5046 - PRINCIPLES OF REFRIGERATION

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
					Theory		Practical Ex.	Total
Lectures	Practical	Credit						
3	2	5	25	25	3hrs.	100	25 (orals)	175

Pre-requisite	Source
~~3057~~	MEC

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	50	175

Rationale: Refrigeration and air conditioning constitutes quite a substantial portion of Heat Power Engineering. The technicians specialising in Heat Power Engineering should therefore develop clear understanding of various concept of refrigeration. The course provides for acquaintance with various refrigeration methods, construction, principles of operation and their applications. Stress has been laid on the student of various components, including controls of various refrigeration systems. Study/demonstration of service operations and tools of the refrigeration system are also taken in term work.

COURSE CONTENTS

	hrs.	mks.
1. INTRODUCTION Basic concepts, refrigeration in industry today, various methods refrigeration.	02	06
2. VAPOUR COMPRESSION REFRIGERATION SYSTEM Simple vapour compression cycle, with reciprocating compressor; Representation on p-h and T-S diagram, unit of refrigeration, COP theoretical, COP Cornat, Refrigeration capacity, wet & dry compression; Superheating and sub-cooling/flashing processes; Simple problem's with single compressor only. Defrosting, necessity, manual, water, automatic hot gas; Electric defrosting methods; Vapour compression system with centrifugal compressor; Advantage & limitations of vapour compression system.	08	12
3. REFRIGERANTS Definition, Classification, Desirable properties; Important refrigerants like Ammonia R-11, R-12,R-22,R-502 CFC refrigerants and their field of application. Secondary refrigerant, important properties for selection of refrigerant, Miscibility of compressor oil and Solubility of water in refrigerant. CFC's and Ozone layer Replacing refrigerant. Driers, special feature in refrigerant piping.	08	20
4. REFRIGERATION EQUIPMENTS Compressors: Selection features, Types used in refrigeration, construction and Working principle off reciprocating and centrifugal Compressor, ON-OFF, Compressor cylinder unloading. Condensers & Receiver: Selection features, Functions, different types, Construction and working principle of shell & tube water cooled condenser, forced convection air cooled condenser, Evaporative condenser. Throttling Devices: Functions, different types, selection features, construction & Working principle of thermostatic expansion valve. Operation of float v/v, solanoid v/v on flooded evaporators. Evaporators: Functions different types, selection features construction and Working of DX Chiller, flooded evaporator, plate type and Fined type.	06	16
5. REFRIGERATION CONTROLS Necessity, high pressure control, Low pressure control, Super heat control, temperature differential and range control, Overload protection, Super heat & pressure limit control, Solenoid v/v	06	10
6. ABSORTION REFRIGERATION SYSTEM Introduction, Basic absortion system and actual ammonia Absortion system, Electrolux refrigeration. Advantage and disadvantages.	06	16
7. APPLICATION OF REFRIGERATION Introduction, requirements, special features of refrigeration in ice manufacture, Domestic refrigerator, Food preservation, Breweries, Refrigerated freight car and trucks, automotive air conditions, low temperature applications.		
Total	48	100

Term work

1. Study/demonstration of service operations of refrigeration system like charging, pumping down, purging of non-condensable gases, descaling, evaluation.
2. To study and demonstrate the use of refrigeration fittings, hand tools & soldering process.
3. To show COP Carnot, COP Theo, & act are in accordance with theory and are decreasing in order and the performance of equipment is satisfactory.
4. To conduct a heat balance at the evaporator of a water cooler.
5. To determine the COP of Ice plant cycle and to demonstrate ice formation.
6. To determine theoretical and actual coefficient of performance of the cycle with and without variation of air speed on food products.

Reference Books:

1. Refrigeration and Air-conditioning – S.C. Arora & Domkundwar
1. Refrigeration and Air-conditioning – Ananthanarayanan
2. Refrigeration and Airconditioning - C.P. Arora
3. Refrigeration and Aircondtioning – B.L. Ballancy
4. Principles of Refrigeration – Warren & Thomas
5. Industrial Refrigeration – P.C. Koelet.