Y2 Q4 Unit 9 HVAC Systems

Content Area: **Integrated Technical Arts**
Course(s): **Building and Construction: Building Technology**
Time Period: **April**
Length: **11 weeks**
Status: **Published**

Career Readiness, Life Literacy and Key skills

TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

Unit Overview & Pacing Outline

In this unit of study, students will explore the use of hand tools and become aclimated to their applications in and around the home.

- Personal and lab safety will be emphasized as various tools are introduced into lab sessions.
- Students will engage in career research relative to this unit of study.
- Environmentally friendly themes are discussed in this unit.

Topics & Pacing:

1. Careers in Heating, Ventilation, Air Conditioning, and Refrigeration
2. Hand Tools
3. Fasteners
4. Working with Copper Tubing
5. Working with Pipe
6. Soldering
7. Brazing and Flame Cutting
8. Mathematics for Technicians
9. Basic Thermodynamic Principles

10. Temperature and Pressure
11. Basic Refrigeration Cycle
12. Other System Components
13. Refrigerants
14. Zeotropic Blends
15. Refrigerant Recovery and Recycling
16. System Evacuation, Leak Detection, and Recharging
17. Working with Metering Devices
18. Special-Purpose Valves
19. Troubleshooting Refrigerant Flow Controls
20. Compressors
21. Compressor Lubrication and Accessories
22. Water Chillers
23. What Is Electricity?
24. Power Transmission and Circuits
25. Induction Motors
26. Electromagnetic Control Devices
27. Motor Controls
28. Defrost Cycles
29. Ductwork
30. Gas Heat with Air Conditioning
31. Oil Heat with Air Conditioning
32. Electric Heat with Air Conditioning
33. Heat Pumps
34. Customer Relations

Enduring Understandings

Through the delivery of the unit outlined above, students will understand:

- the contractual relationships between all parties involved in the building process.
- scheduling practices which ensure the successful completion of a construction project.
- the importance of maintaining jobsite safety.
- how to safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.
- troubleshooting procedures when solving a maintenance problem in buildings.

- the importance of preventative maintenance activities to service existing buildings.

Essential Questions & Skills

What are the safety concerns to be considered when working in a lab setting in school or on the job?

What protection can be used in a laboratory environment? What should be part of an effective safety program? What characteristics are essential to a functional team?

What are the benefits of working in a team environment as opposed to individually?

Why is planning an important aspect to project work?

How does planning influence efficiency?

Why is planning vital to material usage and construction?

How is the design of a product influenced by planning?

Standards/Indicators & SLOs

PATHWAY: CONSTRUCTION (AC-CST)

9.3.12.AC-CST.1 Describe contractual relationships between all parties involved in the building process.
9.3.12.AC-CST.2 Describe the approval procedures required for successful completion of a construction project.
9.3.12.AC-CST.3 Implement testing and inspection procedures to ensure successful completion of a construction project.
9.3.12.AC-CST.4 Apply scheduling practices to ensure the successful completion of a construction project.
9.3.12.AC-CST.5 Apply practices and procedures required to maintain jobsite safety.
9.3.12.AC-CST.6 Manage relationships with internal and external parties to successfully complete construction projects.
9.3.12.AC-CST.7 Compare and contrast the building systems and components required for a construction project.
9.3.12.AC-CST.8 Demonstrate the construction crafts required for each phase of a construction project.
9.3.12.AC-CST.9 Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.

PATHWAY: MAINTENANCE/OPERATIONS (AC-MO)

9.3.12.AC-MO.1 Recognize and employ universal construction signs and symbols to function safely in the workplace.
9.3.12.AC-MO.2 Use troubleshooting procedures when solving a maintenance problem in buildings.
9.3.12.AC-MO.3 Apply construction skills when repairing, restoring or renovating existing buildings.
9.3.12.AC-MO.4 Determine work required to repair or renovate an existing building.
9.3.12.AC-MO.5 Plan and practice preventative maintenance activities to service existing buildings.
9.3.12.AC-MO.6 Maintain and inspect building systems to achieve safe and efficient operation of buildings.

Lesson Titles

Hand Tools

Fasteners

Working with Copper Tubing

Working with Pipe

Soldering

Brazing and Flame Cutting

Mathematics for Technicians

Basic Thermodynamic Principles

Temperature and Pressure

Basic Refrigeration Cycle

Other System Components

Refrigerants

Refrigerant Recovery and Recycling

System Evacuation, Leak Detection, and Recharging

Working with Metering Devices Special-Purpose Valves

Troubleshooting Refrigerant Flow Controls

. Compressors

Compressor Lubrication and Accessories

Water Chiller

What Is Electricity?

