

Course Title: Electromechanical Design

Course ID: MTE 1101

Credit Hours: 3

Rationale:

Electromechanical Design prepares the students for a professional career by providing a broad engineering base suited for the engineering of electromechanical systems and machines, industrial systems (PLC) and offers detailed knowledge toward various subtopics

Semester and year offered: Semester 11 Year 4

Total Student Learning Time (SLT)	Face to Face (Hours)	Total Guided and Independent Learning (Hours)
Lecture	39 (3 hours x 13 weeks)	39 (3 hours x 13 weeks)
Practical/Laboratory	-	-
Course Assignment/Project	-	12 (1 Assignments x 2 hours) (1 project x 10 hours)
Midterm	1.5 (1 Exam x 1.5 hours)	6 (1 Exam x 6 hours)
Quizzes	3 (3 Quizzes x 1 hours)	6 (3 Quizzes x 2 hours)
Final Examination	2 (1 Exam x 2 hours)	12 (1 Exam x 12 hours)
Subtotal	45.5 hours	75 hours
Total (Hours)	120 hours	

Outcomes:

At the end of this course, students will be able to:

CO1: Analyze the fundamentals of electromechanical systems and machines.

CO2: Explain the principles of electromechanical energy conversion and use these principles on electric machines

CO3: Demonstrate knowledge, technique and skills in the design and development of electromechanical machines

Course Outcome	Course Content	Teaching Learning Strategy	Assessment Strategy
Analyze the fundamentals of electromechanical systems and machines.	Basic power transmission systems, Efficiency, Power conversion between modes, Component familiarization, Load matching	Lectures, Presentation, Group discussion.	Quiz, Assignment, Class Test, Examination.

Explain the principles of electromechanical energy conversion and use these principles on electric machines	Ratio elements: Gear and gear trains, Clutches, torque converters, Converters: Fluid, electrical, mechanical, Shaft Size, seal design, Manufacturer's information, e.g. gear selection, Chain, belt , rope, Bearings and its types, Application of bearings.	Lectures, Presentation, Group discussion	Presentation, Assignment, Class Test, Examination.
Demonstrate knowledge, technique and skills in the design and development of electromechanical machine	Electromechanical machines: The selection and use of electrical actuators, system integration aspects	Lectures, Presentation, Group discussion.	Quiz, Assignment, Class Test, Examination.

Main Reference

1. Electromechanical Systems and Devices, Sergey Edward Lyshevski, CRC Press, ISBN: 1420069721, 2008
2. PER Mucci, Handbook for Engineering Design, BSI 1996, Library TA153 MUC

CO and PO relationship

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Taxonomy
CO1		✓											C3, C4
CO2					✓								C4, C5
CO3											✓		C3, C6

Bloom Taxonomy

Cognitive Domain (Knowledge-based)	Affective Domain (Emotion-based)	Psychomotor Domain (Action-based)
C1: Remembering	A1: Receiving	P1: Perception
C2: Understanding	A2: Responding	P2: Set
C3: Applying	A3: Valuing	P3: Guided Response
C4: Analysing	A4: Organizing	P4: Mechanism
C5: Evaluating	A5: Characterizing	P5: Complex over response
C6: Synthesizing (Creating)		P6: Adaptation
		P7: Origination

P01: Engineering Knowledge	P05: Modern Tools	P09: Communication
P02: Problem Analysis	P06: Engineer and Society	P010: Team Work
P03: Design/ Development	P07: Sustainability	P011: Lifelong Learning
P04: Investigation	P08: Ethics	P012: Project Management

Complex Activities and Knowledge Profile

	Complex Engineering Problem	Complex Activities	Knowledge Profile	Assessment
C01	P1	A2	K6	Quiz, Assignment
C02	P1	A4	K7	Quiz, Assignment
C03	P7	A3	K6	Quiz, Assignment

Course Outline Details

Week	Course Learning Outcomes	Course Content	Teaching Learning Strategy	Assessment Strategy	
1	To elaborate the Power transmissiom system	Basic power transmission systems	Lecture, Demonstration, Interactive Session	Written Exam	
2	To describe the operation and characteristics of Power conversion and other tools	Efficiency, power conversion between modes,	Lecture, Demonstration, Interactive Session	Written Exam	
3	To discuss component familiarization	Component familiarization, Load matching	Lecture, Demonstration, Interactive Session	Written Exam	
4	To analyze the function of gear and gear trains	Ratio elements: gears and geartrains.	Lecture, Demonstration, Interactive Session	Written Exam	
5	To evaluate the operation of torque converters	Clutches, torque converters.	Lecture, Demonstration, Interactive Session	Written Exam	
6	To compare converters of various types	Converters - fluid, electrical, mechanical	Lecture, Demonstration, Interactive Session	Written Exam	
7	To demonstrate knowledge on shaft design	Shaft Size, Seal Design,	Lecture, Demonstration, Interactive Session	Written Exam	
8	To elaborate	Manufacturer's information,	Lecture, Demonstration,	Written Exam	

	manufacturer's information	e.g. gear selection.	Interactive Session		
9	To differentiate the operation of Chain, Belt and Rope	Chain, Belt and Rope	Lecture, Demonstration, Interactive Session	Written Exam	
10	To categorize bearing into different types	Bearings and its types, Application of bearings.	Lecture, Demonstration, Interactive Session	Written Exam	
11	To discuss the concept of actuators	Electromechanical machines: The selection and use of electrical actuators.	Lecture, Demonstration, Interactive Session	Written Exam	
12	To analyze the integration aspects of any electromechanical systems	System Integration Aspects	Lecture, Demonstration, Interactive Session	Written Exam	