

APSM 153B: ELECTRIC MOTORS & MOTOR CONTROLS IN HVAC SYSTEMS

Foothill College Course Outline of Record

Heading	Value
Units:	2.5
Hours:	30 lecture, 10 laboratory per quarter (40 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
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 successful student will be able to explain the operation of a three phase electric motor.
- A successful student will be able to describe an electric motor capacitor checkout procedure.

Description

Students learn the basic aspects of the types of motors and their controls used in HVAC systems.

Course Objectives

The student will be able to:

- Describe application and operations of various types of electric motors
- Identify different types of motor controls
- Identify different motor protection devices
- Describe the types of motor drives
- Interpret motor nameplate data
- Troubleshoot motors and motor control devices

Course Content

- Describe application and operations of various types of electric motors
 - Describe the different types of open single phase motors used to drive fans, compressors, and pumps (Lec)
 - Describe the applications of various types of motors (Lec)
 - State which motors have high starting torque (Lec and Lab)
 - List the components that cause a motor to have high starting torque (Lec and Lab)
 - Describe a multi-speed permanent split-capacitor motor and indicate how the different speeds are obtained (Lec and Lab)
 - Explain the operation of a three phase motor (Lec and Lab)
 - Describe a motor used for a hermetic compressor (Lec and Lab)
 - Explain the motor terminal connections used in various compressors (Lec and Lab)

- Describe the different types of compressors that use hermetic motors (Lec and Lab)
- Describe the use of variable speed motors (Lec and Lab)
- Identify different types of motor controls
 - Identify the proper power supply for a motor (Lec and Lab)
 - Describe the application of three phase versus single phase motors (Lec and Lab)
 - Explain how the noise level in a motors can be isolated from the conditioned space (Lec and Lab)
 - Describe the different types of motor mounts (Lec and Lab)
 - Identify the various types of motor drive mechanisms (Lec and Lab)
- Identify different motor protection devices
 - Describe the difference between a relay, a contactor, and a starter (Lec and Lab)
 - State how the locked rotor of a motor affects the choice of a motor (Lec and Lab)
 - List the basic components of a contactor and a starter (Lec and Lab)
 - Compare two types of external motor overloads protection (Lec and Lab)
 - Describe conditions that must be considered when resetting safety devices to restart electric motors (Lec and Lab)
- Describe the types of motor drives
 - Describe different types of electric motor problems (Lec and Lab)
 - List common electrical problems in electric motors (Lec and Lab)
 - Identify various mechanical problems in electric motor (Lec and Lab)
 - Describe a capacitor checkout procedure (Lec and Lab)
 - Explain the difference between troubleshooting a hermetic motor problem and troubleshooting an open motor problem (Lec and Lab)
- Interpret motor nameplate data (Lec and Lab)
- Troubleshoot motors and motor control devices (Lec and Lab)

Lab Content

- Observe motor component demonstrations in the lab.
- Demonstrate tests and analysis for common motor problems.

Special Facilities and/or Equipment

- Laboratory with sheet metal service tools
- Personal protective equipment

Method(s) of Evaluation

- Results of written quizzes and tests
- Responses in class discussions
- Comprehensive written final examination
- Comprehensive final project
- Demonstration of assigned skills to acceptable level per instructor

Method(s) of Instruction

- Lecture
- Discussion
- Demonstration
- Lab assignments followed by discussion

Representative Text(s) and Other Materials

Whitman, B., B. Johnson, J. Tomczyk, and E. Silberstein. Refrigeration and Air Conditioning Technology. 8th ed. Boston, MA: Cengage Learning, 2016.

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

A. Sample reading assignment: From the textbook, Units 17, 18, 19 and 20, "Types of Electric motors, Application of Motors, Motor Controls and Troubleshooting Electric Motors."

B. Sample writing assignment: Answer review questions related to assigned reading.

Discipline(s)

Sheet Metal, Air Conditioning, Refrigeration, Heating