

Course Objective:

To make the students to learn about the Basic electronics, electrical and mechanical components used to control the machines and industries. Various types of sensors, signal conditioning systems and various pneumatic and hydraulic components used in control systems. Micro controllers, PLCS and PLC program and programmable motion control systems.

UNIT I

Introduction: Definition - Trends - Control Methods: Stand alone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

Learning outcome & Suggested Student Activities:

This unit helps the students to understand the importance of mechatronics subject and controlling the various machines, robots etc. Students may observe CNC machines in CAD/CAM lab to understand the mechatronics concepts.

UNIT II

Signal Conditioning: Introduction - Hardware - Digital I/O ,Analog input - ADC , resolution , speed channels Filtering Noise using passive components - Resistors, capacitors - Amplifying signals using OP amps -Software - Digital Signal Processing

Learning outcomes & Suggested Student Activities:

This unit helps the students to understand how to convert the analog signals into useful required form. These signal condition systems may be observed in electronics and communication engineering department labs.

UNIT III

Precision Mechanical Systems: Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts - Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Bearings- Motor / Drive Selection.

Learning outcome & Suggested Student Activities:

In this unit the students learn about the pneumatic and hydraulic systems and about some precisions mechanical component which are useful in the field of automation. This automation system can be observed in many processing industries and manufacturing industries to handle the materials and control the machines (or) process.

UNIT IV

Electronic Interface Subsystems: Motors Isolation schemes- opto coupling, buffer IC's - Protection schemes - circuit breakers, over current sensing, resettable fuses, Power Supply - Bipolar transistors/ MOSFETS.

Electromechanical Drives: Relays and Solenoids - Stepper Motors - DC brushed motors - DC brushless motors - DC servo motors - PWM's - Pulse Width Modulation - Variable Frequency Drives.

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Learning outcome & Suggested Student Activities:

The objective of this unit is to make the student aware of electronic systems, electromechanical drives used in automation. Some of the systems may be observed electrical and electronics labs for better understanding.

UNIT V

Microcontrollers Overview: 8051 Microcontroller , microprocessor structure - Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications, Programming -Assembly.

Programmable Logic Controllers: Basic Structure - Programming: Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection, interface - R232 etc.,-Applications.

Learning outcome & Suggested Student Activities:

This unit helps the student to know about microcontrollers and to programming of programmable logic controls. Students may visit pharmaceutical industries, thermal power plants etc. To observe the PLC based control systems know about the interface between processing equipment and central system.

TEXT BOOKS:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, WBolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics, Ganesh.S.H, Jones and Bartlett publications.

REFERENCE BOOKS:

1. Mechatronics Source Book, Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics, N. Shanmugam, Anuradha Agencies Publisers.
3. Mechatronics System Design, Devdasshetty,Richard,Thomson.
4. Mechatronics, M.D.Singh, J.G.Joshi, PHI.

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