20MD008 MECHANISMS OF AUTOMATION SYSTEMS

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Course Description and Objective: This course is aimed at Post Graduation Level to impart the knowledge on the various mechanisms involved in Advanced Automation Systems. The objective of the course is to explore the parameters involved in controlling and improving the performance of the automation systems.

Course Outcomes: After the completion of course, the student will be able to

- Understand the functional parameters of the Automation Systems
- Analyze the kinematics and dynamics of Mechanisms involved in Automated Systems
- Explore the requisites transportation and feeding mechanisms for industrial applications
- Suggest the appropriate mechanisms for functional attributions of Automated Systems

UNIT – I **L12**

Introduction: Robots, Definition of Levels or Kinds of Robots, Manipulators, Structure of Automatic Industrial Systems, Nonindustrial Representatives of the Robot Family, Relationship between the Level of Robot "Intelligence" and the Product, Processing Layout, Concept of Automatic Manufacturing Process, Productivity of a Manufacturing Process, Kinematic Layout.

UNIT – II **L12**

Dynamics of Drives: Mechanical Drives, Electromagnetic Drives, Electric Drives, Hydraulic Drives, Pneumo-drives, Brakes, Drives with Variable Moment of Inertia

Kinematics and Control: Position Function, Camshafts, Master Controller and Amplifiers, Dynamic Accuracy, Damping of Harmful Vibrations, Automatic Vibration Damping, Electrically Vibration Dampers

UNIT – III **L12**

Transportation: General Considerations, Transportation – Linear, Rotational, Vibration
Feeding: Introduction, Feeding of Liquid and Granular Materials, Feeding of Strips, Wires, Rods etc, Feeding of Orientation parts in Magazines, Feeding parts from Bins

UNIT – IV **L12**

Orientation Devices: General Discussions, Orientation – Active and Passive, Logical Orientation, Non-mechanical Orientation.

Functional Systems and Mechanisms: Automatic Assembling, Special Means of Assembly, Inspection Systems, Miscellaneous Mechanisms –

UNIT – V **L12**

MANIPULATORS: Kinematics and Dynamics, Grippers, Guides, Mobile and Walking Robots
Feedback Sensors: Linear and Angular Displacement Sensors, Speed and Flow-rate Sensors, Force Sensors, Temperature Sensors, Item Presence Sensors.

TEXT BOOKS:

1. Ben – Zion Sandler," Robotics: Designing the mechanisms for Automated Machinery", 2nd Edition, Academic Press, 1999.
2. Jeremy Hirschhorn, "Kinematics and Dynamics of Plane Mechanisms", 3rd Edition, McGraw- Hill, 2005.
3. L. Sciavicco and B. Siciliano, "Modelling and control of Robot Manipulators", 2nd Edition, Springer– Verlag, London,2000.
4. Amitabh Ghosh and Ashok Kumar Mallik, "Theory of Mechanisms and Machines", E.W.P. Publishers.

REFERENCE BOOKS:

1. AllenS.HallJr.,"KinematicsandLinkageDesign",4th Edition,PHI,1964.
2. J.E.ShigleyandJ.J.UickerJr.,"TheoryofMachinesandMechanisms",McGraw-Hill,2015.
3. MohsenShahinpoor, "A Robot Engineering TextBook", 5th Edition, Harper & Row Publishers, NewYork,2012.
4. JosephDuffy, "Analysis of mechanisms and Robot Manipulators", 4th Edition, Edward Arnold, 2010.