

	وزارة التعليم العالي والبحث العلمي - العراق	
<p>جامعة وارث الأنبياء كلية الهندسة قسم تقنيات التبريد والتكييف</p>		

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Maintenance of Air Conditioning systems		Module Delivery
Module Type	C		<input type="checkbox"/> Theory
Module Code	MPAC30٦		<input checked="" type="checkbox"/> Lecture
ECTS Credits	8		<input checked="" type="checkbox"/> Lab
SWL (hr/sem)	200		<input type="checkbox"/> Tutorial
Module Level	3	Semester of Delivery	2
Administering Department	Refrigeration and Air Conditioning Techniques.		College
Module Leader	Amin Sami Amin		Engineering
Module Leader's Acad. Title	Assistant Lecturer		e-mail
Module Tutor			Module Leader's Qualification
Peer Reviewer Name			e-mail
Scientific Committee Approval Date	31/08/2025		e-mail
			Version Number
			1.0

**Relation with other Modules**

العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>	MPAC206	<b>Semester</b>	
<b>Co-requisites module</b>		<b>Semester</b>	

**Module Aims, Learning Outcomes and Indicative Contents**

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. study the maintenance of all types of refrigeration system.</li> <li>2. Introducing students to all the basic topics of this course, the theoretical side and the practical side.</li> <li>3. Introduces theories and operations of heating and air conditioning system. Includes service, testing and repair of air conditioning, ventilation, and heater and engine cooling systems</li> </ol>
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Describe the Refrigeration and Air Conditioning system and the principle of work inside Refrigeration and Air Conditioning workshop</li> <li>2. The student can General Safety Practices and getting to know the Tools and equipment, Refrigeration and air conditioning systems strategies.</li> <li>3. Diagnose air conditioning and heating failures and make the required repairs.</li> <li>4. the student has ability to Refrigeration and air conditioning equipment installation, Inspection and welding of pipes, vacuum and charge, installation problems.</li> <li>5. The student able to troubleshoot for central air conditioning systems, Refrigeration and Oil Chemistry and Management—Recovery, Recycling, Reclaiming, and Retrofitting</li> <li>6. Study the Mechanical and Electrical troubleshooting of Refrigeration and air conditioning system and water chillers</li> <li>7. Study the Conventional air conditioning system (mechanical and electrical components, features, installation, connection, commissioning, maintenance, and control.</li> <li>8. Study the Compressors (types, applications, maintenance, assembly and dis assembly, test and commissioning).</li> <li>9. Study the Evaporators, Condensers, Expansion devices and air washer (types, applications, maintenance, assembly and dis assembly, test and commissioning).</li> <li>10. Study Cooling tower (types, applications, maintenance, assembly and dis assembly, test and commissioning).</li> <li>11. Pumps (types, applications, maintenance, assembly and dis assembly, test and commissioning).</li> <li>12. Refrigeration and air conditioning components cleaning by using chemical materials.</li> </ol>
<b>Indicative Contents</b> المحتويات الإرشادية	<p><b>Indicative content includes the following.</b></p> <ol style="list-style-type: none"> <li>1. General Safety Practices</li> <li>2. Tools and equipments</li> <li>3. Refrigeration and air conditioning equipment classification</li> <li>4. air conditioning and heating failures and make the required repairs.</li> <li>5. Refrigeration and air conditioning equipment installation</li> <li>6. Mechanical and Electrical troubleshooting</li> <li>7. Conventional air condition system(mechanical and electrical components)</li> </ol>
<b>Learning and Teaching Strategies</b>	
استراتيجيات التعلم والتعليم	
<b>Strategies</b>	Assessment is based on hand-in assignments, written exams, Quizzes, reports, Practical testing ,and Online testing.

