Faculty of Engineering & Technology

Mechatronics

Information :

Course Code :	MKT 411	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Specialization of Mechatronics Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	MOHAMED ABDELBAR SHAMSELDIN ALY	12
Lecturer	MOHAMED ABDELBAR SHAMSELDIN ALY	12
Teaching Assistant	Fady Ayman Mohamed Naguib Mahmoud Noah	4
Teaching Assistant	Fady Ayman Mohamed Naguib Mahmoud Noah	4

Area Of Study :

This course aims to:
ÅIntroduce Mechatronics specialization in general and the concept of Multidisciplinary and synergistic integration of different engineering areas with emphasis on Parallel design concept.
ÅEnrich the studentõs basic knowledge about interfacing and data acquisition in Mechatronics Systems.
ÅTrain students to design, simulate, build, and test an elementary Mechatronics Subsystem.¸

Description :

Mechatronics system configuration; Modeling of mechanical translational and rotational systems; Mechanisms systems; Mechanical and electrical actuators; Pneumatic and hydraulic systems; Sensors and encoders; Data acquisition and signal conditioning; Computer-aided drawing (CAD) and interpretation of 3-D technical drawings; Mini project to design, model, implement, and test a mechatronics system.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	a1. Define Mechatronics systems, sensors, actuators, signal conditioning, and control units.
2 -	a2. a2. List the different arrangements of the operational amplifier circuits for different purposes.
3 -	a3. Explain how to properly sample a signal for digital processing,
4 -	a4. Describe signal conditioning systems, analogue to digital (A/D) and digital to analogue (D/A) conversion process
5 -	a5. Describe the steps of using CAD and simulation software for Mechatronics systems.
b.Intellectual Skills: :	
1 -	b1. Analyse the different arrangements of operational amplifiers considering ideal and real models.
2 -	b2. Calculate the proper sampling frequency and the resolution for digital processing.
3 -	b3. Select the proper data acquisition card to solve a given signal processing task.
4 -	b4. Develop CAD & simulation models for Mechatronics system.

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5 -	b5. Analyse the results of simulation models for a simple mechanical, electrical, and electromechanical systems.
c.Professional and Practical Skills: :	
1 -	c1. Analyse lab experimental results of sampling a signal with different sampling frequencies.
2 -	c2. Use the suitable hardware components and software for drafting and implementing a given simple mechatronics system.
d.General and Transferable Skills: :	
1 -	d1. Work in stressful environment and within constraints through assignments and course project
2 -	d2. Effectively manage tasks, time, and resources.
3 -	d3. Search for information and engage in life-long self-learning discipline through self-learning assignments.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction: Course outlines &Information - Mechatronics ï Mechatronics Engineer-Mechatronics system design approach		2	0
Mechatronics system ï Sensors-Actuators -Control unit- Signal Conditioning.		6	0
Analog Signal Processing Using Operational Amplifiers: Ideal model for Operational Amplifier (Different arrangements ï Sample & Hold circuit- Comparator), Real OP Amp: Important Parameters from Data Sheets.		6	6
Data Acquisition: Quantization Theory- A/D Converters- D/A Converters- Virtual Instrumentation - Data Acquisition and Control.		10	8
Modelling of Mechatronics systems: Hard & Soft Models- Model validation and verification- Modelling of Mechanical, Electrical, and Electromechanical Systems. Simulation using MATLAB/SIMULINK		6	4
Lab Experiments: Use of a CAD software for PCB Design & Application- Basic circuits of amplifiers - Signal sampling using DAQ - Simulation of a simple Mechatronics System.		0	12
Project follow -up.		0	2
Midterm Exams		0	2

Teaching And Learning Methodologies :

Interactive Lecturing
Problem solving
Discussion
Experiential learning
Project
Research

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Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments, Participation, & Quizzes	20.00		
Final Exam	40.00		
First Midterm	15.00	5	
Project.	10.00	12	
Second Midterm	15.00	10	

Recommended books :

ÅAlciatore, David G.& Histand, Michael B.; ñIntroduction to Mechatronics and Measurement Systemò, McGraw Hill, 4th Edition, 2012
ÅLecture notes on the course moodle page, FUE website.
Recommended Readings:
ÅBolton, William; ñMechatronics: Electronic Control Systems in Mechanical and Electrical Engineeringò, Prentice Hall, 4th Edition, 2008.

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