

# APPT 153: RF 201 MECHANICAL SYSTEM FUNDAMENTALS

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2024
Units:	7
Hours:	72 lecture, 36 laboratory per quarter (108 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Air Conditioning & Refrigeration Technology Apprenticeship Program.
Advisory:	Not open to students with credit in APPR 133C.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

## Student Learning Outcomes

- A student will be able to describe the function of the evaporator.
- A student will be able to demonstrate knowledge of heat flow and transfer.
- A student will be able to list the various refrigerant control devices.

## Description

Basic and advanced refrigeration concepts. Extensive study of the design, assembly, and operation of compression systems. Includes liquid and vapor control, metering devices, system components, and piping design.

## Course Objectives

The student will be able to:

1. Describe heat flow and transfer
2. Describe the vapor compression cycle
3. Describe various refrigeration systems
4. List the various system components and describe their purpose and operation
5. List the various refrigerant control devices and describe their operation
6. Log an operating system and evaluate operating parameters
7. Demonstrate the removal and recovery of the refrigerant charge, system evacuation, and charging

## Course Content

1. Refrigeration theory
  - a. Basic physical principles and thermodynamics
  - b. Sensible and latent heat
  - c. Elementary refrigeration methods
  - d. Application of the vapor compression refrigeration cycle
  - e. Pressure-enthalpy diagrams
  - f. Refrigerants
2. System components
  - a. Evaporators
  - b. Compressors
  - c. Condensers
  - d. Metering devices
3. Water supply for water cooled condensers
  - a. Open and closed loop
  - b. Once through systems
  - c. Evaporative towers
4. Refrigerant control devices
  - a. Refrigerant distribution
  - b. Filter driers
  - c. Solenoid valves
  - d. Hot-gas bypass capacity control
  - e. Pressure regulators
5. System operation, problems and troubleshooting, maintenance procedures
  - a. Capacity control
  - b. Compressor loading/unloading
  - c. Lubrication systems
  - d. Low ambient control
  - e. Pump-down control
  - f. Recording system operating parameters
  - g. Troubleshooting condensers, evaporators, and metering devices
  - h. System maintenance
    - i. System refrigerant removal, dehydration, and charging

## Lab Content

Students will work individually and in teams on refrigeration system problem-solving, troubleshooting, and maintenance procedures.

## Special Facilities and/or Equipment

1. Personal protective equipment
2. Laboratory with plumbing tools
3. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address

## Method(s) of Evaluation

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

Results of written quizzes and final examination  
Satisfactory completion of hands-on projects  
Maintenance of a student's workbook with questions drawn from text

## Method(s) of Instruction

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

Lecture  
Lab assignment  
Group discussion  
Demonstration

## Representative Text(s) and Other Materials

International Pipe Trades Joint Training Committee. Refrigeration Mechanical Equipment Service Manual. 2014.

International Pipe Trades Joint Training Committee. Refrigerant Controls. 2006.

Although these textbooks are older than 5 years, they conform to national training standards and are considered seminal works in the discipline. We will adopt the next edition of each text, as it is published.

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Readings from textbook Refrigeration Mechanical Equipments Service Manual
  - a. Chapter 17: Refrigerant Piping Accessories
2. Writing assignments given in the laboratory
  - a. Make a schematic drawing of a basic refrigeration system showing commonly used accessories
  - b. Describe the purpose of each component in the system

## Discipline(s)

Air Conditioning, Refrigeration, Heating