Form: Course Syllabus		
	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
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	Number of Pages	06

1.	**Course Title**	Robotics Systems
2.	**Course Number**	0908474
3.	**Credit Hours (Theory, Practical)**	3 hours- Theory
	Contact Hours (Theory, Practical)	
4.	**Prerequisites/ Corequisites**	1. Engineering Numerical Methods (0908311) 2. Automatic Control (0908353)
5.	**Program Title**	B.Sc. in Mechatronics Engineering
6.	**Program Code**	08
7.	**School/ Center**	Engineering
8.	**Department**	Mechatronics
9.	**Course Level**	4th year
10.	**Year of Study and Semester (s)**	2nd Semester 2023/2024
11.	**Other Department(s) Involved in Teaching the Course**	
12.	**Main Learning Language**	English
13.	**Learning Types**	☐ Face to face learning ✓ Blended ☐Fully online
14.	**Online Platforms(s)**	✓ Moodle ✓ Microsoft Teams ☐Skype ☐Zoom
15.	**Issuing Date**	25/02/2024
16.	**Revision Date**	

17. Course Coordinator:

Name: Mohammad Mashagbeh Contact hours: Sun, Tues: 11:30 AM – 1:30 PM

Office number: 23023 Phone number:

Email: m.mashagbeh@gmail.com

18. Other Instructors:

19. Course Description:

Introduction and an overview of robot types, basic components of robot systems, coordinate frames, homogeneous transformations, forward and inverse kinematic of manipulators, Jacobian and singularity of manipulators, manipulator dynamics, force and torque transformation, trajectory planning, and MATLAB programming.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1.

2.

3.

4.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Demonstrate a sound understanding of the main concepts and components of robotic systems.
2. Understand the rotational of a point in space, translation of a point in space, transformation of a point in space, homogenous transformation, moving and fixed frames.
3. Calculate rotation matrix, and the homogenous transformation.
4. Determine forward kinematics, inverse kinematics, and differential kinematics of industrial manipulators.
5. Understand the definition of Jacobian, analytical Jacobian, geometric Jacobian, and the definition of singularity
6. Find the dynamic equations for industrial manipulators.
7. Calculate the trajectory planning of industrial manipulators.
8. Use MATLAB to analyze robotic manipulators [6].

Course ILOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
1	*	*				
2		*				

3		*	*			
4		*	*	*		
5		*	*	*	*	
6		*	*	*	*	
7		*	*	*	*	
8		*	*	*	*	*

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program ILOs / Course ILOs	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)	ILO (6)	ILO (7)
1							
2							
3							
4							
5							
6							
7							
8						*	

23. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Introduction to Robotics.						
	1.2	Introduction to Robotics						
	1.3	Introduction to Robotics						
2	2.1	Introduction to Robotics						
	2.2	Introduction to Robotics.						
	2.3	Vector kinematics.						
3	3.1	Vector kinematics.						
	3.2	Vector kinematics.						
	3.3	Vector kinematics.						
4	4.1	Vector kinematics.						
	4.2	Vector kinematics.						
	4.3	Vector kinematics.						
5	5.1	Forward Kinematics of Industrial Manipulator						
	5.2	Forward Kinematics of Industrial Manipulator						
	5.3	Forward Kinematics of Industrial Manipulator						
6	6.1	Forward Kinematics of Industrial Manipulator						
	6.2	Forward Kinematics of Industrial Manipulator						
	6.3	Forward Kinematics of Industrial Manipulator						
7	7.1	Inverse Kinematics of Industrial Manipulator						
	7.2	Inverse Kinematics of Industrial Manipulator						
	7.3	Inverse Kinematics of Industrial Manipulator						
8	8.1	Inverse Kinematics of Industrial Manipulator						
	8.2	Inverse Kinematics of Industrial Manipulator						
	8.3	Inverse Kinematics of Industrial Manipulator						
9		Midterm week						
10	10.1	Differential Kinematics						
	10.2	Differential Kinematics						
	10.3	Differential Kinematics						
11	11.1	Differential Kinematics						
	11.2	Differential Kinematics						

	11.3	Differential Kinematics						
12	12.1	Differential Kinematics						
	12.2	Differential motion						
	12.3	Differential motion						
13	13.1	Differential motion						
	13.2	Dynamics of serial Manipulators						
	13.3	Dynamics of serial Manipulators						
14	14.1	MATLAB Programming						
	14.2	MATLAB Programming						
	14.3	Path Planning						
15	15.1	Path Planning						
	15.2	Path Planning						
	15.3	Path Planning						

24. Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
Quiz	5			4th Week	On Campus
Midterm Exam	30			9th Week	On Campus
Quiz	5			11th Week	Online Moodle
Project	10			12th Week	On Campus
MATLAB Programming	10			13th Week	Online Moodle
Final Exam	40				

25. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

Textbook, class handouts, scientific calculator, and an access to a personal computer.

26. Course Policies:

A- Attendance policies:

1. Students are expected to attend EVERY class session. They are responsible for all materials, announcements, schedule changes, and other pertinent information discussed in class.
2. Seating plan will be given as the attendance sheet.

B- Absences from exams and submitting assignments on time:

No makeup exams will be offered for any exams during the course, except in the following cases:

1. In the event of the death of a first-order relative (father, mother, sister, or brother).
2. If the student is hospitalized (in-patient) during the exam.

For any other circumstances, the student will receive a grade of zero for the corresponding exam.

27. References:

A- Required book(s), assigned reading and audio-visuals:

B. Siciliano et. al., Robotics – Modeling, Planning and Control, Springer, 2009.

B- Recommended books, materials, and media:

1. Introduction to Robotics: Mechanics and Control by John J. Craig. 2th Edition. Prentice Hall.
2. Robot Modeling and Control: 1st Edition by Mark W. Spong, Seth Andrew Hutchinson, M. Vidyasagar.
3. Introduction to Robotics: Analysis, Control, Applications, 3rd Edition by Saeed B. Niku.

28. Additional information:

Name of the Instructor or the Course Coordinator: Dr. Mohammad Mashagbeh	Signature: ……..……	Date: ……..……
Name of the Head of Quality Assurance Committee/ Department	Signature:	Date:
……	……..……	……..……
Name of the Head of Department	Signature:	Date:
……	……..……	……..……
Name of the Head of Quality Assurance Committee/ School or Center	Signature:	Date:
……	……..……	……..……
Name of the Dean or the Director	Signature:	Date:
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