



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Industrial Robotics

ISE 5525

Credit Hours:

1.50

Course Levels:

Undergraduate (1000-5000 level)

Graduate

Course Components:

Lecture

Lab

Course Description:

Operating principles, selection, use of proximity and optical sensors; switches, relays, actuators; electric motors and controls; electro-pneumatic devices; integration of these for automated industrial systems.

Prerequisites and Co-requisites:

ENGR 1182.01, 1182.02, 1182.04, 1282.01H, 1282.02H, 1282.04H, or 1188, and Jr or Sr standing; or Grad standing in Engineering.

Course Goals / Objectives:

- The general goal of Industrial Robotics is to introduce engineering students to the operating fundamentals, application, and programming methods of industrial robots.
 - 1. identify the characteristics of manufacturing processes, assembly, and material handling operations which make them viable candidates for the application of industrial robots
 - 2. describe the operating principles, successfully program, and demonstrate the control of electric stepper/servo motors - the most common actuators used in industrial robots
 - 3. define the typical coordinate systems and related options used in industrial robots, and explain under what circumstances each might be selected
 - 4. operate a 6-axis articulated arm servo motor robot using a teach pendant, and demonstrate proficiency in programming the robot to successfully perform defined motions (e.g. for gas metal arc welding), and material handling (using pneumatically actuated end-effector gripper)
 - 5. explain the operating principles of a robotic vision system (camera), and successfully program to robot to ?see? and manipulate objects using a vision system
 - 6. demonstrate knowledge of safety issues in the design and use of industrial robotic systems
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Course Topics:

- Course learning objectives, course and lab administration, introduction to the principles of industrial robotics, electric stepper and servo motors, and safety issues. Lab 1: Stepper Motor Control using a PLC
 - wk 2: Introduction to robot coordinate systems, programming structure, and commands.
 - Lab 2: Operating procedures, and manipulating a robot using a teach pendant; defining the robot coordinate system; write a program to move the robot to defined locations in 3-space, and operate the robot gripper.
 - wk 3. Introduction to the methods of defining robot arm pathways, and how the programming method influences the precision of robot arm location. Introduction to the concept of “tool frames” and their potential advantages for various robot actions.
 - Lab 3: Programming the robot to demonstrate how pathway influences location precision, and the use of tool frames when using end effectors on robotic arms.
 - wk 4 Introduction to timers, and defined-location/orientation material handling of objects using a robot with gripper.
 - Lab 4: Program the robot to perform simple material handling operations using the gripper, and 2 separate operations in the robot operating envelope.
 - Introduction to “user frames” - for performing multiple operations in the envelope of the robot space. Lab 5: Program the robot to perform 2 separate operations in the robot operating envelope
 - wk 6. Introduction to vision systems; how they work, and for what they are commonly used.
 - Lab 6: Set-up and calibrate a vision system, and program the robot to use the vision system to locate simple objects, pick them up one at a time, and re-locate them into a new, desired position and orientation.
 - wk 7. Summary of contemporary robot applications and programming demonstration project.
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Designation:

Elective