

EE 514- Robotics

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2

COURSE COORDINATOR

Dr Hassan Ibrahim

TEXT BOOK:

Philip John, "Introduction to Robotics", Edison Wesley Publisher

COURSE DESCRIPTION:

What is a robot's components / Classification and Applications Kinematics for manipulators, joints, links and gripper. Coordinate frames and transformation. Determination of coordinate frames –Orientation of end –effector. Inverse solution to Kinematics equations Calculation of inverse transformation between coordinates An inverse solution Kinematic solution Generalized velocity and torque relations. Velocity and acceleration in fixed and rotating coordinates Jacobean matrix /rotational and transnational acceleration Dynamic models of manipulators State variable representation for robot dynamic models Motion control and controller design for gross & fine motion of robot manipulators. Design specifications based on second - order linear system Controller design (using optimum control) for robot manipulators and discussion survey on sensors and actuators.

PREREQUISITE:

CC 411 & EE 412

RELATION OF COURSE TO PROGRAM:

Elective

COURSE INSTRUCTION OUTCOMES:

The students is familiar with industrial robots in order to perspective it as a tool in manufacturing automation.

TOPICS COVERED:

- Robotic systems.
- Rigid motion and homogenous transformation.
- Direct (forward) kinematics.
- Inverse solution of kinematic equations.
- Velocity (differential) kinematics.
- Manipulator dynamics.
- Robot dynamics and control.

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

Professional Component Content			
Math and Basic Sciences	Engineering Topics	General Education	Engineering Design
	√	√	√

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

Student Outcomes		Course Outcomes
a.	An ability to apply knowledge of mathematics, science, and engineering.	
b.	An ability to design and conduct experiments, analyze and interpret data.	
c.	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	√
d.	An ability to function on multi-disciplinary teams.	
e.	An ability to identify, formulate, and solve engineering problems.	√
f.	An understanding of professional and ethical responsibility.	
g.	An ability to communicate effectively.	
h.	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal content	
i.	A recognition of the need for, and an ability to engage in life-long learning.	
j.	A knowledge of contemporary issues within and outside the electrical engineering profession.	
k.	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	√