

# APPRENTICESHIP: SHEET METAL (APSM)

## APSM 101 • SMQ-1 TRADE INTRODUCTION

<b>Units:</b>	3
<b>Hours:</b>	36 lecture, 4 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Introduction to Sheet Metal as a skilled construction trade including: general overview, trade history and related issues, material handling and safety, sheet metal materials, hardware, and HVAC careers. Includes First Aid and CPR training and certifications.

## APSM 102 • SMQ-2 CERTIFIED SAFETY & BEGINNING TRADE MATH

<b>Units:</b>	3
<b>Hours:</b>	38 lecture, 2 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Course introduces OSHA and related safety issues including job site safety, and aerial lift safety training and certification. Students will learn and apply the math skills necessary to meet the current industry standards in the construction trades. Course consists of basic arithmetic, geometry, algebra and trigonometry principles as applied in the construction trades.

## APSM 103 • SMQ-3 SHEET METAL TOOLS & SHOP

<b>Units:</b>	1.5
<b>Hours:</b>	16 lecture, 24 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Use of sheet metal tools, including hand tools and snips, shear, roll, and hand brake. Use of arithmetic and algebraic principles relating to sheet metal layout, fabrication of duct, pan, 45 degree tap-in, and plenum. Demonstration of other shop equipment used in the sheet metal industry.

## APSM 104 • SMQ-4 SOLDERING & COMMON SEAMS

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Course covers basic soldering and seam fabrication techniques. Includes soldering lap and vertical seams, soldering with various materials and flux, alternate seam fabrication, and fabrication of non-soldered seams.

## **APSM 105 • SMQ-5 DRAFTING INTRODUCTION & VIEWS**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Introduction to communication of construction details through drafting of plans and patterns. Topics include drafting equipment and materials, use of an architect's scale, drawing format, geometric construction, basic views, square and radius elbows, and drawing duct runs.

## **APSM 106 • SMQ-6 BEGINNING DUCT FITTINGS**

<b>Units:</b>	1.5
<b>Hours:</b>	12 lecture, 28 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Focus is on the variety of duct connections, sealing, elbows and transitions common to the sheet metal industry.

## **APSM 107 • SMQ-7 PARALLEL LINE FITTINGS**

<b>Units:</b>	1.5
<b>Hours:</b>	16 lecture, 24 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Introduction to communicating construction details through drafting of plans. Topics include drafting equipment and materials, use of an architect's scale, drawing format, geometric construction, basic views, square and radius elbows, and drawing duct runs.

## **APSM 108 • SMQ-8 TRIANGULATION FITTINGS**

<b>Units:</b>	1.5
<b>Hours:</b>	16 lecture, 24 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course covers triangulation, which is a versatile and higher level layout method, often used on more complicated patterns and in field measuring.

## **APSM 109 • SMQ-9 RADIAL LINE LAY OUT & OGEE OFFSETS**

<b>Units:</b>	1.5
<b>Hours:</b>	14 lecture, 26 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Introduces a third of three traditional sheet metal pattern development methods. Concepts are applied to conical sheet metal projects. In addition, the ogee offset fitting, sometimes important in maintaining efficient air flow, is developed in flat and compound forms.

## **APSM 110 • SMQ-10 BASICS OF ARCHITECTURAL SHEET METAL**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course focuses on essential skills used in architectural sheet metal work, including joint design for water flow, caulking and soldering applications, miters, and expansion joints. Discussion of use of architectural sheet metal in order to protect buildings from moisture and mold damage. Roof and scaffold safety is discussed.

## **APSM 111 • SMQ-11 ARCHITECTURAL SHEET METAL**

<b>Units:</b>	1.5
<b>Hours:</b>	12 lecture, 28 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This architectural sheet metal course seeks to develop an understanding of the common applications and general skills used in architectural sheet metal construction. Chimney saddles, downspouts, flashings and counter flashings, soffits, and scuppers are covered in detail. Students fabricate many of these items.

