هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Robotics
Course Code:	CS464
Program:	Computer Science
Department:	Computer Science
College:	College of Computer and Information Sciences
Institution:	Majmaah University
Version:	1
Last Revision Date:	31 May 2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3(3,0,1))					
2. Course type					
A.	☐University	☐College	☐Department	☐Track	☒ Others
B.	☐Required		☒ Elective		
3. Level/year at which this course is offered: (Level 12/Year 4)					
4. Course general Description:					
The course is introduction to the fundamentals of robotics. Students will learn the fundamentals of robotics, including kinematics, inverse kinematics, Jacobian, velocity, configuration space, motion planning and path planning algorithms.					
5. Pre-requirements for this course (if any)**:**					
CS 320 Artificial Intelligence					
6. Pre-requirements for this course (if any)**:**					
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7. Course Main Objective(s):					
1) Model the kinematics of robotic systems 2) Compute end-effector position and orientation from joint angles of a robotic system 3) Compute the joint angles of a robotic system to reach the desired end-effector position and orientation 4) Compute the linear and angular velocities of the end-effector of a robotic system from the joint angle velocities 5) Convert a robot's workspace to its configuration space and represent obstacles in the configuration space 6) Compute valid path in a configuration space with motion planning algorithms 7) Apply the generated motion path to the robotic system to generate a proper motion trajectory 8) Apply the learned knowledge to several robotic systems: including robotic manipulators, humanoid robots					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.2				
...				
2.0	**Skills**			
2.1	Evaluate physical structure and design the orientation of robots and joint angle movement	**S2**	Class Room Teaching	Mid exam, Quiz, Final exam, Assignment

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.2	Apply the techniques for Computing the linear and angular velocities of the end-effector of a robotic system from the joint angle velocities Able to apply the generated motion path to the robotic system to generate a proper motion trajectory	**S4** **S4**	Class Room Teaching	Mid exam, Quiz, Final exam, Assignment
...				
3.0	**Values, autonomy, and responsibility**			
3.1	CLO4: Engage in activities to explore the learned knowledge to several robotic systems: including robotic manipulators, humanoid robots.	**V2**	Class Room Teaching	Final exam, Mini project/Exercise/ Surevy
3.2				
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Robotics	**4**
2.	Representing positions and rotations	**4**
3.	Rotational transformations and parameterizations ofrotations	**4**
4.	Homogeneous transformations	**4**
5.	kinematic chains andDH convention	**4**
6.	DH convention and forward kinematics	**5**
7.	Inverse kinematics	**4**
8	Angular velocity and Kinematicslab	**4**
9.	The Jacobian matrix	**5**
10.	Trajectory design and configuration space	**4**
11.	Configuration space with examples and motionplanning introduction	**4**
12.	Motion planning: potential field and PRM	**4**

13.	Motionplanning roadmap and motion planning review	4
14.	Mobile robot, sensors and actuators	4
15.	**Review**	2
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Week 5,6	15%
2.	Assignments	Week 4,7	15%
3.	Midterm Exam	Week 9,10	20%
4.	Exercise/Mini project	Week 12	10%
5.	Final Exam	Week 16	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Robot Modeling and Control by Mark M. Spong, Seth Hutchinso, and M. Vidyasagar (ISBN: 9780471649908)
Supportive References	
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom**
Technology equipment (projector, smart board, software)	**PC with Windows/Linux, LCD Projector, Smart Board**
Other equipment (depending on the nature of the specialty)	**Internet Connection**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of Students assessment	Instructors	Direct
Quality of learning resources	Instructors	Direct
The extent to which CLOs have been achieved		
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	CS COUNCIL
REFERENCE NO.	
DATE	