**Foothill College**

**Credit Program Narrative**

**Associate in Science in Air Conditioning Mechanic**

**Item 1. Program Goals and Objectives**

The Air Conditioning Mechanic program is offered in partnership with Sheet Metal Local 104 and Bay Area Training Fund. The program goals and objectives are to provide students on-the-job training and in-class instruction in the service sector of the sheet metal and heating, ventilating and air conditioning (HVAC) industry. The students will learn how to perform scheduled maintenance, troubleshoot and repair the HVAC systems used in commercial buildings.

Program Learning Outcomes:

* Students will be able to achieve EPA 608 and OHSA 30 Certifications.
* Students will be able to understand the different types, properties, and application of refrigerants.
* Students will be able to demonstrate the ability to measure, cut, bend, and make various types of tubing and piping connections.
* Students will be able to demonstrate the safe use of soldering and brazing equipment.
* Students will be able to explain functions of special components: filter driers, sight glass, suction line accumulator, liquid line receiver, hot gas bypass, ambient controls.
* Students will be able to explain the application and operational sequence of electric and gas heating.
* Students will be able to understand the different types of heat sources for hydronic heating (water, steam, geothermal/waste heat, solar).
* Students will be able to perform start-up, diagnosis, repair, and maintenance of cooling towers and pumps.
* Students will be able to demonstrate an understanding of green construction and energy conservation as it applies to the HVAC industry in California.
* Students will be able to explain the LEED rating system, and how it involves HVAC maintenance over the life of the building

**Item 2. Catalog Description**

The Air Conditioning Mechanic program is offered in partnership with Sheet Metal Local 104 and Bay Area Training Fund. This 5-year apprenticeship program provides students with in-class instruction and paid on-the-job training with a sheet metal contractor, in the service sector of the sheet metal and heating, ventilating and air conditioning (HVAC) industry. The students will perform scheduled maintenance and troubleshoot system problems while dealing directly with a variety of customers. The students utilize understanding of refrigerant, electronic and pneumatic controls, filtration and duct systems to maintain safe and efficient system performance. Mechanics use test equipment to verify conditions, research manufacturer's data, and then adjust, repair and replace components as needed. Sheet Metal Air Conditioning Service Mechanics work on residential, light commercial and more often, complex commercial systems. Upgrade training is common in this occupation as more advanced and "greener" equipment is produced.

Per California Code of Regulations, this program is limited to students admitted to the Sheet Metal Local 104 & Bay Area Industry Training Fund's Air Conditioning Mechanic Program.

Upon completion of the program, students will be eligible to receive a Certificate of Achievement in Air Conditioning Mechanic from Foothill College and an Apprenticeship Completion Certificate from the California Division of Apprenticeship Standards (DAS). The graduates will be employable as HVAC Service Technician/Mechanic; HVAC Service Manager; HVAC Contractor; NATE Certified Air Conditioning Mechanic; Test, Adjust & Balancing Technician; Building Inspector; foreman; estimator/detailer; contractor; instructor; project manager and other related occupations.