## **APSM 112 • SMQ-12 FIELD INSTALLATION**

<b>Units:</b>	2
<b>Hours:</b>	28 lecture, 12 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course addresses knowledge and application specific to field work in the sheet metal industry. Students receive training and safety certifications for forklift, scissor lift, or articulating booms. Proper techniques for rigging and hoisting loads are presented. Field measurement and job-site layout considerations are practiced. In addition, fire damper types are presented as well as the necessity of following the manufacturer's specifications for applications related to life safety in buildings.

## **APSM 113 • SMQ-13 WELDING 1: PROCESS & SAFETY OVERVIEW**

<b>Units:</b>	1.5
<b>Hours:</b>	16 lecture, 24 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course begins with an overview of common welding safety hazards and personal protective equipment for welding. The Gas Metal Arc Welding process is introduced and practiced by students as commonly used in the sheet metal industry. Machine set-up and basic skills are stressed.

## **APSM 114 • SMQ-14 WELDING 2: GMAW**

<b>Units:</b>	1.5
<b>Hours:</b>	12 lecture, 28 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course continues with development of Gas Metal Arc Welding and Flux Core Arc Welding skills. In addition, the SMAW welding process and metallurgy are introduced. Progress in student welding skill development is essential.

## **APSM 116 • SMQ-16 PLANS & SPECIFICATIONS**

<b>Units:</b>	3
<b>Hours:</b>	38 lecture, 2 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Introduction to plans and specifications and their applications in the sheet metal construction industry. This includes reading and interpreting title blocks, lines, abbreviations, symbols, sections, details and schedules for residential and commercial projects. Architectural, structural, mechanical, electrical, control, and specialty drawings are covered in detail.

## **APSM 117 • SMQ-17 SUBMITTALS & SHOP DRAWINGS**

<b>Units:</b>	2.5
<b>Hours:</b>	34 lecture, 6 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course continues to build on job specification and blueprint reading instructions and adds the creation of a shop drawing and use of submittals as done in the sheet metal industry. This includes reading typical plans, specifications and submittals, identifying specific information on the submittal, applying a numbering system to the shop drawing, creating material lists from the shop drawing or submittal, and field use of drawings and submittals.

## **APSM 118 • SMQ-18 INDUSTRIAL & STAINLESS STEEL INTRODUCTION**

<b>Units:</b>	1.5
<b>Hours:</b>	16 lecture, 24 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Course introduces heavy gauge industrial sheet metal techniques and stainless steel applications used in the industry. Topics include calculations of bend allowances for heavy gauge metal, layout and forming heavy gauge metal, using a blowpipe, material handling equipment, marking, forming and surface finishing stainless steel products. Safety and material handling practices are reviewed.

## **APSM 119 • SMQ-19 HVAC AIR SYSTEMS & DUCT DESIGN**

<b>Units:</b>	3
<b>Hours:</b>	36 lecture, 4 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Course addresses the basics and critical details of heating, ventilating, and air conditioning (HVAC), and system design, operation, installation, and fabrication standards. Students will learn how HVAC systems can be designed with human comfort and efficient operation in mind. Students will learn basic components, and how to identify loss factors of typical HVAC systems. Load calculations and air flow calculations are performed and duct leak testing is introduced, stressing the importance of energy efficiency with today's environmental concerns.

## **APSM 120 • SMQ-20 MEASURING & SKETCHING**

<b>Units:</b>	1.5
<b>Hours:</b>	14 lecture, 26 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Field measuring and sketching techniques are discussed in detail as it relates to sheet metal work. Topics covered include measuring techniques and safety, reference points, calculations, and industry accepted symbols, views and representations. Students measure and produce sketches.

## **APSM 121 • SMQ-21 FABRICATION & SHORTCUTS**

<b>Units:</b>	1
<b>Hours:</b>	8 lecture, 32 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Theory and application of sheet metal fabrication and shortcuts used in residential and commercial construction are reviewed in this course. Students will gain a working knowledge of alternative fabrication techniques and theory. Geometry and math associated with fabrication are an integral part of this course. Jobsite conditions and fabrication of specialty items are emphasized.

## **APSM 122 • SMQ-22 CODES & STANDARDS**

<b>Units:</b>	3
<b>Hours:</b>	38 lecture, 2 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students are introduced to the organization and interpretation of building codes and standards in the sheet metal industry. The restrictions and limitations these codes place on the construction industry are covered in detail. Students work with codes common to the industry and use SMACNA standards to research information.

