T. Y. B. Tech (E&TC Engineering)
Academic Year – 2021-2022 Semester -V
[EC3103]: Mechatronics

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week	TH:3	In Sem. Evaluation:15 Marks
LAB: -2 Hours/Week	LAB:1	Mid Sem. Exam : 25 Marks
		End Sem. Exam : 60 Marks
		Lab Evaluation : 25 Marks

Course Prerequisites: Analog circuits, Electronics circuits and Machines and Microcontrollers.

Course Objective:

This course provides an introduction of key elements of mechatronics systems such as sensors, actuators and final control elements along with basic communication protocols. The objective of this course is to design basic mechatronics systems.

Course Outcomes:

After successful completion of the course, students will able to:

CO1: Describe and analyze hardware and software components of Mechatronics systems.
CO2: Select an appropriate sensor/actuator to meet requirements of an industrial applications
CO3: Develop data acquisition system using bus standards and communication protocols.
CO4: Identify industrial solution for complex engineering problems using PLC.

Course Contents

UNIT-I	Introduction to Mechatronics	06 Hours

Basics of Mechatronics Systems : Definition of Mechatronics, Key elements of Mechatronics Systems, Levels of Mechatronics systems, architecture and working of Mechatronics system such as washing Machines, Digital Cameras, CD Players, camcorders.

UNIT-II	Sensors, Signal conditioning and Transmitters	08 Hours

Types of sensors, Selection of sensors (application specific), Measurement Characteristics, Application of sensors. Specifications, signal conditioning circuits and applications of sensor: displacement, velocity and motion sensors, proximity sensors, force, pressure, flow, level, temperature sensors, humidity, ph and conductivity sensors. Need of transmitters, two wire transmitters – Smart and Intelligent transmitters.

UNIT-III	Hydraulic Systems	08 Hours

Introduction to Hydraulic Actuators and Fluid Power systems: Concept of Actuators, Classification of Actuators: Pneumatic, Hydraulic and Electrical Actuators, Fluid Power systems, Hydraulic Systems: Physical Components of a Hydraulic systems, Hydraulic Pumps (e.g. Gear Pumps, Vane Pumps, Piston Pumps and Axial Piston Pumps) , Filters and Pressure Regulation, Relief Valve, Accumulator. Electronics circuits for hydraulic systems.

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B.O.S. Chairman	Dean Academics	Director RSCOE, Pune

UNIT-IV	Pneumatic Systems	06 Hours
Introduction to Pneumatic an Actuators Physical Components of a Pneumatic Systems, Pneumatic Cylinders, Pneumatic Actuators (e.g. Spring Actuator and Spring Actuator with positioner), Air compressor, Air Receiver, Air Dryer Air Service Treatment: Air Filter, air regulator and Gauge, Air Lubricator and Pressure regulation Intake and Air Filter. Case study of Robotic Pick and Place robot		
UNIT-V	**Electrical Actuators, Electron-Mechanical Actuators**	**07 Hours**
Electrical-Actuation system: Selection criteria and specifications of stepper motors, solenoid valves,relays (Solid State relays and Electromechanical relays). Selection Criterion of control valve, Single acting and Double acting Cylinders. Electro-Pneumatic: Pneumatic Motors, Valves: Electro Hydraulic: 3/2 Valves, 4/2 Valves, 5/3 Valves Cables: Power cable and Signal cables		
UNIT-VI	**Mechatronics Systems in Automobile**	**07 Hours**
(Treatment with Block Diagram Approach) Boat Autopilot, High Speed tilting trains, Automatic car parking systems, Engine Management systems, Antilock Brake systems (ABS) ,CNC Machines(Only Black Diagram and explanation)		

Lab Contents

Guidelines for Assessment

- Total marks assigned are 25.
- Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file.
- Final practical examination for specific practical and oral examination will be conducted.

List of Laboratory Assignments/Experiments

1	Servomotor position control using photo electric pickup
2	Position and velocity measurement using encoders
3	Study of liquid flow measurement.
4	Study on the application of data acquisition systems for industrial purposes.
5	Interfacing of any 2- sensors with data acquisition systems.
6	Study of Hydraulic Trainer.
7	Study of Pneumatic Trainer.
8	Study of Electro-Pneumatic Trainer.
9	Study of Electro-Hydraulic Trainer.

Text Books:

T1. W. Boltan ―Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering‖ 6th Edition, Pearson Education, 2016

T2. David Alciatore and MaichaelB Histand, ―Introduction to Mechatronics and Measurement Systems‖,4th Edition, Tata McGraw Hill 2013.

T3. K.P. Ramachandran, G.K. Vijayaraghavan and M.S. Balasundaram, ―Mechatronics-Integrated Mechanical Electronic Systems‖, Willey Publication 2008

Reference Books:

R1. Nitaigour P. Mahalik ,‖ Mechatronics-Principles, Concepts and Applications‖, Tata McGraw Hill, Eleventh reprint 2011.

R2. DevdasShetty and Richard A.Kolk, ―Mechatronics System Design‖, Thomson India Edition 2007.

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