



5055 Santa Teresa Blvd  
Gilroy, CA 95023

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### Course Outline

**COURSE:** HVAC 201      **DIVISION:** 50      **ALSO LISTED AS:**

**TERM EFFECTIVE:** Spring 2023

**CURRICULUM APPROVAL DATE:** 06/13/2023

**SHORT TITLE:** BASIC ELECTRICAL

**LONG TITLE:** Basic Electrical Theory

<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
		Total Learning Hrs:	216	

#### **COURSE DESCRIPTION:**

Students will study concepts of electricity, controls, and electrical loads found on air conditioning and refrigeration circuits. The course includes both the theory and practices of electricity applicable to the air conditioning and refrigeration industries. The course establishes a thorough understanding of electron theory, voltage, current, resistance, Ohm's law, magnetism, mathematical concepts, and common units of electrical measurements.

**PREREQUISITES:**

**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:

By the end of this course, a student should:

1. Troubleshoot an electrical circuit.
2. Solve electrical control problems.
3. Test electrical components and perform preventative maintenance checks.
4. Calculate the voltage, amperage, and resistance using Ohm's law.

## COURSE OBJECTIVES:

By the end of this course, a student should:

1. Describe the physical characteristics and the function of several semiconductors.
2. Explain the differences between series and parallel circuits.
3. Describe the construction of a transformer and the way a current is induced in a secondary circuit
4. Explain the characteristics that make certain materials good conductors and others good insulators.
5. Identify some typical problems in an electrical circuit.
6. Describe procedures for making electrical measurements.
7. Differentiate between a pictorial and a line-type electrical wiring diagram.
8. Follow the sequence of electrical events in a heat-cool electrical circuit.
9. Describe the functions of mechanical and electromechanical controls.
10. Describe and demonstrate the function of a bimetal device.
11. Discuss and demonstrate the thermocouple.
12. Explain and demonstrate the thermistor.
13. Make general comparisons between different dimetal applications.
14. Describe the use of variable-speed motors, inverters, variable frequency drives (VFDs) and electronically commutated motors (ECMs).
15. Describe the different types of open single-phase motors used to drive fans, compressors, and pumps.
16. Describe the use of variable-speed motors, inverters, variable frequency drives (VFDs) and electronically commutated motors (ECMs).
17. Describe and demonstrate the mechanics of the refrigeration cycle.

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

Curriculum Approval Date: 06/13/2023

### LECTURE CONTENT:

9 Hours

Content: Principles of Electricity, Structure of an Atom, Ohm's Law, Series/Parallel Circuits, Electrical Measurements, Use of Multi-meter to Measure, Ohms, Voltage, Current

9 Hours

Content: Electric Heaters, Solenoids, Wiring Diagrams, Principles of Designing Ladder Diagrams, Differences Between Schematic Pictorial/Ladder Diagrams, Reading and Interpreting Diagrams

12 Hours

Content: Heating Systems, Principles of Residential Gas Fired Heating Systems, Principles of Electric Heat, Controls and Safeties, Differences Between Control and Safety Switches, Interpretation of Control and Safety Symbols, Adjustment of Controls and Safeties, Electric Circuits, Troubleshooting Electrical Circuits, Fundamentals of Electric Circuit Design

9 Hours

Content: Electric Loads, Fan Motors, Compressor Motors

13 Hours

Content: Refrigeration Plant, Principles of the Mechanics of the Refrigeration Cycle, Principles of Heat Transfer, Three Phase Loads and Supplies, Three Phase Electricity Generation, Wye/Delta Transformers, Wye/Delta Motors, Customer Relations

2 Hours

Final

**LAB CONTENT:**

9 Hours

Content: Safety, Use of Equipment, Principles of Electricity, Structure of an Atom, Ohm's Law, Series/Parallel Circuits, Electrical Measurements, Use of Multi-meter to Measure, Ohms, Voltage, Current

9 Hours

Content: Electric Heaters, Solenoids, Wiring Diagrams, Principles of Designing Ladder Diagrams, Differences Between Schematic Pictorial/Ladder Diagrams, Reading and Interpreting Diagrams

12 Hours

Content: Heating Systems, Principles of Residential Gas Fired Heating Systems, Principles of Electric Heat, Controls and Safeties, Differences Between Control and Safety Switches, Interpretation of Control and Safety Symbols, Adjustment of Controls and Safeties, Electric Circuits, Troubleshooting Electrical Circuits, Fundamentals of Electric Circuit Design

9 Hours

Content: Electric Loads, Fan Motors, Compressor Motors

13 Hours

Content: Refrigeration Plant, Principles of the Mechanics of the Refrigeration Cycle, Principles of Heat Transfer, Three Phase Loads and Supplies, Three Phase Electricity Generation, Wye/Delta Transformers, Wye/Delta Motors, Customer Relations, Troubleshoot the field repair of leaking heat exchangers. Customer service scenarios.

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 12 of textbook. Complete Review Questions at end of Unit. Study for quizzes/examinations.

Required Outside Hours 18

Assignment Description

Read corresponding information in Units 14 and 15 of textbook. Complete Review Questions at end of Units. Study for quizzes/examinations. Homework: Complete the Service Technician Calls scenarios.

Required Outside Hours 24

Assignment Description

Read corresponding information in Units 13, 14 and 15 of textbook. Complete Review Questions at end of Units. Study for quizzes/examinations. Homework: Complete the Service Technician Calls scenarios. Troubleshoot an electrical circuit.

Required Outside Hours 18

Assignment Description

Read corresponding information in Unit 17 of textbook. Complete Review Questions at end of Unit. Study for quizzes/examinations.

Required Outside Hours 30

Assignment Description

Read corresponding information in Unit 12 of textbook and related Handouts. Complete Review Questions provided on Handouts. Study for quizzes/examinations. Homework: Complete several troubleshooting and customer service scenarios.

**METHODS OF EVALUATION:**

Writing assignments

Evaluation Percent 20

Evaluation Description

10% - 30% Homework, Lab Reports

Problem-solving assignments

Evaluation Percent 20

Evaluation Description

10% - 30% Lab Projects

Skill demonstrations

Evaluation Percent 20

Evaluation Description

20% - 40% Lab Projects/Troubleshooting

Objective examinations

Evaluation Percent 40

Evaluation Description

30% - 50% Quizzes/Examinations

**REPRESENTATIVE TEXTBOOKS:**

John A. Tomczyk, Eugene Silberstein, William C. Whitman, William M. Johnson. Refrigeration and Air Conditioning Technology, 9th Edition. Boston, MA: Cengage Learning, 2021 or a comparable textbook/material.

ISBN: 9780357702635

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

Tomczyk, Silberstein, Whitman, Johnson. Lab Manual for Refrigeration and Air Conditioning Technology, 9th Edition. Boston, MA: Cengage Learning, 2021.

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:

Minimum Hours:

Course Control Number: CCC000587350

Sports/Physical Education Course: N

Taxonomy of Program: 094600