ME451 Refrigeration and Air Conditioning

Credit: 3 Approval: Approved in 3rd Senate

Prerequisite: Consent of the faculty member

Students intended for:

Elective or Core: Elective Semester: Odd/Even

Course objective To provide knowledge on various refrigeration cycles, system components and refrigerants. To provide knowledge on design aspects of Refrigeration & Air conditioning Systems.

Course Content:

- **Refrigeration:** Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration,Refrigerationeffect & C.O.P.
- **Air Refrigeration cycle:** Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).
- **Vapour Compression System:** Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.
- **Vapour Absorption system:** Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison.
- **Refrigerants:** Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants.
- **Emerging refrigeration Technologies:** Magnetocaloric, electrocaloric, thermoelectric based refrigeration
- **Air Conditioning:** Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP)
- **Refrigeration Equipment & Application:** Elementary knowledge of refrigeration & air conditioning equipments e.g. compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

Books and references

Refrigeration and Air conditioning by C.P Arora.

Manohar Prasad, “Refrigeration and Air Conditioning”, Wiley Eastern Ltd., 1983.

Roy. J. Dossat, “Principles of Refrigeration”, Pearson Education 1997.