



Philadelphia University

Faculty of Engineering and Technology
Mechatronics Engineering Department
First Semester 2019/2020

Course Details:

- Title:** Robotics and Automation (640542)
- Prerequisite:** Digital Control (640441) + Programmable Logic Controller (640445)
- Credit Hours:** 3 credit hours (16 weeks per semester, approximately 45 contact hours)
- Textbook:** “Introduction to Robotics: Mechanics and Control” by John Craig, 4th edition, 2018.
“Introduction to Autonomous Mobile Robots” by Siegwart and Nourbakhsh, 2nd edition, 2011.
- References:** “Autonomous Mobile Robots: Sensing, Control, Decision Making and Applications”. Edited by Shuzhu Ge and Frank Lewis. CRC Taylor and Francis Group 2006.
“Robotics” By Appin Knowledge Solutions. Infinity Science Press 2007
- Description:** This course introduces the field of robotics to the undergraduate students. It is divided into two parts: Robotic Manipulators and Autonomous Robots.
- Website:** <http://www.philadelphia.edu.jo/academics/inaimi>
- Instructor:** Dr. Ibrahim Al-Naimi
Email: inaimi@philadelphia.edu.jo
Office: Engineering building, room 6410, ext: 2124.
Office hours: Sunday, Tuesday, and Thursday: 9:10-10:00 and 11:10-12:00

Course Outlines:

Week	Topic
(1)	Introduction to Robotics
(2, 3, 4)	Robot manipulator: Spatial Descriptions and Transformations
(5, 6, 7)	Forward Manipulator Kinematics (DH Parameters)
(8, 9)	Inverse Manipulator Kinematics
(10, 11)	Instantaneous Kinematics (Jacobian Matrix) and Problem of Singularity
(12)	Dynamics of Manipulator (Euler-Lagrange Equation)
(13)	Trajectory and Control: Overview
(14)	Autonomous Mobile Robot: Locomotion
(15)	Mobile Robot Kinematics and Control: Overview
(16)	Localization, Planning, Navigation, and Obstacle Avoidance (Bug algorithms)

Course Learning Outcomes with reference to ABET Student Outcomes:

Upon successful completion of this course, student should:

1.	Understand the main concepts of robotics.	[4, 5]
2.	Understand the fundamentals and models of mobile robotics.	[1, 4]
3.	Understand the mathematical modeling of robot manipulators.	[1, 4]
4.	Practice analysis and design of robotic systems applying Matrix Laboratory (MATLAB).	[1, 2, 6]

Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

Sub-Exams: The students will be subjected to two scheduled written exams, first exam and second exam during the semester. Each exam will cover materials given in lectures in the previous 3-4 weeks.

Quizzes: Four quizzes of (10-15) minutes will be conducted during the semester. The materials of the quizzes are set by the lecturer.

Final Exam: The students will undergo a scheduled final exam at the end of the semester covering the whole materials taught in the course.

Grading policy:

First Exam	20%
Second Exam	20%
Quizzes	20%
Final Exam	40%

Total: 100%

Attendance Regulation:

The semester has in total 45 credit hours. Total absence hours from classes and tutorials must not exceed 15% of the total credit hours. Exceeding this limit without a medical or emergency excuse approved by the deanship will prohibit the student from sitting the final exam and a zero mark will be recorded for the course. If the excuse is approved by the deanship the student will be considered withdrawn from the course.

October, 2019