

## Faculty of Engineering & Technology

### Electromechanical Design

#### Information :

**Course Code :** MAN 515

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Mechatronics Engineering

#### Instructor Information :

Title	Name	Office hours
Lecturer	Abdel Moneim Mohamed El Mahdi Ismail	7
Lecturer	Ziad Ahmed Ibrahim Abdo	3
Lecturer	Ziad Ahmed Ibrahim Abdo	3
Teaching Assistant	Mohamed Samir Ahmed Mohamed	1
Teaching Assistant	Raouf Mahmoud Mourad Naguib	
Teaching Assistant	Mohamed Samir Ahmed Mohamed	1

#### Area Of Study :

This course aims to:

- Introduce the integration of Mechanical and Electrical System as a building block of Mechatronics Systems.
- Enrich the students knowledge in construction, analysis, and design of electromechanical systems.
- Train students to design, build, and test a simple Electromechanical Subsystem.

#### Description :

Design of mechanical motion transmission systems: gearing, couplings, belts and lead-screws, Sensing and measurement of mechanical motion, Sensor selection, Electromechanical actuator selection and specification, sequential controller design, Digital I/O, Case studies

#### Course outcomes :

##### a. Knowledge and Understanding: :

1 -	a1. Describe the main steps for design of electromechanical systems.
2 -	a2. Identify the different Electrical components of the Electromechanical
3 -	a3. Identify the different Mechanical components of the Electromechanical
4 -	a4. Describe the function of different transmission mechanisms
5 -	a5. Describe the different motion profiles used in designing electromechanical

##### b. Intellectual Skills: :

1 -	b1. Select the suitable mechanical & Electrical components needed
2 -	b2. Develop the needed computer programs for design and control
3 -	b3. Evaluate the performance of Electromechanical Systems and

4 -	b4. Analyze the different motion profiles used in designing the
<b>c. Professional and Practical Skills: :</b>	
1 -	c1. Use the available software for design and control of electromechanical
2 -	c2. Use the suitable hardware components and software for implementing
3 -	c3. Prepare a technical presentation report for a given task.
<b>d. General and Transferable Skills: :</b>	
1 -	d1. Work in stressful environment and within constrain.
2 -	d2. Work inside a team (Team work project).
3 -	d3. Effectively manage tasks, time, and resources.
4 -	d4. Search for information and engage in life-long self-learning discipline

### **Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction . Design principles.		2	0
Basic building blocks ( Electrical components): AC/ DC Motors . Stepper motors . H drive-PWM . Stepper motors drive and control- Linear Motors- speed torque curves . Motor selection.		10	8
Basic building blocks (Mechanical components): Gear heads- multi gear ratio gear boxes (ICE/Auto) . Rotary motion/Direct drive- Rotary motion/ Gearhead Drive - Rotary motion/Belt& Pulley Drive - Linear motion/Lead (Power)Screw Drive- Linear motion/ Belt& Pulley drive - Linear motion/ Rack and Pinion drive- Linear motion/Roll feed drive- Linear motion/ Linear motor drive. Use of available software for design.		12	6
System analysis . Position- Velocity- Acceleration- Jerk- Velocity Profile: Trapezoid . Cosine . Parabolic.		6	2
Lab experiments: Hydraulic & Pneumatic . Motor speed & position control- Stepper motor/load control- DC motor/Load control-		0	8
Project follow -up.		0	4
Midterm Exams		0	2

### **Teaching And Learning Methodologies :**

Interactive Lecturing
Problem solving
Discussion
Experiential learning
Project
Research

### 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 :

Frederick G. Moritz, %Electromechanical Motion Systems Design and Simulation, John Wiley & Sons, Ltd, 2014  
 Alcioro, David G. & Histan, Michael B.; %Introduction to Mechatronics and Measurement System, McGraw Hill, Latest editions.  
 Richard G. Budynas & J. Keith Nisbett; %Shigley's Mechanical Engineering Design, McGraw Hill; latest edition