

Program Assessment Plan 2021-2023  
Air Conditioning & Refrigeration

Air Conditioning & Refrigeration Learning Outcomes

SLO 1: Evaluate system performance

Evaluate system performance using pressure and temperature measurements.

MEASURES	RESULTS	ACTIONS								
<p><b>Measure 1.1</b></p> <p>Performance Evaluation and Rubric - Performance evaluation of usage of a gage manifold to evaluate refrigerant pressures assessed with a rubric.</p> <p>Direct - Exam (Course)</p> <p><i>Principle of Refrigeration III: HACR 1180</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration students will demonstrate how to use a gage manifold to evaluate refrigerant pressures (on first formal attempt).</p>	<p><b>MET</b></p> <p>Measure 1.1</p> <p>■ Met ■ Not Met</p> <table border="1"> <tr> <td>Met:</td> <td>94%</td> </tr> <tr> <td>Not Met:</td> <td>6%</td> </tr> <tr> <td>Met Total:</td> <td>94%</td> </tr> <tr> <td>Not Met Total:</td> <td>6%</td> </tr> </table> <p><b>Analysis</b></p> <p>This skillset is taught across multiple courses and students learn to read gauges prior to the administration of the measure. Students become familiar with and are well-prepared. Some students struggle with hooking up the gauges correctly.</p>	Met:	94%	Not Met:	6%	Met Total:	94%	Not Met Total:	6%	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Increase repetition related to this skillset throughout the semester. Students will become more familiar and should continue to complete at a high rate.</p>
Met:	94%									
Not Met:	6%									
Met Total:	94%									
Not Met Total:	6%									
<p><b>Measure 1.2</b></p> <p>Performance Evaluation and Rubric - Performance evaluation of usages of a digital thermometer to determine proper temperature differentials assessed with a rubric</p> <p>Direct - Exam (Course)</p> <p><i>Principle of Refrigeration III: HACR 1180</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration students will use a digital thermometer to determine proper temperature differentials.</p>	<p><b>MET</b></p> <p>Measure 1.2</p> <p>■ Met ■ Not Met</p> <table border="1"> <tr> <td>Met:</td> <td>97%</td> </tr> <tr> <td>Not Met:</td> <td>3%</td> </tr> <tr> <td>Met Total:</td> <td>97%</td> </tr> <tr> <td>Not Met Total:</td> <td>3%</td> </tr> </table> <p><b>Analysis</b></p> <p>Students have plenty hands-on time to develop this skillset through repetition. Some students struggle with the difference between latent heat transfer and sensible heat transfer and why humidity needs to be factored in. Time on task allows for conversations with students to help them understand the meaning.</p>	Met:	97%	Not Met:	3%	Met Total:	97%	Not Met Total:	3%	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Faculty will use different systems instead of the same one so students are able to learn to adapt to different environments.</p>
Met:	97%									
Not Met:	3%									
Met Total:	97%									
Not Met Total:	3%									

SLO 2: Interpret technical drawings

Interpret technical drawings to determine system configuration and sequence of operation.

**Air Conditioning**

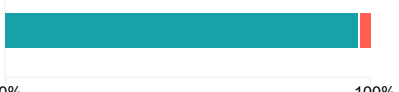
MEASURES	RESULTS	ACTIONS								
<p><b>Measure 2.1</b></p> <p>Performance Evaluation and Rubric - Performance evaluation of usage of a schematic to troubleshoot an electrical system assessed with a rubric.</p> <p><i>Applied Elec &amp; Troubleshooting: HACR 1240</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration program students will demonstrate a use of the schematic to troubleshoot an electrical system.</p>	<p><b>MET</b></p> <p>Measure 2.1</p> <p>■ Met ■ Not Met</p> <table border="1"> <tr> <td>Met:</td> <td>92%</td> </tr> <tr> <td>Not Met:</td> <td>8%</td> </tr> <tr> <td>Met Total:</td> <td>92%</td> </tr> <tr> <td>Not Met Total:</td> <td>8%</td> </tr> </table> <p><b>Analysis</b></p> <p>Students have a lot of time with hands-on experience for this particular task. Some students struggle with the use of a meter and especially different kinds of meters. Students learn that having a consistent meter of high-quality becomes important on the job.</p>	Met:	92%	Not Met:	8%	Met Total:	92%	Not Met Total:	8%	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Faculty will provide more exposure to the different types of meters and reinforce the importance of finding a consistent meter to use that works for them individually.</p>
Met:	92%									
Not Met:	8%									
Met Total:	92%									
Not Met Total:	8%									
<p><b>Measure 2.2</b></p> <p>Performance Evaluation and Rubric - Performance evaluation of usages of an electric meter for troubleshooting an electrical system assessed with a rubric.</p> <p>Direct - Exam (Course)</p> <p><i>Applied Elec &amp; Troubleshooting: HACR 1240</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration program students will demonstrate the use of an electric meter for troubleshooting an electrical system.</p>	<p><b>MET</b></p> <p>Measure 2.2</p> <p>■ Met ■ Not Met</p> <table border="1"> <tr> <td>Met:</td> <td>90%</td> </tr> <tr> <td>Not Met:</td> <td>10%</td> </tr> <tr> <td>Met Total:</td> <td>90%</td> </tr> <tr> <td>Not Met Total:</td> <td>10%</td> </tr> </table> <p><b>Analysis</b></p> <p>Sometimes students struggle with wiring correctly and then have to troubleshoot with their meter. This helps them better understand schematics. They may get an indication they don't understand at first but with repetition they learn it on their own with some guidance.</p>	Met:	90%	Not Met:	10%	Met Total:	90%	Not Met Total:	10%	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Sometimes faculty are too quick to step in and offer guidance. In the new cycle, faculty will give students more time to troubleshoot on their own without assistance so they can build a deeper understanding and apply critical thinking skills.</p>
Met:	90%									
Not Met:	10%									
Met Total:	90%									
Not Met Total:	10%									

