

MODULE DESCRIPTION FORM

Module Information				
Module Title	Networks and Sensors		Module Delivery	
Module Type	C		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	AIE324			
ECTS Credits	6			
SWL (hr/sem)	150 H/Sem.			
Module Level	2	Semester of Delivery		4
Administering Department	Artificial Intelligence Eng.		College	College of Engineering
Module Leader	Amjed Baqer Jumaah		e-mail	Amjed.baqer@alayen.edu.iq
Module Leader's Acad. Title	Asst. Lec.		Module Leader's Qualification	MSc
Module Tutor	Amjed Baqer Jumaah		e-mail	Amjed.baqer@alayen.edu.iq
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date			Version Number	1.0

Relation with other Modules			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	fundamental concepts of communication networks - network architectures and models (OSI & TCP/IP) - wired and wireless sensor networks (WSNs) - sensor characteristics and classifications - practical experiments using sensors and microcontrollers - data acquisition, signal conditioning, and transmission techniques - IoT concepts and smart system applications.



م.م. د. سرمد كاظم ذياب

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Module Learning Outcomes	Knowledge	A1	A1.1: Understand network fundamentals and layered architectures. A1.2: Describe the sensor classifications, characteristics, and performance parameters. A1.3 Explain the structure and functioning of Wireless Sensor Networks (WSNs), including network architecture, communication protocols, and data transmission mechanisms. A1.4 Discuss the foundations of sensor technologies and network integration, including data acquisition, processing.
		A4	A4.1 Recognize and analyze different types of network topologies and communication protocols and their use in diverse networking applications. A4.2 Identify and evaluate sensor characteristics (such as accuracy, sensitivity, and range) for reliable data acquisition and monitoring. A4.3 Apply data collection and real-time processing techniques in Wireless Sensor Networks (WSNs) for efficient system performance. A4.4 Estimate and analyze network performance metrics (e.g., latency, throughput, energy consumption) and interpret results for practical applications. A4.5 Implement data aggregation and compression techniques for efficient transmission in sensor networks. A4.6 Develop communication and routing solutions for reliable and energy-efficient network operation. A4.7 Apply localization and tracking techniques in sensor networks to real-world scenarios and practical tasks.
	Skills	B1	B.1.1 Function efficiently as an individual B.1.2 Function as a member of multidisciplinary and multicultural teams
		B3	B.3.1 Acquire and apply new knowledge. B.3.2 Practice the strategies of searching for information in life-long self-learning
	Ethics	C3	C.3.1 Utilize contemporary technologies C.3.2 Make use of codes of practice and standards, quality guidelines
Indicative Contents	Indicative content includes the following. Unit 1: Introduction to Networks (6 hours) • Definition of computer and communication networks • Types of networks (LAN, MAN, WAN) • Network topologies		

	Unit 2: Network Models and Protocols (8 hours) • OSI model • TCP/IP model • Data link and transport protocols Unit 3: Wireless Sensor Networks (WSNs) (8 hours) • Architecture of WSN • Node components • Energy efficiency in WSN • Applications of WSN Unit 4: Introduction to Sensors (8 hours) • Sensor definition and classification • Active vs Passive sensors • Analog vs Digital sensors • Sensor characteristics: • Sensitivity • Accuracy • Resolution • Linearity • Response Time Unit 5: Signal Conditioning and Data Acquisition (6 hours) • Amplification • Filtering • ADC conversion • Noise reduction Unit 6: IoT and Smart Systems (6 hours) • IoT architecture • Sensor integration with microcontrollers • Cloud connectivity basics
Learning and Teaching Strategies	

Strategies	• Presentation • Interactive learning • Discussions • Brainstorming • Group Solving Problems • Problem-Based Learning • Self-learning			
	Student Workload (SWL)			
	Structured SWL (h/sem)	78	Structured SWL (h/w)	5.2
	Unstructured SWL (h/sem)	72	Unstructured SWL (h/w)	4.8
	Total SWL (h/sem)	150		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري		
	Material Covered	LOs
Week 1	Introduction to Networks	A1.1, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 2	Network Topologies & Types	A1.2, A1.3, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 3	OSI Model	A1.3, A4.1, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 4	TCP/IP Model	A1.4, A4.3, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 5	Network Protocols	A1.5, A4.4, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 6	Wireless Sensor Networks	A1.6, A4.5, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 7	Midterm Exam	A1.6, A4.5, B1.1, B1.2, B3.1, B3.2, C3.1
Week 8	Introduction to Sensors	A1.7, A4.6, B1.1, B1.2, B3.1, B3.2, C3.1
Week 9	Sensor Characteristics	A1.7, A4.7, B1.1, B1.2, B3.1, B3.2, C3.1

Week 10	Signal Conditioning	A1 – A1.9
Week 11	Data Acquisition Systems	A1.8, A4.8, B1.1, B1.2, B3.1, B3.2, C3.1
Week 12	IoT Fundamentals	A1.9, A4.9, B1.1, B1.2, B3.1, B3.2, C3.1
Week 13	Smart Systems Applications	A1.9, A4.9, B1.1, B1.2, B3.1, B3.2, C3.1
Week 14	Review & Applications	A1,A2 , A3 , A4, A5
Week 15	Final Exam	All

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر		
	Material Covered	Los
Week 1	Lab Orientation	A4.1, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 2	LAN Configuration	A4.1, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 3	Packet Tracer Simulation	A4.1, B1.1, B1.2, B3.1, B3.2, C3.1
Week 4	Arduino Basics	A4.3, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 5	Temperature Sensor	A4.4, B1.1, B1.2, B3.1, B3.2, C3.1, C3.2
Week 6	Ultrasonic Sensor	A4.5, B1.1, B1.2, B3.1, B3.2, C3.1
Week 7	Midterm Practical	A4.5, B1.1, B1.2, B3.1, B3.2, C3.1
Week 8	LDR Sensor	A4.6, B1.1, B1.2, B3.1, B3.2, C3.1
Week 9	ADC Implementation	A4.7, B1.1, B1.2, B3.1, B3.2, C3.1
Week 10	ESP32 WiFi Module	A4 – A4.7

Week 11	Wireless Data Transmission	A4.7, B1.1, B1.2, B3.1, B3.2, C3.1
Week 12	IoT Data Monitoring	A4.7, B1.1, B1.2, B3.1, B3.2, C3.1
Week 13	Mini Project Development	A4.7, B1.1, B1.2, B3.1, B3.2, C3.1
Week 14	Project Presentation	A4.5, B1.1, B1.2, B3.1, B3.2, C3.1
Week 15	Final Practical Exam	A4.6, B1.1, B1.2, B3.1, B3.2, C3.1

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	A1, A4
	Assignments	2	10% (10)	2, 4,6,8,10 and 12	A1, A4
	Projects / Lab.	1	10% (10)	14	A1, A4, B1, B3, C3
	Report	1	10% (10)	13	A1, A4, B1, B3
Summative assessment	Midterm Exam	1hr	10% (10)	7	A1, A4
	Final Exam	3hr	50% (50)	15	A1, A4
Total assessment			100% (100 Marks)		

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. Computer Networking: A Top-Down Approach – James F. Kurose & Keith W. Ross.	Yes

	2. Sensors and Transducers – D. Patranabis.	
Recommended Texts	Wireless Sensor Networks: Technology, Protocols, and Applications – Kazem Sohraby et al.	NO
Websites	https://eng.alayen.edu.iq//colleges/e/42	

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.