

MECHATRONICS

Module – I:

Sensors and Transducers:- Sensors and transducers, Performance terminology, Displacement, position and proximity, Velocity and motion, Force, Fluid pressure, Liquid flow, Liquid level, Temperature, Light sensors, Selection of sensors, Inputting data by switches. Book – 1: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12.

Signal conditioning:- Signal conditioning, The operational amplifier, Protection, Filtering, Pulse modulation.

Book – 1: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6.

Digital Signals:- Digital signals, Analogue and digital signals, digital-to-analogue and analogue-to-digital converters, Multiplexers, Data acquisition, Digital signal processing. Book – 1: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6.

Pneumatic and Hydraulic Actuation Systems:- Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Servo and proportional control valves, process control valves, Rotary actuators.

Book – 1: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8.

Module – II:-

Mechanical Actuation Systems:- Mechanical systems, Types of motion, Kinematic chains, Cams, Gears, Belt and chain drives, bearings, Mechanical aspects of motor selection. Book – 1: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9.

Electrical Actuation Systems:- Electrical systems, Mechanical switches, Solid-state switches, Solenoids, D.C. motors, A.C. motors, Stepper motors.

Book – 1: 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7.

Basic System Models:- Mathematical models, Mechanical system building blocks, Electrical system building blocks, Electrical system building blocks, Fluid system building blocks, Thermal system building blocks. Book – 1: 10.1, 10.2, 10.3, 10.4, 10.5.

Module – III:-

System Models:- Engineering systems, Rotational-translational systems, Electromechanical systems, Electromechanical systems, Linearity, Hydraulic-mechanical systems, Summary, Problems.

Book – 1: 11.1, 11.2, 11.3, 11.4, 11.5.

Closed-loop Controllers:- Continuous and discrete control processes, Terminology, Two-step mode, Proportional mode, Derivative control, Integral control, PID controller, Digital controllers, Control system performance, Controller tuning, Velocity control, Adaptive control, Summary, Problems.

Book – 1: 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.10, 15.11, 15.12.

Programmable Logic Controllers:- Introduction to PLCs, Basic Structure of a PLC, Principles of Operation, PLCs versus Computers, Introduction to Internal Architecture and Hardware Components, PLC Programming, Analog I/O, Selecting a PLC for the Application, Application of PLCs for Control.

Book – 2: 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8, 13.9.

Text Books:

1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engg. Pearson Publication, 4th Edition by William Bolton, 2010.
2. Mechatronics Integrated Mechanical Electronic Systems by K. P. Ramachandran, G. K. Vijayaraghavan, M. S. Balasundaram, Wiley India Edition, Printed on 2008.

Reference Books:

1. Mechatronics integrated Technologies for Intelligent Machines by A. Smaili, F.Mrad, Oxford University Press, Printed on 2009.
2. Mechatronic Sources Book, Cengage Learning India Edition by Newton C Braga, 2nd Edition, 2010.