SLO 3: System performance analysis

Produce system performance analysis and present results.


MEASURES	RESULTS	ACTIONS
<p><b>Measure 3.1</b></p> <p>Performance Evaluation and Rubric - Performance evaluation of competency with determination if a residential air conditioning system has proper evaporator split assessed with a rubric.</p> <p>Direct - Exam (Course)</p> <p><i>Residential Air Cond II: HACR 2520</i></p>	<p><b>MET</b></p> <p>Measure 3.1</p> <p>■ Met ■ Not Met</p>	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>This assignment will be broken down so that specific emphasis will be placed on the assessment and not only on presentation of the findings.</p>

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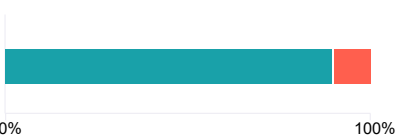
<p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration Program students will determine if a residential air conditioning system has proper evaporator temperature split.</p>	<p>Met: 97%</p> <p>Not Met: 3%</p> <p>Met Total: 97%</p> <p>Not Met Total: 3%</p> <p><b>Analysis</b></p> <p>Most students excelled with this assessment. Students have had a lot of repetition at this point. Students learn the principles early on. Students need to realize that there are different refrigerant temps and pressures. Ex: review issues with airflow before temps/pressures.</p>	
<p><b>Measure 3.2</b></p> <p>Students will present results from evaporator temperature split analysis to a mock customer (presentation &amp; customer service skills, plus).</p> <p>Direct - Exam (Course)</p> <p><i>Residential Air Cond II: HACR 2520</i></p> <p><b>Target</b></p> <p>At least 70% of Air Conditioning and Refrigeration Program students will present results from evaporator temperature split analysis to a mock customer.</p>	<p><b>MET</b></p> <p>Measure 3.2</p> <p>■ Met ■ Not Met</p>  <p>0% 100%</p> <p>Met: 97%</p> <p>Not Met: 3%</p> <p>Met Total: 97%</p> <p>Not Met Total: 3%</p> <p><b>Analysis</b></p> <p>Most students excelled with this assessment. Students seemed to struggle with presenting the results to a customer. Some areas where students can improve are looking a customer in the eye, breaking down information at the customer's level, and overall social interaction skills.</p>	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Student expectations will be increased for the customer interaction portion of the assessment. This will reinforce the importance of this step in the process.</p> <p><b>Revise Benchmark / Target</b></p> <p><b>COMPLETE</b></p> <p>The performance targets for this measure will be increased to raise expectations. The performance standards will be increased in the next cycle to: At least 80% of Air Conditioning and Refrigeration Program students will present results from evaporator temperature split analysis to a mock customer.</p>

SLO 4: Operational System Faults

Detect faults in an operational system and present solutions.