## **APSM 123 • SMQ-23 RESIDENTIAL SHEET METAL**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Introduction to sheet metal work specific to residential construction including: the various types of residential heating, ventilation and air conditioning systems, combustion theory, basic air distribution, furnace construction, filters, humidifiers, installation techniques, maintenance procedures and roof drainage system requirements.

## **APSM 124 • SMQ-24 METAL ROOFING**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Overview of the different types of metal roofs used in the sheet metal industry, installation skills, and safety concerns. Common roof seams are fabricated. Use of manufactured and shop-fabricated materials for roof lay out and installation is practiced, including roof penetrations and related flashings.

## **APSM 125 • SMQ-25 DETAILING**

<b>Units:</b>	3
<b>Hours:</b>	36 lecture, 4 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Detailing in the sheet metal industry is a specialized skill that requires extensive knowledge and proper attention to detail when working with drawings and specifications. In this course, students will compile detail information from plans, specs, submittals, standards, field measurements, and codes.

## **APSM 126 • SMQ-26 FOREMAN TRAINING**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course is for journeyman-level sheet metal workers who want to become supervisors, site managers, leads, and foreman. In this course, students will be able to identify the roles and responsibilities of the foreman, and reasons to become a foreman. Students will practice self-evaluation, successful foreman attributes, managing and leading others, and project management. They will learn to start a project and see it through to successful completion.

## **APSM 127 • SMQ-27 BASIC AUTOCAD**

<b>Units:</b>	1.5
<b>Hours:</b>	12 lecture, 28 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students learn how to follow the proper protocols for computer lab use and perform essential computer file management operations. Students will navigate through the basic AutoCAD screen and command menus. Students will demonstrate the basic use of the AutoCAD program by creating and plotting a drawing assignment within parameters and given template. Students will be able to demonstrate how AutoCAD is used in the Sheet Metal Industry.

## **APSM 128 • SMQ-28 HVAC ENERGY CONSERVATION & ENVIRONMENTAL TECHNOLOGY**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course is an introduction to energy and environmental technologies for the sheet metal and HVAC industry. It includes an introduction to California Title 24 requirements for HVAC systems, duct system testing, assessing utility bill and equipment nameplate data, the LEED point system, and basic heat transfer calculations. It also includes an overview of upcoming energy initiatives in California.

## **APSM 130 • SMQ-30 ADVANCED WELDING**

<b>Units:</b>	1.5
<b>Hours:</b>	14 lecture, 26 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Advanced techniques used in oxy-fuel/plasma cutting, GMAW, and GTAW on various types and thicknesses of base material.

**APSM 131 • SMQ-31 CAD DETAILING**

<b>Units:</b>	1
<b>Hours:</b>	10 lecture, 30 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Course covers basic computer-aided design (CAD) drawing skills required by industry. Use of CAD DUCT or similar specialized third party sheet metal detailing software to set up drawings, including 3-D duct detailing program with emphasis on electronic coordination. This course focuses on file management and drawing protocol and utilization of structural and architectural backgrounds. Students will design ducting within the CAD drawing and use CAD DUCT or similar software for location and elevation, as well as collision checks. Please note that other industry-recognized third party software may be utilized in lieu of CAD DUCT, such as "Benchmark Draft" software, for similar lessons.

**APSM 132 • SMQ-32 INTERMEDIATE CAD DETAILING THIRD PARTY**

<b>Units:</b>	1
<b>Hours:</b>	10 lecture, 30 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Continuation of 3-D duct detailing program for electronic coordination, emphasizing accessing, editing, and recovering files with CAD DUCT or similar third party sheet metal detailing software system. Students will use format standards, tag files, and program utilities. Using contract documents, students will work through the steps necessary to create a job file.

**APSM 133 • SMQ-33 ADVANCED ARCHITECTURAL**

<b>Units:</b>	1.5
<b>Hours:</b>	12 lecture, 28 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Develop advanced skills to layout architectural custom flashing and cornices. Work with the newest metal roofing material. Work with copper and other materials to lay out and fabricate specialized architectural items.

