Faculty of Engineering & Technology

Robot Mechanics

Information :

Course Code :	MKT 471	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Mechatronics Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	MOHAMED ABDELBAR SHAMSELDIN ALY	9
Lecturer	MOHAMED ABDELBAR SHAMSELDIN ALY	9
Teaching Assistant	Fady Ayman Mohamed Naguib Mahmoud Noah	2
Teaching Assistant	Fady Ayman Mohamed Naguib Mahmoud Noah	2

Area Of Study :

Prepare students to analyze rigid motion with coordinate transform.
Develop the students' ability to derive robot manipulator kinematics and use DH convention.
Train students to solve simple inverse kinematics problems.
Train students to solve robot motion planning problems.

Description :

Robotics overview and applications; Robot sensors and actuators, Robotic technology and systems; Kinematic Modeling: Spatial Representations and Transformations; DH and Homogenous transformations; Forward and inverse Kinematics; Jacobian for velocities and static analysis; Problem solving using up to date standard S/W robotics tools (Matlab); implementing the right industrial robotics system for a plant.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Define robot terminology and taxonomy.
2 -	Explain the Denavit-Hartenberg, DH convention for axis transformation and building table.
b.Intellectual Skills: :	
1 -	Analyze the forward kinematics of robot chain.
2 -	Create homogenous transformation matrices.
3 -	Derive inverse kinematics of serial robot chains.
c.Professional and Practical Skills: :	
1 -	Use the suitable software for analysis of robot kinematics.
2 -	Select right robot type for a motion application need.
d.General and Transferable Skills: :	
1 -	Manage tasks, time, and resources.

2 -	Search for information and engage in life-long self-learning discipline through self-learning assignments.
3 -	Collaborate effectively within multidisciplinary team.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction	4	4	0
Rigid motion	6	4	2
Forwards kinematics	10	4	6
Inverse kinematics	10	4	6
Jacobian matrix and singularity	16	8	8
Project discussion	8	4	4
Project presentation	6	2	4

Teaching And Learning Methodologies :

Interactive Lecturing
Problem solving
Discussion
Project
Research

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignment Assessments	5.00		
Final Exam	40.00		
Mid- Exam 1I	15.00		
Mid- Exam I	15.00		
Participation	5.00		
Project	10.00		
Quizzes	10.00		

Recommended books :

ÅBruno Siciliano, Robotics, Modeling, Planning and Control.Springer 2009.
ÅCraig, John J, R. Introduction to Robotics: Mechanics and Control, Pearson Education International, 2005, 3rd Edition.
ÅSaeed B. Niku, Introduction to Robotics, Prentice Hall, 2001.
ÅK.S. Fu, R.C. Gonzalez, and C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987
ÅH.Asada and J. Slotine, Robot Analysis and Control, John Wiley & Sons New York, 1986, 3rd Edition.
ÅFu, K.S., Gonzalez, R.C., and Lee, C.S.G. Robotics: Control, Sensing, Vision, and Intelligence, McGraw Hill, 1986.
ÅMegahed, S.M., Robotics: Principles of Robot Modelling and Simulation, John Wiley, 1993.