

**B.Tech IV Year I Semester**

**JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA**

**19AME75b- MECHATRONICS AND MEMS**

*(Professional Elective-IV)*

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**Course Objectives:** The objectives of the course are to make the students learn about

- Familiarize the technologies behind modern mechatronic systems.
- Explain fundamentals for the development of fully automated system.
- Develop a robotic or automated systems focusing on the hardware and software integration.
- Demonstrate the development of mechatronic system and MEMS.

**UNIT – 1: Introduction:**

**10 Hrs**

Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications – Computer numerical control (CNC) machines, Tool monitoring systems, Flexible manufacturing system (FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Explain the role of mechatronics in industry. L2
- Identify the application of mechatronics in automation industry L3

**UNIT – II: Sensors:**

**10Hrs**

**Sensors:** Static characteristics of sensors, Displacement, Position and Proximity sensors, Force and torque sensors, Pressure sensors, Flow sensors, Temperature sensors, Acceleration sensors, Level sensors, Light sensors, Smart material sensors, Micro and Nano sensors, Selection criteria for sensors.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify various types of sensors L2
- Choose sensors for particular application L3
- Measure different quantity's using sensors L4

**UNIT – III: Actuators:**

**10Hrs**

Mechanical, Electrical, Hydraulic and Pneumatic Actuation systems, Characteristics and their limitations, Design of Hydraulic and Pneumatic circuits, Piezoelectric actuators, Shape memory alloys, Selection criteria for actuators.


**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify various actuation systems L2
- Choose the criterion for different actuators L1

**UNIT – IV: Microprocessors, Microcontrollers and Programmable Logic Controllers 8 Hrs**

**Microprocessors, Microcontrollers and Programmable Logic Controllers:** Architecture of of Microprocessor, Microcontroller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

  
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**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the architecture of microprocessors, microcontrollers and PLC L2
- Formulate various programs using PLC L6

**UNIT – V: Micro Electro Mechanical Systems (MEMS):**

**8Hrs**

History, Effect of scaling, Fabrication Techniques: Oxidation, Physical Vapor deposition, Chemical Vapor Deposition, Lithography, Etching, Wafer bonding, LIGA, DRIE, Applications: Lab on chip.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Demonstrate the knowledge of MEMS L2
- Classifying different fabrication techniques of MEMS L4
- Illustrate the application of MEMS in industry L2

**Text Books:**

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering , WBolton, 3/e Pearson Education Press, 2005.
2. Devadas Shetty and Richard A Kolk, Mechatronic System Design, 2/e, Cengage learning, 2010.

**Reference Books:**

1. Clarence W. de Silva, Mechatronics an Integrated Approach, CRC Press, 2004.
2. James J Allen, Micro Electro Mechanical Systems Design, CRC Press Taylor & Francis group, 2005.
3. Ganesh S Hedge, Mechatronics, Jones & Bartlett Learning, 2010.

**Course Outcomes:**

At the end of this Course the student will be able to

- Explain mechatronics systems in industry L2
- Identify mechatronic systems encountered in practice L3
- Examine the components of a typical mechatronic system L4
- Compare the various techniques used for development of MEMS L4
- Develop programs using PLC L6

  
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