**APSM 134 • SMQ-34 ADVANCED LAYOUT FABRICATION**

<b>Units:</b>	1
<b>Hours:</b>	10 lecture, 30 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Course addresses advanced methods of pattern development using both calculator and manual methods. Students will utilize math formulas relating to sheet metal lay out, fabrication, and shop procedures with the ITI Sheet Metal Pro Calculator, as well as apply geometric construction techniques to advanced patterns and job-site layouts.



**APSM 136 • SMQ-36 SERVICE BASICS**

<b>Units:</b>	2
<b>Hours:</b>	26 lecture, 14 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

This course addresses the knowledge and development of the basic skills necessary for a sheet metal worker to service a basic HVAC building system.

**APSM 151A • SERVICE INTRODUCTION & SAFETY**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students receive an introduction to their building trade service apprenticeship and the union HVAC industry with an emphasis on safety.

**APSM 151B • ESSENTIAL HVAC SERVICE SKILLS**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students gain further understanding of the roles and responsibilities of a beginning level HVAC service apprentice, including maintenance, vehicle use, documentation and professional representation.

**APSM 151C • HEAT, MATTER & ENERGY IN HVAC SYSTEMS**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students are introduced to the physical laws governing heat and energy transfer as it pertains to HVAC.

**APSM 152A • PIPING, REFRIGERANT EVACUATION & RECOVERY**

<b>Units:</b>	1.5
<b>Hours:</b>	12 lecture, 28 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students are introduced to the materials and types of connections used in HVAC piping. Students learn how to safely evacuate and recover HVAC refrigerants.

**APSM 152B • CHARGING REFRIGERANT SYSTEMS**

<b>Units:</b>	2
<b>Hours:</b>	20 lecture, 20 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students learn the fundamentals of charging refrigerant systems.

## **APSM 152C • INTRODUCTION TO ELECTRICITY**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students receive an introduction to electricity as related to HVAC equipment, with an emphasis on safety when working with HVAC equipment.

## **APSM 153A • FIELD INSTALLATION FOR THE SERVICE TECHNICIAN**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students establish basic steps for installation and start-up of HVAC systems.

## **APSM 153B • ELECTRIC MOTORS & MOTOR CONTROLS IN HVAC SYSTEMS**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

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

## **APSM 153C • COMPONENTS OF THE REFRIGERANT CYCLE**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students learn the theory and components of the refrigerant cycle, as used to transfer heat.

## **APSM 154A • REFRIGERATION IN AIR CONDITIONING**

<b>Units:</b>	2
<b>Hours:</b>	20 lecture, 20 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students apply the refrigerant cycle theory to its use in an HVAC system and investigate the functions of individual components in these systems.

## **APSM 154B • GAS & ELECTRIC HEATING**

<b>Units:</b>	2
<b>Hours:</b>	20 lecture, 20 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students explore the operation, maintenance, and repair of gas and electric heating systems.

## **APSM 154C • HYDRONIC HEATING**

<b>Units:</b>	2
<b>Hours:</b>	25 lecture, 15 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will learn the basic principles of and equipment used in hydronic heating.

## **APSM 155A • SHEET METAL FABRICATION**

<b>Units:</b>	1.5
<b>Hours:</b>	16 lecture, 24 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students learn essential sheet metal fabrication as required in HVAC duct systems. Students build seams and selected common duct fittings.

## **APSM 155B • AIR DISTRIBUTION & EFFICIENT DUCT DESIGN**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students develop an understanding of air flow characteristics and the proper design of duct systems.

## **APSM 155C • MAINTAINING EFFICIENT OPERATION OF ELECTRIC COOLING & HEATING EQUIPMENT**

<b>Units:</b>	2
<b>Hours:</b>	25 lecture, 15 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students learn to perform maintenance procedures required for efficient operation of HVAC systems.

## **APSM 156A • HEAT PUMP EFFICIENT OPERATION & SERVICE**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students learn how heat pumps function to transfer heat in either direction and apply theory with actual components.

