MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**RealTime Systems**			**Module Delivery**	
Module Type	**E**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOMU0202056**				
ECTS Credits	5				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	CET		**College**	ETC	
Module Leader	Hussein Abdulameer Abaas		**e-mail**	hussein.alkhamees@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	1/10/2025		**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 teach the students about Real-time scheduling and schedulable analysis. 2. To enable the students to Formally specify and verify the timing constraints 3. Design methods for real-time systems 4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• correctly and precisely reason about times, events, and action • list and reason about the sources of error and inexactitude in time interval measurement, execution time prediction, and scheduling • empirically estimate the accuracy of a real time clock • measure the execution time of a piece of code • empirically estimate the accuracy and overhead of a real-time scheduler • describe and apply commonly used abstract models and terminology for real-time scheduling and resource management • recognize, classify, and formulate the hard and soft timing requirements of a software system • select an appropriate software architecture and combination of scheduling techniques to satisfy a set of timing requirements • understand and apply the proofs of the fundamental theorems of deadline and fixed priority real-time scheduling • carry out schedulability analysis using deadline and fixed-priority approaches • implement a set of tasks with periodic and aperiodic timing requirements, using C threads and a real-time variant of the Linux operating system • evaluate the suitability of an operating system for real-time applications
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part-A [20 Hrs] Introduction to RTS: what is system, what is RT, what is the concept of time in systems, classification, specs of each type, how and when,

	Part-B [20Hrs] Scheduling: the concept of scheduling, types, clock, priority, aperiodic, sporadic tasks, resource access, resource control Part-C [20 Hrs] Multi-processor scheduling: coordination, resource sharing, temporal constraints. Part-D [10 hrs] RTOS, Datastores, timers, kernels

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module focuses on fostering active student engagement during exercises, fostering the development of critical thinking skills, and encouraging participation. This will be accomplished through a combination of classroom instruction, interactive tutorials, and the inclusion of engaging experiments that involve sampling activities that capture students' interest. The aim is to refine and enhance students' critical thinking abilities while ensuring their active involvement in the learning process.

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	4.26
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)	6, 10	LO #1-5, LO #5-9
	Assignments	2	10% (10)	8, 13	LO #1-6, LO #6- 10
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	14	LO # 1- 12
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	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 RTs
Week 2	Hard Versus Soft Real-Time Systems
Week 3	A Reference Model of Real-Time Systems
Week 4	Commonly Used Approaches to Hard Real-Time Scheduling
Week 5	Clock-Driven Scheduling
Week 6	Priority-Driven Scheduling of Periodic Tasks
Week 7	**Midterm Exam**
Week 8	Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems. Resources and Resource Access Control
Week 9	Clock sync, timers, Kernels
Week 10	RT in distributed Systems
Week 11	Scheduling in multi-processors
Week 12	Clock Sync.
Week 13	Hardware, timers, Kernels
Week 14	RTOS
Week 15	Real Time data stores

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Arduino UC
Week 2	Static loops
Week 3	Dynamic loops
Week 4	Watchdog
Week 5	Timers
Week 6	Arduino RTOS
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	Network app (client)
Week 12	Network app (server)
Week 13	Network app (UDP)
Week 14 & 15	Proto-typing

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Real-Time Systems, Jane W. S. Liu, 2000	NO
Supporting Texts		No
Online resource	https://www.youtube.com/watch?v=yShUSwskUNA&list=PL1iLu2CSC9EU4mMByEhBp9CcYgAIiDs_v https://personal.utdallas.edu/~cxl137330/courses/fall13/RTS/RTS.html http://www.cs.fsu.edu/~baker/realtime/syllabus.html#Objectives	

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.