



**JORDAN UNIVERSITY OF SCIENCE & TECHNOLOGY**  
**MECHANICAL ENGINEERING DEPARTMENT**  
**ME 543 - MECHATRONICS SYSTEMS INTERGRATION**  
**Semester**

**Catalog Data - 2013:** 3 Credit hours (3 h lectures). Design and analysis of mechatronics and automation systems. Selection and integration of actuators, sensors, hardware, and software. Design of logic control systems. Pneumatic and hydraulic systems design and simulation, Ladder Programming, PLC's integration and programming. Case studies including automation systems Finite state machine methods. Feedback control. Safety logic systems. Case studies including automation systems, mobile robots, and unmanned vehicle systems.

**Text Book(s):** David W. Pessen "Industrial Automation – Circuit Design and Components," John Wiley & Sons.

**Instructor:** \_\_\_\_\_

**Class Schedule:** \_\_\_\_\_

**Office Hours:** \_\_\_\_\_

**Pre/Co-Requisites:** ME462 AUTOMATIC CONTROL ( 1)  
ME425 MICROCONTROLLERS APPLICATION

- Outcomes:**
- 1- Introduce Motion classifications, and proper Sensor/Actuator selection. [a,c, e]
  - 2- Design, analysis and simulation of low cost Hard-Wired Relay circuits of electro-pneumatic and electro-hydraulic systems to automate industrial processes. [c]
  - 3- Design, analysis and simulation of **PLC** Ladder programs to control industrial processes.[k,c]

**Topics Covered:**

Week	Description
1	Motion classification and selection of actuators. Industrial Sensors.
2	Introduction to automation and examples. Introduction to projects.
3 & 4	Switching algebra. Selection of switching elements.
5 & 6	Design of sequential control circuits-Ladder diagram & Sequence charts.
7 & 8	Design of sequential control circuits-pseudo-Karnaugh map.
9 & 10	Flexible automation – Programmable Logic Controllers (PLC). Programming the PLC. PLC demo.
11	Cascade Method
12	Case studies on mobile robots***.
13	Case studies on automation

**Computer Usage:** Training on Automation Studio and a fluid power control software, RSlogix Ladder logic

**Design Activities/Project(s):** The course provides design experience for the student in the form of a case study. The student will be required to design an automation setup for a typical industrial application. A project will be designed and developed by each student At the end of the course.

**Lab. Experiment(s):** Mechatronics lab (at least two labs will be provided during this semester)

Scientific Visit(s): N/A

Evaluation: (*Projects*, Attendance, Homework, quizzes & participation) 0-20%  
 1<sup>st</sup> Exam 20-30%  
 2<sup>nd</sup> Exam 20-30%  
 Final Exam 40% TBA

**Relationship of the Course to ME Outcomes:**

ABET a – k	√	Level (L, M, H)	Mechanical Eng. Program Outcomes
a	√	M	a. Apply knowledge of mathematics, science, and engineering in practice.
b			b. Design and conduct experiments as well as analyze and interpret data.
c	√	H	c. Design a system, components, or process to meet desired needs.
d			d. Function on multidisciplinary teams.
e	√	H	e. Identify, formulate, and solve engineering problems.
f			f. Understanding of professional and ethical responsibility of an engineer.
g			g. Communicate effectively.
h			h. Broad education to understand the impact of engineering solutions in global and societal context.
i			i. Recognition of the need for, and possess the ability to engage in, lifelong learning.
j			j. Possess knowledge of contemporary issues.
k	√	H	k. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
l			l. Adhere to safety rules and regulations.

L: Low, M:Medium, H: High

**ABET**

**Category:**

Engineering Science 2 Credits  
 Engineering Design 1 Credits

Prepared By: \_\_\_\_\_

Date: \_\_\_\_\_

**Rules and notes:**

- 1) Never come late to the classroom, you will disturb your mates and your instructor if you do so.
- 2) Turn OFF your cell phones during the class.
- 3) DO Not TALK during the class please, unless you have a question for me.
- 4) Late home works are still accepted with a 35% penalty for every late CALENDAR day.
- 5) Make up exams are not held without an official signed and approved excuse from the DEAN. Please understand that this is a university law and I have no control over it.
- 6) Office hours are the hours I dedicate for you to ask me. If you think they do not suit you, then we can still arrange for a time of our convenience by sending an e-mail to me (you should expect an approval from my side).
- 7) The exams specified on the course syllabus are not subject to negotiations or change once approved by you TODAY.