1. Module details

Module name — **Industrial Refrigeration**

Module duration — 1 module (36-40hrs)

Module code — NR17.1

Discipline code — 0703320

2. Module purpose

The purpose of this module is to provide the students with the knowledge and skills in service, maintenance and repair tasks on industrial refrigeration systems and associated equipment.

3. Prerequisites

NR11, NR12

4. Relationship to competency standards

NES102, NES105, NES301

5. Content

1. **Applications**
   - Blast Freezers
   - Food production
   - Wine/beer production
   - Abattoirs
   - Bulk food storage & markets

2. **Refrigerants and Oils**
   - Types and applications
   - Codes and regulations
   - Safety and handling

3. **Components**
   - Compressors
     - Function
     - Screw compressors
     - Reciprocating compressors
     - Rotary vane compressors
     - Volumetric efficiency
     - Discharge temperatures
     - Maintenance requirements
     - Methods of compression
     - Applications
   - Evaporators
   - Metering devices
   - Flow Controls
   - Auxiliary equipment

4. **Industrial Systems**
   - Liquid recirculation
   - Dry expansion and flooded
   - Eutectic solutions
   - Continuous ice making
   - Freezing
   - Air blast
   - Liquid immersion
   - Surface contact
   - Chillers

5. **Servicing**
   - Testing
   - Maintenance
   - Fault finding and repairs

6. Assessment strategy

Assessment methods

Short answer questions, multiple choice questions, practical demonstration of skills

Conditions of assessment

7. Learning outcome details

Learning outcome 1

Describe the different types of industrial refrigeration systems used in industrial refrigeration

Assessment criteria

1.1 Identify the different industrial refrigeration systems

1.2 Explain the difference between short and long term holding

1.3 Explain the term liquid recirculation using a schematic diagram

1.4 Describe the principle operations of multiple systems used in industrial refrigeration

Learning outcome 2

Describe the function and operation of industrial refrigeration compressors

Assessment criteria

2.1 Identify various types of compressors used in industrial refrigeration. e.g. reciprocating, rotary vane, screw, compound

2.2 Explain and describe the terms volumetric efficiency & compression ratio as it relates to industrial refrigeration compressors

2.3 Plot and compare a single stage to a two stage operating system

	2.4 Describe and explain the procedures required for maintaining industrial refrigeration compressors
Learning outcome 3	**Describe the operation of industrial refrigeration plant, equipment and their accessories**
Assessment criteria	3.1 Identify various types of evaporators used in industrial refrigeration systems
	3.2 Identify various types of condensers used in industrial refrigeration systems
	3.3 Identify various types of metering devices used in industrial refrigeration systems
	3.4 Describe and list ancillary equipment installed in industrial refrigeration systems
	3.5 Identify various types of flow controls used in industrial refrigeration systems
	3.6 Identify various types of defrost methods used in industrial refrigeration systems
Learning outcome 4	**List the various refrigerants and oils suitable for use in industrial refrigeration**
Assessment criteria	4.1 Select the appropriate refrigerants to satisfy the requirements of several industrial refrigeration applications, listing the characteristics of each refrigerant
	4.2 List and describe the types of secondary refrigerants used in industrial refrigeration systems and identify their application
	4.3 Identify the appropriate oils for use in various industrial refrigeration applications
Learning outcome 5	**Describe the layout and design requirements of an industrial refrigeration plant**
Assessment criteria	5.1 Outline the principles of good plant design
	5.2 Identify practical considerations that need to be meet when designing pipe and component locations within the plant
	5.3 Identify the seasonal requirements on industrial refrigeration plants
	5.4 Describe the monitoring devices used in industrial refrigeration systems
Learning outcome 6	**Demonstrate the correct servicing and fault finding procedures required when servicing or monitoring an industrial refrigeration system**

Assessment criteria	6.1 Describe the maintenance procedures that are to be undertaken on an industrial refrigeration system 6.2 Identify systematic fault finding procedures for industrial refrigeration plants 6.3 List the methods used to locate refrigerant leaks on industrial refrigeration systems 6.4 List the correct procedures for charging industrial refrigeration systems 6.5 List the correct procedures for commissioning industrial refrigeration systems
Learning outcome 7	**List and explain the OH&S requirements, Codes of Practice, Australian Standards associated with the correct installation, operation and maintenance of an industrial refrigeration system**
Assessment criteria	7.1 Safe handling of refrigerants 7.2 Identify safety hazards related to industrial refrigeration systems 7.3 List and describe the safety equipment required for the safety hazards identified in 7.2 7.4 List and describe all monitoring equipment and procedures required for the operation and maintenance of industrial refrigeration systems 7.5 List and describe the necessary first aid and evacuation procedures in the event of a refrigerant spill 7.6 List the procedures required to notify the relevant emergency services in an emergency situation

8. Delivery of the module

Delivery strategy	Class room , practical workshop and site inspections
Resource requirements	Principles of Refrigeration. Dossat,R.J Reciprocating Refrigeration Manual. Trane Air Conditioning Industry Codes of practice Australian Standards • AS 1668.2 – 1991

	• AS 1670 – 1986 • AS/NZS 1677.1 – 1998 • AS/NZS 1677.2 - 1998
Occupational health and safety requirements	All necessary respirators and protective clothing must be available. Codes of practice concerning CFC/HCFC reduction must be observed All equipment must be able to be safely exposed during examination by the student