Number of units 6	T 4	P 2	Th 2	Number of weekly hours	Annual System 30 weeks	**Al-Esra'a University College Department: Engineering of Refrigeration and Air Conditioning Technologies**
				Refrigeration and air conditioning		Second stage

Course Objective

Teaching the student, the principles of refrigeration and air conditioning, and the different types of refrigerants and how to use their tables and charts, psychometric chart for air, and the vapor compression system components.

Week	Topic	Practical subject	Notes
1-2	SI units, Fundamental properties of Air and Water vapour mixture; The composition of dry air, definition of (moist air properties) , Dry and wet bulb temperatures, partial pressure, Relative humidity moisture content and dew point temperature. Ozone depletion and global warming effect.		
2-3	Calculation of moist air properties(moisture content, relative humidity, dew point, enthalpy, Dry and wet bulb temperatures, using related equations. Adiabatic temperature saturation.		
3-4	Pshyecromertic chart. air-conditioning processes, Building of Pshyecromertic, adiabatic mixing of air, sensible cooling, sensible heating, dehumidification.	Measuring of air velocity using pitot tube and manometer	
5	Dehumidification; Humidification – Humidification by water injection, steam injection, adiabatic saturation, adiabatic efficiency, Constant wet bulb temperature saturation.	Application on air psychometric chart	
6-7	Cooling and dehumidification with reheat , by pass factor, contact factor, pre heating with humidification and reheat. Summer and winter cycle.	Sensible heating and cooling	
8-9	Human comfort, indoor conditions, metabolic rate and human comfort. Heat transfer from human body. Effect of clothes effect of environment on human comfort, other factors affecting human comfort.	Dehumidification	

10	Finger equation, combined human comfort, instrumentation, air purity, selection of indoor conditions.		
11-13	Weather and outdoor conditions, wind, local wind, mists, Seasonal wind and relative humidity, three methods of selection of indoor conditions.	Humidification of air by direct injection of water droplets	
14-15	Selection of supply air conditions. Removing of sensible heat, heat generated due fans, selection of indoor supply air.		
Half-year Break			
16-17	Refrigerants, types of old and new refrigerant. Effect of refrigerant on Ozone, Global heat, secondary refrigerants.		
18	Refrigeration application, refrigeration theory, second law of thermodynamics, heat pump, reversed Carnot cycle, Simple vapour compression cycle, vapour compression cycle components.	Mixing of air	
19	Simple vapour compression cycle analysis, factors affecting vapour compression cycle performance(effect of suction temperature, effect of condensing temperature, effect of sub-cooling, effect of super-heating, effect of pressure loss)		
20	Ideal and actual vapour compression cycle, improvement of vapour compression cycle, Flash tank, sub-cooling of refrigerant.	Cooling and dehumidification with reheat	
21-23	Multi pressure cycles: Removing of flash gas, inter-cooler, single evaporator and single compressor, single compressor and two evaporators, two compressors and two evaporators, multi-stage compression cycle using, water intercooler, flash inter cooler, liquid refrigerants inter-cooler)	Mixing and adiabatic saturation with reheat	
24-25	Vapour compression cycle components: Compressors, type of compressors, positive displacement compressors, reciprocating compressors, Volumetric and mechanical efficiency of compressors, rotary compressors, scroll compressors, screw compressors, centrifugal compressors	Calculation of theoretical compressor work input its theoretical mass flow rate Calculation of capacity of condenser unit of the vapor compression cycle	
26-28	Condensers: types of condensers, type air-cooled condensers, type of water cooled condensers. Evaporative condensers and cooling towers	Calculation of the capacity and coefficient of performance of vapor compression unit Calculation the C.O.P of the real vapor compression cycle	

29-30	Secondary components of vapour compression cycle.		