

APSM 173A: ELECTRICAL FUNDAMENTALS, ELECTRIC MOTORS & ROTATIONAL MEASUREMENTS

Foothill College Course Outline of Record

| Heading | Value |
|-------------------------|--|
| Effective Term: | Summer 2022 |
| 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 properly measure electrical circuit volts, amps and ohms.
- A successful student will be able to identify instruments used to determine rotational speed.

Description

Students will gain an overview of common electrical terminology, electrical formulas, types of motors used in the HVAC industry and measuring rotational speed.

Course Objectives

The student will be able to:

1. Define common electrical measurement terms
2. Calculate electrical values for power and energy
3. Identify common electrical symbols on drawings in the HVAC industry
4. Diagram simple electrical circuits
5. Properly measure volts, amps and ohms
6. Describe common motors used in the HVAC industry
7. Identify common information on motor nameplates
8. Describe common accessories used with electric motors
9. Identify instruments used to determine rotational speed
10. Properly determine RPM using various instruments

Course Content

1. Define common electrical measurement terms
 - a. Define voltage, amperage, resistance, ohms, watts and power (Lec and Lab)

2. Calculate electrical values for power and energy
 - a. Calculate power and energy (Lec and Lab)
 - b. Define Ohm's law (Lec and Lab)
3. Identify common electrical symbols on drawings in the HVAC industry
 - a. Describe a common electrical ladder and schematic diagrams (Lec and Lab)
 - b. Identify and illustrate common electrical symbols used in the HVAC industry (Lec and Lab)
4. Diagram simple electrical circuits
 - a. Diagram simple electrical circuits for a furnace (Lec and Lab)
 - b. Identify wye and delta electrical connections, single and three phase electrical circuits (Lec and Lab)
5. Properly measure volts, amps and ohms (Lec and Lab)
 - a. Properly measure volts, amps and ohms using various meters (Lec and Lab)
 - b. Define true RMS and its importance (Lec and Lab)
 - c. Describe safety concerns and protocols when taking electrical measurements (Lec and Lab)
6. Describe common motors used in the HVAC industry
 - a. Describe the common types of motors used in modern HVAC systems (Lec and Lab)
7. Identify common information on motor nameplates
 - a. Describe and define the information found on a motor nameplate (Lec and Lab)
8. Describe common accessories used with electric motors
 - a. Describe to purpose and use of VFD, circuit breaker, disconnect switch, starter, and various thermal overload devices used with motors (Lec and Lab)
 - b. Calculate brake horsepower for single and three phase motor circuits (Lec and Lab)
9. Identify instruments used to determine rotational speed
 - a. Describe the use of the four most commonly used styles of tachometers (Lec and Lab)
 - b. Define and identify contact and non-contact style tachometers (Lec and Lab)
 - c. Describe safety concerns when using tachometers (Lec and Lab)
10. Properly determine RPM using various instruments
 - a. Properly obtain RPM readings using various styles of tachometers (Lec and Lab)

Lab Content

1. Properly measure volts, amps and ohms in HVAC applications
2. Properly determine RPM using standard industry instruments

Special Facilities and/or Equipment

1. Laboratory with sheet metal test and balance tools and sample system components
2. Personal protective equipment
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 tests
- Responses in class discussions

Comprehensive written final examination
Demonstration of assigned skills to acceptable level per instructor

Method(s) of Instruction

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

Lecture
Discussion
Demonstration
Lab assignments followed by discussion

Representative Text(s) and Other Materials

International Training Institute for the Sheet Metal and Air Conditioning Industry. Testing, Adjusting & Balancing of Environment Systems. 2003.

This is the standard sheet metal textbook/workbook used for this course. Although it may not be within five years of the required published date, it is the most current book used when teaching this course.

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

1. Sample reading assignment: From the textbook, unit on electrical fundamentals and motors
2. Sample writing assignment: Define common electrical measurement terms

Discipline(s)

Sheet Metal