

ECE245:ELEMENTS OF ROBOTICS LABORATORY

L:0 T:0 P:2 Credits:1

Course Outcomes: Through this course students should be able to

CO1 :: Analyze robot for a particular application on the basis of different specifications

CO2 :: Use a robotic simulation software to analyze different types of robots

CO3 :: Simulate different control strategies for robot manipulator

CO4 :: Define different specifications for different robots

CO5 :: Integrate different actuators and sensors for robotic applications

CO6 :: Apply kinematics and dynamics of a particular robot

List of Practicals / Experiments:

Robot Anatomy

- Determination of maximum and minimum position of links and visualization of DOF on Sierena 's Perro and Twist robot.

Specifications of robot

- Estimation of accuracy, repeatability and resolution AND other specifications of robot using Sierena 's utility robot U-BOT

Robot coordinate system

- Verification of transformation (Position and orientation) with respect to gripper and world coordinate system using Sierena's Bi-ped Humanoid (NINO V2)

Forward kinematics

- Forward kinematics of two axis planar articulated robot using analytical and DH algorithm using Orangewood Robotic Arm

Inverse kinematics

- Inverse kinematics of two axis planar articulated robot using geometric approach and DH algorithm using Orangewood Robotic Arm

Trajectory planning

- Implementation of trajectory planning algorithm for straight line motion of two axis planar articulated robot using Orangewood Robotic Arm

End effectors and sensors

- Study and usage of different types of end effectors/sensors using Orangewood Robotic Arm

Programming the robot

- Robot Programming for Color identification/shape identification/path tracking using Sierena's Utility Robot U-Bot

Study of actuators

- Study the action of pneumatic and hydraulic single and double acting cylinders using sierena's humanoid robot (NIN) V2)

List of Projects

- Programming the robot for pick and place operation using any robot
- Robot Programming for Color identification/shape identification/path tracking
- Autonomous mobile robot for efficient path planning
- Maze solver robot with automated obstacle avoidance
- ROS installation

- Programming the robot for pick and place operation using any robot using orangewood robotic arm
- Maze solver robot with automated obstacle avoidance using sierena's humanoid robot NINO V2
- Autonomous mobile robot for efficient path planning using Sierena's Utility U-BOT

References:

1. ROBOTICS TECHNOLOGY & FLEXIBLE AUTOMATION by S R DEB, MC GRAW HILL
2. INTRODUCTION TO ROBOTICS by S K SAHA, MC GRAW HILL