4PT03: REFRIGERATION, AIR CONDITIONING AND COMPRESSORS
CREDITS - 4 (LTP: 3,0,1)

Course Objective:

1. To analyze various refrigeration cycles and psychrometric processes.
2. To analyze compressors for efficient energy transfer.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	150
3	0	2	4	60	40	20	30	

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Air cycle Refrigeration:** Bell-coleman cycle and its analysis, Reversed Brayton cycle, need for air-conditioning air-crafts, working and analysis of simple, Bootstrap and regenerative air refrigeration systems, advantages of using air cycle for air-craft applications. **Vapour compression Refrigeration:** Modifications in reversed Carnot cycle, analysis of simple cycle, effects of load variation, temperature of condenser, liquid under cooling and suction superheating on performance, actual cycle, limitations of single stage system and need for multi-staging ,compound compression with intercooler, flash gas removal and flash intercooling ,multi-evaporator systems. **Vapour absorption Refrigeration:** Desirable characteristics of refrigerant and refrigerant-absorbent pair, working principle of Aqua-NH_3 system, actual cycle, Aqua-LiBr system, comparison with vapour compression system, Electrolux refrigerator.	15
2	**Refrigerants**: Nomenclature, desirable thermal, chemical and physical properties, primary and secondary refrigerants, Future industrial refrigerants. **Refrigeration system components**: Refrigeration system components, and selection of compressors, scroll compressor, condensers, expansion devices, and evaporators, refrigeration piping accessories, evacuation and charging of refrigerant.	5
3	**Psychrometry:** Dalton's law of partial pressure, Properties of moist air, temperature and humidity measuring instruments, psychrometric chart, and psychrometric processes such as sensible heating and cooling, heating and humidification cooling and dehumidification, chemical dehumidification, adiabatic saturation, desert cooler, introduction to applied psychrometry.	8
4	**Reciprocating compressors:** Construction and working, Multistage conditions for minimum work, Intercooling, Heat rejected in compressors and intercoolers, Efficiency and control of air compressors. **Centrifugal compressors:** Construction and Operation, Ideal energy transfer (Euler's work) velocity diagram, Isentropic efficiency, Static and total temperatures, Power input factor, Slip and slip factor, Pressure coefficient, Pre-whirl, Effect of blade shape on performance, Surging and choking. **Axial Flow Compressors :**	14

Unit No.	Topics	Teaching Hours
	Introduction, Construction and operation, Velocity diagram and work done factor, Pressure ratio and static pressure rise, Characteristics of curves of centrifugal and axial flow compressors.	
		Total **42**

List of References:

1. C P Arora, "*Refrigeration and Air Conditioning*", Third Edition, McGraw-Hill India Publishing Ltd.
2. Ramesh Arora, "*Refrigeration and Air-conditioning*", First Edition, Prentice Hall of India.
3. Manohar Prasad, "*Refrigeration and Air Conditioning*", Third Edition, New Age International Publisher.
4. Roy. J Dossat, "*Principles of Refrigeration*", Fourth Edition, Pearson Education.
5. Jordon and Prister, "*Refrigeration and Air Conditioning*", First Edition, Prentice Hall of India Pvt. Ltd.
6. W.F. Stocker and J. W. Jones, "*Refrigeration and Air Conditioning*", Second Edition, McGraw-Hill.
7. R. Yadav, "*Applied Thermodynamics*", First Edition, Central Publishing House.
8. B.K.Venkanna, "*Fundamentals of Turbo machinery*", First Edition, Prentice Hall of India.
9. Valan Arasu, "*Turbo Machines*", First Edition, Vikas Publishing House Pvt Ltd.
10. S.M. Yahya, "*Turbines, Compressors and Fans*", Fourth Edition, McGraw-Hill India Publishing Ltd.

Course Outcomes (COs):

At the end of this course students will be able to …

1. Analyze various refrigeration cycles.
2. Explain refrigerants and refrigeration system components.
3. Analyze psychometric processes.
4. Analyze compressors and their processes.