MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Controllers**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOMU0202054**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	CET		**College**	ETC	
Module Leader	**Fanar Ali Joda**		**e-mail**	fanaralijoda@uomus.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	29/10/2023		**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	
Module Aims أهداف المادة الدراسية	1. To know the types of microcontrollers and its architecture 2. To understand the difference between the microcontroller and microprocessor 3. dealing with the internal parts of microcontrollers 4. programming the PIC microcontrollers 5. connect the microcontrollers with peripherals to input and output the information 6. Implement interrupts in programs 7. Programming the PIC with the peripherals devices
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how integrated circuits and microcontrollers works. 2. Known the advantages of using Microcontrollers and Microprocessors. 3. Summarize what is meant by a Peripheral Interface Controller. 4. Describe the PIC Microcontroller. 5. Known type and function of register and SFR in Microcontroller. 6. Explain the A/D (Analog-to-Digital) Converter. 7. Discuss Capture, Compare, and Pulse width modulation modules in PIC microcontrollers. 8. Define and implement interrupts in programs. 9. Explain serial communication systems. 10. Identify how the Oscillator works in an electric circuit. 11. Programming the microcontroller, outputting data/signals, reading data/signals, and character LCD. 12. Application projects of microcontrollers.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. --Introduction to Introduction to Microcontrollers, Integrated Circuits, General Organization of PIC Microcontrollers: Pins Properties, Registers & Special Function registers, Ports (Input / Output), and Power Supply. Microcontroller Pins Features. The memory unit (ROM, Masked ROM, OTP ROM, UV EPROM, and EEPROM Memory). RAM memory and Flash memory. [15 hrs] --Central Processor Unit (CPU). Interrupt (example of interrupt in a microcontroller). Arithmetical Logical Unit (ALU). Instruction Decoder. Accumulator. Bus (Address Bus and Data Bus). [10 hrs] --Serial Communication, Baud rate, I2C Protocol, SPI (Serial Peripheral Interface), and UART (Universal Asynchronous Receiver/Transmitter) [15 hrs]

	--Oscillator. Timers, using interrupt in timer operating, Watchdog Timer. Counters [10 hrs] --Revision problem classes [5 hrs] --A/D (Analog-to-Digital) Converter, procedure takes place in the A/D converter module, overall plan of ADC, ADRESH, and ADRESL Registers, A/D Acquisition Requirements , ADCON0 Register & ADCON1 Register, Reference Volts. CCP Modules (Capture, Compare, and Pulse width modulation in PIC microcontrollers [19 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in learning and developing their skills in microcontrollers and logic thinking, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering the type of lab experiments involving assignments and project design activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب موزع على (15) اسبوع			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.26
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 12	LO #1-4, LO #5-10
	Assignments	2	10% (10)	4, 10	LO #1-3, LO #4-9
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 1-10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-8
	Final Exam	4hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the microcontroller, the difference between MP and Microcontroller
Week 2	The architecture of PIC Microcontroller
Week 3	General Organization of PIC, Registers & Special Function registers
Week 4	Memory Units and CPU
Week 5	I/O ports of the Microcontroller
Week 6	Serial communication, Oscillator, and Timer/Counters
Week 7	Baud rate
Week 8	Programming the Microcontroller
Week 9	**Midterm Exam**
Week 10	outputting data/signals, Reading data/signals , Character LCD
Week 11	A/D converter & Analog Module
Week 12	On-Chip CCP (Capture, Compare & PWM)
Week 13	Microcontroller Interrupts Programming
Week 14	EEPROM Programming
Week 15	Application projects of Microcontroller

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Micro C with a simple program
Week 2	Lab 2: Counter and Flash LED
Week 3	Lab 3: program using Micro C to count from increasing and decreasing
Week 4	Lab 4: Seven Segment
Week 5	Lab 5: LCD & Switch
Week 6	Lab 6: program using Micro C to input analog signal and read data
Week 7	Lab 7: EEPROM to read and write data.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	PIC Microcontrollers: An Introduction to Microelectronics, Martin P. Bates. Teach Yourself PIC Microcontrollers, M. Amer Iqbal Qureshi	Yes
Recommended Texts	Interfacing PIC Microcontrollers to Peripheral Devices:2011,	No
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

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.