

Maine Community College System
Five Year Program Review

College: Central Maine Community College
CIP: 47.0201

Program: Heating, Ventilation, Air Conditioning & Refrigeration
Credentials: Associate in Applied Science (AAS)

Review Team: Tobby Bragdon, Eric Berg, Marc Gilbert, Jeff Green, David Lewis, Jessica Mean, Jim Allard
Date: March 2025 Period of Review: AY 2018/2019-2022/2023

Program Overview:

1) **Program description** (from the most recent college catalog):

Upon successful completion of the Heating, Ventilation, Air Conditioning and Refrigeration Technology Certificate program, graduates are eligible to obtain EPA 608 Universal Certification. This certification is required for technicians handling refrigerants.

2) **Program Learning Outcomes: all program learning outcomes are expected to be assessed within the five-year cycle. Please attach an Assessment Data and Reflection Template for each program learning outcome. Explain how the department used the assessment results to improve teaching, learning, and the curriculum.**

List the program learning outcomes:	Method of assessment: list the courses and activities/assignments used to assess the learning outcomes
<ol style="list-style-type: none"> 1. Explain the basic theory of the subject matter or HVAC/R system for the course of instruction based on industry standards. 2. Analyze a scenario based upon an HVAC/R equipment system failure. 3. Employ a systematic approach to troubleshooting a HVAC/R system malfunction and prepare an effective repair solution to residential applications. 4. Obtain EPA 608 Universal Certification. 	<ol style="list-style-type: none"> 1 - HVT 105 – Basic Refrigeration Principles: review to evaporation and condensing of various refrigerants at different pressures, evacuate refrigerant per EPA standards and recharge units per manufacturer instructions. 2- HVT 180 – HVAC/R Diagnostics and Troubleshooting: work with computer aided faults added by instructor to troubleshoot refrigeration systems. Find the root cause of error codes on mini-split and standard heating systems and correct per manufactures system troubleshooting flow charts. 3- HVT 152 – Heat Pumps: Build a VRF mini split system and analyze failures due to improper installation and wiring. Interpret error codes and correct problems. 4. HVT 180 - HVAC/R Diagnostics and Troubleshooting and PHT 259 – Propane and Natural Gas II. Here students are assessed by determining the superheat and subcooling of traditional refrigerant based systems, weighing in the charge of newer VRF systems and completing the required task of service work orders by documenting results. Students are also assessed on their ability to take CO1 and O2 measurements of carbon-based fuel systems, analyzing system performance and completing the required work.

	<p>5. HVT 180 - HVAC/R Diagnostics and Troubleshooting, HVT 152 – Heat Pumps, and PHT 259 – Propane and Natural Gas II. Students are assessed with their ability to use tools and supplies in maintaining refrigerant based and carbon-based systems so that the systems are operating at maximum efficiency. They are also assessed in best practices that maintain a safe environment for building occupants.</p> <p>6-HVT 105 - Basic Refrigeration Principles. This course culminates with the administration of an EPA Universal Refrigerant Certification exam.</p>
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3) Credentials Awarded within the IPEDS year, i.e. July 1-June 30:

Credentials				
Credential	AY1920	AY2122	AY2223	AY2324
AAS	--	4	3	8
Certificate	2	1	1	10

4) Program Graduates Employed:

Number of Completers with any Wage Data	--
% of Completers with any Wage Data	--
# of Completers with First Year Earnings	--
Median First Year Earnings	--

5) Partnerships, collaborations, associations and memberships

a) Advisory Meeting Dates and Attendance (past 3 years)

<i>Date(s) of Meeting</i>	<i># of college attendees</i>	<i># of Non-college attendees</i>
11/4/21	2	3
11/2/22	1	6
2023 no meeting held		

b) Program external accreditation, associations, and memberships (if applicable):

6) Other Indicators of student success, direct and/or indirect, which may include:

	AY1920	AY2021	AY2122	AY2223	AY2324
Licensure/certification pass rates (if applicable)	--	--	--	--	--
Program Advisory Committee Member Survey (on scale of 1-5 averaged):	--	--	--	--	--

Program Curriculum	--	--	--	--	--
Technical currency of the program	--	--	--	--	--
Preparation of program graduates for work in the field	--	--	--	--	--
Communication from program administration/faculty	--	--	--	--	--
Overall quality of the program	--	--	--	--	--
Other (please specify):	--	--	--	--	--

7) Student demographics:

Admissions - AAS					
AAS	AY1920	AY2021	AY2122	AY2223	AY2324
Fall Applications	22	23	33	47	49
% chg in Fall Applicants from PY	--	5%	43%	42%	4%
Enrolled (Yield)	9	4	9	17	27
% chg in Enrolled from PY	--	-56%	125%	89%	59%
Admissions - Certificate					
Certificate	AY1920	AY2021	AY2122	AY2223	AY2324
Fall Applications	12	10	9	16	25
% chg in Fall Applicants from PY	--	-17%	-10%	78%	56%
Enrolled (Yield)	5	1	3	3	5
% chg in Enrolled from PY	--	-80%	200%	0%	67%

Student Enrollment ¹					
AAS	AY2021	AY2122	AY2223	AY2324	AY2425
Unduplicated Headcount Enrolled in Program	12	13	35	43	57
% chg in Headcount from PY	--	8%	169%	23%	33%
Enrolled Credit Hours	148	183	423	504	688
% chg in Credit hours from PY	--	24%	131%	19%	37%
FTE	10	12	28	34	46
% chg in FTE from PY	--	24%	131%	19%	37%
Student Enrollment - Certificate					
Certificate	AY2021	AY2122	AY2223	AY2324	AY2425
Unduplicated Headcount Enrolled in Program	4	7	4	10	12
% chg in Headcount from PY	--	75%	-29%	100%	20%
Enrolled Credit Hours	38	79	50	81	113
% chg in Credit hours from PY	--	108%	-37%	62%	40%
FTE	3	5	3	5	8
% chg in FTE from PY	--	108%	-37%	62%	40%

