



8996

HEATING, VENTILATION, AND
AIR CONDITIONING SYSTEMS
(9)

40S / 40E / 40M

A Refrigeration and Air Conditioning Technology
Course

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HEATING, VENTILATION, AND
AIR CONDITIONING SYSTEMS (12D)
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Course Description

A student wanting to develop skills in the refrigeration and air conditioning industry must have knowledge of heating, ventilation, and air conditioning fundamentals. The student will learn how to fabricate and assemble ducting systems and related equipment. The student will also learn the basic theory of combustion and how warm air heating systems work. The student will be able to use basic troubleshooting techniques to diagnose and repair basic heating and cooling equipment.

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the **maintenance of a safe workspace**.

GLO 1.1: Create and maintain a **safe working environment** in machining technology.

- SLO 12C.1.1.1 Demonstrate awareness of the principles of workplace hazards surrounding HVAC environments.
- SLO 12C.1.1.2 Demonstrate awareness of the principles of Workplace Hazardous Materials Information Systems (WHMIS) as they apply to the refrigeration and air conditioning service and repair industry. (A3.11)
- SLO 12C.1.1.3 Describe the purpose of Material Safety Data Sheets (MSDS).
- SLO 12C.1.1.4 Describe workplace health and safety procedures (e.g., S.A.F.E., right to refuse). (A3.11)
- SLO 12C.1.1.5 Follow safety information on supplier labels.
- SLO 12C.1.1.6 Identify the process for reporting injuries.
- SLO 12C.1.1.7 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain). (A3.7)
- SLO 12C.1.1.8 Identify fire prevention and control strategies.
- SLO 12C.1.1.9 Identify emergency evacuation and response procedures.

GLO 1.2: Create and maintain a **safe working environment**.

- SLO 12C.1.2.1 Identify hazards and precautions working with and around air handling equipment.

- SLO 12C.1.2.2 Identify hazards and precautions working with and around energized equipment. (A12.2)
- SLO 12C.1.2.3 Identify and report hazards (e.g., electrical safety, ergonomics, material handling, and chemical) related to processes, materials, tools, and equipment used in the refrigeration and air conditioning shop.
- SLO 12C.1.2.4 Follow the directions of the teacher/supervisor in regards to safe work practices.
- SLO 12C.1.2.5 Follow safe practices and procedures for facilities, processes, materials, tools, and equipment used in the refrigeration and air conditioning shop (e.g., equipment used in the refrigeration and air conditioning shop (e.g., keep work area clean and organized, avoid horseplay). keep work area clean and organized, avoid horseplay).
- SLO 12C.1.2.6 Describe and use appropriate personal protective equipment. (e.g., gloves, safety glasses or goggles, hearing protection, respirator mask, etc.). (A3.2)
- SLO 12C.1.2.7 Locate first aid and eyewash station.
- SLO 12C.1.2.8 Identify and report hazards (e.g., electrical, ergonomic, material handling, chemicals, and spills) related to materials, processes, tools and equipment used in the refrigeration and air conditioning facility.

Goal 2: Demonstrate the safe and appropriate selection, operation, and management of shop equipment and tools.

GLO 2.1: Demonstrate the safe and appropriate selection, operation, and management of shop equipment and tools.

- SLO 12C.2.1.1 Demonstrate the safe and appropriate selection, operation, and management of equipment and tools used to manipulate sheet metal.

Goal 3: Demonstrate the safe and appropriate selection and utilization of materials.

GLO 3.1 Demonstrate the safe and proper appropriate selection and utilization of fasteners and supports.

- SLO 12C.3.1.1 Identify and describe proper selection and application of fasteners and supports.

GLO 3.2 Demonstrate the safe and proper manipulation of piping and tubing.

- SLO 12C.3.2.1 Describe and demonstrate the proper selection, set-up, modification, and manipulation of related piping and tubing systems.

GLO 3.3 Demonstrate the safe and appropriate manipulation of **sheet metal**.

SLO 12C.3.3.1 Demonstrate the safe and appropriate manipulation of sheet metal.

Goal 4: Install heating, cooling, and refrigeration equipment.

GLO 4.1 Demonstrate an awareness of the **installation requirements** for heating, cooling, and refrigeration equipment.

SLO 12C.4.1.1 Identify proper system types for various installation applications.

GLO 4.2 Demonstrate the appropriate installation of heating, cooling, and refrigeration equipment.

SLO 12C.4.2.1 Demonstrate appropriate installation of heating, ventilation, and air conditioning systems.

GLO 4.3: Test and document refrigeration and air conditioning systems.

SLO 12C.4.3.1 Test HVAC/R systems, and record pressures and temperatures.

Goal 5: Diagnose and repair heating, cooling, and refrigeration equipment.

