives: Discuss EPA regulations as they relate to refrigerants. Describe ozone depletion. Discuss popular refrigerants and their applications. Define the terms recover, recycle, and reclaim. Describe methods of recovering refrigerants, including active and passive methods. Discuss the Clean Air Act Amendments. Describe the skills required to pass the EPA Universal Technicians test.

9 Hours

Content: Different Types of Evaporators, Natural Draft Systems, Forced Draft Systems, Fin Spacing, Defrost Methods, Electric Defrost, OFF Cycle Defrost, Hot Gas Defrost

Student Performance Objectives: Define high-, medium-, and low-temperature refrigeration. Identify different types of evaporators. Describe a parallel-flow, plate-and-fin evaporator. Describe multiple- and single-circuit evaporators. Describe off-cycle defrost.

12 Hours

Content: Evaporator Pressure Regulators, Crankcase Pressure Regulators, Fan Cycle Switches, Low Pressure Switches, High Pressure Switches, Defrost Time Clocks, Solenoid Valves, Electrical Concepts, Accumulators, Receivers, Walk in Boxes, Reach in Cases

Student Performance Objectives: Distinguish between mechanical and electrical controls. Explain how and why mechanical controls function. Describe an automatic pumpdown system. Describe electrical controls that apply to refrigeration. Describe random, planned, hot gas, cool gas, and external heat defrost.

12 Hours

Content: Making Flaked Ice, Cuber Operation, Water Reservoirs, Auger Blade Operation, Evaporator Barrels, Freeze Cycle/Harvest Cycle, Sequence of Operation for Cubers, Performance Data Sheets, Bin Controls, Ice Machine Safeties

Student Performance Objectives: Describe the basic refrigeration cycle for ice flake machines. State the purpose of the water fill system and of a bin control in an ice flake machine. Explain the purpose of a flush cycle in an ice flake machine. Describe the purpose of a harvest cycle in an ice machine. State the purpose of microprocessor controls in ice machines. Discuss the importance of water and ice quality in ice making.

9 Hours

Content: Parallel Rack Systems, Secondary Fluid Systems, Supermarket Refrigeration

Student Performance Objectives: Describe a parallel refrigeration system. Describe a secondary-fluid refrigeration system. Explain what is meant by preserving liquid subcooling. Discuss walk-in refrigeration applications.

2 Hours

Final

Lab Content:

9 Hours

Content: EPA (Environmental Protection Agency) Certification Preparation; Types of Refrigerants and their Effect on the Ozone Layer; Equipment used to Recovery, Recycling and Reclaiming Refrigerants; High and Low Pressure Appliances; EPA Universal Technicians Test

Student Performance Objectives: Demonstrate two methods for recovering refrigerant from a system. Demonstrate how to correctly use a modern refrigerant recycling and recovery machine. Practice the skills required to pass the EPA Universal Technicians test.

9 Hours

Content: Different Types of Evaporators, Natural Draft Systems, Forced Draft Systems, Fin Spacing, Defrost Methods, Electric Defrost, OFF Cycle Defrost, Hot Gas Defrost

Student Performance Objectives: Determine the boiling temperature in an evaporator. Describe how different types of evaporators function. Evaluate whether a particular evaporator is performing properly.

12 Hours

Content: Evaporator Pressure Regulators, Crankcase Pressure Regulators, Fan Cycle Switches, Low Pressure Switches, High Pressure Switches, Defrost Time Clocks, Solenoid Valves, Electrical Concepts, Accumulators, Receivers, Walk in Boxes, Reach in Cases

Student Performance Objectives: Identify a evaporator pressure-regulating valve and a crankcase pressure-regulating valve and state their functions. Identify a solenoid valve and state its function. Demonstrate how to adjust a CPR valve in a typical refrigeration system.

12 Hours

Content: Making Flaked Ice, Cuber Operation, Water Reservoirs, Auger Blade Operation, Evaporator Barrels, Freeze Cycle/Harvest Cycle, Sequence of Operation for Cubers, Performance Data Sheets, Bin Controls, Ice Machine Safeties

Student Performance Objectives: Discuss and demonstrate basic troubleshooting for ice flake machines. Read and interpret ice production and performance charts for ice machines. Explain the sequence of operation of an ice machine. Explain what is meant by input/output troubleshooting for microprocessors. Discuss the difference between cleaning and sanitizing an ice machine and demonstrate those processes. Perform service on a commercial ice cube machine.

9 Hours

Content: Parallel Rack Systems, Secondary Fluid Systems, Supermarket Refrigeration

Student Performance Objectives: Determine the application and the approximate temperature range of a refrigeration system by its features. Perform troubleshooting on various display equipment systems.

2 Hours

Final

METHODS OF INSTRUCTION:

Lecture, discussion, multi-media presentation, demonstration, guided practice.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 18

Assignment Description: Read corresponding information in Unit 9 of textbook as well as the EPA Handout. Complete Review Questions at end of Unit. Study for quizzes/examinations. Homework: Complete Workbook Exercises related to unit topics.

Required Outside Hours: 18

Assignment Description: Read corresponding information in Unit 21 of textbook. Complete Review Questions at end of Unit. Study for quizzes/examinations. Homework: Perform various troubleshooting exercises related to evaporator evaluation. Complete Workbook Exercises related to unit topics.

Required Outside Hours: 24

Assignment Description: Read corresponding information in Unit 25 of textbook. Complete Review Questions at end of Unit. Study for quizzes/examinations. Homework: Complete Workbook Exercises related to unit topics.

Required Outside Hours: 24

Assignment Description: Read corresponding information in Unit 27 of textbook. Complete Review Questions at end of Unit. Study for quizzes/examinations. Homework: Perform various troubleshooting exercises related to commercial ice machines. Complete Workbook Exercises related to unit topics.

Required Outside Hours: 18

Assignment Description: Read corresponding information in Unit 26 of textbook. Complete Review Questions at end of Unit. Study for quizzes/examinations. Homework: Complete Workbook Exercises related to unit topics.

METHODS OF EVALUATION:

Writing assignments

Percent of total grade: 20.00 %

Homework, Lab Reports

Problem-solving assignments

Percent of total grade: 20.00 %

Lab Projects

Skill demonstrations

Percent of total grade: 20.00 %

Lab Projects/Troubleshooting

Objective examinations

Percent of total grade: 40.00 %

REPRESENTATIVE TEXTBOOKS:

Required Representative Textbooks

John A. Tomczyk, Eugene Silberstein, William C. Whitman, William M. Johnson. Refrigeration and Air Conditioning Technology, 8th Edition. Boston, MA: Cengage Learning,2017.

ISBN: 978-1-305-57829-6

Reading Level of Text, Grade: 12th Verified by: MS Word

Tomczyk, Silberstein, Whitman, Johnson. Lab Manual for Refrigeration and Air Conditioning Technology, 8th Edition. Boston, MA: Cengage Learning,2017.

ISBN: 978-1305578708

Reading Level of Text, Grade: 12th Verified by: MS Word

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

CSU GE:

IGETC:

CSU TRANSFER:

Not Transferable

UC TRANSFER:

Not Transferable

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department:

CSU Crosswalk Course Number:

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: C

Maximum Hours: 3

Minimum Hours: 1.5

Course Control Number: CCC000591492

Sports/Physical Education Course: N

Taxonomy of Program: 094600