Mechanical Engineering Dept. Department

Syllabus
ME 444: Introduction to Mechatronics (2-3-3)

Course Catalog Description:

A multidisciplinary course that introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology; Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control; The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology.

Course Pre-requisites:

- EE 204: Funda. of Electrical Circuits

Course Objectives:

1. Student will learn the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology.
2. Student will learn instrumentation and measurement system analysis and design.
3. Student will learn sensors and actuators; computer data acquisition and control.
4. Student will learn the integration of mechanisms, materials, sensors, interfaces, actuators.
5. Student will learn microcontrollers, and information technology.

Course Learning Outcomes:

CLO1. The Student will: Be able to gain knowledge of basic mechatronics systems and establish a design criteria for solving a specific problem.

CLO2. The Student will: Be able to conduct proper and simple analysis of existing mechatronic systems in order to assess its performance to support the development of their own systems.

CLO3. The Student will: Be able to conduct laboratory mechatronic experiments, analyze data and interpret results related to Electro, Hydraulic and Pneumatic Systems and PLCs.

CLO4. The Student will: Be able to design a basic intelligent robotic system and understand the factors affecting the designs. Following the necessary procedure by specifying the system components and proper system layout and functions using manual calculations as well as utilizing modeling and simulation software.

CLO5. The Student will: Be aware of emerging technologies and contemporary issues related to Robotics and Artificial Intelligence.

Learning Resources:

• The lecture provided material and occasional references. To be posted on Blackboard.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Report	10	15.0%
Project	15	25.0%
Poster Presentation	15	10.0%
Defense Presentation	2	15.0%
Oral/Written Examination	9	15.0%

Lab Assessment Plan:

Assessment Task	Week Due	Weight
During Laboratory Assessments	15	20.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introductory Lecture
	Overview on Mechatronics
2	Electro-Mechanical Systems
	Electro-Pneumatic Systems
3	Electro-Hydraulic Systems
	Sensors
4	Sensors (Continue)
	Actuators
5	Actuators (Continue)
	Design Considerations
6	Sensors and Actuators Interfacing
	Interfacing with Electronic Devices
7	PLC and Ladder Logic
	Microcontrollers and Signal Conditioning
8	Signal Conditioning
	Signal Amplification
9	A/D Encoders
	D/A Decoders
10	Modeling of Physical Systems

Week#	Topics
11	Control systems fundamentals
	Open Loop Control Systems
12	Closed Loop control Systems
	Feedback Control (P, PI, PD, PID)
13	Feedback Control (P, PI, PD, PID) (Continue)
	CAD/CAM
14	CAD/CAM (Continue)
	Performance Metrics
15	Evaluation of Course
	Closing Remarks

Lab Weekly Schedule:

Week#	Topics
1	Introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology.
2	Introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology. (Continue)
3	Introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology. (Continue)
4	Introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology. (Continue)
5	Introduces the design and realization of mechatronics; Electro-mechanical systems controlled by microcontroller technology. (Continue)
6	Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control.
7	Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control. (Continue)
8	Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control. (Continue)
9	Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control. (Continue)
10	Instrumentation and measurement system analysis and design; sensors and actuators; computer data acquisition and control. (Continue)
11	The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology.
12	The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology. (Continue)
13	The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology. (Continue)
14	The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology. (Continue)

Week#	Topics
15	The integration of mechanisms, materials, sensors, interfaces, actuators, microcontrollers, and information technology. (Continue)