



INTRODUCTION TO ELECTROMECHANICAL DESIGN

LECTURE 1

COURSE: ELECTROMECHANICAL DESIGN

PREPARED BY

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INTRODUCTION

- This course will focus on the principles of Electromechanical engineering and design.
- In this course, students will learn to analyze and design equipment based on the combination of electrical/electronic circuits and mechanical systems.

INTRODUCTION

A practical introduction to electromechanical systems with emphasis on modeling, analysis and design techniques. The contents include standard motors, linear actuators, magnetic bearings, LVDTs and so on.

COURSE RATIONALE

The course rationale is to provide students with modeling and analysis tools that can be used to design electrical machines (standard motors, linear actuators, magnetic bearings, LVDTs, etc).

Course Learning Outcome (CLO)

Having successfully completed this course, students should have the knowledge to:

CO1	Develop knowledge about the advanced electromechanics, electrical machines, electrostatic machines, electromechanical sensors and harmonic effects
CO2	Demonstrate knowledge about selecting machines and theirs Models and circuits for electrical drives
CO3	Analyze drive system models for electrical and mechanical terminals, power electronics for control of electrical machines and so on.

EVALUATION PROCESS

Assessment Strategy	Assessment Percentage
Quizzes based on reading and video lesson reflections. There will be 2 or more than 2 quizzes in total.	15%
Discussion Forums to ensure class participation and reflect learning. There should be one in each week	10%
Homework assignments: Depending on the topic taught, an assignment will be provided to all students on a weekly basis	10%
Mid Term Examination at the middle of the semester.	15%
After completion of the course, there will be a final examination.	40%

EVALUATION OF COURSE OUTCOMES

Assessment Method	Percentage	CO1	CO2	CO3
Quiz	15%	√	√	√
Forum	10%	√	√	
Assignment	10%	√	√	
Mid Term Exam	15%	√		√
Final/Term Paper	40%	√	√	√

ELECTROMECHANICAL DESIGN

- The term 'Electromechanical' relates to mechanical device which is electrically operated. *especially* being a transducer for converting electrical energy to mechanical energy

DEFINITION

Electromechanical design (alternatively written as **electromechanical engineering**, or **electro-mechanical eng.**) refers to the analysis, design, manufacture and maintenance of equipment and products based on the combination of electrical/electronics circuits and mechanical systems.



DEFINITION

- More specifically, Electromechanical design combines processes and procedures drawn from electrical engineering and mechanical engineering.
- Electromechanical design deals with the interaction of electrical and mechanical systems as a whole and how the two systems interact with each other.

SYSTEMS

This process is especially prominent in systems such as those of DC or AC rotating electrical machines which can be designed and operated to generate power from a mechanical process (generator) or used to power a mechanical effect (motor).

ELECTROMECHANICAL DEVICES

- Electromechanical devices are ones which have both electrical and mechanical processes.
- Strictly speaking, a manually operated switch is an electromechanical component due to the mechanical movement causing an electrical output.
- Though this is true, the term is usually understood to refer to devices which involve an electrical signal to create mechanical movement, or vice versa mechanical movement to create an electric signal.

ELECTROMECHANICAL DEVICES

Often involving electromagnetic principles such as in relays, which allow a voltage or current to control another, usually isolated circuit voltage or current by mechanically switching sets of contacts, and solenoids, by which a voltage can actuate a moving linkage as in solenoid valves.

EARLY PRACTICE

Before the development of modern electronics, electromechanical devices were widely used in complicated subsystems of parts, including electric typewriters, teleprinters, clocks, initial television systems, and the very early electromechanical digital computers.

MODERN PRACTICE

- Today, electromechanical processes are mainly used by power companies. All fuel based generators convert mechanical movement to electrical power.
- Some renewable energies such as wind and hydroelectric are powered by mechanical systems that also convert movement to electricity.

EXAMPLES

- Another electromechanical device is Piezoelectric devices, but they do not use electromagnetic principles.
- Piezoelectric devices can create sound or vibration from an electrical signal or create an electrical signal from sound or mechanical vibration.

REFERENCES

- The Characteristics of Mechanical Engineering Systems, R Holmes.
- Handbook for Engineering Design, PER Mucci.

The background is a blue gradient with decorative white circuit-like lines in the corners. The lines consist of straight segments and small circles, resembling a stylized electronic circuit board.

THANK YOU