

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
				Power Plants	Fourth stage	
<u>Course Objective</u>						
Teaching the student, the steam properties, thermal processes, types of boilers, fuels and combustion also the turbines which needed in air conditioning.						

Week	Topic	Lab. Experiment Assignments	Notes
1-4	Plant Steam Cycles, Main Cycles, Reheat Cycle, Regenerative Cycle, Open Feed Water Heater, Closed Feed Water Heater, Combined Cycles, Binary Cycle Working on Mercury and Steam, Combined Condenser.		
5-6	Introduction to Heat Exchangers, Theoretical Principles, Parallel Flow H.E., Counter Flow H.E, Cross Flow H.E, The Log Mean Temperature Difference Method, The NTU Method, Shell and Tubes H.E., Condensing, Evaporation.		
7-11	Steam Boilers, Kinds, Burners, Air Preheated, Preheated and Superheated, Combustion and Fuels, Complete and Incomplete Combustion, Correct Air/Fuel Ratio, Access Air Supplied, Heat Generation, Boiler Efficiency, pinch principle.		
12-14	Steam Condensers, Kinds, Direct Contact Condensers, Surface Condenser, Design and Manufacturing, Efficiency of the Condensers.		
15-16	Steam Nozzles, Applications, Steam Expansion, Discharge, Velocity of Steam Through Nozzles, Values of Critical Pressure, Diameters of Throat and Exit for Maximum Discharge, The Friction, Supersaturated Flow,		

	Steam Injector.		
Half –year Break			
17	Turbo-Machinery, Classification, Principle Theory, Dimensionless Numbers.		
18-21	The Pumps, Kinds of Pumps, System Characteristics, Pumps Characteristics, Matching Pumps to System Characteristics, Operation of Pumps in series and Parallel, Centrifugal pumps, Velocity Triangles, Blades Guidance, The Blades, External Guidance, Casing, The Characteristics of Suction and Discharge sides, Hydraulic Characteristics, Cavitations.		
22-25	Steam Turbines, The Kinds, Impulse Turbine, Blades Efficiency, Reaction Turbine, Reaction Ratio, Installation, Multi Stage Blades,		
26-30	Power Plants Systems, Feeding Water Cycle, Water Treatment and Testing, Piping Systems, Valves, Globe Valve, Gate Valve, Chick Valve, Special Valves, Safety Valves, Control Systems, Blowers, Measurement instruments, The Goal of Measurements, Classifications, Temperature Measurements, Pressure Measurements, Discharge Measurements, Gas Analysis, Velocity Measurements, Level Recorder, Electrical Measurements.		

Lab. Experiments :

week	Lab. Exp. Assignments	notes
1-5	The boiler feed-water treatment	Each exp. Repeated four times with variables inputs, with discussion in fifth week
6-10	The steam nozzle	=====
11-15	The boiler	=====
16-20	The steam Turbine	=====
21-25	The steam injector	=====
26-30	The water pump	=====