



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Design of Air Conditioning Systems		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	RAC 404		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	Four	Semester of Deliver	
Administering Department	PM	College	TEMO
Module Leader	Omar Sadoon Khaleel	e-mail	omarsadoon@ntu.edu.iq
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p>Module Objectives أهداف المادة الدراسية</p>	<ol style="list-style-type: none"> 1. To understand types of air conditioning system. 2. To understand how to select best A/C system for each application. 3. To understand the basic processes for refrigeration and air conditioning system. 4. To understand the air properties and how to use psychometric chart with draw each process. 5. To understand types of air distribution within each zone. 6. To understand advanced air duct design. 7. To understand how to selection best air diffuser with all accessories.
<p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p>	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <ol style="list-style-type: none"> 1. Demonstrate the ability to do technical work in a variety of heating, cooling, and refrigeration fields. 2. Identify and describe various components in a typical air-conditioning system. 3. Identify and demonstrate correct use of tools, materials, and equipment used in the trade. 4. Evaluate a motor in a hermetic compressor to determine if it is electrically sound and safe to start. 5. Follow the circuit of a typical electric air-conditioning system. 6. Take wet-bulb and dry-bulb temperature readings and determine relative humidity from the psychometrics chart. 7. Use information to determine the level of comfort from the ASHRAE generalized comfort chart.
<p>Indicative Contents المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p>Psychometric Process and Advanced applications [15 hrs] Water air condition system design [15 hrs] Evaporative cooling applications [10 hrs] Noise and source [10 hrs] Mini Project: Design mini project for different air conditioning systems [10 hrs]</p>

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.
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Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	10% (10)	3,5 and 10	LO #1, #2,#3,#4 and #5, #6
	Assignments	2	10% (10)	2 and 14	LO #4 and #7
	Projects / Lab.	15	20% (20)	Continuous	All
	Report	0	0		
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		



Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fast review about process that student took in second stage.
Week 2	Explain psychometrics chart.
Week 3	Humidification methods.
Week 4	Dehumidification methods.
Week 5	Advanced applications.
Week 6	Main components of water air conditioning system with benefits
Week 7	Types of water air conditioning system, Explain advantages and disadvantages of water air conditioning system
Week 8	Water effects, Water pipe diameter design, Types of pump connection.
Week 9	Pump capacity and head calculation. Static loss calculates. Dynamic loss calculates.
Week 10	Reduce loss within pipe. Problems.
Week 11	Study the evaporative cooling system. How the system work.
Week 12	Performance of evaporative system. Advantages and disadvantages. Application.
Week 13	Definition of Sound. Basic of noise. Study the source of noise.
Week 14	Noise criteria and how to reduce it by using silencers, Types of silencer.
Week 15	Design mini project for different air conditioning systems
Week 16	Preparatory week before the final Exam



Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Application of air Psychrometric chart
Week 2	Sensible heating and cooling
Week 3	Central cooling with dehumidification
Week 4	Effect of fresh air on central cooling with dehumidification
Week 5	Central heating with humidification
Week 6	Effect of fresh air on central heating with humidification
Week 7	Performance of forward centrifugal fan
Week 8	Performance of Radial centrifugal fan
Week 9	Performance of backward centrifugal fan
Week 10	Comparison between types of centrifugal fan performance
Week 11	Effect of variable cold water velocity (single fan coil unit) on outlet air properties
Week 12	Effect of variable cold water velocity (double fan coil unit) on outlet air properties
Week 13	Comparison of single and double effect of fan coil unit on outlet air properties
Week 14	Lab 14: Effect of air velocity on the dynamic pressure losses
Week 15	Lab 15: Effect of air velocity on the total pressure losses

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	G.F. Hundy , "Refrigeration and Air Conditioning",2010. P. L. Ballaney, "Refrigeration and Air Conditioning ".	Yes
Recommended Texts	A Bhatia, HVAC Made Easy: A Guide of Heating and Cooling Load Estimation, PDH online course M196 (4PDH).	Yes
Websites	https://www.youtube.com/watch?v=OvVCCljuluY	

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Code	Course/Module Title	ECTS	Semester
RAC 404	Design of Air Conditioning Systems	6	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
3	2	78	72
Description			
<p>The Design of Air Conditioning Systems course offers a comprehensive exploration of designing efficient and effective air conditioning systems for various applications. Students will learn about the principles of thermodynamics, heat transfer, and psychometrics to understand the fundamental concepts underlying air conditioning. The course covers topics such as load calculations, equipment selection, duct design, refrigeration cycles, and control systems. Students will gain hands-on experience through design projects and simulations, allowing them to apply their knowledge to real-world scenarios. The course also addresses energy efficiency, sustainability, indoor air quality, and environmental considerations in air conditioning design. Upon completion, students will possess the skills and knowledge necessary to design and optimize air conditioning systems that provide optimal comfort, energy efficiency, and environmental sustainability. This course prepares students for careers in HVAC engineering, building design, and energy management.</p>			