3/4 B.Tech. FIFTH SEMESTER

FE   **FE - MECHATRONICS**   **Credits: 4**

Lecture:- 4 periods/week   **Internal assessment: 30marks**
Tutorial: --   **Semester end examination: 70 marks**

Objectives:

1. Describe the way mechatronics integrates different disciplines with applications.
2. Acquire knowledge on actuators and drive systems.
3. Illustrate various motion control systems and its algorithms.
4. Generalize the basics of Architecture of intelligent machines.
5. Extrapolate the operation of Programmable Logic Controllers (PLC) and its features.
6. Classify the concepts of sensors and transducers and its interfacing with its applications

Learning outcomes:

 At the end of course the students will have:

1. Interpret the way mechatronics integrates different disciplines with applications.
2. List the different types of actuators and drive systems.
3. Explain various motion control systems and its algorithms
4. Memorize the basics of Architecture of intelligent machines.
5. Describe the basic structure of Programmable Logic Controllers (PLC) and its features.
6. Discuss the concepts of sensors and transducers and its interfacing.

Pre-Requisites:

Basic electrical and electronics

UNIT – I
INTRODUCTION:
Definition of Mechatronics products, design considerations and tradeoffs. Overview of Mechatronic products. Intelligent machine Vs Automatic machine economic and social justification. Measurement Systems - Control Systems - Traditional design and Mechatronics Design.

UNIT – II
ACTUATORS AND DRIVE SYSTEMS:
Mechanical, Electrical, hydraulic drive systems, Characteristics of mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations.

UNIT – III
MOTION CONTROL:
Control parameters and system objectives, Mechanical Configurations, Popular control system configurations. S-curve, motor/load inertia matching, design with linear slides.

UNIT – IV
MOTION CONTROL ALGORITHMS:
Significance of feed forward control loops, shortfalls, fundamentals concepts of adaptive and fuzzy – control. Fuzzy logic compensatory control of transformation and deformation non- linearity's.

UNIT – V
ARCHITECTURE OF INTELLIGENT MACHINES:
Introduction to Microprocessor and programmable logic Controls and identification of systems. System design classification, motion control aspects in Design. Microprocessors: Microprocessors, Control, Microprocessor systems, Architecture.

UNIT – VI
PROGRAMMABLE LOGIC CONTROLLERS:
Introduction, Basic structure, input/output processing, programming, Mnemonics Timers, Internal relays and counters. Data handling. - Analog input/ output, D/A Converters and A/D Converters, Selection of PLC.

UNIT – VII
SENSOR INTERFACING:
Analog and digital sensors for motion measurement, digital transducers, Human-Machine and machine- Machine inter facing devices and strategy.

UNIT – VIII
SENSORS AND TRANSDUCERS:
Introduction-Performance terminology-Displacement, position and Proximity - Velocity and Motion-Fluid pressure-Temperature sensors - Light sensors – Selection of sensors-Signal processing.

Learning resources

Text books:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, (3rd edition), by W Bolton, by Pearson Education Press, 2005.
2. Design with Microprocessors for Mechanical Engineers, by Stiffler, A.K., McGraw-   Hill, 1992.

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. Designing intelligent machines, by B.Histand and David G. Alciatore, Open University