## **APSM 156B • COOLING TOWERS, PUMPS & PIPING**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students develop an understanding of cooling towers, pumps, and condensing water circulation system requirements, using theory and system materials.

## **APSM 156C • CHILLED WATER HVAC SYSTEMS & COMPONENTS**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students receive an introduction to the operation, maintenance and repair of chilled water systems.

## **APSM 157A • PLANS & SPECIFICATIONS FOR THE SERVICE TECHNICIAN**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students gain an introduction to and experience in reading and interpretation of building plans and specifications, especially as related to mechanical systems and equipment.

## **APSM 157B • HVAC ENERGY CODES & STANDARDS**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students are introduced to the California mechanical code, Building Energy Use Index, Title 24, and "Green" LEED construction, with particular attention to the role of HVAC service in energy conservation.

## **APSM 157C • INDOOR AIR QUALITY & ENERGY EFFICIENCY**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will consider factors of indoor air quality versus energy efficiency, including airflow, filtration, air changes per hour, and humidity. Related HVAC equipment solutions, including economizers and duct system designs will also be discussed. Students will be introduced to typical measurements and requirements.

## **APSM 158A • INTRODUCTION TO DIRECT DIGITAL HVAC CONTROLS**

<b>Units:</b>	2
<b>Hours:</b>	28 lecture, 12 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students are introduced to the components and principles that comprise a direct digital control system.

## **APSM 158B • PNEUMATIC CONTROLS FOR HVAC SYSTEMS**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students apply theory using components of a pneumatic control system to develop a sound understanding of a pneumatic control system operation.

## **APSM 158C • INVERTER, VRF & HEAT RECOVERY TECHNOLOGY**

<b>Units:</b>	2.5
<b>Hours:</b>	35 lecture, 5 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students explore the components and principals that comprise inverter, variable refrigerant flow (VRF), and heat recovery systems as used in the HVAC industry.

## **APSM 159A • INTRODUCTION TO TESTING ADJUSTING & BALANCING HVAC SYSTEMS**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of the fundamental process of heat transfer and how pressures relate to air movement in HVAC systems.

## **APSM 159B • AIRFLOW & PSYCHROMETRICS FOR TAB**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of the purpose for commercial HVAC systems, the main characteristics of psychrometrics and methods to measure airflow in HVAC systems.

## **APSM 159C • TESTING ADJUSTING & BALANCING OF HVAC SYSTEMS**

<b>Units:</b>	2
<b>Hours:</b>	28 lecture, 12 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will continue to explore methods of testing, adjusting and balancing HVAC systems. More complex systems will be explored, using applicable measuring equipment. Written reports will be produced.

## **APSM 171A • HVAC TRADE HISTORY & INTRODUCTION TO TESTING, ADJUSTING & BALANCING**

<b>Units:</b>	3
<b>Hours:</b>	36 lecture, 4 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an introductory overview of TAB in the HVAC industry. Students will be able to describe human comfort and HVAC industry process needs.

## **APSM 171B • BASICS OF AIRFLOW, HEAT ENERGY & HEAT TRANSFER**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students obtain an overview of the fundamental process of heat transfer and how pressures relate to air movement in HVAC systems.

## **APSM 171C • SAFETY TRAINING FOR TAB APPRENTICESHIP**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain certifications in OSHA 10 compliance, CPR and first aid, fall protection and NFPA 70E arc flash compliance.

## **APSM 172A • BASIC HVAC SYSTEMS, PSYCHROMETRICS, AIR PRESSURES & MEASUREMENTS OF AIR**

**Units:** 2.5  
**Hours:** 32 lecture, 8 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 and Credit** Degree-Applicable Credit Course

**Status:**

**Foothill GE:** Non-GE

**Transferable:** None

**Grade Type:** Letter Grade (Request for Pass/No Pass)

**Repeatability:** Not Repeatable

Students will confirm an understanding of the main characteristics of psychrometrics and methods to measure airflow in commercial HVAC systems.

## **APSM 172B • PROPORTIONAL BALANCING**

**Units:** 2  
**Hours:** 24 lecture, 16 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 and Credit** Degree-Applicable Credit Course

**Status:**

**Foothill GE:** Non-GE

**Transferable:** None

**Grade Type:** Letter Grade (Request for Pass/No Pass)

**Repeatability:** Not Repeatable

Students will learn and practice the proportional balancing method to adjust air and water flows in commercial HVAC systems.

