

*EE343-2: Robotics*

Course code and name	EE343-2: Robotics
Credits units	2 Credit units
Contact hours	4 Contact hours: 1 lecture, 1 tutorial and 2 practical
Instructor name	Dr. Emad Saeid Hassan
Textbook	M. Xie, FUNDAMENTALS OF ROBOTICS LINKING PERCEPTION TO ACTION, 2003.
Other supplemental materials	<ul style="list-style-type: none"><li>- Reza N. Iazar, Theory of Applied Robotics Kinematics, Dynamics, and Control, Spring, 2007</li><li>- John J. Craig, Introduction to Robotics Mechanics and Control, 3<sup>rd</sup> edition, 2005.</li></ul>
Specific course information	
a. Course description	This course gives an introduction to the central topics in robotics, robot definition, robot uses, Laws of robotics, robot Key Components, Robot Classifications. This course also outlines the Motion of Rigid Bodies, Robot Kinematics, differential kinematics, Mechanical System of Robots, dynamics, and control of robot manipulators. Finally, Electromechanical System of Robots and Control System of Robots are presented.
b. Prerequisite	EE341-3
c. Required / Elective	Required
Course Learning Outcomes	
<u>CLO of the Lecture Activities:</u>  CLO1: Define the robot, robot uses, laws of robotics, robot key components, robot classifications and kinematics.  CLO2: Explain the mechanical system of robots, the electromechanical system of robots, dynamics, the Denavit-Hartenberg (DH) method and the control system of robots.  CLO3: Model the rigid body motion, homogeneous transformation, inverse homogeneous transformation, transformation using DH, and inverse transformation using DH.	

CL04: Analyze the forward kinematics, inverse kinematics, angular velocity, rigid body velocity, and acceleration kinematics.

CLO of the Laboratory Activities:

CL01: Verify theory and to improve knowledge learned in class.

CL02: Formulate and solve problems related to theory.

CL03: Design and safety conducts an experimental procedure.

CL04: Independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

CL05: Communicate critical analysis of scientific information through written reports.

CL06: Be integrated inside a group of work and respect the team working.

**Brief list of topics to be covered**

- Robot Definition, Robot Uses, Laws of Robotics,
- Robot Key Components, Robot Classifications
- Kinematics, Rotation Kinematics Global Cartesian Axes and Local Cartesian Axes
- Motion Kinematics, Rigid Body Motion,
- Homogeneous Transformation, Inverse Homogeneous Transformation,
- Robot Mechanism, Robot Kinematics , Denavit-Hartenberg (DH) method
- Inverse Transformation Using DH, Inverse Kinematics
- Angular Velocity, Rigid Body Velocity, Acceleration Kinematics
- Force and Torque (Moment), Kinetic energy & Work, Force and Torque Generators
- The different between open-loop and closed-loop control systems.
- Study the robot as a closed-loop control system.
- Sensing elements in robot system, Information System of Robots.
- Data Interfacing and Communication, Typical network topologies, D/A & A/D Converters.

**Mapping Course Learning Outcomes to Student Outcomes**

		Lecture Activities							
		S01	S02	S03	S04	S05	S06	S07	

CL01							
CL02							
CL03							
CL04							
	Laboratory Activities						
	S01	S02	S03	S04	S05	S06	S07
CL01							
CL02							
CL03							
CL04							
CL05							
CL06							