

## **32082 ROBOTICS**

### **DETAILED SYLLABUS**

#### **UNIT I FUNDAMENTALS OF ROBOT TECHNOLOGY**

Introduction – History of robot - Definitions-Robot Anatomy – Basic configuration of Robotics – Robot Components – Manipulator, End effector, Driving system, Controller and Sensors. Mechanical arm – Degrees of freedom – Links and joints – Types of joints – Joint notation scheme – Pitch, Yaw, Roll – Classification of robots – Work envelope, Work Volume – Effect of structure on Control ,Work envelop and Work volume. Introduction to PUMA robot.

#### **UNIT II ROBOT CONTROLLER, DRIVE SYSTEMS AND END EFFECTERS**

Robot controller – Configuration - Four types of controls – Open loop and closed loop controls – Speed of response and stability – Precision of movements: Spatial resolutions, accuracy and repeatability. Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – Stepper motors, DC Servo motors and AC Servo motors – Salient features – Applications and Comparisons of Drives. End effecters – Grippers – Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Two fingered and Three fingered Grippers, Internal and External Grippers – End Of Arm Tooling (EOAT)- Selection and Design considerations.

#### **UNIT III SENSORS AND MACHINE VISION**

Requirements of Sensors – Sensor devices used in robot work cell - Principles and applications of the following types of sensors – Position sensors: Piezo-electric sensors, LVDT, Resolvers, Optical encoders and Pneumatic position sensors – Range sensors – Proximity sensors: Inductive, Capacitive, Ultrasonic and Optical proximity sensors – Touch sensors: Binary sensors, Analog sensors – Wrist sensors – Slip sensors. Machine vision system – Camera – Frame grabber – Sensing and digitizing image data – Signal conversion – Image storage – Lighting techniques – Image processing and analysis – Data reduction: Edge detection, Feature extraction and object recognition – Applications – Inspection, Identification, Visual serving and navigation.

#### **UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING**

Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two and Three degrees of freedom – Deviations. – Robot dynamics – Static analysis - Robot programming – Teach pendant programming – Lead through programming – Robot programming languages – VAL Programming – Motion commands, Sensor commands, End effector commands and Simple programs.

For Notes, Syllabus, Question Papers and Many more

**UNIT V ROBOT APPLICATIONS IN MANUFACTURING**

Robot applications – Material handling – Press loading and unloading – Die casting – Machine tool loading and unloading – Spot welding – Arc welding – Spray painting – Assembling – Finishing – Automatic Guided Vehicle – Adopting robots to workstations – Requisite robot characteristics and Non requisite robot characteristics – Stages in selecting robots for industrial applications – Safety considerations for robot operations – Robotics in the future and characteristics task– Economical analysis of robots – Social implications.

**Text Books:**

1) Industrial Robotics – Technology, Programming and Applications,.P.Groover, MC Grew Hill, 2001