## **APSM 172C • DUCT LEAKAGE TESTING**

**Units:** 2  
**Hours:** 28 lecture, 12 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 and Credit** Degree-Applicable Credit Course

**Status:**

**Foothill GE:** Non-GE

**Transferable:** None

**Grade Type:** Letter Grade (Request for Pass/No Pass)

**Repeatability:** Not Repeatable

Students will gain an overview of the various methods of duct leakage testing, per requirements applied in the commercial HVAC industry.

## **APSM 173A • ELECTRICAL FUNDAMENTALS, ELECTRIC MOTORS & ROTATIONAL MEASUREMENTS**

**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 and Credit** Degree-Applicable Credit Course

**Status:**

**Foothill GE:** Non-GE

**Transferable:** None

**Grade Type:** Letter Grade (Request for Pass/No Pass)

**Repeatability:** Not Repeatable

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

## **APSM 173B • TEMPERATURE MEASUREMENTS, DUCT SYSTEMS & BASIC CONTROLS**

**Units:** 2.5  
**Hours:** 32 lecture, 8 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 and Credit** Degree-Applicable Credit Course

**Status:**

**Foothill GE:** Non-GE

**Transferable:** None

**Grade Type:** Letter Grade (Request for Pass/No Pass)

**Repeatability:** Not Repeatable

Students will gain an understanding of a variety of temperature measurements, the use of temperature measurement instruments, basic overview of HVAC duct systems and the control devices used to regulate temperature and humidity in HVAC systems.

## **APSM 173C • HVAC FANS, FAN LAWS & V-BELT DRIVES**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will survey common types of fans used in HVAC systems and learn the factors that affect fan performance and fan drive packages.

## **APSM 174A • HYDRONIC SYSTEMS, PUMPS & HYDRONIC BALANCING**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of the components and design of hydronic systems used in HVAC. Students will be able to measure pressures and determine flow through a pump and across various hydronic components.

## **APSM 174B • BALANCING DOCUMENTATION, COOLING TOWERS & TAB RELATED SKILLS**

<b>Units:</b>	2
<b>Hours:</b>	24 lecture, 16 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will use Microsoft Word and Excel to complete reporting documentation used in the TAB industry. Students will determine performance values of cooling towers used in HVAC systems.

## **APSM 174C • FIRE LIFE SAFETY LEVEL 1**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of various types of fire dampers used in HVAC systems. Upon completion, students will be able to perform fire damper operational tests and inspections.

## **APSM 175A • TABB TECHNICIAN CERTIFICATION**

<b>Units:</b>	2
<b>Hours:</b>	20 lecture, 20 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will demonstrate proper test and balance skills and achieve TABB Technician certification.



## **APSM 175B • DDC CONTROLS & PROGRAMS**

<b>Units:</b>	2
<b>Hours:</b>	24 lecture, 16 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of direct digital control systems used in HVAC systems. Students will program and produce control documentation for a packaged rooftop HVAC system.

## **APSM 175C • FIRE LIFE SAFETY LEVEL 2**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will become familiar with the building codes that govern fire life safety systems. Upon completion, students will be able to test a fire life safety system and achieve ICB FLS Level 2 certification.

## **APSM 176A • PLANS & SPECIFICATIONS, CODES & STANDARDS**

<b>Units:</b>	2.5
<b>Hours:</b>	30 lecture, 10 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will explain the organization of construction documentation specifications and plans used in the TAB HVAC industry. Students will prepare a TAB bid estimate, per standards used in the TAB industry.

## **APSM 176B • BASIC REFRIGERATION & BRAZING/SOLDERING**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will describe the location and function of components used in HVAC refrigeration systems. Students will demonstrate proper brazing and soldering techniques.

## **APSM 176C • CLEAN ROOMS & HEPA FILTER TESTING**

<b>Units:</b>	2
<b>Hours:</b>	28 lecture, 12 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will describe the purpose of a cleanroom and the function of HEPA and ULPA filters. Students will perform HEPA filter challenge and cleanroom performance testing to industry standards.

