



8988

SYSTEM FUNDAMENTALS (9)

30S / 30E / 30M

A Refrigeration and Air Conditioning Technology  
Course



# 8988 SYSTEM FUNDAMENTALS (12D)

## 30S / 30E / 30M

### Course Description

A student wanting to develop skills in the refrigeration and air conditioning service and repair industry must have knowledge of the basic principles of the refrigeration cycle and components, and the basic hand tools necessary to test and install equipment and fabricate sheet metal ducting. The student will learn the procedures to assemble various parts and components.

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**Goal 1:** Describe and apply appropriate **health and safety** practices as they apply to refrigeration and air conditioning.

**GLO 1.1:** Describe and apply appropriate **health and safety** practices.

- SLO 11A.1.1.1 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 11A.1.1.2 Describe the purpose of Material Safety Data Sheets (MSDS).
- SLO 11A.1.1.3 Describe workplace health and safety procedures (e.g., S.A.F.E., right to refuse). (A3.11)
- SLO 11A.1.1.4 Demonstrate the ability to follow safety information on supplier labels.
- SLO 11A.1.1.5 Identify the process for reporting injuries.
- SLO 11A.1.1.6 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain). (A3.7)
- SLO 11A.1.1.7 Identify fire prevention and control strategies.
- SLO 11A.1.1.8 Identify emergency evacuation and response procedures.
- SLO 11A.1.1.9 Identify hazards and describe safe work practices pertaining to air compressors.

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

- SLO 11A.1.2.1 Identify hazards and precautions working with and around energized equipment. (A12.2)
- SLO 11A.1.2.2 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 facility.
SLO 11A.1.2.3	Follow the directions of the teacher/supervisor with regard to safe work practices.
SLO 11A.1.2.4	Follow safe practices and procedures for facilities, processes, materials, tools, and equipment used in the refrigeration and air conditioning shop (e.g., keep work area clean and organized, avoid distractions).
SLO 11A.1.2.5	Describe and use appropriate personal protective equipment (e.g., gloves, safety glasses or goggles, hearing protection, respirator mask, etc.). (A3.2)
SLO 11A.1.2.6	Locate first aid and eyewash station.
SLO 11A.1.2.7	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.

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**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 11A.2.1.1	Demonstrate use of Freon recovery unit and vacuum pump.
SLO 11A.2.1.2	Identify types of specialized tools and equipment, and describe their applications. <ol style="list-style-type: none"> <li>a. Recovery and recycle</li> <li>b. Evacuation</li> <li>c. Charging (A4.5)</li> </ol>

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**Goal 3:** Demonstrate the safe and appropriate **use of materials**.

**GLO 3.1:** Demonstrate the safe and appropriate use of **fasteners and supports**.

No applicable SLOs.

**GLO 3.2:** Demonstrate the safe and proper manipulation of **pipng and tubing**.

No applicable SLOs.

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

No applicable SLOs.

**GLO 3.4:** Demonstrate the appropriate management of materials.

No applicable SLOs.

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**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 11A.4.1.1 Define terminology associated with compressors.
- SLO 11A.4.1.2 Describe the purpose and operating principles of the compressor in the refrigeration system.
- SLO 11A.4.1.3 Identify types of compressors, and describe their characteristics and applications (e.g., reciprocating, scroll, rotary, screw, centrifugal).
- SLO 11A.4.1.4 Identify compressor components, and describe their purpose and operation.
- SLO 11A.4.1.5 Identify cooling and lubrication of compressors.
- SLO 11A.4.1.6 Demonstrate operation of compressors.

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

- SLO 11A.4.2.1 Demonstrate appropriate installation of HVAC/R systems

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

- SLO 11A.4.3.1 Test and document refrigeration and air conditioning systems.

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**Goal 5: Repair** heating, cooling, and refrigeration equipment.

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

- SLO 11A.5.1.1 Identify problems in heating, cooling, and refrigeration equipment, and determine which components need repair/replacement.

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

- SLO 11A.5.2.1 Perform repairs to heating and cooling equipment.

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

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

SLO 11A.6.1.1 Identify service requirements for HVAC equipment.

SLO 11A.6.1.2 Perform services on HVAC equipment.

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**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**.

SLO 11A.7.1.1 Research topics related to heating and air conditioning service, repair, and technical bulletins using online resources.

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

SLO 11A.7.2.1 Research topics covered in installation and maintenance manuals and manufacturer information.

SLO 11A.7.2.2 Read, interpret, and communicate nameplate data.

SLO 11A.7.2.3 Read, interpret, and communicate information found on product labels.

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

SLO 11A.7.3.1 Apply mathematical formulas and techniques to related refrigeration and air conditioning calculations.

SLO 11A.7.3.2 Convert between Fahrenheit, Celsius, Kelvin, and Rankine systems of measurement.

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

SLO 11A.7.4.1 Describe heat flow and identify methods of heat transfer.

SLO 11A.7.4.2 Identify states of matter, and describe their characteristics.

SLO 11A.7.4.3 Describe basic gas laws associated with refrigeration, and perform calculations to demonstrate relationships.

SLO 11A.7.4.4 Describe the effect of pressure on evaporation, condensing, freezing, and melting temperatures.

- SLO 11A.7.4.5 Explain the operation of the vapour compression cycle.
  - SLO 11A.7.4.6 Identify components of a vapour compression cycle, and describe their purpose and operation.
  - SLO 11A.7.4.7 Describe the physical changes of the refrigerant as it circulates through the system.
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**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 society.

- SLO 11A.8.1.1 Discuss the long-term health hazards related to the service and maintenance of HVAC/R equipment.
- SLO 11A.8.1.2 Discuss the benefits of HVAC/R to the health and well-being of human beings.

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

- SLO 11A.8.2.1 Describe and apply appropriate disposal practices.
- SLO 11A.8.2.2 Discuss concerns regarding environmental damage attributed to HVAC equipment and products.

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

- SLO 11A.8.3.1 Describe sustainable business practices within the refrigeration and air conditioning industry
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**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:** Practise the **ethical and legal standards** as they pertain to the refrigeration and air conditioning service and repair industry.

- SLO 11A.9.1.1 Identify the ethical and legal expectations of HVAC/R technicians.
- SLO 11A.9.1.2 Identify the necessity for legal standards in the HVAC industry.

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

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

- SLO 11A.10.1.1 Demonstrate critical-thinking and problem-solving skills.
- SLO 11A.10.1.2 Demonstrate regular attendance and punctuality.
- SLO 11A.10.1.3 Demonstrate accountability by taking responsibility for their actions.
- SLO 11A.10.1.4 Demonstrate adaptability, initiative, and effort.
- SLO 11A.10.1.5 Demonstrate the ability to accept and follow direction and feedback.
- SLO 11A.10.1.6 Demonstrate teamwork skills.
- SLO 11A.10.1.7 Stay on task and use time effectively.
- SLO 11A.10.1.8 Communicate respectfully and effectively with coworkers and customers.

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

- SLO 11A.10.2.1 Discuss the importance of project management, and how each tradesperson's work affects the work of others, including those in other trades.

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**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 11A.11.1.1 Describe education and career opportunities and professional HVAC/R organizations.

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**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.

No applicable SLOs.



