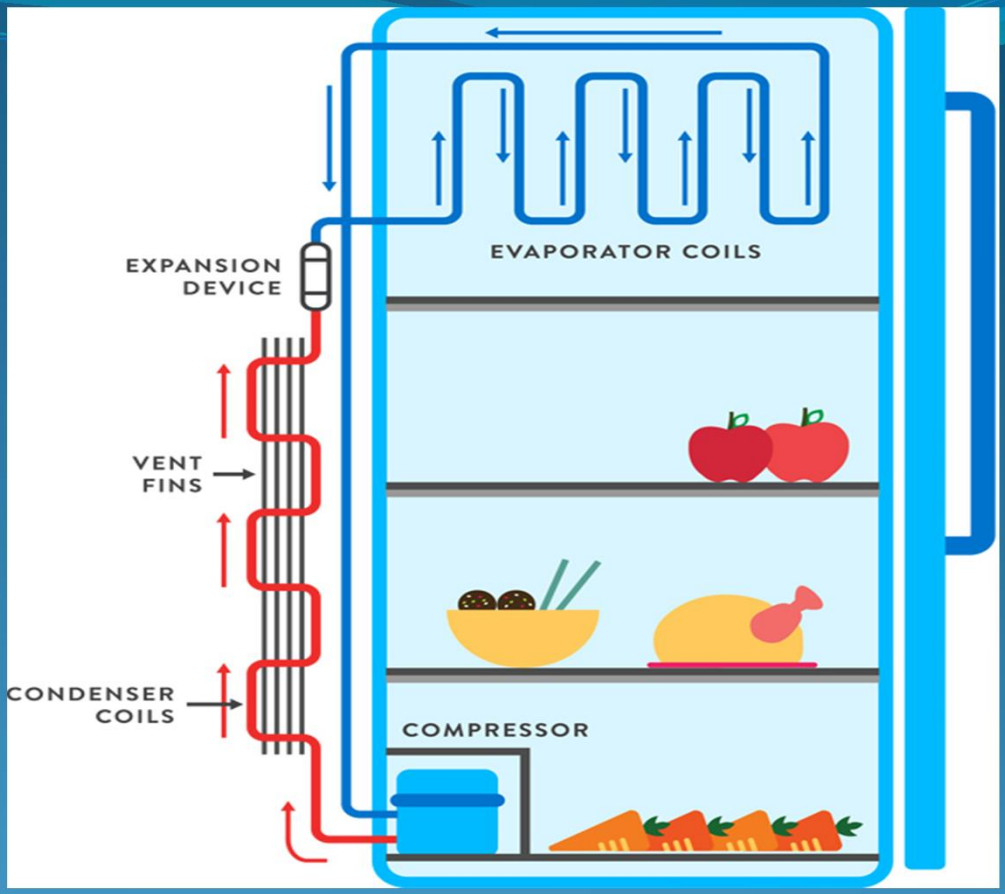
MEE-S402



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Course Details:

Introduction , carnot refrigeration cycle, COP, application Air refrigeration cycle , Bell Coleman air refrigeration cycle , Brayton refrigeration cycle ,optimum COP and pressure ratio , air craft refrigeration system , Classification of air craft refrigeration system , Actual power for refrigeration system, Dry air rated temperature(DART). Refrigerants-Classification , nomanclature , desirable properties of refrigerants , common refigerants, secondery refrigerants & CFC free refigerants Vapour compression system- Single stage system , analysis of vapour compression cycle , effect of pressure change on COP , Use of T-S & p-h charts , effect of subcooling of condensate on COP& capacity , effect of superheeting of vapour compression , construction details of refrigerator and air conditioners, Multy stage compression.

Vapour absorption system-Working Principles of continuous absorption system , comparision between absorption and compression system. Theory of mixtures , Temp. concentration diagram , Enthalpy concentration diagram. Adiabetic mixing of two systems , Lithium bromide water vapour absorption system. Working principles , Comparison with ammonia water system.

Air conditioning- Introduction to air conditioning , Psychromatrics , terms , definitions , adiabetic saturations& thermodynamics , wet bulb temperature , psychrometers , use of psychrometric charts , air conditioning requirements for comfort and industrial processes, comfort charts , comfort zones , cooling towers ,cooling and heating load calculations. Refrigeration equipment & application—Expansion devices , duct design , food preservation cold storage , refrigerators , freezers , ice plants , water coolers , thermal analysis for human bodies, automotive air conditioning – brief overview. , Introduction to soler radiation distributions , emperical methods to evolute heat transfer throw walls & roofs, infiltration , passive heating and cooling of building.

- **Text Books and References:**
- 1. Refrigeration and air conditioning by **Manohar Prasad**
- 2. Principles of refrigeration by **Roy J Dosset**
- 3. Refrigeration and air conditioning by **Arora and Domkundwar**
- 4. Refrigeration & air conditioning by **C P Arora**

Introduction

- **Refrigeration** may be defined as the process of achieving and maintaining a temperature below that of the surroundings, the aim being to cool product to the required temperature.
- **Refrigerant**

A refrigerant is a substance, usually a fluid, used in a refrigeration cycle for producing lower temperature

In most cycles it undergoes phase transitions from a liquid to a gas and back again.

Ex- R11, R12,R134,NH_3 etc

Refrigerant Effect RE

It is the amount of heat which is extracted from storage in order to maintain lower temp.

The coefficient of performance or COP

It is the ratio of desired effect/work input

$$\text{COP}=\frac{RE}{W}=\frac{R_e}{W}$$

Significance of COP : it is represents a running cost of a refrigeration system.Large value of COP lesser is running cost.

Unit of refrigeration : (TR-Ton of refrigeration)

It is the amount of heat which be extracted from 1ton of water at $0^o\ C$ in order to convert into ice at $0^o\ C$ in 24hrs.

Or

A ton of refrigeration (TR), also called a refrigeration ton (RT), is a unit of power used to describe the heat-extraction capacity of refrigeration and air conditioning equipment. It is defined as the rate of heat transfer that results in the melting of 1 short ton of pure ice at 0 °C (32 °F) in 24 hours.

1 TR = 3024.2 kCal/hr = 3.5 kW = 3.5 kJ/sec. =210 kJ/min.

Refrigeration capacity : Cooling **capacity** is the measure of a cooling system's ability to remove heat. The SI unit is watt (W).

RC= kJ/sec. = kW RE = kJ/kg

RC = m^0 RE

Power input to compressor

$$P_{in} = \dot{m}\, W_{in} \qquad W_{in} = \text{kJ/kg}$$

$$\text{COP} = \frac{RE}{W} = \frac{RE}{W}\frac{\dot{m}}{\dot{m}} = \frac{RC}{P_{in}}$$

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