	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Advanced Technologies Department of Refrigeration and Air Conditioning Techniques Engineering	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Control and Measurements**			**Module Delivery**	
Module Type	**C**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**HVAC-409**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	4		**Semester of Delivery**	2	
Administering Department	BSC-HVAC		**College**	Advanced Technologies	
Module Leader	**Mustafa Abbas**		**e-mail**	hussein.kt@uowa.edu.iq	
Module Leader's Acad. Title	Asst.Lect		**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	31-8-2026		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MPAC304	**Semester**	L3,S2
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**Course Objectives**: as an example 1. Students become familiar with various types of sensors which have been used in HVAC control systems. 2. Knowing the aims of the control systems and their importance in the HVAC. 3. Providing enough details to understand each element in the HVAC control system. 4. Providing a more in-depth understanding of troubleshooting HVAC control systems. 5. The student will be able to follow and read wiring diagrams.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Outcomes: as an example** 1. Applying fundamentals of control systems. 2. Reading, drawing, and interpreting HVAC control system diagrams. 3. Select the HVAC control systems. 4. Controlling required indoor air quality and thermal comfort conditions. 5. Applying knowledge of how energy savings can be achieved by HVAC control systems. 6. Identifying problems with the HVAC control systems.
Indicative Contents المحتويات الإرشادية	Control engineering is applied in many different fields and at many different levels. The components of all control systems are diverse in nature and may include electrical, electronic, mechanical, thermal, and fluidic devices. The aims behind using control systems in HVAC are: 1. Maintain thermal comfort conditions. 2. Maintain optimum indoor air quality. 3. Reduce energy use. 4. Safe plant operation.

	5. To reduce manpower costs. 6. Identify maintenance problems. 7. Efficient plant operation to match the load. 8. Monitoring system performance.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Assessment is based on hand-in assignments, written exams, Case studies, Quizzes, report presentations, Practical testing

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	116	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	34	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (10)	3,6,9,12	All
	Assignments	2	5% (10)	6,12	All
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	5% (10)	14	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered

Week 1	Fundamentals of control systems and measurements include principles, elements, purposes for HVAC systems, open and close loop control, energy sources, accuracy, the standard of measurements, and description of measurement devices.
Week 2	Controlled variables, sensors, time response, measurements, feedback, and Control actions include two position controllers, proportional controllers, proportional plus integral controllers, and proportional plus integral plus derivative controllers. Control devices, valves, dampers, relays thermostats, humidistats, and pressure transducers.
Week 3	Pneumatic control systems and their sensors. Errors in Measurements: Types of errors and Statistical Analysis.
Week 4	Principles of electrical control systems include their elements, electrical symbols and wiring drawings, control, and power circuit diagrams.
Week 5	Electrical control of air handling units, variable speed controller, and multispeed staters.
Week 6	Fundamentals of electronic control systems include their elements, sensors, transducers, amplifiers, and Wheatstone bridge.
Week 7	Digital Direct Control (DDC), components and operating cycle, microprocessor, pneumatic to electronic control system,
Week 8	Input and output signals – digital and analog, system network controller.
Week 9	Complete control systems, single-zone systems, single-zone AHU; minimum outside air, single-zone AHU; economy cycle outside air, multizone air handling systems
Week 10	Single-zone humidity control, static pressure control of outside air, preheat with outside air thermostat
Week 11	Enthalpy control, outside air; enthalpy economy cycle, economizer control
Week 12	Energy savings in HVAC systems, HVAC energy efficiency ratio (EER), energy-efficient heating and cooling systems, seasonal energy efficiency ratio (SEER), and energy management system (EMS).
Week 13	PLCs, types of PLCs, study hardware and software used in PLC.
Week 14	Implementation of logic gates, implementation of On-Delay Timer,
Week 15	Troubleshooting HVAC control systems.
Week 16	**Preparing for the final exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Workplace safety rules, knowing about the instruments, tools, and supplies.
Week 2	Measurements of controlled variables (temperature, humidity, pressure, etc.).
Week 3	Domestic and commercial refrigerator and freezer controls.
Week 4	Ice maker controls and water cooler controls, vendor machine controls.

Week 5	Defrost control, defrost timers, wiring diagram of the evaporator defrosting, hot gas defrosting, and hot gas bypass.
Week 6	Compressor protection devices, oil pressure controls, low- and high-pressure controls, and overload controls.
Week 7	Air conditioning power and control circuits and reversing valves.
Week 8	Residential central air conditioning control systems,
Week 9	Reversing the rotating direction in 3-phase AC. Motor (power and control circuit). Reversing the rotating direction in 3-phase AC. Motor by using PLC.
Week 10	Star-delta starter (power and control circuit). Star-delta starter (power and control circuit) by using PLC.
Week 11	Chilled controls.
Week 12	Chilled controls by using PLC.
Week 13	Control systems of air handling units (AHU).
Week 14	Control systems of air handling units (AHU) by using PLC.
Week 15	Troubleshooting.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Haines, Roger W., and Douglas C. *Control heating, ventilating, and air conditioning systems*. Springer Science & Business Media, 2006.	Yes
Recommended Texts	Montgomery, Ross, and Robert McDowall. *Fundamentals of HVAC control systems*. Elsevier, 2008	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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded

(0 – 49)	**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.







اسناد المادة: م.م مصطفى عباس

التاريخ :31-8-2026

رئيس القسم: ا.م.د محمد حسن عبود

العميد : ا.م.د علي باسم

التاريخ : 31-8-2026