2BM303: Medical System Actuators **[3 0 2 3 1]**

Learning Outcomes:

The educational objectives of the course are to educate students to attain the following:

- Explain important physical principles applied in actuators.
- Identify various types of actuators including hydraulic, mechanical, electrical, electromechanical and magnetostrictive actuators.
- Implementation and use of actuator for biomedical applications.

SYLLABUS

Unit No.	Topics	Lectures (Hours)
	Introduction to the overview and importance of the course.	
1	**INTRODUCTION:** Definition of actuator, Actuators as system components. Actuator in open and closed loop mechanism.	4
2	**ELECTRO MAGNETIC ACTUATORS:** Definition of electromagnetic actuators; **AC TWO PHASE SERVOMOTOR:**Construction features and characteristics, Torque and power equations; **LINEAR MOTOR:**Principle, operation and construction, Equivalent circuit; **PERMANENT MAGNET DC MOTOR.**	6
3	**STEPPER MOTOR:** Principle, Operation and construction, Half, full and Micro stepping, Torque equation, Sizing of stepper motor, Stepper motor driving circuit.	6
4	**FLUID POWER ACTUATORS:** Proportional Valves; Electro Hydraulic Valve; Electro pneumatic Valve; Pressure Control Valve; Fluid Power Motors and Pumps, Type of valves, actuators for medical bed.	6
5	**LINEAR ELECTROMECHANICAL DEVICES:** Relays: Basic components of electromagnetic relay, AC & DC relay, Contact type & material, Reed Relay, Thermal Relay, Solid State Relay. Solenoid valve, plunger magnet.	6
6	**MAGNETOSTRICTIVE ACTUATORS:** Physical Effect; Material, Comparison between Piezoelectric and Magnetostrictive Actuators; Applications	5
7	**TRANSFORMERS:** Introduction; Construction; Principle of operation; EMF equation; Transformer on no load and load; Equivalent circuit; Regulation; Losses; Efficiency; All-day efficiency; Open Circuit, Short Circuit and back to back test; Parallel operation; Auto-transformer.	6

Term Work and Practical shall be based on the above syllabus.

Text Books:

1. Actuators-Basics and Applications By: H.Janocha(Ed.)
2. A text book of Electrical TechnologyVolume – 2 By: B. L. Theraja

Reference Books:

1. Electrical Machines By: H. T. Kashipara, Mahajan Publishing House.
2. Electromechanical Components in Servomechanism By: Sidney Davis and Lidgerwood.
3. Linear electric actuators and generators By:I.Boldea and S.A.Nasar
4. Fractional and Sub fractional Horsepower Electric Motors By: Veinott.
5. Electric Relays: Principles and Applications By: Vladimir Gurevich.