Engineering Program

Specialization	**Technology of remote industrial sensing and controlling**
Course Number	20413251
Course Title	**Actuators**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

Brief Course Description:

This course covers the principle of operation of various types of actuators used in industry such as: electrical actuators, pneumatic and electro-pneumatic actuators, hydraulic and electro-hydraulic actuators and special types of actuators used in modern industry.

Course Objectives:

Upon the completion of the course, the student will be able to:

- Introduce student to the basic of electrical phenomena used in actuators
- Understand various types of electrical actuators
- Give the necessary background about pneumatic and hydraulic actuators
- Introduce special type of actuators used in new industry

Detailed Course Description:

Chapter No.	Content	Textbook	Time Needed
1	**Principles of electromechanical actuators** • Electromagnetic Principle • Solenoid Actuators • Voice Coil Actuators • Relay Actuator	Introduction to Biomechatronics, Graham Brooker , 2011 + Introduction to Mechatronics and Measurement Systems, **David G. Alciatore, 2012,** Fourth Edition	2
2	**Rotary actuators** • DC Motors - DC Motor Electrical Equations - Permanent Magnet DC Motor Dynamic Equations - Brush DC - Brushless DC - Stepper Motors • AC Motors • Other Motor Types	Introduction to Mechatronics and Measurement Systems, **David G. Alciatore, 2012,** Fourth Edition + Fundamentals of Mechatronics Musa Jouaneh, 2013	3
3	Driving and Selection Rotary Actuators • Servo Drives. • PWM Control of DC Motors • Stepper Motor Drive Methods • Wiring and Amplifiers • Actuator Selection	Introduction to Mechatronics and Measurement Systems, **David G. Alciatore, 2012,** Fourth Edition + Fundamentals of Mechatronics Musa Jouaneh, 2013	3
4	Pneumatic Actuators • Principles • Direct Pneumatic Actuators • Reverse acting Actuators • Pneumatic cylinder • Electro-pneumatic valves - Principles	Process control instrumentation technology Fluid Power with Applications	3

	- 2-way ,3-way, and 4 way valve - Pressure and flow valves		
5	Hydraulic Actuators • Hydraulic cylinder • Electro-Hydraulic valves - Principles - 2-way ,3-way, and 4 way valves - Check and poppet valves - Pressure and flow valves • Hydraulic servo • Hydraulic pumps - Gear pump - Piston pump - Vane pump	Process control instrumentation technology + Fluid Power with Applications + Introduction to Mechatronics and Measurement Systems, **David G. Alciatore, 2012,** Fourth Edition	3
	Special types of actuators • Bellows Actuators - Prime mover - Conventional • Piezoelectric Actuators • Translation Screw Devices	Introduction to Biomechatronics, Graham Brooker , 2011	2

Evaluation Strategies:

		Percentage	Date
1. Exams	**First Exam**	20%	/ /20__
	Second Exam	20%	/ /20__
	Final Exam	50%	/ /20__
2. Homework and Projects		10%	/ /20__
Total		100%	

Teaching Methodology:

- Lectures
- PowerPoint slides
- Term projects

Text Books & References:

Textbooks

1. Fundamentals of Mechatronics Musa Jouaneh, 2013
2. Introduction to Mechatronics and Measurement Systems, **David G. Alciatore, 2012,** Fourth Edition
3. Introduction to Biomechatronics, Graham Brooker , 2011

References

Process control Instrumentation Technology , Curtis D. Johnson, 8-th edition.