**Student Workload (SWL)**

## الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	144	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	10
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	106	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	11
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	250		

**Module Evaluation**

## تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 , 11	
	Assignments	5	10% (10)	3,5,7,10,13	
	Projects / Lab.				
	Report	2	10% (10)	8 , 13	
Summative assessment	Midterm Exam	2 hr	20% (20)	7	
	Final Exam	3hr	50% (50)	15	
<b>Total assessment</b>			100% (100 Marks)		

**Delivery Plan (Weekly Syllabus)**

## المنهاج الأسبوعي النظري

	Material Covered
<b>Week 1</b>	General Safety Practices, Tools and equipment, Refrigeration and air conditioning systems strategies. Refrigeration and air conditioning equipment classification (types, applications, maintenance, control, mechanical and electrical parts). Test and commissioning Refrigeration and air conditioning equipment.
<b>Week 2</b>	Refrigeration and air conditioning equipment installation, tubing, welding, leak
<b>Week 3</b>	types of installation, mechanical and electrical connections, piping, Appropriate places selection, piping's and insulations assembly, air purge, vacuum and charge, installation problems
<b>Week 4</b>	Mollier's charts (drawing, point's determination, troubleshooting for central air conditioning systems, Refrigeration and Oil Chemistry and Management—Recovery, Recycling, Reclaiming, and Retrofitting
<b>Week 5</b>	Mechanical troubleshooting study of Refrigeration and air conditioning system and water chillers.
<b>Week 6</b>	Electrical troubleshooting study of Refrigeration and air conditioning system and water chillers.
<b>Week 7</b>	Conventional air condition system (mechanical and electrical components, features, installation, connection, commissioning, maintenance, and control.
<b>Week 8</b>	Compressors (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 9</b>	Evaporators and air washer (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 10</b>	Condensers (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 11</b>	Cooling tower (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 12</b>	Expansion devices (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 13</b>	Fans (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 14</b>	Pumps (types, applications, maintenance, assembly and dis assembly, test and commissioning).
<b>Week 15</b>	Refrigeration and air conditioning components cleaning by using chemical materials.

**Delivery Plan (Weekly Lab. Syllabus)**

## المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Dismantling the commercial system knew the basic parts and accessories and isolate each part of it for other parts.
Week 2	Repair compressor through the dismantling of reciprocating compressor semi –hermetic of commercial system
Week 3	identify the parts and functions and the method of examination and then gathered and examined parts of the compressor and take all measures in order to examine the operation and performance.
Week 4	Maintenance of air cooled condenser system for commercial and examination of the leak and treatment. Cleaning of the inside and outside and sweep the fins also work includes everything related to the fans for the condenser. Maintenance of water-cooled condenser system for commercial and examination of the leak and treatment. Cleaning of the interior and exterior work includes mechanical and chemical cleaning, as well as the pump and piping for the condenser
Week 5	Maintenance - evaporator system for commercial and leakage of examination and treatment. Cleaning of the inside and outside and sweep the fins also work includes everything related to the fans for the evaporator
Week 6	Dismantling expansion valve (used for different types of commercial systems) and checked and calibrated and cleaned.
Week 7	Maintenance of electrical accessories for commercial and test it (power and control circuit. Connect the electrical connections of the power and control circuits and test the connections.
Week 8	Conduct a process of checking the leak and add oil and make the process of charging and discharging of the gas by using modern equipment not impact on the environment. Checking the final inspection of the system and the first to hold the operation of the system to ensure the safety of the electrical and mechanical connection.
Week 9	Maintenance of mechanical and electrical axial fans and Accessories. Maintenance of mechanical and electrical centrifugal fans and Accessories.
Week 10	Maintenance of water pumps (the dismantling of the pump and the maintenance of internal parts and then assembled) adjust the straightness of the pump and the electric motor.
Week 11	Maintenance of all extensions of piping system (disassembly of the different types of valves to get to know their parts and re- assembled and tested) and examined and operated.
Week 12	Maintenance of air handling unit through the dismantling of parts and inspection and lubrication and then re- connect and straighter transmission belt and pulleys.
Week 13	Maintenance of cooling tower (fans –ball bearing- tank-nozzles-piping-pill and straighter transmission belt and pulleys).
Week 14	Maintenance of an air vehicle air conditioner and includes cleaning -Maintenance – components vacuum and churcing with modern equipment that do not adversely affect the environment.
Week 15	operating and inspection the vehicle air conditioner system.

**Learning and Teaching Resources**

## مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Refrigeration and air conditioning Technology	yes

Recommended Texts	Modren refrigeration and airconditioning maintenance	Yes
Websites		

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
<p><b>Note:</b> 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.</p>				

استاذ المادة  
التاريخ: ٢٠٢٥-٠٨-٣١

رئيس القسم  
ا.م.د محمد حسن عبود  
التاريخ: ٢٠٢٥-٠٨-٣١

