20ME2702A - MECHATRONICS

Offering Branches	ME		
Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20ES1101 - Basic electrical and electronics engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** the concepts related to elements of Mechatronic systems.	**K2**
CO2	**Summarize** the construction and working of sensors used in building mechatronic systems.	**K3**
CO3	**Illustrate** various types of actuation systems and their components.	**K3**
CO4	**Develop** mathematical models using building blocks and make use of these models to find the dynamic response.	**K3**
CO5	**Summarize** the construction and working of closed loop controllers, Micro processor and Micro controllers.	**K3**
CO6	**Illustrate** the features and applications of digital logic, PLC and of Fuzzy logic.	**K3**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3									2		2	3	1
CO2	3									2		2	3	1
CO3	3		3							2		2	3	1
CO4	3	3			2					2		2	3	1
CO5	3				2					2		2	3	1
CO6	3				2					2		2	3	1
Avg.	**3**	**3**	**3**		**2**					2		2	3	1

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION:** Definition of Mechatronics, evolution of mechatronics, systems, measurement systems, control systems, mechatronic design process, traditional design and mechatronic design, applications of mechatronic systems, advantages and disadvantages of mechatronic systems. **SENSORS:** classification of sensors, basic working principles, Velocity sensors – Proximityand Range sensors, ultrasonic sensor, laser interferometer transducer, Hall Effect sensor, inductive proximity switch. Light sensors – Photodiodes, phototransistors, tactile sensors – PVDF tactile sensor, micro-switch and reed switch, Piezoelectric sensors, vision sensor	**CO1 CO2**
UNIT-2	**PNEUMATIC AND HYDRAULIC ACTUATION SYSTEMS:** Actuation systems, Pneumatic and Hydraulic systems- constructional details of filter, lubricator, regulator, direction control valves, pressure control valves, flow control valves, actuators-linear and rotary.	**CO1 CO3**

	ELECTRICAL ACTUATION SYSTEMS: Electrical systems, Mechanical switches, solid state switches, solenoids, DC motors, AC motors, stepper motors. Characteristics of pneumatic, hydraulic, electrical actuators and their limitations.	
UNIT-3	**BASIC SYSTEM MODELS:** Mathematical models, mechanical system building blocks, electric system building blocks, fluid system building blocks, thermal system building blocks. **DYNAMIC RESPONSES OF SYSTEMS:** Transfer function, Modelling dynamic systems, first order and second order systems.	**CO1 CO4**
UNIT-4	**CLOSED LOOP CONTROLLERS:** Classification of control systems, feedback, closed loop and open loop systems, continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller. **MICROPROCESSOR AND MICRO CONTROLLER:** Introduction, Architecture of a microprocessor (8085), Architecture of a Micro controller, Difference betweenmicroprocessor and a micro controller.	**CO1 CO5**
UNIT-5	**DIGITAL LOGIC:** Digital logic, number systems, logic gates, Boolean algebra, Karnaugh maps, application of logic gates, sequential logic, transducer Signal Conditioning and devicesfor data conversion. **PROGRAMMABLE LOGIC CONTROLLERS:** Introduction, basic structure, input/output processing, programming, mnemonics, timers, internal relays and counters, shift register, master and jump controls. Data handling, Analog input/output, selection of a PLC. **FUZZY LOGIC APPLICATIONS IN MECHATRONICS**: Fuzzy logic systems, Fuzzy control,Uses of Fuzzy expert systems.	**CO1 CO6**

Learning Resources

Text Books	1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, (3rdedition), by W Bolton, Pearson Education Press, 2005. 2. Mechatronics System Design, 5th Indian reprint, 2009, by Devdas shetty, Richard A. kolk,PWS Publishing Company
Reference Books	1. Mechatronics Source Book, by Newton C Braga, Thomson Publications, Chennai. 2. Mechatronics, by N. Shanmugam, Anuradha Agencies Publishers. 3. Control sensors and actuators, by C.W.Desilva, Prentice Hall. 4. Design with Microprocessors for Mechanical Engineers, by Stiffler, A.K.McGraw- Hill(1992).
E-Resources & other digital material	1. https://onlinecourses.nptel.ac.in/noc22_me54/course

Commented [RK1]: