	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al-Anbiyaa College of Advanced Technologies Department of Robotic and Artificial Intelligence Engineering Techniques	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Introduction to Robotics			**Module Delivery**	
Module Type	C			☒Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☒ Seminar	
Module Code	RTAI103				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		1	**Semester of Delivery**		
Administering Department		Robotic Engineering Techniques and Artificial Intelligence	**College**	College of Advanced Technologies	
Module Leader	Riyadh Nazar Ali		**e-mail**	riyad.nazar@uowa.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		
Module Tutor	None		**e-mail**		
Peer Reviewer Name			**e-mail**		

Scientific Committee Approval Date		**Version Number**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	NA	**Semester**	
Co-requisites module	NA	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	• Introduce the foundations of industrial robotics and the core engineering topics needed to model and control robot manipulators (actuators, mechanisms, kinematics, Jacobian, statics, and dynamics). • Develop practical competence in using MATLAB to model robot arms, compute workspace and kinematics, and visualize/animate robot motion.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Explain basic robot concepts, types, and industrial context, and identify common robot structures and DOF. • Analyse planar serial/parallel mechanisms using forward and inverse kinematics, and compute velocity relationships using the Jacobian. • Apply statics and dynamics ideas to relate forces/torques and motion (e.g., free-body diagrams and Newton–Euler formulation). • Implement core robotics computations and visualisations in MATLAB (workspace, inverse/velocity kinematics, Jacobian, sensors/actuators).
Indicative Contents المحتويات الإرشادية	• Lectures: Industrial robots and manipulation; actuators and drive systems (DC motors, power electronics); robot mechanisms (serial and parallel linkages); planar kinematics; differential motion and Jacobian properties; statics; dynamics (Newton–Euler). • Labs (MATLAB): MATLAB basics for robotics; variables/vectors; workspace calculation; visualization and animation; robot types/frames; inverse and velocity kinematics; Jacobian; sensors and actuators.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	• Learning is delivered through theory lectures supported by tutorials and seminars to reinforce key concepts and problem-solving. • Practical understanding is developed through lab sessions where students apply robotics topics using MATLAB-based activities.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	5	5 % (5)	2,5,8,10,13	LO # 1, 4, 5, 7,8
	Assignments	5	5 % (5)	1,4,7,11,15	LO # 1-15
	Lab.	10	10 % (10)	1-9	LO # 1-15
	Report	10	10 % (10)	1-8	LO # 1-15
Summative assessment	**Midterm Exam**	3 hr.	20 % (20)	9	LO # 1-15
	Final Exam	3 hr.	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction (Era of Industrial Robots, Manipulation and Dexterity)
Week 2	Actuators (DC Motors, Dynamics of Single-Axis Drive Systems)
Week 3	Drive Systems (Power Electronics)

Week 4	Robot Mechanisms (Joint Primitives and Serial Linkages)
Week 5	Robot Mechanisms (Parallel Linkages)
Week 6	Planar Kinematics (Planar Kinematics of Serial Link Mechanisms)
Week 7	Planar Kinematics (Inverse Kinematics of Planar Mechanisms)
Week 8	Differential Motion (Differential Relationship)
Week 9	Differential Motion (Properties of the Jacobian)
Week 10	Differential Motion (Inverse Kinematics of Differential Motion)
Week 11	Statics (Free Body Diagram)
Week 12	Statics (Energy Method and Equivalent Joint Torques)
Week 13	Dynamics (Newton-Euler Formulation of Equations of Motion)
Week 14	Preparatory week before the final Exam
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to MATLAB
Week 2	Introduction to MATLAB for Robotics
Week 3	Basic Variable Examples
Week 4	Vector Demonstration and Simple Mathematics
Week 5	Robot Arm Workspace Calculation
Week 6	Create Main Visualization
Week 7	Create Animation of Arm Rotating
Week 8	Summary Statistics
Week 9	Robot Types, DOF, Workspace, and Coordinate Frames
Week 10	Inverse Kinematics
Week 11	Velocity Kinematics
Week 12	Jacobian Matrix
Week 13	Sensors & Actuators
Week 14	Preparatory week before the final Exam
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	The Basics of Robotics" by Fareed Shakhatreh from Lahti University of Applied Sciences, written as an orientation guide to robot design. It explains core robotics foundations: automation concepts, robot types and applications, and the multidisciplinary skills needed (mechanics, electronics, control, sensors, actuators, and programming). It then surveys key robot subsystems (power, transmissions, sensors, electronics, software), introduces servo motor selection/design, and covers industrial robots, manipulators/kinematics, frames/transformations, and trajectory planning.	n

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.

استاذ المادة

Riyadh Nazar Ali

24/1/2026

رئيس القسم

التاريخ :