



**DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM, BSC.**

Course Syllabus

1. Course number and name

ME xxx Robotics and mechatronics systems.

2. Credits and contact hours

(3+0) 3 credit hours, 3 contact hours

3. Course type

Blended Learning Course (2+1)

4. Instructor's or course coordinator's name

Dr. Mohammad Nasir

5. Textbook information

Niku, Saeed B. Introduction to robotics: analysis, control, applications. John Wiley & Sons, 2020. ISBN: 978-1-119-52760-2

a. Other supplemental materials

Instructor's notes

6. Specific course information

a. Catalog description

This course contains basic introduction to Robotics systems, kinematics, dynamics, trajectory planning, sensors, motion control systems, basics to microcontrollers.

b. Prerequisites or co-requisites

Co-requisite: Control systems and dynamic of machinery courses

c. The course is:

Elective in Mechanical Engineering program.

7. Specific goals for the course

a. Course outcomes:

After completion of the course, students are expected to be able to:

1. Understanding the robot kinematics and dynamics models and derivations.
2. Be familiar with robot trajectory planning.
3. Practice the robot design including actuator, sensors, and motion control systems.



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b. The following student outcomes are addressed by the course:

SO-(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

SO-(4) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environmental, and societal context.

SO-(pc) The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

8. Learning Outcomes and their Alignment with Program Educational Objective (PEO's), Methods of Delivery, and Assessment Methods:

Learning Outcomes	Program PEOs	Method of Delivery	Assessment Method
Course Outcomes			
CO-(1): Understanding the robot kinematics and dynamics models and derivations.	-	Lectures (Example and Problems)	Midterm Exam
CO-(2): Be familiar with robot trajectory planning.	-	Lectures (Example and Problems)	Assignment
CO-(3): Practice the robot design including actuator, sensors, and motion control systems.	-	Lectures (Example and Problems)	Final Exam
Student Outcomes			
SO-(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	2	Lectures (Example and Problems)	Midterm Exam
SO-(4) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environmental, and societal context.	1, 3	Term Project	Term Project- Part 2



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SO-(pc) The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.	1	Term Project	Term Project- Part 1
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9. Weekly Teaching Plan

Week No.	Lecture	Topic	Method of Delivery
1	Sun (9-10)	Introduction to Robotics systems	Lecture
	Tue (9-10)	Introduction to robotics system types	Lecture
	Thu (9-10)	Interactive videos- Chapter 1	synchronous active learning
2	Sun (9-10)	Robotics system types	Lecture
	Tue (9-10)	Robotics system types	Lecture
	Thu (9-10)	Case studies	Asynchronous active learning
3	Sun (9-10)	Robotics system kinematics	Lecture
	Tue (9-10)	Robotics system kinematics	Lecture
	Thu (9-10)	Solving examples	Online Lecture/ synchronous
4	Sun (9-10)	Robotics system DH representation	Lecture
	Tue (9-10)	Robotics system DH representation	Lecture
	Thu (9-10)	Solving examples	Online Lecture
5	Sun (9-10)	Robotics Inverse kinematics	Lecture
	Tue (9-10)	Robotics Inverse kinematics	Lecture
	Thu (9-10)	Solving examples	Online Lecture



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6	Sun (9-10)	Robotics dynamics	Lecture
	Tue (9-10)	Robotics dynamics	Lecture
	Thu (9-10)	Solving examples	Online Lecture
7	Sun (9-10)	Force calculations	Lecture
	Tue (9-10)	Force calculations	Lecture
	Thu (9-10)	Motor sizing examples	Online Lecture
8	Sun (9-10)	Trajectory planning	Lecture
	Tue (9-10)	Trajectory planning	Lecture
	Thu (9-10)	Trajectory planning	Online Lecture
9	Sun (9-10)	Trajectory planning methods	Lecture
	Tue (9-10)	Trajectory planning methods	Lecture
	Thu (9-10)	examples	Online Lecture
10	Sun (9-10)	Sensors and actuators	Lecture
	Tue (9-10)	Sensors and actuators	Lecture
	Thu (9-10)	Sensors and actuators	Online Lecture
11	Sun (9-10)	Sensors and actuators	Lecture
	Tue (9-10)	Sensors and actuators	Lecture
	Thu (9-10)	Examples	Asynchronous active learning
12	Sun (9-10)	Locomotion and navigation	Lecture
	Tue (9-10)	Locomotion and navigation	Lecture
	Thu (9-10)	Examples	Synchronous active learning



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13	Sun (9-10)	Motion control systems	Lecture
	Tue (9-10)	Motion control systems	Lecture
	Thu (9-10)	Case studies	synchronous active learning
14	Sun (9-10)	Motion control systems using Arduino	Lecture
	Tue (9-10)	Motion control systems using Arduino	Lecture
	Thu (9-10)	Examples	synchronous active learning
15	Sun (9-10)	project	Lecture
	Tue (9-10)	project	Lecture
	Thu (9-10)	Project discussions	synchronous active learning

10. Grade Distribution:

Assessment	Grade	Week No.
- Midterm Exam	30%	7 th Week
-Assignments (Reports /Quizzes/ Seminar / Tutorials/ Home works)	20%	1-16 th Week
- Final Examination	50%	16 th Week

Note: Make-up exams will be offered for valid reasons. It may be different from regular exams in content and format.