**Item 3. Program Requirements**

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| --- | --- | --- | --- | --- |
| **Requirements** | **Course #** | **Title** | **Units** | **Sequence** |
| Core Courses (69 units) | APSM 122 | SMQ-22 Codes & Standards | 3 | Year 4, Spring  |
| APSM 151A | Service Introduction & Safety | 2.5 | Year 1, Fall  |
| APSM 151B | Essential HVAC Service Skills | 2.5 | Year 1, Winter  |
| APSM 151C | Heat, Matter & Energy in HVAC Systems | 2.5 | Year 1, Fall  |
| APSM 152A | Piping, Refrigerant Evacuation & Recovery | 1.5 | Year 1, Spring  |
| APSM 152B | Charging Refrigerant Systems | 2 | Year 2, Winter  |
| APSM 152C | Introduction to Electricity | 2.5 | Year 1, Spring  |
| APSM 153B | Electric Motors & Motor Controls in HVAC Systems | 2.5 | Year 2, Fall  |
| APSM 154A | Refrigeration in Air Conditioning | 2 | Year 2, Winter  |
| APSM 154B | Gas & Electric Heating | 2 | Year 2, Spring  |
| APSM 154C | Hydronic Heating | 2 | Year 2, Spring  |
| APSM 155A | Sheet Metal Fabrication | 1.5 | Year 2, Fall  |
| APSM 156A | Heat Pump Efficient Operation & Service | 2.5 | Year 3, Fall  |
| APSM 156B | Cooling Towers, Pumps & Piping | 2.5 | Year 3, Winter  |
| APSM 156C | Chilled Water HVAC Systems & Components | 2.5 | Year 3, Winter  |
| APSM 157A | Plans & Specifications for the Service Technician | 2.5 | Year 3, Fall  |
| APSM 157B | HVAC Energy Codes & Standards | 2.5 | Year 4, Winter  |
| APSM 158A | Introduction to Direct Digital HVAC Controls | 2 | Year 5, Fall  |
| APSM 158C | Inverter, VRF & Heat Recovery Technology | 2.5 | Year 3, Spring  |
| APSM 159B | Airflow & Psychrometrics for TAB | 2.5 | Year 1, Winter  |
| APSM 172B | Proportional Balancing | 2 | Year 3, Spring  |
| APSM 173B | Temperature Measurements, Duct Systems & Basic Controls | 2.5 | Year 4, Fall  |
| APSM 173C | HVAC Fans, Fan Laws & V-Belt Drives | 2.5 | Year 4, Fall  |
| APSM 174A | Hydronic Systems, Pumps & Hydronic Balancing | 2.5 | Year 4, Winter  |
| ASPM 175B | DDC Controls & Programs  | 2 | Year 5, Fall  |
| APSM 177A | Title 24 Mechanical Acceptance Testing | 2.5 | Year 4, Spring  |
| APSM 177B | Advanced DDC Controls/ Commissioning of HVAC Systems | 2 | Year 5, Winter  |
| APSM 177C | Energy Auditing  | 2.5 | Year 5, Spring  |
| APSM 178A | Indoor Air Quality | 2 | Year 5, Spring |
| APSM 178C | Foreman Training/Project Management for HVAC  | 2.5 | Year 5, Winter  |

**TOTAL UNITS: 69 units**

**Proposed Sequence:**

Year 1, Fall = 5 Year 2, Fall = 4

Year 1, Winter = 5 Year 2, Winter = 4

Year 1, Spring = 4 Year 2, Spring = 4

Year 3, Fall = 5 Year 4, Fall = 5

Year 3, Winter = 5 Year 4, Winter = 5

Year 3, Spring = 4.5 Year 4, Spring = 5.5

Year 5, Fall = 4

Year 5, Winter = 4.5

Year 5, Spring = 4.5

**TOTAL UNITS: 69 units**

* English proficiency: ENGL 1A, 1AH, 1S & 1T, or equivalent.
* Mathematics proficiency: MATH 105, 180, or any MATH course approved for Foothill GE Area V.
* Communication & Analytical Thinking.

A minimum of 90 units is required\*to include:

* Completion of one of the following general education patterns: Foothill General Education, CSU General Education Breadth Requirements or the Intersegmental General Education Transfer Curriculum (IGETC)
* Core courses (69 units)

\*Additional elective work may be necessary to meet the 90-unit minimum requirement for the associate degree.

**Note:** All courses pertaining to the major must be taken for a letter grade. In addition, a grade of “C” or better is required for all core courses used for the degree.

**Item 4. Master Planning**

The Certificate of Achievement in Air Conditioning Mechanic aligns with the Foothill College Mission statement well. As part of a state registered apprenticeship program, it provides high level technical training to diverse students with different socio-economic backgrounds. It serves the students who live in the Santa Clara, Alameda, Contra Costa, SF, San Mateo, Monterey, and San Benito counties, and it provides on-the-job training with local employers. The program provides students with livable wages and health benefits for them and their families in the most prosperous state.

