

SAN DIEGO COMMUNITY COLLEGE DISTRICT  
CONTINUING EDUCATION  
COURSE OUTLINE

**SECTION I**

**SUBJECT AREA AND COURSE NUMBER**

MECT 400A

**COURSE TITLE**

REFRIGERATION/AIR CONDITIONING

**TYPE OF COURSE**

NON-FEE

VOCATIONAL

**CATALOG COURSE DESCRIPTION**

This is an open entry/exit course in the entry level skills required for employment in the Refrigeration and Air Conditioning Repair industry. Instruction in the theory of operation, diagnosis, and the repair of major household refrigeration and air conditioning units is included. (FT)

**LECTURE HOURS**

83

**LABORATORY HOURS**

202

**ADVISORIES**

NONE

**RECOMMENDED SKILL LEVEL**

Eighth grade reading level, knowledge of general mathematics, ability to communicate effectively in the English language.

**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 in the operational theory and repair of refrigeration and air conditioning systems. Students will develop the necessary problem solving techniques used to diagnose malfunctioning refrigeration and air conditioning systems. Instruction is designed to enhance the students' reading, writing, math, communication skills and knowledge of science facts that are used in the industry. Instruction in customer communication skills and ethical business practices is also included.

COURSE OBJECTIVES

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

1. Demonstrate general safety practices and procedures related to the Refrigeration/Air Conditioning Repair industry.
2. Demonstrate use of the latest equipment to diagnosis and repair all major refrigeration and air conditioning units.
3. Read and interpret electrical schematics.
4. Repair various brands of refrigeration and air conditioning units.
5. Charge, recover, and dispose of refrigerant according to EPA standards.
6. Complete all repairs in an efficient and competent manner.
7. Demonstrate competence in making service calls and proper customer relations.
8. Explain how to start and operate a small business.
9. Demonstrate use of a personal computer and basic software in order to access, retrieve, and save files.

**SECTION II**

COURSE CONTENT AND SCOPE

All Modules of the course contain the following:

1. System Descriptions
2. Theory of Operation
3. Diagnostic and Repair Procedures
4. Component Functions
5. Related Terminology

COURSE CONTENT AND SCOPE (CONTINUED)

Math review for all modules may cover the following areas: addition, subtraction, multiplication, and division of whole numbers, fractions and decimals; the metric system; linear measurements; graphs; ratios; degrees and angles; percentages; reading dial-gages; volume measures; liquid measurement; weight and mass.

MODULE I 10 Hrs.  
SAFETY

1. Program Orientation
2. Shop and Equipment Introduction
3. Safety Procedures
  - 3.1. Fire safety
  - 3.2. Evacuation plan
  - 3.3. EPA rules and regulations
  - 3.4. MSDS use and location
  - 3.5. Hazardous material handling & disposal
  - 3.6. Proper hand tool use

MODULE II 15 Hrs.  
BASIC ELECTRICAL THEORY

1. Electron Theory
2. Electrical Circuits
3. Diagnostic Methods
4. Diagnostic Equipment
5. Schematics

MODULE III 50 Hrs.  
THEORY OF REFRIGERATION

1. Refrigeration Theory
  - 1.1. Transfer of heat
    - 1.1.1. Convection
    - 1.1.2. Conduction
    - 1.1.3. Radiation
    - 1.1.4. Latent heat
    - 1.1.5. Evaporation
  - 1.2. Basic A/C systems
    - 1.2.1. Operation
    - 1.2.2. Components
    - 1.2.3. Pressures
    - 1.2.4. Refrigerants
  - 1.3. Service
    - 1.3.1. Safety precautions
    - 1.3.2. Refrigerant recovery
    - 1.3.3. Discharging
    - 1.3.4. Evacuation

COURSE CONTENT AND SCOPE (CONTINUED)

1.3.5. Charging

MODULE IV 100 Hrs.

REFRIGERATORS AND FREEZERS

1. System Components
  - 1.1. Refrigeration components
  - 1.2. Insulation
  - 1.3. Cabinets
  - 1.4. Mechanisms, manual defrost
  - 1.5. Automatic defrost
  - 1.6. Electrical circuits
  - 1.7. Ice makers
2. Service and Repair
  - 2.1. Review of EPA regulations
  - 2.2. Diagnosis
  - 2.3. Electrical schematics
  - 2.4. Compressors
  - 2.5. Evaporators
  - 2.6. Condensers

MODULE V 100 Hrs.

AIR CONDITIONING

1. Room Air Conditioners
  - 1.1. Types of room A/C units
  - 1.2. System components
  - 1.3. Service and repair
    - 1.3.1. Electrical circuits
    - 1.3.2. Diagnosis using schematics
  - 1.4. EPA regulations

MODULE VI 10 Hrs.

BUSINESS PROCEDURES AND CUSTOMER RELATIONS

1. Business Conduct and Ethics
  - 1.1. Consumer affairs
2. Repair Orders and Job Scheduling
3. Phone Skills
4. Oral and Written Communications
5. Keyboarding Skills and Computer Literacy for Use in this Field
6. Starting Your Own Business
  - 6.1. Small business license
  - 6.2. Capital investment
  - 6.3. Insurance
  - 6.4. Marketing

### APPROPRIATE READINGS

1. Manufacturers technical manuals and service manuals.
2. Various parts manuals.
3. Trade magazines.

### WRITING ASSIGNMENTS

Typical writing assignments will include, but are not limited to, all of the following:

1. Resume writing.
2. Providing written answers to assigned questions.
3. Complete repair orders.

### OUTSIDE ASSIGNMENTS

Students are expected to spend a minimum of 1 hour per day outside of class in practice and preparation for each day of class. Appropriate assignments may include, but are not limited to:

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

### APPROPRIATE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING

Students will perform analysis and evaluation of reading and/or classroom materials and utilize this analysis in classroom discussions, writing assignments, and in performing laboratory activities. Students must select and use appropriate methods and materials needed to complete laboratory assignments.

### EVALUATION

A student's grade will be based on multiple measures of performance. The assessment will measure development of independent critical thinking skills and will include evaluation of the students ability to:

1. Perform the manipulative skills of the craft, as required, to industry standards.
2. Maintain attendance per current policy.
3. Participate in classroom activities.
4. Perform on written, oral, or practical exams.
5. Demonstrate initiative and dependability.

The student will receive an evaluation at the end of each module. A grade point average of 2.0 or a letter grade of C or better must be achieved for satisfactory completion.

EVALUATION (CONTINUED)

Upon successful completion of each individual course a Certificate of Course Completion will be issued. Upon successful completion of all courses included in the program a Certificate of Program Completion will be issued.

METHOD OF INSTRUCTION

Classroom lectures, demonstrations, laboratory, audio-visual presentations, and computer assisted instruction, group and individual instruction, field trips, job shadowing and internships may be utilized.

TEXT AND SUPPLIES

Text:

*Modern Refrigeration and Air Conditioning*, Althouse, Turnquist, current edition  
*Corporate Training Manuals*, current editions

PREPARED BY: Ray Rameriz DATE: July, 1982  
REVISED BY: Charles O. Reasons DATE: May, 1984  
REVISED BY: Jim Womack DATE: August, 1984  
REVISED BY: Charles O. Reasons DATE: January 21, 1995  
REVISED BY: Sammuel Cummings DATE: February, 2007  
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