MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Embedded Systems**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOMU0302064**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	الأنظمة الطبية الذكية		**College**	العلوم	
Module Leader	ا.د مهدي عبادي مانع		**e-mail**	mahdi.ebadi@uomus.edu.iq	
Module Leader's Acad. Title	Prof.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	ا.د مهدي عبادي مانع		**e-mail**	mahdi.ebadi@uomus.edu.iq	
Peer Reviewer Name	ا.د مهدي عبادي مانع		**e-mail**	mahdi.ebadi@uomus.edu.iq	
Scientific Committee Approval Date	1/10/2024		**Version Number**	2.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	UOMU0302035	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of this module is to understand the need for embedded computer systems, and the engineering process to design, implement and validate them. 1. To provide the practical and theoretical skills needed to understand the design process of advanced embedded systems. 2. Students will define a specification for an embedded system 3. discuss methods for reliable systems to solve a variety of problems for various application domains. 4. Understand the embedded systems design process. 5. Define a specification for an advanced embedded system. 6. Discuss methods for implementing reliable embedded systems to solve various problems. 7. Compare and contrast different options for the realisation of advanced embedded systems and their suitability for their application domain.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Articulate the need for embedded computer systems, and the requirements imposed on them by their application scenario. 2. Be able to apply an engineering process to design, implement and validate embedded systems. 3. Demonstrate the different levels of abstraction that are used throughout the design process, and be able to decide the most appropriate abstractions at each step. 4. Explore hardware/software implementation trade-offs, and a number of partitioning, mapping and evaluation techniques that can be used to analyse that trade-off for a particular application scenario. 5. Program computing platforms that have limited performance, energy, memory and storage capacity. 6. Design and evaluate custom hardware architectures.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Theory Characteristics of embedded system applications and challenges in advanced embedded system design, The embedded system design process microprocessor architectures, Instruction sets, processor and System on microprocessors architectures, Hardware and Software System design and analysis techniques Processes and operating systems, Embedded communication architectures and multiprocessing, Various embedded systems will be examined as case studies . [15 hrs] Revision problem classes [6 hrs]

	Part B – practical project Arduino program under python and C language. [15 hrs] embedded system project in. [7 hrs] GUI and all codes in embedded system. [15 hrs]

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 type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
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	5% (10)	2,5	
	Assignments	4	5% (10)	3,4,6,7	
	Projects / Lab.	1	15% (10)	Continuous	
	Report	1	5% (10)	5-9	
Summative assessment	Midterm Exam	3 hr	20% (10)	8	
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Microprocessors, 8086/8088 MP
Week 2	Architectures of 8086/8088 MP, The major parts of BIU, and major parts of EU
Week 3	Logical address and Physical address generation , Machine language and Assembly language
Week 4	8086 Addressing Modes: examples
Week 5	Encoding of 8086 Instructions: examples
Week 6	Embedded System principles , components, Basic Structure of an Embedded System
Week 7	Embedded System types and embedded Communication
Week 8	Mid-term Exam
Week 9	Microcontroller, Microcontroller types
Week 10	8051 Microcontroller
Week 11	applications of microcontrollers, Microcontroller vs Microprocessor
Week 12	Types Of Memories Used In Embedded System
Week 13	CPU memory interface , Memory Hierarchy
Week 14	Techniques For the Embedded System and internal system
Week 15	Design of Medical embedded system

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Introduction to Emu 8086 program
Week 3-4	Transfer Instruction
Week 5-6	Loading the register SI by the value
Week 7-8	arithmetic Instruction
Week 9-10	Introduction to Arduino and C Programming
Week 11-12	Declaring and Instantiating Variables
Week 13	Output on the Serial Monitor
Week 14	Input / Output Layout on Arduino

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Embedded Systems Architecture A Comprehensive Guide for Engineers and Programmers. Tammy Noergaard	Yes
Recommended Texts	Introduction to Microcontrollers Courses 182.064 & 182.074 Vienna University of Technology Institute of Computer Engineering Embedded Computing Systems Group March 19, 2006	yes
Websites	ANDES Confidential, http://www.andestech.com/	

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.