

ES450 Introduction to Robotic Systems

Summary: This is a traditional first course in articulated robotics (a.k.a. arm-like or manipulator robots). Such robots are commonly used in manufacturing, medicine and hazardous/explosive material handling. The course is primarily taught from a kinematics perspective (i.e. how should the robot's joints be controlled to accomplish a task?), rather than a design or artificial intelligence perspective. The final 4 weeks introduce computer vision (automated interpretation of camera images). There is a significant hands-on project and laboratory component.



Credits: 2-2-3

Prereq: 2/C engineering major or approval of department chair.

Topics/Text: *Robot Modeling and Control* by Spong, Hutchinson and Vidyasagar

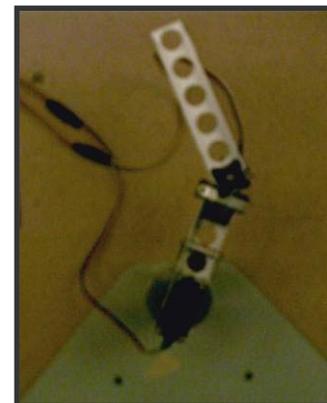
- Articulated (arm-like) Robotic Applications: Manufacturing, Medicine, hazardous waste/explosive handling
- Robotic Mechanisms, Sensors and Actuators
- Position-based Tasks: Forward and Inverse Kinematics
- Velocity and Force-based Tasks: The Jacobian
- Trajectory Planning
- Computer Vision I: Detecting Objects using Color, Size and Shape
- Computer Vision II: Determine Position and Orientation of Objects in Image

Laboratory Hardware: We use two platforms.

- *Robix Kits* - a kit that allows you to build your own small robots
- *ScorBot* - A larger commercially available robot that is similar to an industrial

Sample Lab Exercises

- "Welding" and assembling small cars
- Making a robot "etch-a-sketch"
- Identifying parts using a camera system



Sample Projects: The project component is a student defined project that combines robotics and computer vision. Example tasks that have been automated:

Burger Flipper	Tic-Tac-Toe
Part Sorting	"IED" defusal
Checkers	Molding Clay
Making Coffee	Coloring a picture

