B.Tech III Year II Semester
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65c- SENSORS FOR INTELLIGENT MANUFACTURING
(Open Elective - II)

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Course Objectives: The objectives of the course are to make the students learn about
- Familiarize the sensors used in intelligent manufacturing.
- Illustrate sensors used in precision manufacturing and CNC machine tools.
- Explain sensors for monitoring of manufacturing systems.
- Outline advanced sensors used in intelligent manufacturing.

UNIT – 1: Introduction   12 Hrs
Principles, classifications and characteristics of sensors – Electrical, magnetic, optical, acoustic, pneumatic, magnetic, electro-optical and vision sensors, role of sensors in intelligent manufacturing.

Learning Outcomes:
At the end of this unit, the student will be able to
- List out various types of sensors used in manufacturing.   .   **L1**
- Explain the characteristics of different sensors.   **L3**
- Explain optical, magnetic, pneumatic and acoustic sensors.   **L3**
- Describe the role of sensors in intelligent manufacturing.   **L4**

UNIT – II: Sensors and control in CIM and FMS: 10 Hrs
Design of CIM, decision support system for CIM, analysis of CIM, development of CIM strategy with sensors and control. FMS-Robot control with machine vision sensors-Architecture of robotic vision system, image processing, image acquisition, enhancement, segmentation, transformation, industrial application of robot vision, multi Sensor controlled robots, measurement of robot density, robot programming.

Learning Outcomes:
At the end of this unit, the student will be able to
- Identify various types of inbellisort manufacturing systems.   **L2**
- List the various types of sensors in CIM.   **L2**
- Explain machine sensors.   **L3**
- Describe architecture of robotic design systems.   **L4**

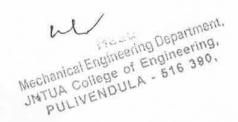### UNIT – III: Sensors in Precision Manufacturing: 8Hrs
Testing of manufacturing components, principles and applications of digital Encoders, opto-electronic colour sensors, control applications in robotics. Sensors for CNC machine tools– linear, position and velocity sensors. Automatic identification techniques for shop floor control.

Learning Outcomes:
At the end of this unit, the student will be able to
- List out different types of sensors in precision manufacturing.   **L1**
- Describe the principle behind opto-electronic color sensors   **L2**
- Select sensors for CNC machine tools.   **L3**
- Explain automatic identification techniques for shop floor control.   **L3**

UNIT – IV: Control of Manipulators: **8 Hrs**

Sensors for Monitoring of Manufacturing Systems: Principles – sensors for monitoring temperature, force, vibration and noise. Sensors to detect machinery faults. Selection of sensors and monitoring techniques.

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

• Identify various types of machine failures in manufacturing systems.	L2
• Select sensors for monitoring of force, vibration and noise.	L3
• Explain monitoring techniques for machinery faults.	L3
• Name sensors used for temperature.	L3

UNIT – V: Smart / Intelligent sensors: **8 Hrs**

Integrated sensors, micro sensors, nano sensors. Manufacturing of semi conductor sensors. Fibre optic sensors – Fibre optic parameters, configurations, photoelectric sensor for long distance, sensor alignment techniques.

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

• List out advance sensors in intelligent manufacturing.	L1
• Explain about semiconductor and integrated sensors.	L3
• Describe micro and nano sensors.	L3
• Discuss principles of fibre optic sensors.	L3

Text Books:
1. Sabrie Soloman, Sensors and Control systems in Manufacturing, McGraw-Hill, 2/e, 2010.
2. H.K Tonshoff and I.Inasaki, Sensor Applications Vol 1: Sensors in Manufacturing, Wiley-VCH Publications, 2001.

Reference Books:
1. Sabrie soloman, Sensors Handbook, McGraw Hill, 2/e, 20210

2. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G.Odrey, Industrial Robotics, Tata McGraw-Hill, 2008.

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

• Classify various sensors used in intelligent manufacturing.	L2
• Describe sensors used in computer integrated manufacturing and machine sensors.	L3
• Discuss sensors used in precision manufacturing.	L3
• Identify reasons behind machinery faults.	L3
• Discuss advanced sensors in intelligent manufacturing.	L3

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