

<b>Number of units</b> 6	<b>T</b> 4	<b>Pr</b> 2	<b>Th</b> 2	Number of weekly hours	Annual System 30 weeks	<b>Al-Esra'a University College</b> <b>Department: Engineering of Refrigeration and Air Conditioning Technologies</b>
				<b>Refrigeration and airconditioning-2</b>		Third stage
<b><u>Course Objective</u></b>						
The subject aims to enable and qualify the student for the knowledge of the HVAC&Refr.systems and their accessories equipment including piping, ducting, fans,pumps,..etc., thermal load estimation and food preservation.						

Week	Topic	Lab. Experiment Assignments	Notes
1	Site survey of air conditioned space, relation between heat gain and cooling load.		
2-4	Inside and outside design conditions, for winter & summer, heating load calculation ( heat loss from windows, doors, walls, roof, floor, base of building, ventilation ( air change method, air required for each person, air volume per unit area,) infiltration ( crack method) total heating load.		
5	Cooling load ( radiation glasses, conduction heat transfer through walls, roof, glasses,..etc using equivalent temperature deference,)		
6-7	Heat transfer through part ions, peoples heat generated, people metabolic rate, lighting heat, motors & equipment, ventilation and infiltration load.		
8	Room total load, zone load, building load, bypass factor, cooling coil temperature.		
9-11	Psychrometric processes, cooling & dehumidification, cooling & dehumidification in case of high latent load, cooling & humidification, evaporative cooling, heating & humidification.		
12	Air ducting ( pressure loses in straight duct, duct fittings ( sudden enlargement & contraction, branches, bends, ....etc)		
13	Duct design, methods of design, equal friction method, balancing of duct system.		
14-15	Fans (type, selection, performance of centrifugal, laws) room air distribution, selection of supply & return air opening, diffusers, grilles, return grilles.)		

**Half-year Break**

16-17	Water piping design, pressure losses in straight, and other links, valves, and accessories, cooling water pipes, water pipe network design.		
18-19	Pumps ( performance, types, pump selections, design of water distribution system , design of expansion tank)		
	<b>Refrigeration and Cold Storage</b>		
20	Food thermal properties, water contain, primary freezing point, ice fraction, density, specific heat.		
21	Freezing and nonfreezing foods, thermal conductivity, parallel method, respiration heat, heat transfer coefficient of surface.		
22	Time of Food cooling and freezing.		
23	Estimation of Food cooling Time depending on dimensionless heat transfer coefficient, method of freezing estimation.		
24	Blanc Equation for freezing time estimation.		
25-26	Refrigeration and the food deceases, biological deceases sources, microbes growth, critical growth requirement of microbes, control of microbes growth, HACCP method.		
	<b>Refrigeration Load</b>		
27-29	Thermal load of transportation, air filtration, equipment, safety factor, total ref. load, principle of freezing storage design, volume calculation, design of the storage construction, storage requirement,		
30	Methods of construction, space requirement, treatment of air and vapor infiltration from cracks, floor structure, preparing of the roof, water derange, Freezing systems ,fan coil unit, valve selection, vale position, system design, Refrigerators.		

Week	Practical Subjects
1	Calculation of thermal balance and COP of heat pumps in case cooling and heating
2	Calculation of chilled water refrigeration capacity, With studying the sensible cooling process.
3	Refrigeration system
4	Evaporative cooling system
5	Cooling Tower performance
6	Air conditioning Unit performance.
7	Actual refrigeration cycle
8	Thermal balance of air conditioning unit.
9	Thermo-electric refrigeration unit.
10	Domestic absorption refrigeration unit
11	Thermal balance of refrigeration system.
12	Test of fan performance
13	Processes of air conditioned
14	Calculation of the performance of window type A/C unit.
15	Study the pressure drop in ducting system accessories.
16	Study the characteristic of a centrifugal pump & draw the relations between the head, power and the flow.
17	Parallel & series pumps connection, and the relation between the heads and their flow.