1. Module details

Module name

Compound Refrigeration Systems

Module duration

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 - 40 hours.

Module code

NUE352

Discipline code

0703310

2. Module purpose

The purpose of this module is to provide participants with the skills, knowledge and attitudes required to service and install low temperature equipment used in the refrigeration industry.

3. Prerequisites

NR17 Industrial Refrigeration.

4. Relationship to competency standards

This module provides part of the underpinning knowledge and skills in the 'Evidence Guide' of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from NUEITAB.

5. Content

Special low temperature equipment
Compressor problems
Suction pressures
Compressor ratios
Discharge temperatures
Capacity
Pressure enthalpy (PE) diagrams

Low temperature systems (applications)
Two stage
Cascade
Typical low temperature systems (construction)
Operation
Accumulators
Solenoid valves
Oil separators
Intercoolers
RMD
Pressure regulators
Brines
Pumps

Advantage of low temperature systems
Comparison
Characteristics
Calculations

6. Assessment strategy

Assessment methods

Assessment should be progressive reflecting a holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.

Conditions of assessment

Learning and assessment will take place in an environment that is conducive to a learner's development.

7. Learning outcome details

Learning outcome 1

Describe the reasons for using special low temperature equipment.

Assessment criteria

1.1 Explain the problems associated with low suction pressures.

1.2 Explain the effect of increased compression ratios on the capacity and discharge temperatures.

1.3 Plot stages on PE diagrams.

Learning outcome 2

Describe the differences between the low temperature systems used in the refrigeration industry.

Assessment criteria

2.1 Describe a two stage refrigeration system.

2.2 Describe a cascade refrigeration system.

2.3 Describe an indirect refrigeration system.

2.4 List the applications for the industrial refrigeration systems mentioned in 2.1, 2.2, 2.3.

Learning outcome 3	**Describe with the aid of schematic diagrams the fundamentals of operation and location of components of typical low temperature refrigeration systems.**
Assessment criteria	3.1 Draw schematic diagram of a two stage system. 3.2 Draw schematic diagram of a cascade system. 3.3 Describe the operation of a two stage system. 3.4 Describe and list ancillary equipment installed in industrial refrigeration systems. 3.5 Describe the operation of a cascade system. 3.6 Describe the operation of the following components for the above mentioned systems: - Accumulators - Intercoolers - Solenoid valves - Oil separators - Pressure regulators - RMD's 3.7 Describe the various refrigerants used in the systems mentioned above (include both primary and secondary refrigerants).
Learning outcome 4	**Outline the advantages of two stage, cascade systems.**
Assessment criteria	4.1 Outline the major differences between the systems. 4.2 Compare and contrast PE values of each system. 4.3 Describe the key characteristics of each system. 4.4 Describe the performance versus cost implications and the rationale for using one system over the other.

8. Delivery of the module

Delivery strategy	Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require learning outcome sequence other than that indicated in the module.
Resource requirements	Principles of Refrigeration. Dossat, R.J. Reciprocating Refrigeration Manual. Trane Air Conditioning.
Occupational health and safety requirements	A safe and healthy environment will be provided for students and teachers as well as the particular safety procedures followed as part of the learning / teaching activity and content.