1. Module details

Module name

REFRIGERATION SYSTEM ANALYSIS

Nominal duration

One module
It is anticipated that students will achieve the competencies specified in 35 to 40 hours.

Module codes

EA142

Discipline code

2. Module purpose

To provide the student with the knowledge and

3. Prerequisites

EA141 - Refrigeration Science

4. Relationship to competency standards

TBA

5. Content

1. Pressure Enthalpy Definitions
   - high pressure & low pressure refrigerants e.g. R124 & R23
   - triple point of new refrigerants
   - glide of trinary blends
   - differential evaporation of refrigerant blends
   - variable refrigerant volume

2. Refrigeration cycle
   - expansion process
   - vaporising process
   - compression process
   - condensing process
   - compression ratio

3. Enthalpy processes
   - co-efficient of performance
   - effect of suction temperature on cycle efficiency
   - effect of condensing temperature on cycle efficiency

4. Actual refrigerating cycles
   - effects of superheating suction vapour
   - superheating without useful cooling
   - superheating that produces useful cooling
   - superheating in suction piping outside the refrigerated space
   - superheating the vapour inside the refrigerated space
   - effects of subcooling the liquid
   - liquid - suction heat exchangers
   - effects of pressure losses resulting from friction

6. Learning outcome details

On the completion of this module, the learner will be able to:

Learning outcome 1

Identify the main processes with relation to a pressure enthalpy diagram.

Assessment criteria

Written short answer questions.

1.1 Define the following:
- sensible heat
- saturated liquid
- saturated vapour
- latent heat
- enthalpy
- entropy
- adiabatic process
- pressure/temperature relationships
- isothermal expansion
- isothermal compression
- quantity of heat
- power

Learning outcome 2

Compare theoretical vapour compression cycles with actual cycles using information collected from operating units.

Assessment criteria

Written questions and practical report.

2.1 Produce a plot of the saturated vapour and liquid curves for different refrigerants (R-22, MP39/R401A, R134A)

2.2 Plot a theoretical pressure enthalpy diagram for single and multi stage vapour compression refrigeration cycles.

2.3 Plot pressure enthalpy diagrams for an actual operating single stage and multi - stage vapour compression refrigeration system.

Learning outcome 3

Practically and theoretically establish how various changes to the refrigeration system cycle can effect the enthalpy process.

Assessment criteria

Practical and written short answer questions.

3.1 Calculate the heat gain, heat rejected and work input of theoretical and actual single and multi-stage vapour compression refrigeration systems.

3.2 Plot the pressure enthalpy diagram for an actual operating single stage vapour compression refrigeration system showing the effects of high and low suction pressures.

3.3 Plot the pressure enthalpy diagram for a single stage vapour compression refrigeration system showing the effects of high and low temperature changes across the condenser.

	3.4 Calculate the co-efficient of performance of an operating vapour compression refrigeration system using a pressure enthalpy diagram.
Learning outcome 4	Practically and theoretically demonstrate the effect(s) that various superheating and subcooling methods have on the refrigeration cycle.
Assessment criteria	Practical 4.1 Calculate the heat gain, heat rejected and work input of an actual operating single stage vapour compression refrigeration system. 4.2 Plot the pressure enthalpy diagram for an actual operating single stage vapour compression refrigeration system showing the effects of superheating suction vapour. 4.3 Plot the pressure enthalpy diagram for an actual operating single stage vapour compression refrigeration system showing the effects of subcooling liquid refrigerant. 4.4 Plot the pressure enthalpy diagram for an actual operating single stage vapour compression refrigeration system showing the effects of pressure loss resulting from friction.
7. Assessment Strategies	See Assessment Criteria
8. Module Delivery Strategies	This module contains learning outcomes that will require both theory and practical instruction. As such, it will require resources to facilitate both on and off-the-job delivery strategies. These strategies may involve: - co-operative registered off-the-job provider/employer delivery sharing available resources. - delivery by an employer who is subregistered as an off-the-job provider, with qualified trainers in-house using resources to facilitate on and off-the-job delivery. - off-the-job objectives should focus on the industry context while on-the-job objectives should reflect application within enterprise operations. Assessment instruments will need to be developed by the module provider. These instruments will need to reflect consistency with stated module learning outcomes and related assessment criteria. Alternative assessment procedures will need to be considered, and applied as appropriate to student's needs.

9. Resource Requirements	All references used be latest. Australian Refrigeration and Air Conditioning Volumes I & II A CR & D Project Trust Publication. Dossat, R.J., Principles of Refrigeration., Second Edition, SI Version, John Wiley and Sons, New York Latest Edition. Ashrae Handbook, Refrigeration Systems and Applications., SI Version Ashrae, Atlanta. Latest Edition.
10. Occupational health and safety requirements	Learners must be made aware of all relevant OH&S issues in all situations and are required to demonstrate safe working practices at all times. All work areas must comply with current OH&S legislation.