

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	10
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 :

- 1. Bruno Siciliano, Robotics, Modeling, Planning and Control. Springer 2009.
- 2. Craig, John J, R. Introduction to Robotics: Mechanics and Control, Pearson Education International, 2005, 3rd Edition.
- 3. Saeed B. Niku, Introduction to Robotics, Prentice Hall, 2001.
- 4. K.S. Fu, R.C. Gonzalez, and C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987
- 5. H.Asada and J. Slotine, Robot Analysis and Control, John Wiley & Sons New York, 1986, 3rd Edition.
- 6. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G. Robotics: Control, Sensing, Vision, and Intelligence, McGraw Hill, 1986.
- 7. Megahed, S.M., Robotics: Principles of Robot Modelling and Simulation, John Wiley, 1993.