GLO 5.1: Diagnose problems in heating, cooling, and refrigeration equipment.

SLO 12C.5.1.1 Diagnose problems in HVAC/R equipment.

GLO 5.2: Repair heating, cooling, and refrigeration equipment.

SLO 12C.5.2.1 Perform necessary repairs to heating, ventilation, and air conditioning systems.

Goal 6: Service heating, cooling, and refrigeration equipment.

GLO 6.1: Demonstrate awareness of the **servicing needs** of heating, cooling, and refrigeration equipment.

SLO 12C.6.1.1 Identify service and maintenance required for heating ventilation and air conditioning systems.

GLO 6.2: Demonstrate the appropriate **servicing** of heating, cooling, and refrigeration equipment.

SLO 12C.6.2.1 Perform service and testing for heating, ventilation, and air conditioning systems.

Goal 7: Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to the refrigeration and air conditioning service and repair industry.

GLO 7.1: Demonstrate skills from **information and communication technology**.

No applicable SLO.

GLO 7.2: Read, interpret, and communicate information relevant to the refrigeration and air conditioning service and repair industry.

SLO 12C.7.2.1 Apply use of manuals to commission, repair, and maintenance of heating, ventilation, and air conditioning systems.

GLO 7.3: Apply the knowledge and skills related to the refrigeration and air conditioning service and repair industry from **mathematics**.

SLO 12C.7.3.1 Apply necessary mathematical formulas to make air movement calculations.

GLO 7.4: Apply knowledge and skills from the sciences to the refrigeration and air conditioning service and repair industry.

No applicable SLO.

Goal 8: Demonstrate awareness of **sustainability** as it pertains to the refrigeration and air conditioning service and repair industry.

GLO 8.1: Describe the impact of human **sustainability** on the health and well-being of refrigeration and air conditioning mechanics and their clients.

SLO 12A.8.1.1 Discuss the long-term health and human sustainability concerns for refrigeration and air conditioning technicians.

SLO 12C.8.1.2 Discuss the contribution of refrigeration and air cooling systems to human health and well-being.

GLO 8.2: Describe the refrigeration and air conditioning industry's **sustainability practices and impact on the environment.**

SLO 12C.8.2.1 Discuss the need to recover refrigerants to prevent their release into the environment.

SLO 12C.8.2.2 Discuss new innovations in high-efficiency equipment.

GLO 8.3: Describe **sustainable business practices** within the refrigeration and air conditioning service and repair industry.

SLO 12C.8.3.1 Discuss some of the factors that help sustain a business in the long term (e.g., quality of work, good customer relations, working conditions, etc.).

Goal 9: Demonstrate awareness of the **ethical and legal standards** as they pertain to the refrigeration and air conditioning service and repair industry.

GLO 9.1: Practice the **ethical and legal standards** as they pertain to the refrigeration and air conditioning service and repair industry.

SLO 12C.9.1.1 Demonstrate an understanding of codes and regulations related to heating, ventilation, and air conditioning systems.

Goal 10: Demonstrate **employability skills** related to the refrigeration and air conditioning service and repair industry.

GLO 10.1: Demonstrate fundamental **employability skills.**

SLO 12C.10.1.1 Demonstrate critical-thinking and problem-solving skills.

SLO 12C.10.1.2 Demonstrate regular attendance and punctuality.

SLO 12C.10.1.3 Demonstrate accountability by taking responsibility for their actions.

SLO 12C.10.1.4 Demonstrate adaptability, initiative, and effort.

SLO 12C.10.1.5 Demonstrate the ability to accept and follow direction and feedback.

SLO 12C.10.1.6 Demonstrate the ability to stay on task and to use time in class and in the shop effectively.

SLO 12C.10.1.7 Demonstrate the ability to communicate respectfully with co-workers and customers.

GLO 10.2: Demonstrate an understanding of the **business operation** of a refrigeration and air conditioning service and repair shop.

SLO 12C.10.2.1 Discuss how the work of refrigeration and air conditioning technicians contributes to the business operation of a facility.

Goal 11: Understand **career opportunities** in the refrigeration and air conditioning service and repair industry and associated professions.

GLO 11.1: Describe **education and career opportunities** and **professional organizations** in the refrigeration and air conditioning service and repair industry and associated professions.

SLO 12C.11.1.1 Discuss the opportunities for employment in the refrigeration and air cooling industry.

Goal 12: Understand the **evolution, technological progression, and emerging trends** in the refrigeration and air conditioning service and repair industry.

GLO 12.1: Describe the **evolution, technological progression, and emerging trends** in the refrigeration and air conditioning service and repair industry.

SLO 12C.12.1.1 Discuss new trends in heating, ventilation, and air conditioning systems.

