Implementation date
Fall 2010

PROGRAM CONCENTRATION: **Architecture, Construction, Communications & Transportation**

CAREER PATHWAY: **CLIMATE CONTROL SYSTEMS TECHNOLOGY**

COURSE TITLE: **Heating, Ventilation, Air Conditioning and Refrigeration I**

This course is preceded by Introduction to Mechanical Systems. The course is the second of three courses that provides the trainee a solid foundation in HVACR skills and knowledge and the concepts involved with conditioning air within a given space. It is the third step in gaining a Level One Industry Certification in HVAC.

This course builds on the concepts of math concepts introduced in Occupational Safety. It provides knowledge of the hardware and systems used by an HVACR technician and the basic skills to install them. It provides a general knowledge of refrigeration and heating processes including the electronic circuitry. It also shows the integration between the electrical and HVACR fields. It provides an understanding of joining and piping practices in HVACR systems. It provides an introduction to the skills and knowledge of conduit bending and installation.

ACCT -HVACR1-1 Students will understand and apply math concepts as applied to HVACR.

a. Solve algebraic equations that relate to the HVACR trade.
b. Calculate volume, weight, pressure, vacuum, and temperature.
c. Construct simple geometric figures and solve basic geometry problems that relate to the HVACR trade.

Academic Standard(s):

MC2A2. Students will solve simple equations

a. *Solve quadratic equations in the form $ax^2 + bx + c = 0$, where $a = 1$, by using factorization and finding square roots where applicable*

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

b. *Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.*

MM1P3. Students will communicate mathematically.

c. *Use the language of mathematics to express mathematical ideas precisely*

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ACCT -HVACR1-2 Students will use hand and power tools associated with the HVACR trade in a professional and safe manner.

a. Demonstrate the ability to correctly use the following: pipe wrenches, torque wrenches, hammers and mallets, tin snips, hand and power hacksaws, drills, and measuring instruments.
b. Describe the general procedures for maintenance of hand and power tools.
c. Describe or demonstrate the safety precautions that must be followed when using hand and power tools.

Academic Standard(s):

MM1P3. Students will communicate mathematically

b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.

SSCG15. The student will explain the functions of the departments and agencies of the federal bureaucracy.

d. Compare and contrast the organization and responsibilities of independent regulatory agencies, government corporations, and executive agencies.

ACCT -HVACR1-3 Students will understand the selection, handling, methods of joining, installation, and supporting of HVACR pipe and tubing.

a. Describe procedures and precautions that must be taken when preparing and installing HVACR piping.
b. Select, prepare, and join tubing and piping using various fittings.
c. Braze and solder copper tubing and fittings in a safe and professional manner
d. Demonstrate correct preparation and installation of PVC and Ferrous Metal Piping.

Academic Standard(s):

SSCG18 The student will demonstrate knowledge of the powers of Georgia's state and local governments

a. Analyze the services provided by state and local government.

ELAALRC3 The student acquires new vocabulary in each content area and uses it correctly. The student

b. Uses content vocabulary in writing and speaking

ELAALRL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing. The student

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a. Identifies and correctly uses idioms, cognates, words with literal and figurative meanings, and patterns of word changes that indicate different meaningsor functions.

ACCT -HVACR1-4 Students will understand electrical circuitry associated with the HVACR trade.

a. Describe how voltage, current, resistance and power are related.
b. Describe the differences between series and parallel circuits.
c. Recognize and describe the purpose and operation of the various electrical components used in HVACR equipment.
d. Make voltage, current, and resistance measurements using electrical test equipment.
e. State and demonstrate safety precautions that must be followed when working on electrical equipment.

Academic Standard(s):
MM1P3. Students will communicate mathematically.

d. Use the language of mathematics to express mathematical ideas precisely.

SSCG15 The student will explain the functions of the departments and agencies of the federal bureaucracy

a. Compare and contrast the organization and responsibilities of independent regulatory agencies, government corporations, and executive agencies

SPS10 Students will investigate the properties of electricity and magnetism

c. Explain the flow of electrons in terms

- *alternating and direct current.*
- *the relationship among voltage, resistance and current.*
- *simple series and parallel circuits*

c. Investigate applications of magnetism and/or its relationship to the movement of electrical charge as it relates to

- *electromagnets*
- *simple motors*
- *permanent magnets*

ACCT -HVACR1-5 Students will demonstrate an understanding of how an HVACR system conditions and cools the air within a specified space.

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a. Demonstrate an understanding of the basic refrigeration cycle.
b. Recognize the major components of a cooling system and explain how they operate.
c. Identify refrigerants and demonstrate procedures for safe handling of them.
d. Use temperature and pressure measuring instruments to evaluate the condition of the system.

Academic Standard(s):

SSCG15 The student will explain the functions of the departments and agencies of the federal bureaucracy

a. Compare and contrast the organization and responsibilities of independent regulatory agencies, government corporations, and executive agencies

SPS5 Students will compare and contrast the phases of matter as they relate to atomic and molecular motion

b. Relate temperature, pressure, and volume of gases to the behavior of gasses.

ELAALRC3 The student acquires new vocabulary in each content area and uses it correctly. The student

b. Uses content vocabulary in writing and speaking.
c. Explores understanding of new words found in subject area texts.

ACCT -HVACR1-6 Students will demonstrate an understanding of how an HVACR system conditions and heats the air within a specified space.

a. Explain the three methods of heat transfer.
b. Recognize the major components of a forced air furnace (gas and electric) and explain their function.
c. State the factors that must be considered when installing a furnace.
d. Perform preventive maintenance procedures such as cleaning and filter replacement.

Academic Standard(s):

SPS7 Students will relate transformations and flow of energy within a system

a. Identify energy transformations within a system (e.g. lighting of a match).

ELAALRC3 The student acquires new vocabulary in each content area and uses it correctly. The student

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b. Uses content vocabulary in writing and speaking
c. Explores understanding of new words found in subject area texts

Reading Across the Curriculum

Reading Standard Comment
After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

Students will enhance reading in all curriculum areas by:

a. Reading in all curriculum areas
   - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
   - Read both informational and fictional texts in a variety of genres and modes of discourse.
   - Read technical texts related to various subject areas.

b. Discussing books
   - Discuss messages and themes from books in all subject areas.
   - Respond to a variety of texts in multiple modes of discourse.
   - Relate messages and themes from one subject area to messages and themes in another area.
   - Evaluate the merit of texts in every subject discipline.
   - Examine author's purpose in writing.
   - Recognize the features of disciplinary texts.

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- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

d. Establishing context

- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

FOUNDATION SKILLS

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: *Learners achieve state academic standards at or above grade level.*

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: *Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.*

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

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CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: *Learners plan and manage academic-career plans and employment relations.*

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.