Power Transmission and Circuits

Induction Motors

Electromagnetic Control Devices

Motor Controls

Ductwork

Gas Heat with Air Conditioning

Oil Heat with Air Conditioning

Electric Heat with Air Conditioning

Heat Pumps

Inter-Disciplinary Connections

CAEP.9.2.12.C	Career Preparation
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.
CAEP.9.2.12.C.7	Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.
CAEP.9.2.12.C.8	Assess the impact of litigation and court decisions on employment laws and practices.
CAEP.9.2.12.C.9	Analyze the correlation between personal and financial behavior and employability.

Anticipatory Set

Stated in daily lesson plans and posted via Smartboard, blackboard, or as per teacher instructions.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

Group students based on topic knowledge

Create pods with student captains

Create tiered lessons

Create handouts for common questions

Include hands-on activities and projects

Provide study guides, worksheets, and notes

Flip your classroom

Use the Think-Pair-Share method

Try digital curriculum

Modifications: At Risk Learner

- Additional time for assignments
- Adjusted assignment timelines
- Agenda book and checklists
- Answers to be dictated
- Assistance in maintaining uncluttered space
- Books on tape
- Concrete examples
- Extra visual and verbal cues and prompts
- Follow a routine/schedule
- Graphic organizers
- Have students restate information
- No penalty for spelling errors or sloppy handwriting
- Peer or scribe note-taking
- Personalized examples
- Preferential seating
- Provision of notes or outlines
- Reduction of distractions

- Review of directions
- Review sessions
- Space for movement or breaks
- Support auditory presentations with visuals
- Teach time management skills
- Use of a study carrel
- Use of mnemonics
- Varied reinforcement procedures
- Work in progress check

Modifications: ELL

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- Choice of test format (multiple-choice, essay, true-false)
- Continue practicing vocabulary .
- Provide study guides prior to tests .
- Read directions to the student .
- Read test passages aloud (for comprehension assessment) .
- Vary test formats .

Modifications: 504 & IEP

- Allow for redos/retakes
- Assign fewer problems at one time (e.g., assign only odds or evens)
- Differentiated center-based small group instruction
- Extra time on assessments
- Highlight key directions
- If a manipulative is used during instruction, allow its use on a test
- Opportunities for cooperative partner work
- Provide reteach pages if necessary
- Provide several ways to solve a problem if possible
- Provide visual aids and anchor charts
- Test in alternative site
- Tiered lessons and assignments

- Use of a graphic organizer
- Use of concrete materials and objects (manipulatives)
- Use of word processor

Modifications: G&T

- Alternate assignments/enrichment assignments
- Enrichment projects
- Extension activities
- Higher-level cooperative learning activities
- Pairing direct instruction with coaching to promote self-directed learning
- Provide higher-order questioning and discussion opportunities
- Provide texts at a higher reading level
- Tiered assignments
- Tiered centers

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Formative Assessment

Unit formative assessments are drawn from, but not limited to:

- Observations during in-class activities; of students' non-verbal feedback during lecture.
- Homework exercises as review for exams and class discussions.
- Reflections journals that are reviewed periodically during the semester.
- Question and answer sessions, formal—planned and informal—spontaneous.
- Conferences between the instructor and student at various points in the semester.
- In-class activities where students informally present their results.
- Student feedback collected by periodically answering specific question about the instruction and their self-evaluation of performance and progress.

Benchmark Assessments

Skills-based assessment

Reading response

Writing prompt

Lab practical

Summative Assessment

Summative assessments are related specifically to material covered in the current unit of study.

- Quiz, Test, MP Assessment.
- Final examination (a truly summative assessment).
- Term papers (drafts submitted throughout the semester would be a formative assessment).
- Projects (project phases submitted at various completion points could be formatively assessed).
- Portfolios (could also be assessed during its development as a formative assessment).
- Performances, Speeches, Critiques.
- Student evaluation of the course (teaching effectiveness).
- Instructor self-evaluation.

Resources & Materials

- Heating & Cooling Essentials, Goodheart-Wilcox, 2016

- Instructional videos from various sources
- Construction Technology 4th Edition
- Core Curriculum 5th Edition
- Hand and Power Tools as Needed

Technology

- Chromebooks, Google Drive Storage & Related Google Apps
- MS Office Software as Needed
- SmartBoard Presentations and Peripheral Technology
- Smartphones
- Power Tools as Needed

TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS1	Identify and define authentic problems and significant questions for investigation.
TECH.8.1.12.F.CS2	Plan and manage activities to develop a solution or complete a project.