

SAN DIEGO COMMUNITY COLLEGE DISTRICT
CONTINUING EDUCATION
COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER

MECT 431

COURSE TITLE

AIR CONDITIONING/HEATING I

TYPE COURSE

NON-FEE

VOCATIONAL

CATALOG COURSE DESCRIPTION

This is the first course of a two course program that provides entry-level training in heating and air conditioning occupations. Instruction in this course will cover the following areas: basic air conditioning and heating theory; heating fundamentals and appliances; requirements and controls; circuits, thermostats; schematics and communications. (FT)

LECTURE/ LABORATORY HOURS

72

ADVISORIES

NONE

RECOMMENDED SKILL LEVEL

Understanding and reading comprehension in English, ability to calculate basic math at the 9th grade level or higher.

INSTITUTIONAL STUDENT LEARNING OUTCOMES

1. Social Responsibility
SDCE students demonstrate interpersonal skills by learning and working cooperatively in a diverse environment.
2. Effective Communication
SDCE students demonstrate effective communication skills.

INSTITUTIONAL STUDENT LEARNING OUTCOMES (CONTINUED)

3. Critical Thinking
SDCE students critically process information, make decisions, and solve problems independently or cooperatively.
4. Personal and Professional Development
SDCE students pursue short term and life-long learning goals, mastering necessary skills and using resource management and self-advocacy skills to cope with changing situations in their lives.

COURSE GOALS

To provide instruction and practical application of occupational knowledge and skills in the Heating and Air Conditioning (HVAC) industry and to provide students with a working knowledge of the tools and equipment associated with the modern HVAC industry. Integrated throughout the course are career preparation standards, which include communication, interpersonal skills, problem solving, safety, technology, and other employment skills. Students who successfully complete the program will be qualified for entry-level positions in the HVAC industry. Jobs in the field include air conditioning installer and repair helper, refrigeration installer and furnace installer.

COURSE OBJECTIVES

Students will demonstrate through practical applications, written and oral communication skills, their ability to:

1. Explain the air conditioning process and heat transfer.
2. Explain basic electricity, requirements for a circuit, and describes basic components in a HVAC control circuit.
3. Demonstrate the ability to use multimeters to check voltages and troubleshoot electrical components.
4. Demonstrate the ability to read electrical diagrams, describes series and parallel circuits.
5. Complete assigned work within the allotted time.
6. Demonstrate effective communications with others.
7. Choose appropriate actions in response to constructive criticism.
8. Demonstrate performance, attendance, comprehension and skill abilities required within the trade.
9. Demonstrate positive attitude, cooperation, honesty and integrity.
10. Demonstrate punctuality and dependability.
11. Demonstrate ability to follow oral and written directions.
12. Demonstrate ability to work well with minimum supervision.
13. Demonstrate initiative by working beyond minimum requirements.
14. Meet job standards of neatness and grooming.

SECTION II**COURSE CONTENT AND SCOPE**

The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

1.	Communications	3 Hours
	1.1. Employer Relations	
	1.2. Written Communications	
	1.3. Customer Relations	
2.	Definition of Air Conditioning	6 Hours
	2.1. The Air Conditioning Process	
	2.2. Heat Transfer	
	2.3. Elements of Air Conditioning Systems	
3.	Basic Electricity	3 Hours
	3.1. Electron Theory	
	3.2. Alternating Current	
	3.3. Electrical Safety	
	3.3.1. Lock-out/ Tag-out	
	3.3.2. Safety equipment	
	3.3.3. Safe work habits	
4.	Requirements for a Circuit	9 Hours
	4.1. Fuses and Circuit Breakers	
	4.2. Transformers	
	4.3. Switches	
5.	Electrical Measuring Devices	3 Hours
	5.1. Proper and Safe uses of the Multimeter	
	5.2. Proper and Safe uses of the Amprobe	
6.	Schematic Reading	9 Hours
	6.1. Series Circuit	
	6.2. Parallel Circuit	
	6.3. Combination Circuits	
	6.4. Control Circuits	
	6.5. Circuit Diagrams	
7.	Thermostats	6 Hours
	7.1. Thermostat Components	
	7.2. Thermostat Sub-bases	
	7.3. Installing Thermostats	
8.	Heating Fundamentals	9 Hours
	8.1. Heat Measurement	
	8.2. Combustion	
	8.3. Heat Transfer	
	8.4. Flues and Chimneys	
9.	Heating Components	9 Hours
	9.1. Furnace Cabinets	
	9.2. Filters	
	9.3. Blowers	
	9.4. Blower Motors	
	9.5. Fan Control	

