

DESE Model Curriculum

GRADE LEVEL/UNIT TITLE: 9-12 / HVAC — System Installation and Maintenance

Course Code: CONSTRUCTION

COURSE INTRODUCTION: HVAC

This course is designed to provide the HVAC (Heating, Ventilation, and Air Conditioning) student with a solid background in the principles of HVAC systems and the practices of installing and maintaining them.

Units in this course include:

1. System Basics
2. System Components
3. System Installation and Upkeep

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<p>UNIT DESCRIPTION: System Installation and Upkeep These lessons are design to build upon the previous units to provide the HVAC student with the culmination of knowledge and skills necessary to install and maintain different types of HVAC systems. Topics covered include system installation, maintenance, and troubleshooting of multiple systems and system components.</p>	<p>SUGGESTED UNIT TIMELINE: 3 lessons Lesson 1: Basic Installation and Maintenance Lesson 2: Troubleshooting, Part 1 Lesson 3: Troubleshooting, Part 2 CLASS PERIOD (min.): 90 minutes</p>					
<p>ESSENTIAL QUESTIONS:</p> <ol style="list-style-type: none"> 1. What are the various connectors used in HVAC systems? How are they used? 2. How are HVAC systems properly installed and maintained? 3. How are leaks detected and corrected within HVAC systems? 4. How are electrical problems detected and corrected within HVAC systems? 5. How are problems with cooling systems detected and corrected? 6. How are problems with heating systems (and heat pumps) detected and corrected? 						
<p style="text-align: center;">ESSENTIAL MEASURABLE LEARNING OBJECTIVES CCSS LEARNING GOALS (Anchor Standards/Clusters) CROSSWALK TO STANDARDS</p>						
1. Students will identify the various connectors for HVAC systems and describe their uses.				L 9-10.1 L 9-10.2 L 11-12.1 L 11-12.2	3212-07	Level 1
2. Students will identify improper installation methods and accurately describe the proper alternatives and maintenance practices.				L 9-10.1 L 9-10.2 L 9-10.4 L 9-10.6 L 11-12.1 L 11-12.2 L 11-12.4 L 11-12.6 WHST 9-10.1 WHST 9-10.4 WHST 9-10.8	03212-07	Level 2

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				WHST 9-10.10 WHST 11-12.1 WHST 11-12.4 WHST 11-12.8 WHST 11-12.10 RST 11-12.9		
3. Students will describe the proper methods of troubleshooting and correcting leaks and electrical problems within HVAC systems.				L 9-10.1 L 9-10.2 L 9-10.4 L 9-10.6 L 11-12.1 L 11-12.2 L 11-12.4 L 11-12.6 WHST 9-10.1 WHST 9-10.4 WHST 9-10.8 WHST 9-10.10 WHST 11-12.1 WHST 11-12.4 WHST 11-12.8 WHST 11-12.10 RST 11-12.9	03205-07 03208-07	Level 3
4. Students will describe the proper methods of troubleshooting and correcting problems within heating and cooling systems, including their components.				L.9-10.1 L.9-10.2 L.9-10.4 L.9-10.6 L.11-12.1 L.11-12.2 L.11-12.4 L.11-12.6	03210-07 03209-07 03311-08	Level 3

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ASSESSMENT DESCRIPTIONS*: (Write a brief overview here. Identify Formative/Summative. Actual assessments will be accessed by a link to PDF file or Word doc.)

Students will demonstrate their understanding of content and ability to apply learned skills by:

- Verbally identifying and describing the purposes of HVAC connectors (Formative)
- Identifying in writing improper installation and maintenance practices seen in photographs of installations, the resulting disrepair in the HVAC systems, and the proper practices that should have been used (and that would have solved/prevented the problem shown in the photograph). (Summative)
- Design flowcharts to guide troubleshooting in HVAC systems (Summative)

***Attach Unit Summative Assessment, including Scoring Guides/Scoring Keys/Alignment Codes and DOK Levels for all items. Label each assessment according to the unit descriptions above (i.e., Grade Level/Course Title/Course Code, Unit #).**

Obj. #	INSTRUCTIONAL STRATEGIES (research-based): (Teacher Methods)
1, 2, 3, 4	Direct: Instructor lectures.
Obj. #	INSTRUCTIONAL ACTIVITIES: (What Students Do)
1, 2	Demonstrations
2, 3, 4	Writing to Inform

UNIT RESOURCES: (include Internet addresses for linking)

Support documents:

- [HACK ATTACK RUBRIC]
- [TROUBLESHOOTING FLOWCHART RUBRIC]

Internet resources:

- Air Conditioning Contractors of America (www.acca.org)
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) (<http://www.ashrae.org/>)
- Refrigeration Service Engineers Society (RSES) (<http://www.rses.org/>)
- <http://hvacfun.com/>
- <https://www.lucidchart.com/>
- <http://www.achrnews.com/keywords/4364-hvac-troubleshooting>
- <http://hvacfun.com/tt-tech-tips-index.htm>
- <http://www.hvacpartsoutlet.com/troubleshootingguides.aspx>

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Resources available from MCCE free loan library (www.mcce.org):

- T&I DVD ROM 11.2
HVAC Basics: Residential Heating and Ventilation
Shopware
LAWRENCEVILLE, NJ, FILMS MEDIA, 2008.
DVD ROM — This program illustrates several different types of heating systems, including forced-air gas furnaces, high-efficiency furnaces, and hot air systems. Different types of ignition and fuels are covered, along with the major elements of gas furnaces, including solenoids, burners, manifolds, heat exchangers, and more. Air flow components such as supply and return plenums, air filters, and split capacitor motors are also explained, in addition to thermostats, pilot safety switches, and gas valves. Viewers will get a look at the automated service centers at the heart of many modern large office buildings, which maintain climate control using high-tech sensors and adjustment systems. 24 minutes.
- T&I DVD ROM 11.3
HVAC Basics: Residential Air Conditioning
Shopware
LAWRENCEVILLE, NJ, FILMS MEDIA, 2008.
DVD ROM — This program, summarizes air conditioning operation and service. Typical systems for cooling or dehumidifying residential environments are covered. Details on condensing units and their components—including the condenser coil, compressor, motor, fan, and accumulator—are illustrated along with typical outside housings and insulation materials. The three methods of heat transfer—conduction, convection, and radiation—are outlined, along with the difference between high side and low side pressure systems. The refrigeration cycle is demonstrated, as are different types of compressors, such as scroll, reciprocating, and piston. Heat pumps, electrical controls, evaporators, and sight glasses are explained. 21 minutes.