

**DEPARTMENT OF MECHANICAL ENGINEERING**

**LESSON PLAN**

**6<sup>TH</sup> SEMESTER**

**SUBJECT - INDUSTRIAL ROBOTICS & AUTOMATION**

**SECTION - A & B**

**SESSION- 2022 - 2023**

<b>MONTH</b>	<b>NO. OF PERIODS AVAILABLE</b>	<b>TOPICS TO BE COVERED</b>
<b>FEB</b>	<b>14</b>	<p><b>1.0 Fundamentals of Robotics:</b> 1.1 Definition; Robot anatomy (parts) and its working. 1.2 Robot Components: Manipulator, End effectors; Construction of links, Types of joints. 1.3 Classification of robots; Cartesian, Cylindrical, Spherical, Scara, Vertical articulated. 1.4 Structural Characteristics of robots; Mechanical rigidity; Effects of structure on control work envelope and work Volume. 1.5 Robot work Volumes, comparison. 1.6 Advantages and disadvantages of robots.</p> <p><b>2.0 Robotic Drive System and Controller:</b> 2.1 Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives. 2.2 AC servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary motion. 2.3 Feedback devices; Potentiometers; Optical encoders; DC tachometers. 2.4 Robot controller; Level of Controller; Open loop and Closed loop controller. 2.5 Microprocessor based control system; Robot path control: Point to point, Continuous path control and Sensor based path control; Controller programming.</p>
<b>MARCH</b>	<b>23</b>	<p><b>3.0 Sensors:</b> 3.1 Requirements of a sensor. 3.2 Principles and Applications of the following types of sensors: Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation Principle, Structured lighting approach). 3.3 Proximity sensing; Force and torque sensing.</p> <p><b>4.0 Introduction to Machine Vision:</b> 4.1 Robot vision system (scanning and digitizing image data); Image processing and analysis. 4.2 Cameras (Acquisition of images); Videocon camera (Working principle &amp; construction). 4.3 Applications of Robot vision system: Inspection, Identification, Navigation &amp; serving.</p>
<b>APR</b>	<b>23</b>	<p><b>5.0 Robot kinematics and Robot Programming:</b> 5.1 Forward Kinematics; Inverse Kinematics and Differences. 5.2 Forward Kinematics and Reverse Kinematics 5.3 Teach Pendant Programming; Lead through programming; Robot programming Languages; VAL Programming. 5.4 Motion Commands; Sensor Commands; End effector commands; and Simple programs.</p> <p><b>6.0 Automation &amp; Industrial Applications:</b> 6.1 Basic elements of automated system, advanced automation functions, levels of automation. 6.2 Application of robots in machining; welding; assembly and material handling.</p>