

ROBOTICS LAB

Industrial Robot

An industrial robot is a robot system used for manufacturing. Industrial robots are automated, programmable and capable of movement on two or more axes.

Typical applications of robots include welding, painting, assembly, pick and place for printed circuit boards, packaging and labeling, palletizing, product inspection, and testing; all accomplished with high endurance, speed, and precision. They can assist in material handling.

Technical description

Defining parameters:

- Number of axes – two axes are required to reach any point in a plane; three axes are required to reach any point in space. To fully control the orientation of the end of the arm (i.e. the wrist) three more axes (yaw, pitch, and roll) are required. Some designs (e.g. the SCARA robot) trade limitations in motion possibilities for cost, speed, and accuracy.
- Degrees of freedom – this is usually the same as the number of axes.
- Working envelope – the region of space a robot can reach.
- Kinematics – the actual arrangement of rigid members and joints in the robot, which determines the robot's possible motions. Classes of robot kinematics include articulated, cartesian, parallel and SCARA.
- Carrying capacity or payload – how much weight a robot can lift.
- Speed – how fast the robot can position the end of its arm. This may be defined in terms of the angular or linear speed of each axis or as a compound speed i.e. the speed of the end of the arm when all axes are moving.
- Acceleration – how quickly an axis can accelerate. Since this is a limiting factor a robot may not be able to reach its specified maximum speed for movements over a short distance or a complex path requiring frequent changes of direction.
- Accuracy – how closely a robot can reach a commanded position. When the absolute position of the robot is measured and compared to the commanded position the error is a measure of accuracy. Accuracy can be improved with external sensing for example a vision system or Infra-Red. See robot calibration. Accuracy can vary with speed and position within the working envelope and with payload (see compliance).

- Repeatability – how well the robot will return to a programmed position. This is not the same as accuracy. It may be that when told to go to a certain X-Y-Z position that it gets only to within 1 mm of that position. This would be its accuracy which may be improved by calibration. But if that position is taught into controller memory and each time it is sent there it returns to within 0.1mm of the taught position then the repeatability will be within 0.1mm.

1. Robotics Pick and Place Cell – Material Handling Application:

Robot – KUKA KR 6 R900 Robot

Robot Controller – KUKA KRC Robot Controller

- ✓ High-speed pick and place robots can be mounted on a stand to allow the robots to access their entire working envelope.
- ✓ Product will enter the robotic work envelope after its orientation has been identified by an upstream vision system.
- ✓ Using a custom end of arm tool, the product will be picked and placed by the robot at the desired location.
- ✓ Product can pass/fail inspection based on customer defined specifications for length, straightness, shape, etc.

2. Robotic Arc Welding Cell – Arc Welding Application

Robot – KUKA KR16

Robot Controller – KUKA KRC Robot Controller

- ✓ Robot welding means welding that is performed and controlled by robotic equipment.
- ✓ In general equipment for automatic arc welding is designed differently from that used for manual arc welding.
- ✓ Automatic arc welding normally involves high duty cycles, and the welding equipment must be able to operate under those conditions.
- ✓ In addition, the equipment components must have the necessary features and controls to interface with the main control system.

3. Robotic Spot Welding Cell – Spot Welding Application

Robot – KUKA KR 219 R 2700 Robot

Robot Controller – KUKA KRC Robot Controller

- ✓ The spot welding robot is the most important component of a robotized spot-welding installation.
- ✓ Welding robots are available in various sizes, rated by payload capacity and reach. Robots are also classified by the number of axes.
- ✓ A spot welding gun applies appropriate pressure and current to the sheets to be welded. There are different types of welding guns, used for different applications, available. An automatic weld-timer initiates and times the duration of current.

Courses Offered:

Robotics:

S.No	Domain	Course Name	Hours	Mandatory Prerequisite
1	Robotics	Basic Robot Programming and Material Handling Application	80	Robcad Basics
2	Robotics	Robotic Application-MIG Welding	80	Robcad Basics
3	Robotics	Robotic Application- Spot Welding	80	Robcad Basics