

**I. CATALOG DESCRIPTION:**

- A. Department Information:  
Division: Technology  
Department: Refrigeration and Air Conditioning  
Course ID: REFRIG 104x3  
Course Title: Refrigeration Electricity I  
Units: 4  
Lecture: 3 Hours  
Lab: 3 Hours  
Prerequisite: None

B. Course and Schedule Description: Fundamentals of direct and alternating current circuits, test equipment, electric motors of all types, wiring and control devices used in modern refrigeration equipment. Includes practical lab work with electrical refrigeration trainers and projects.

**II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: Three (3)**

**III. EXPECTED OUTCOMES FOR STUDENTS:**

Upon completion of the first repetition of the course, students will be able to:

- A. Distinguish between common electrical components used in the refrigeration field.
- B. Demonstrate an understanding of how the electrical components function and knowledge of each components purpose.
- C. Measure ohms, amps, and volts using a multi-meter.
- D. Select troubleshooting techniques on an electrically malfunctioning refrigeration system using a ladder diagram.
- E. Test compressor terminals for shorts and grounds.
- F. Practice safety procedures.

Upon completion of the second repetition of the course, students will be able to:

- A. Illustrate skill and knowledge by categorizing electrical components into solid-state and electro-mechanical types.
- B. Demonstrate different methods of troubleshooting electrical systems, showing the use of linear logic.
- C. Develop skill and confidence helping first-time students.

Upon completion of the third repetition of the course, students will be able to:

- A. Explain the operation of electro-mechanical devices and the use of different semi-conductor sensors.
- B. Compare several different electrical sensors and demonstrate how to troubleshoot them.
- C. Use improved knowledge and skills while helping first-time students and assisting the instructor with teaching and evaluating.

**IV. CONTENT:**

- A. Safety Rules
- B. Measuring Instruments
  - 1. Meter operation
  - 2. Measuring resistance
  - 3. Measuring current
  - 4. Measuring voltage
- C. Electrical Components
  - 1. Identifying electrical components
  - 2. Relays, contactors, and motor starters
  - 3. Transformers

San Bernardino Valley College  
Curriculum Approved: March 4, 2002

4. Defrost timer
  5. Thermostat
  6. High and low limit switches
- D. Electrical Quantities
1. Ohm's law calculations,  $E = IR$ ,  $P = IE$
- E. Electrical Circuits
1. Series circuit measurements and calculations
  2. Parallel circuit measurements and calculations
  3. Series-parallel circuit measurement and calculations

**V. METHODS OF INSTRUCTION:**

Methods of instruction will vary from instructor to instructor but may include:

- A. Lectures and discussions about electrical components used in HVAC systems to include their function, purpose and methods of analysis and troubleshooting.
- B. Lectures and discussions are complemented with practical laboratory projects emphasizing electrical components and systems, methods of analysis and troubleshooting.
- C. Dynamics are accented with the use of show and tell demonstrations and videos.
- D. Homework is assigned to promote expertise, vocabulary, and writing skills.

**VI. TYPICAL ASSIGNMENTS:**

Typical assignments will vary from instructor to instructor but may include:

- A. Provide a written analysis of Ohm's Law describing the interaction of amps, volts, and ohms.
- B. What are the three major parts of an atom and what is their charge?
- C. Design, construct, and analyze five electrical circuits.

**VII. EVALUATION:**

A. Methods of evaluation will vary from instructor to instructor but shall include:

1. Written tests
  2. Final exam
- Typical Questions:
- a. What force keeps the electron from falling into the nucleus of the atom?
  - b. Materials that make the best insulators contain how many valence electrons?
3. Practical evaluations, including a student lab notebook consisting of no less than ten, lab project reports.

B. Frequency of evaluation will vary from instructor to instructor but may include:

1. Three written tests
2. One final exam

C. Levels of evaluation upon repetition:

1. First enrollment:  
Students are to have a good understanding of different electrical components.
2. Second enrollment:  
Students are expected to have a thorough understanding of electrical components and show enough growth in working skills and confidence to assist the instructor with first-time students.
3. Third enrollment:  
Students are expected to show increasing skills while working as group leaders and assisting the instructor in lecture demonstrations and organizing lab projects.

**VIII. TYPICAL TEXT:**

Smith, Electricity for Refrigeration, Heating, and Air Conditioning, 5<sup>th</sup> Edition, Delmar, Albany, New York, 1997  
Herman, S., Electricity and Controls for HVAC/R, Delmar, New York, 2001  
Mahoney, E., Electricity for Air Conditioning and Refrigeration Technicians, Prentice Hall, New Jersey, 2000

San Bernardino Valley College  
Curriculum Approved: March 4, 2002

**IX. OTHER SUPPLIES REQUIRED OF STUDENTS: None**