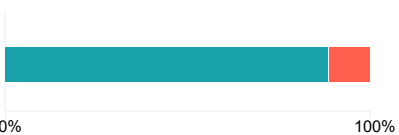
MEASURES	RESULTS	ACTIONS
<p><b>Measure 4.1</b></p> <p>Mechanical – Isolate mechanical fault and determine cause. (instructor will remove a part to create fault)</p> <p>Direct - Exam (Course)</p> <p><i>Residential Air Cond II: HACR 2520</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration Program students will identify the mechanical fault created by the instructor in a residential air conditioning unit and present proposed solutions.</p>	<p><b>MET</b></p> <p>Measure 4.1</p> <p>■ Met</p>  <p>0% 100%</p> <p><i>Values are not shown when too close to each other. Click or use arrow keys to see details.</i></p> <p>Met: 100%</p> <p>Met Total: 100%</p> <p>Not Met Total:</p> <p><b>Analysis</b></p> <p>Students spend a lot of time working on this skillset in class. Students encounter a lot of</p>	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Faculty will divert the focus to a system fault which helps students understand the connection of the system overall. Help students not rely on assumption but rely on sequence of operation to determine fault.</p>

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	<p>different kinds of problems to troubleshoot. Some students don't always understanding where to start because they are still developing their troubleshooting skills. Students have to develop their own sequence of operation.</p>									
<p><b>Measure 4.2</b></p> <p>Electrical - Isolate electrical fault and determine cause. (incorporate trainer)</p> <p>Direct - Exam (Course)</p> <p><i>Applied Elec &amp; Troubleshooting: HACR 1240</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration Program Students will isolate electrical fault and determine cause.</p>	<p><b>MET</b></p> <p>Measure 4.2</p> <p>■ Met ■ Not Met</p>  <table border="1"> <tr> <td>Met:</td> <td>90%</td> </tr> <tr> <td>Not Met:</td> <td>10%</td> </tr> <tr> <td>Met Total:</td> <td>90%</td> </tr> <tr> <td>Not Met Total:</td> <td>10%</td> </tr> </table> <p><b>Analysis</b></p> <p>Students are presented with many opportunities to troubleshoot electrical faults. They use critical thinking skills to analyze the issue. Students struggle to figure out how to start the process until they develop an order of operation that works for them. This is a fairly advanced assessment.</p>	Met:	90%	Not Met:	10%	Met Total:	90%	Not Met Total:	10%	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>Students need more opportunities for "failure" without the instructor walking them through it directly. This allows students to sharpen their critical thinking skills individually.</p>
Met:	90%									
Not Met:	10%									
Met Total:	90%									
Not Met Total:	10%									

SLO 5: Facilitate service request

Facilitate service requests effectively and efficiently through a commitment to high standards of professionalism.

MEASURES	RESULTS	ACTIONS								
<p><b>Measure 5.1</b></p> <p>Interaction with customer via a service call (Lab Activity 7) – Rubric will be developed based on lab activity and elements of professionalism</p> <p>Direct - Exam (Course)</p> <p><i>HVAC Introduction: HACR 1150</i></p> <p><b>Target</b></p> <p>At least 90% of Air Conditioning and Refrigeration Program Students will complete the customer service exercise with a rubric score of 80% or better.</p>	<p><b>NOT MET</b></p> <p>Measure 5.1</p> <p>■ Met ■ Not Met</p>  <table border="1"> <tr> <td>Met:</td> <td>89%</td> </tr> <tr> <td>Not Met:</td> <td>11%</td> </tr> <tr> <td>Met Total:</td> <td>89%</td> </tr> <tr> <td>Not Met Total:</td> <td>11%</td> </tr> </table> <p><b>Analysis</b></p> <p>This assessment takes a significant amount of time to implement due to the individual nature. Faculty have to work one-on-one with each student. Students work in a mock customer service situation. Some students are too worried about upsetting customers so they struggle with presenting honest/accurate information. Social skills can also become an issue.</p>	Met:	89%	Not Met:	11%	Met Total:	89%	Not Met Total:	11%	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p> <p>More emphasis will be placed on helping students understand to not get "too technical" and focus more on customer understanding.</p>
Met:	89%									
Not Met:	11%									
Met Total:	89%									
Not Met Total:	11%									
<p><b>Measure 5.2</b></p>	<p><b>MET</b></p> <p>Measure 5.2</p>	<p><b>Other - [Instructional Strategy]</b></p> <p><b>COMPLETE</b></p>								

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Written Exam on professionalism related to service requests (Chapter 3)

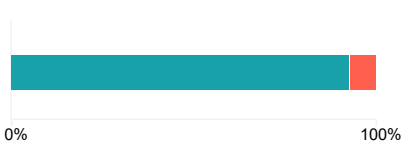
Direct - Exam (Course)

*HVAC Introduction: HACR 1150*

**Target**

At least 90% of Air Conditioning and Refrigeration Program Students will achieve a written exam score of 80% or better (Chapter 3)

■ Met ■ Not Met



Met: 93%  
Not Met: 7%  
Met Total: 93%  
Not Met Total: 7%

**Analysis**

This is a multiple choice exam that students have a lot of time to prepare for. The textbook lays out an example customer service situation. Students who participate in the lecture and complete the chapter reading usually perform at a high level.

Faculty will spend more time on the performance evaluation so that understanding is strengthened prior to attempting the written exam.