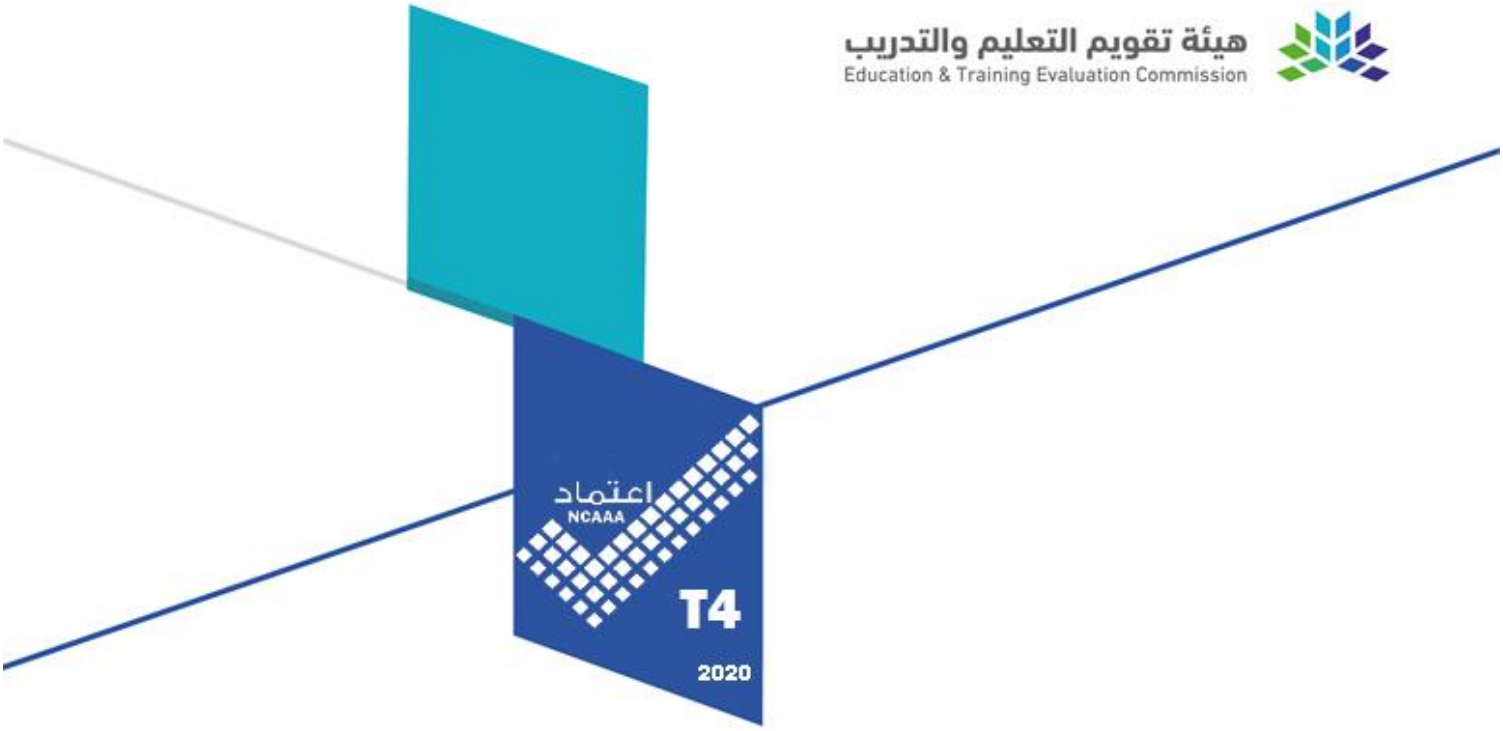
الرقم: ٦٦/١٨٨٣١ التاريخ: ١٤٤٤/٠٥/١١ عدد المرفقات: *



Course Specifications

Course Title:	Robotics
Course Code:	CS 465
Program:	Computer Science
Department:	Computer Science
College:	College of Computer and Information Sciences
Institution:	Majmaah University

الرقم: ٦٦/١٨٨٣١ التاريخ: ١٤٤٤/٠٥/١١ عدد المرفقات: *

Table of Contents

A. Course Identification

1. Credit hours: 3(3,0,1)
2. Course type **a.** University ☐ College ☐ Department ☐ Others ☒ **b.** Required ☐ Elective ☒
3. Level/year at which this course is offered: Level 12/Year 4
4. Pre-requisites for this course (if any)**: CS 320**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	55	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	44
2	**Laboratory/Studio**	
3	**Tutorial**	11
4	**Others** (specify)	
	Total	55

B. Course Objectives and Learning Outcomes

1. Course Description

An 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.

2. Course Main Objective

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

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	CLO5- Apply the learned knowledge to several robotic systems: including robotic manipulators, humanoid robots.	K1
1.2		
1.3		
1...		
2	**Skills :**	
2.1	CLO1: Understand background of robotics and various types of robots	S1
2.2	CLO2: Study about physical structure, orientation of robots, joint angle movement	S1
2.3	CLO3: 3. Study techniques for Computing the linear and angular velocities of the end-effector of a robotic system from the joint angle velocities	S5
2.4	CLO4: Able to apply the generated motion path to the robotic system to generate a proper motion trajectory	S5
2.5		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

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

11	Mobile robot, sensors and actuators	3
Total		55

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	CLO5- Apply the learned knowledge to several robotic systems: including robotic manipulators, humanoid robots.	Classroom Teaching	Quiz, Assignment, Mid Exam, Final Exam
1.2			
…			
2.0	**Skills**		
2.1	CLO1: Understand background of robotics and various types of robots	Classroom Teaching	Quiz, Assignment, Mid Exam, Final Exam
2.2	CLO2: Study about physical structure, orientation of robots, joint angle movement	Classroom Teaching	Quiz, Assignment, Mid Exam, Final Exam
2.3	CLO3: 3. Study techniques for Computing the linear and angular velocities of the end-effector of a robotic system from the joint angle velocities	Classroom Teaching	Quiz, Assignment, Mid Exam, Final Exam
2.4	CLO4: Able to apply the generated motion path to the robotic system to generate a proper motion trajectory	Classroom Teaching	Quiz, Assignment, Mid Exam, Final Exam
2.5			
3.0	**Values**		
3.1			
3.2			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	Week 4, 10,13	15 %
2	Assignments	Week 7, 13	15%
3	Midterm Exam	Week 8	20 %
4	Exercise	Every Week	10 %
5	Final Exam	Week 16	40 %
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : Each student is allotted to an academic advisor for guidance and counseling

F. Learning Resources and Facilities

1.Learning Resources

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

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	**Classroom**
Technology Resources (AV, data show, Smart Board, software, etc.)	**PC with Windows/Linux, LCD Projector, Smart Board**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**Internet Connection**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Final Exam Answer Scripts Verification	Review Committee member	Review
Course Feedback	Students	Survey

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	