## **APSM 177A • TITLE 24 MECHANICAL ACCEPTANCE TESTING**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will explain the requirements of the California Title 24 energy code. Students will perform all Title 24 mechanical acceptance tests required in non-residential mechanical systems. Students will achieve NEMIC Mechanical Acceptance Test Technician certification.

## **APSM 177B • ADVANCED DDC CONTROLS/COMMISSIONING OF HVAC SYSTEMS**

<b>Units:</b>	2
<b>Hours:</b>	24 lecture, 16 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will install, program and calibrate direct digital control components on HVAC systems. Students will describe the SMACNA commissioning process and prepare sample functional performance tests.

## **APSM 177C • ENERGY AUDITING**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will demonstrate the skills and knowledge to prepare and conduct a building energy audit to industry standards. Students will achieve the ICB Energy Audit Technician certification.

## **APSM 178A • INDOOR AIR QUALITY**

<b>Units:</b>	2
<b>Hours:</b>	28 lecture, 12 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will explain basic factors of air quality, demonstrate the use of indoor air quality test instruments and perform various tests to prepare a sample IAQ report.

## **APSM 178B • GREEN CONSTRUCTION & LEED CERTIFICATION FOR HVAC**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of "Green Construction" principles and techniques used in the HVAC industry. Students will identify various methods of energy conservation and generation in high performance buildings.

## **APSM 178C • FOREMAN TRAINING/ PROJECT MANAGEMENT FOR HVAC**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will describe the role and responsibilities of jobsite foreman and project managers. Students will prepare a sample job cost tracking worksheet.

## **APSM 179A • BUILDING & CASCADING PRESSURES/AIR CHANGE TESTING**

<b>Units:</b>	2
<b>Hours:</b>	24 lecture, 16 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will perform and calculate air changes per hour on building spaces, adjust room and building pressure differentials and prepare associated required documentation, per industry standards.

## **APSM 179B • SOUND & VIBRATION IN HVAC SYSTEMS**

<b>Units:</b>	2.5
<b>Hours:</b>	32 lecture, 8 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Upon completion, students will measure room sound pressure readings to properly complete noise criterion (NC) and room criterion (RC) reports to industry standards. Students will properly conduct vibration testing on various HVAC equipment and document results to industry standards.

## **APSM 179C • BIOLOGICAL SAFETY CABINETS/LABORATORY FUME HOODS**

<b>Units:</b>	2
<b>Hours:</b>	24 lecture, 16 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

Students will identify various types of laboratory fume hoods and biological safety cabinets and describe the function of each style. Students will follow proper industry standards to test laboratory fume hoods and biological safety cabinets to required industry standards.

## **APSM 180A • BUILDING AUTOMATION & CONTROLS 1**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of the electronic controls within a control system as they apply to building automation controls in a HVAC system.

## **APSM 180B • BUILDING AUTOMATION & CONTROLS 2**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of operator interfaces, using theory and hands-on application as it applies to building automation controls in an HVAC system.

## **APSM 180C • BUILDING AUTOMATION & CONTROLS 3**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of the network wiring and wireless controls within a control system as they apply to building automation controls in a HVAC system.

## **APSM 181A • BUILDING AUTOMATION & CONTROLS 4**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of DDC controllers, including prints and sequence of operations, using theory and hands-on application as it applies to building automation controls in an HVAC system.

## **APSM 181B • BUILDING AUTOMATION & CONTROLS 5**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of the retrofit process within a control system as they apply to building automation controls in a HVAC system.

## **APSM 181C • BUILDING AUTOMATION & CONTROLS 6**

<b>Units:</b>	2
<b>Hours:</b>	18 lecture, 22 laboratory per quarter (40 total per quarter)
<b>Prerequisite:</b>	Per California Code of Regulations, this course is limited to students admitted to the Sheet Metal Apprenticeship Program.
<b>Degree and Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	None
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

Students will gain an overview of building automation and controls used in HVAC systems. Students will develop an understanding of identifying and troubleshooting common problems within a control system as they apply to building automation controls in a HVAC system.