COURSE CONTENT AND SCOPE (CONTINUED)

9.6.	Limit Controls	
10.	Gas Heating	9 Hours
10.1.	Proper Safety Procedures with Gas	
10.2.	Heat Exchangers	
10.3.	Burners	
10.4.	Thermocouples	
10.5.	Gas Valves	
11.	Electric Heating	6 Hours
11.1.	Heating Elements	
11.2.	Limit Controls	

APPROPRIATE READINGS

Reading assignments may include but, are not limited to, the following: textbooks, trade publications, equipment schematics, wiring symbols and diagrams.

WRITING ASSIGNMENTS

Writing assignments are required and may include, but are not limited to, the following: personal resume with cover letter, preparation of work orders, invoices, work proposals and time sheets.

OUTSIDE ASSIGNMENTS

Outside assignments may include, but are not limited to, the following:
Students are expected to spend a minimum of two hours per day outside of class in practice and preparation for each day in class. Appropriate assignments may include, but not limited to:

1. Appropriate readings
2. Preparing research projects
3. Preparing appropriate writing assignments
4. Studying as needed to perform successfully in class

APPROPRIATE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING

Critical thinking assignments are required and may include, but are not limited to, the following: mathematical problems applied to the industry, interpretation of wiring schematics, sequencing of job operations and applications of real world troubleshooting using class theory.

EVALUATION

A student's grade will be based on multiple measures of performance related to the course objectives. Multiple measures may include, but are not limited to, the following: mid-term and final exams, quizzes, class participation and attendance.

METHOD OF INSTRUCTION

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

Lecture, discussion, computer assisted instruction, laboratory, discussion seminar, lecture/lab combination, learning modules, audio-visual, collaborative learning, job shadowing, guest speakers from industry, technology demonstrations, field trips or field assignments.

TEXTS AND SUPPLIES

Textbooks may include, but are not limited to:

Electricity for Refrigeration, Heating and Air Conditioning, Russell E. Smith, 2nd edition, Breton Publishers, a division of Wadsworth, Inc, North Scituate, Massachusetts, current edition.

Troubleshooting and Servicing HVAC&R Electrical Systems, ESCO Institute, current edition.

AnswerMan Principles of Air Conditioning, ESCO Institute, current edition.

AnswerMan Electricity for HVAC&R – A Guide to Troubleshooting, ESCO Institute, current edition.

Doolin's Troubleshooters Bible, Doolco Inc., current edition.

MANUALS:

Air Conditioning, Mechanical Equipment Service Manual. Published by the National Steamfitters and Pipefitters Apprenticeship Committee, current edition.

Standard Service Techniques, Chapter 2, Electrical, Carrier Air Conditioning Company, Syracuse, NY

PERIODICALS:

WEBSITES: www.york.com/; www.yorkupg.com/homeowners/index.asp; www.ashrae.org; <http://hpac.com/>; www.energycodes.gov/comcheck/89_compliance_manual.stm; www.ahrexpo.com/; www.carrier.com; www.bryant.com; www.lennox.com;

SOFTWARE:

SUPPLIES:

PREPARED BY: Nancy Helt DATE: 1/28/10

REVISED BY: Instructional Services, SLOs added DATE: March 9, 2017

Instructors must meet all requirements stated in Policy 3100 (Student Rights, Responsibilities and Administrative Due Process), and the Attendance Policy set forth in the Continuing Education Catalog.

REFERENCES:

San Diego Community College District Policy 3100
California Community Colleges, Title 5, Section 55002
Continuing Education Catalog