



Ministry of Higher Education and
Scientific Research - Iraq
Al-Mansour University College
Department of Communication Engineering



الملحق 4: وصف المادة الدراسية

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Microcontroller		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	COM 36113		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	UGIII	Semester of Delivery	
Administering Department	BSc - COMM	College	Al-Mansour University College
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	13-9-2025	Version Number	1.0

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



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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	36. Introduce the basic microcontroller concepts and type to of microcontroller. 37. Impart knowledge on the concepts of Embedded Systems and Challenges. 38. Impart knowledge on the concepts of Internet of Things. 39. Impart knowledge on the concepts of Arduino and types.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Demonstrate knowledge and understanding of the fundamental concepts, principles, and theories underlying microcontroller design and theory, as well as principles of embedded systems, with core knowledge. 2. Explain the embedded systems and their applications. 3. Demonstrate achievement of subject knowledge, particularly via seminars. 4. Explain the basic knowledge of Arduino. 5. Arduino program structure.
Indicative Contents المحتويات الإرشادية	1. Introduction to Microcontrollers: - What is a Microcontroller? Definition, core components (CPU, memory, I/O ports, timers, etc.), and a comparison with microprocessors. - Embedded Systems: Understanding the role of microcontrollers within embedded systems. - Microcontroller Architectures: Discussion of common architectures like Harvard vs. Von Neumann. - Key Microcontroller Features: Overview of key features such as clock frequency, memory size, number of I/O pins, and peripheral devices. 2. Microcontroller Architecture and Organization (e.g., 8051, PIC, ARM): Central Processing Unit (CPU): - Arithmetic Logic Unit (ALU): The part of the CPU that performs arithmetic and logic operations. - Registers: General-purpose registers, special function registers (SFRs), program counter (PC), and stack pointer (SP). Memory Organization: - Types of Memory: ROM (Read-Only Memory) and RAM (Random-Access Memory). - Memory Maps: How memory is organized and addressed within the microcontroller. Input/Output (I/O) Ports: - Function of I/O ports for connecting to external devices. - Configuring ports as input or output. Pin Diagrams and Pin Descriptions: A detailed explanation of the functions of each pin on a specific microcontroller chip. 3. Instruction Set and Programming:



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	• Instruction Set: The set of commands that the CPU can understand and execute. • Addressing Modes: How the microcontroller specifies the location of data to be processed. • Assembly Language Programming: ○ Assembler directives and syntax. ○ Writing, assembling, and debugging simple programs. • High-Level Language Programming (e.g., C/C++): ○ Embedded C programming. ○ Using compilers for microcontrollers. ○ Bit-wise operations and other techniques for hardware control. 4. Interfacing: • Analog-to-Digital Converter (ADC) and Digital-to-Analog Converter (DAC): ○ Converting analog sensor signals to digital values. ○ Generating analog output signals.
Description	Introduction to microcontroller (Hardware / IDE overview). Introduction to DSP Processors (Hardware / IDE overview). Examples: Blinking LEDs, Fading of LED, Circling of LEDs (FOR loop). Serial monitoring: Controlling of LEDs from computer, Reading analog and digital inputs. Digital inputs: Controlling LED using push button. Switching ON a relay. Analog inputs: Controlling a DC motor (PWM), Changing the brightness of LEDs using potentiometers, LCD displays: Wiring of LCD screen with Arduino, Displaying a message in LCD screen, Screen navigation on LCD, Turn ON a LED by entering the password, Knowing the status of the LED, Scrolling of text, Displaying room temperature using LM 35 temperature sensor. Seven segment display: Simple automatic countdown and count up (FOR loop), Increment or decrement a number by using push button. Servo motors: Indexing of Servo motor, Direction control of Servo Motor.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The primary strategy adopted for delivering this module is to encourage students' participation in the lecture while refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

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	12	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (5)	3 and 12	LO #1 to #3 and #4 to #6
	Assignments	2	10% (5)	3 and 13	LO #3 to #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #3, #4 and #6
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #5
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		



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Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Embedded Systems (Hardware &Software).
Week 2	Introduction to Microcontroller (Hardware &Software).
Week 3	Introduction to DSP Systems (Hardware &Software).
Week 4	Arduino Types and hardware description
Week 5	Arduino software and program structure
Week 6	Arduino Data Types and Functions
Week 7	Arduino Variables & Constants and operators
Week 8	Arduino Control Statements and Loop
Week 9	Arduino Functions, Time, and Libraries
Week 10	Arduino Pulse Width Modulation
Week 11	Introduction to Raspberry pi
Week 12	Raspberry pi Types and hardware description
Week 13	Raspberry pi software and program structure
Week 14	Revision
Week 15	Final exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to the fundamental of LAB and devices use
Week 2	Experiment: Blinking LEDs, Fading of LED, Circling of LEDs (FOR loop)
Week 3	Experiment: Reading Analog Voltage and Printed out to The Serial Monitor
Week 4	Experiment: Digital Input Controlling LED using pushbutton. Switching ON a relay
Week 5	Experiment: Controlling LED using (Light Dependent Resistor) LDR Sensor



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Week 6	Experiment: Controlling LED Using IR Remote Sensor
Week 7	Experiment: LCD Liquid Crystal Display Displaying a Message in LCD Screen
Week 8	Experiment: Measure the Temperature and Humidity Using DHT11 Sensor and Display Result on The LCD Screen
Week 9	Experiment: Measure the Distance Using Ultrasonic Sensor and Display Result on The LCD Screen
Week 10	Raspberry pi tools & Board
Week 11	Raspberry pi sensors
Week 12	Blinking LEDs using raspberry pi
Week 13	Project
Week 14	Revision
Week 15	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Embedded Systems: Real-Time Interfacing to Arm Cortex-M Microcontrollers by Jonathan W. Valvano: A popular choice for those learning to program the widely-used Arm Cortex-M family of microcontrollers. • Getting Started with Arduino by Massimo Banzi: While Arduino is a development board and not a microcontroller itself, this book is an excellent entry point for absolute beginners as it simplifies the process of microcontroller programming and hardware interaction.	Yes
Recommended Texts	• The 8051 Microcontroller and Embedded Systems by M.A. Mazidi: A classic and highly-regarded book for a foundational understanding of microcontrollers, particularly the 8051 family. • Programming Embedded Systems in C and C++ by Michael Barr: This book focuses on the practical aspects	No



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	of programming microcontrollers, which is crucial for building real-world applications.	
Websites	None	

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.				