¹ = students within the program in the fall of the academic year

Student Success					
Cohort Year - AAS	AY2021	AY2122	AY2223	AY2324	AY2425
Cohort Enrollment	10	15	27	32	37

Retained to the next semester	60%	93%	59%	63%	--
Retained to the next year	10%	73%	41%	44%	--
Graduation Rates - AAS					
100% of program time	20%	20%	26%		
150% of program time	20%	40%	26%		
200% of program time	20%	40%			
Transfer Rate (non-graduates) ²	30%	0%			
Transfer Rate (graduates)	0%	0%			
Enrolled in Another Program ²	0%	--			
Graduated from Another Program ²	0%	13%			
Student Success Certificate					
Cohort Year - Certification	AY2021	AY2122	AY2223	AY2324	AY2425
Cohort Enrollment	2	4	7	6	10
Retained to the next semester	50%	25%	86%	83%	--
Retained to the next year	0%	25%	86%	17%	--
Graduation Rates - Certificate					
100% of program time	0%	0%	0%	33%	
150% of program time	0%	0%	14%		
200% of program time	0%	0%	57%		
Transfer Rate (non-graduates) ²	0%	0%			
Transfer Rate (graduates)	0%				
Enrolled in Another Program ²	0%				
Graduated from Another Program ²	0%				

². Determined at the maximum graduation point in this table, i.e. 200%

8) Strengths, challenges, and planned steps for continuous improvement: In your summary assessment you should reference sections of this review that informs the plan.

Program Strengths:

- The program started in 2019 and since then enrollment has grown significantly each year. The increasing enrollment in the program reflects its growing success and the strong demand for hands-on training in the state.
- The program has four full-time faculty who bring over 175 years of combined industry experience. Faculty maintain state licenses and attend a wide array of professional development opportunities to broaden skills. The success of the program is attributed to these faculty members who built it and continue to develop it.
- The two-story state-of-the-art lab, which was built when the program began five years ago, features advanced refrigeration simulators, HVAC mockups, and a full-scale heat recovery demonstrator. The lab is equipped with the latest technologies in the field.
- Beyond the formal lab space, students also have access to an outdoor mockup construction site shared with the Building Construction Trades department. This collaborative environment allows HVT, PHT, and BCT students to engage in multidisciplinary projects that mirror real-world residential construction challenges.
- The program is very fortunate to have an extremely dedicated adjunct faculty member.

Challenges:

- The Plumbing and HVAC programs share space. High enrollment in both programs has led to challenges with the physical space.
- Adjunct faculty can be difficult to find because they can make more money in the field.
- Program equipment is expensive and since it was all installed at relatively the same time, it may need to be replaced in a similar timeframe.

Planned steps for continuous improvement:

- With three sections of first-year students, the Department Chair and Academic Dean are exploring scheduling solutions to address current space needs.
- Heat and other resources have been provided to the outdoor mockup buildings so the spaces can be used year-round for instruction.
- The College will use its capital technology plan to be prepared for when equipment may need to be replaced.
- Faculty attendance at a national HVAC/R educational conference will provide insight into integrating VR technology into the curriculum.
- Faculty will actively engage the program advisory panel for guidance on attracting qualified adjunct instructors while also researching and expanding the use of externships to enhance student learning.

Five-year Assessment Plan for Student Learning Outcomes

Heating, Ventilation, Air Conditioning & RefrigerationMarch 2025

Name of Program or General Education Domain

Date

Learning goal:

Student learning outcomes:	Academic year during which assessment will occur	Source(s) and type of assessment artifact(s) that will be collected (e.g.: embedded questioning, capstone assignments, standardized testing, performance observation, portfolio reviews, etc.)	Method(s) to be used for assessing artifact(s)	Assessment Goal (targets/criteria) for direct measure	Assessment Outcome (Number of Students Achieving an "acceptable" or better)	Assessment Goal was:		
						Met	Not Met	Pending Review
Explain the basic theory of the subject matter or HVAC/R system for the course of instruction based on industry standards.	2024-2025	Standardized testing, embedded questioning	Written exams, student presentations	85% of students achieve a passing score on theory assessments	85% or better			X
Employ a systematic approach to troubleshooting an HVAC/R system malfunction and prepare an effective repair solution in	2024-2025	Performance observation, capstone assignments	Hands-on troubleshooting exercises, instructor evaluations	85% of students successfully diagnose and propose repair solutions	85% or better	X		

residential and light commercial applications.								
Analyze component failures to determine the root cause of the component failure.	2024-2025	Performance observation, problem-based learning projects	Instructor evaluations, lab-based assessments	85% of students accurately determine failure root causes	85% or better			X
Verify if the path of repair was correct by testing and/or completing a work order/report.	2024-2025	Capstone assignments, portfolio reviews	Instructor review of work orders, testing reports	85% of students correctly verify repairs through testing or documentation	85% or better			X
Demonstrate the correct usage of tools and supplies required to service and maintain systems.	2024-2025	Embedded questioning, performance observation	Instructor evaluations, student self-assessments	90% of students correctly use tools and supplies in service scenarios	85% or better			X
Obtain EPA 608 Universal Certification.	2024-2025	Certification exam results	Official EPA 608 exam performance	85% of students pass the EPA 608 Universal Certification exam	85% or better			X

Most significant assessment findings? (Pedagogical, instructional, curricular changes). Please report on actions taken and on ongoing assessment plans.