**Item 5. Enrollment and Completer Projections**

Currently, there are 110 students enrolled in the Air Conditioning Mechanic program. The retention rate for this program is between 90 to 95 percent because it also offers employment opportunities. We project to have 12 students graduating in 2020-21 and approximately 60-70 students will graduate by 2025-2026.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Year 1 (FY 2018-19)** | **Year 2 (FY 2019-20)** |
| **Course #** | **Title** | **Annual Sections** | **Annual****Enrollment** | **Annual Sections** | **Annual Enrollment** |
| APSM 122 | SMQ-22 Codes & Standards | 9 | 116 | 6 | 68 |
| APSM 151A | Service Introduction & Safety | 4 | 25 | 3 | 15 |
| APSM 151B | Essential HVAC Service Skills | 3 | 8 | 1 | 5 |
| APSM 151C | Heat, Matter & Energy in HVAC Systems | 5 | 25 | 3 | 22 |
| APSM 152A | Piping, Refrigerant Evacuation & Recovery | 4 | 20 | 4 | 21 |
| APSM 152B | Charging Refrigerant Systems | 0 | 0 | 0 | 0 |
| APSM 152C | Introduction to Electricity | 0 | 0 | 7 | 43 |
| APSM 153B | Electric Motors & Motor Controls in HVAC Systems | 1 | 15 | 5 | 26 |
| APSM 154A | Refrigeration in Air Conditioning | 3 | 15 | 5 | 26 |
| APSM 154B | Gas & Electric Heating | 4 | 20 | 3 | 15 |
| APSM 154C | Hydronic Heating | 0 | 0 | 4 | 19 |
| APSM 155A | Sheet Metal Fabrication | 0 | 0 | 7 | 41 |
| APSM 156A | Heat Pump Efficient Operation & Service | 2 | 6 | 3 | 15 |
| APSM 156B | Cooling Towers, Pumps & Piping | 1 | 5 | 4 | 16 |
| APSM 156C | Chilled Water HVAC Systems & Components | 3 | 8 | 4 | 26 |
| APSM 157A | Plans & Specifications for the Service Technician | 3 | 17 | 4 | 20 |
| APSM 157B | HVAC Energy Codes & Standards | 1 | 10 | 2 | 19 |
| APSM 158A | Introduction to Direct Digital HVAC Controls | 0 | 0 | 0 | 0 |
| APSM 158C | Inverter, VRF & Heat Recovery Technology | 3 | 8 | 1 | 5 |
| APSM 159B | Airflow & Psychrometrics For TAB | 0 | 0 | 2 | 13 |
| APSM 172B | Proportional Balancing | 6 | 68 | 2 | 21 |
| APSM 173B | Temperature Measurements, Duct Systems & Basic Controls | 0 | 0 | 1 | 13 |
| APSM 173C | HVAC Fans, Fan Laws & V-Belt Drives | 0 | 0 | 2 | 22 |
| APSM 174A | Hydronic Systems, Pumps & Hydronic Balancing | 1 | 5 | 1 | 13 |
| ASPM 175B | DDC Controls & Programs | 1 | 10 | 2 | 15 |
| APSM 177A | Title 24 Mechanical Acceptance Testing | 11 | 125 | 13 | 171 |
| APSM 177B | Advanced DDC Controls/ Commissioning of HVAC Systems | 1 | 6 | 3 | 28 |
| APSM 177C | Energy Auditing  | 1 | 6 | 1 | 6 |
| APSM 178A | Indoor Air Quality | 1 | 6 | 2 | 13 |
| APSM 178C | Foreman Training/Project Management for HVAC | 1 | 6 | 1 | 6 |

**Item 6. Place of Program in Curriculum/Similar Programs**

The Certificate of Achievement in Air Conditioning Mechanic is an addition to our existing CTE programs and registered apprenticeship programs.

While the Certificate of Achievement in Air Conditioning Mechanic is similar to the existing Air Conditioning and Refrigeration Technology program at Foothill, it differentiates itself in the need to train Sheet Metal workers as Air Conditioning Mechanics and by including Testing and Balancing of HVAC equipment as part of the curriculum. Industry needs require both trades to be trained independently of each other.

**Item 7. Similar Programs at Other Colleges in Service Area**

There are no other programs similar to this one in Foothill’s service area and out of the service area because our program is a state registered apprenticeship program.

**Additional Information Required for State Submission:**

**TOP Code:** 0946.00 - Environmental Control Technology (HVAC)

**Annual Completers:** 12-17

**Net Annual Labor Demand:** 908

**Faculty Workload:** 2 full-time and 10 part-time

**New Faculty Positions:** 0

**New Equipment:** 0

**New/Remodeled Facilities:** 0

**Library Acquisitions:** 0

**Gainful Employment:** Yes

**Program Review Date:** December 2023

**Distance Education:** 0%

**ATTACH THE FOLLOWING** (Apprenticeship only)**:**

1. **Labor Market Information and Analysis**
2. **Approval Letter from the California Division of Apprenticeship Standards (DAS)**