

# **ROBOTICS**

## **(Open Elective)**

### **OBJECTIVES:**

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.

### **UNIT- I:**

#### **Introduction**

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots  
**ROBOT KINEMATICS AND DYNAMICS**  
Positions,

### **UNIT-II:**

#### **Orientations and frames, Mappings**

Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics Of Six Degree of Freedom Robot Arm – Robot Arm dynamics

### **UNIT- III:**

#### **Robot Drives and Power Transmission Systems**

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link - Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws,

### **UNIT -IV:**

#### **Manipulators**

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators

### **UNIT- V:**

#### **Robot End Effectors**

Classification of End effectors – Tools as end effectors. Drive system for grippers-Mechanical adhesive-vacuum-magnetic-grippers. Hooks&scoops. Gripper force analysis and gripper design. Active and passive grippers.

## **UNIT -VI:**

### **Path planning & Programming**

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion – straight line motion-Robot languages-computer control and Robot software.

### **OUTCOMES:**

- The Student must be able to design automatic manufacturing cells with robotic control using
- The principle behind robotic drive system, end effectors, sensor, machine vision robot Kinematics and programming.

### **TEXT BOOKS:**

1. Deb S. R. and Deb S., “Robotics Technology and Flexible Automation”, Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J. Craig, “Introduction to Robotics”, Pearson, 2009.
3. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

### **REFERENCE BOOKS:**

1. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.
2. Fu K. S., Gonzalez R. C., Lee C. S. G., "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill, 1987