Course Description Form

1. Course Name:
Refrigeration Systems / 4rd
2. Course Code:
MPAC406
3. Semester / Year:
(Annual System) (2024−2025)
4.Description Preparation Date:
The beginning of the university calendar for the year (2023-2024)
5.Available Attendance Forms:
Theoretical and Practical Classes
6.Number of Credit Hours (Total) / Number of Units (Total)
90 rs. (theoretical) + 30 hrs. (practical) /8 units
7.Course administrator's name (mention all, if more than one name)
Name: Asst. Lect. Rassol Hamed Rasheed Email: rassol.ha@uowa.edu.iq

4. Course Objectives	
Course Objectives	This course aims to enhance the students' knowledge of the principles of vapor compression refrigeration systems and it's analysis, also studying types of refrigeration units and cryogenic refrigeration.

5. Teaching and Learning Strategies	
Strategy	1- Lectures and illustrations: Data Show 2- Practical tests using laboratory equipment 3- Multimedia using the e-learning system 4- Delivering a lecture, answering students' questions, and discussing with the

6. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1-3	2Theoretical+ 2 practical.	The student understands th subject	Condensers and Evaporat Condensers and evaporators as exchangers, overall heat transfer coefficients, heat transfer and pressure drop for the flu flow in heat exchanger tubes and shell. Extended surfaces, Heat transfer and pressure drop for air side	Theoretical + practical	quiz
4-5	2Theoretical+ 2 practical.	The student understands th subject	Condensers, Required condensing capacity, condensing coefficient, fouling factor, de-super heating, condenser design, Wilson plots, air and non-condensable gases.	Theoretical + practical	quiz
6-7	2Theoretical+ 2 practical.	The student understands th subject	Evaporators, Boiling in the shell, boiling inside tube, evaporators performance, pressure drop in tubes, frost.	Theoretical + practical	quiz
8-10	2Theoretical+ 2 practical.	The student understands th subject	Expansion devices: Purpose and types of expansion devices, capillary tube, selection of capillary tube , analytical computation of pressure drop in capillary tube, increment length, chocked flow graphical method of capillary tube selection , Constant pressure expansion valve, controlling of super-heating in thermostatic expansion valve.	Theoretical + practical	quiz
11-13	2Theoretical+ 2 practical.	The student understands th subject	Vapor compression refrigeration system Analysis: balance point and system simulation, reciprocating compressors, condenser performance, condensing system mathematical and graphical analysis, evaporator performance, performance of complete system graphical and mathematical analysis, some performance trends, the expansion devices, sensitivity analysis.	Theoretical + practical	quiz
14-15	2Theoretical+ 2 practical.	The student understands th subject	Cooling towers and evaporative condensers: Heat rejected to atmosphere, cooling towers, analysis of counter flow cooling tower, stepwise integration, acceptance test, predicting outlet conditions from tower, air conditions through tower, evaporative condense when using a cooling tower and evaporative condensers.	Theoretical + practical	quiz
16-18	2Theoretical+ 2 practical.	The student understands th subject	Absorption refrigeration system: relation between vapour compres and absorption refrigeration units, th absorption refrigeration system, temperature and concentration properties of LiBr-water solution, calculations of mass flow rates in the absorption cycle, enthalpy of LiBr-water solutions, thermal analysis of simple cycle, absorption cycle with heat exchanger,	Theoretical + practical	quiz

			crystallization, capacity control, aqua-ammonia system .		
19-20	2Theoretical+ 2 practical.	The student understands th subject	Adsorption system : the relation between adsorption and absorption, absorption and vapour compression cycle, the analysis of adsorption system, mathematical analysis of the adsorption system .	Theoretical + practical	quiz
21	2Theoretical+ 2 practical.	The student understands th subject	Steam jet refrigeration: system components, analysis of steam refrigeration system, approximation analysis, equilibrium concentration.	Theoretical + practical	quiz
22-23	2Theoretical+ 2 practical.	The student understands th subject	Air refrigeration system : the working principle of the cycle, design considerations, atmosphere temperature, humidity pressure, load calculation, refrigeration, heating, temperature control, ventilation, pressure control of zone, types of air system.	Theoretical + practical	quiz
24	2Theoretical+ 2 practical.	The student understands th subject	Thermoelectric refrigeration: working principle, types of thermoelectric refrigeration systems, electro-acoustic refrigeration, working principle, types.	Theoretical + practical	quiz
25-26	2Theoretical+ 2 practical.	The student understands th subject	Cryogenic and liquefaction of gases: Cryogenic, Joul-Thomson effect, air liquefaction by Hopson system (Joul-Thomson expansion)	Theoretical + practical	quiz
27-28	2Theoretical+ 2 practical.	The student understands th subject	Temperature entropy diagram for air, calculation of work required for gas compression , Claude syst,em, cascade system, general consideration for gas liquefaction, Hydrogen , Pre-Cooling system for air liquefaction, Helium	Theoretical + practical	quiz
29	2Theoretical+ 2 practical.	The student understands th subject	Vortex tube: Types and working principle	Theoretical + practical	quiz
30	2Theoretical+ 2 practical.	The student understands th subject	Heat Pipe: Types and working princi	Theoretical + practical	quiz

7. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

8. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Refrigeration and Air conditioning W.f.stoker
Main references (sources)	1- Air Conditioning Engineering - 5th Edition (Malestrom)- J P Jones 2- Refrigeration and Air Conditioning – Abbas Al joubory
Recommended books and references (scientific journals, reports…)	Refrigeration and Air Conditioning (MCQ)
Electronic References, Websites	Refrigeration and Air conditioning W.f.stoker