

MODULE DESCRIPTION FORM

Module Information			
Module Title	Robotics Fundamentals		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	AIE223		
ECTS Credits			
SWL (hr/sem)	60 H/Sem		
Module Level	2	Semester of Delivery	2
Administering Department	Artificial Intelligence Eng.		College
Module Leader	Sarmad Kadhim Alkhfaji		e-mail
Module Leader's Acad. Title	Asst. Lec.		Module Leader's Qualification
Module Tutor	Omar Chasib Kaduhm		e-mail
Peer Reviewer Name			e-mail
Scientific Committee Approval Date			Version Number
		1.0	

Relation with other Modules			
Prerequisite module	BAS 021	Semester	٤
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	By the end of this module, students will be able to: 1. Understand the fundamental principles of robotics and automation and their significance in intelligent engineering systems. 2. Identify and describe the main components of robotic systems, including mechanical structure, sensors, actuators, and control units. 3. Apply coordinate systems, position and orientation representation, and homogeneous transformations in robot modeling. 4. Explain basic robot kinematics, degrees of freedom, workspace analysis, and mobile robot fundamentals. 5. Recognize essential robotic control concepts and relate them to Artificial Intelligence applications.



٢٠١ - د سمر كاسم خياي

Module Learning Outcomes	Knowledge	A ¹	A1.1 Explain the fundamental concepts of robotics, automation, and robot classifications. A1.2 Describe the main components of robotic systems including sensors, actuators, and control units.	
		A ²	A2.1 Analyze coordinate systems, reference frames, and position/orientation representations used in robotics. A2.2 Apply homogeneous transformations in modeling robotic motion.	
		A ³	A3.1 Analyze basic robot kinematics, degrees of freedom, and workspace characteristics. A3.2 Describe the fundamentals of mobile robots and robotic control concepts.	
	Skills	B1	B1.1 Function efficiently as an individual in solving robotics-related problems. B1.2 Function as a member of multidisciplinary and multicultural engineering teams.	
		B2	B2.1 Communicate effectively – graphically and analytically – using contemporary engineering tools. B2.2 Communicate verbally and in writing technical robotics concepts to a range of audiences.	
	Ethics	C2	C1.1 Recognize professional and ethical responsibilities in robotics and intelligent systems applications. C1.2 Demonstrate respect for diversity and teamwork ethics in engineering practice.	
Indicative Contents				
Learning and Teaching Strategies				
Strategies	• Discussions • Tutorial and graphics • Brain storming • Project • Problem Solving • Report & discussion assessment			
Student Workload (SWL)				
Structured SWL (h/sem)		Structured SWL (h/w)	4	
Unstructured SWL (h/sem)		Unstructured SWL (h/w)	4	
Total SWL (h/sem)	60			

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
	Material Covered	LOs
Week 1	Introduction to Robotics and Automation	A1.1
Week 2	Definition, History, and Evolution of Robots	A1.1
Week 3	Classification of Robots and Applications	A1.2
Week 4	Industrial and Service Robotics Applications	A1.2, C2.2
Week 5	Robot Anatomy and Subsystems	A1.2
Week 6	Sensors and Actuators Overview	A1.2, B3.1
Week 7	Coordinate Systems and Reference Frames	A2.1
Week 8	Midterm Examination	--
Week 9	Position and Orientation Representation	A2.1
Week 10	Homogeneous Transformations	A2.2
Week 11	Introduction to Robot Kinematics	A3.1
Week 12	Mobile Robots Fundamentals	A3.2
Week 13	Degrees of Freedom and Workspace Analysis	A3.1
Week 14	Overview of Robotic Control Concepts	A3.2
Week 15	Review, Applications, and Safety in Robotics	C2.1, C2.2, B2.2

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	A2,A3
	Assignments	2	10% (10)	2, 4,6 ,10,12 and 14	A2,A3
	Projects / Lab.	1	10% (10)	13	A2,A3
	Presentation	1	10% (10)	13	A2,A3
Midterm Exam		1hr	10% (10)	7	A2

Summative assessment	Final Exam	3hr	50% (50)	15	A2,A3
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Basic Stepper Motor Rotation in Clockwise and Counter-Clockwise Directions
Week 2	Lab 2: Displaying Messages on LCD Screen (16x2) Using Arduino
Week 3	Lab 3: Using IR Remote Control to Operate LEDs or Motors
Week 4	Lab 4: Reading Temperature Sensor (LM35 or DHT11) Using Arduino
Week 5	Lab 5: Light Intensity Measurement Using LDR Sensor
Week 6	Lab 6: Simple Obstacle Detection with Ultrasonic Sensor
Week 7	Lab 7: Controlling Servo Motor Using Potentiometer
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	GROOVER_Industrial_Robotics_Technology_Programming_And_Applications	Yes
Recommended Texts	Ben-Ari, M., & Mondada, F. (2018). <i>Elements of Robotics</i> . Springer.	Yes
Websites	https://eng.alayen.edu.iq/colleges/	

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.				