

Fundamentals of Robotics

COURSE OUTLINE

Catalogue Number	88-5005-0000
Category	Industrial Robotics
Duration	15 Hours
Additional Content with Hardware Package	10 Hours
Software Supplied	RoboCell Robotic Simulation Software
Additional Software	MotoSimEG-VRC

① **Note:** Activities written in italics require hardware. See the Course Materials document and the individual lab activity documents for details.

Video: Welcome to the Course!

Course Introduction

Activity 1: Introduction to Robotics

What is a Robot?
The History of Robotics
Applications of Robots

Activity 2A: Industrial Robots

Defining Industrial Robots
Applications of Industrial Robots
Structure and Function of Robot Components
End Effectors (Tools)
Peripheral Devices and the Robot's Environment

Activity 2B: How Robots Work

Robotic System Components
Types of Robot Joints
Types of Robots
Robotic Control Systems
Programming Languages & RoboCell Software
The Programming Pendant

Activity 3A: Using Robotic Simulation Software: Part 1

Simulation Software

Task: Running RoboCell and Opening a Project

RoboCell Window Components

3D Image Window

Task: Adjusting the View of the Robot Workcell

Activity 3B: Using Robotic Simulation Software: Part 2

Running Programs

Task: Running a Sample Program

Manipulating the Robot

Task: Robot Working Limits

Video: Robot Coordinate Systems

Activity 4: Recording Robot Positions

Homing

Task: Running RoboCell and Opening a Project

Recording Positions

Executing Movements

Joint Coordinate System

Cartesian Coordinate System

Jog Control Window

Task: Manipulating the Robot in the XYZ Coordinate System

Encoders and the Data Dashboard

Lab Activity I: Getting Started with Your Robotic Arm

Lab Activity II: Coordinate Systems

Video: Robot Positions

Lab Activity III: Motion Programming Part 1

Lab Activity IV: Motion Programming Part 2

Activity 5: Programming a Simple Pick and Place Task

Record and Teach Commands

Task: Running RoboCell and Opening a Project

Moving a Cube by Recording Four Positions

Task: Recording and Teaching Positions

Programming Tools

Task: Writing a Simple Robot Program

Task: Saving a Robot Project

Task: Running a Robot Program

Video: The Gripper

Lab Activity V: Operating the Gripper

Activity 6: Basic Robotic Programming Tools

RoboCell Program Structure

Object Inspection Task

Task: Recording Positions

Task: Programming

Task: Adding Remarks to a Program

The Set Variable

Task: Adding Variables to a Program

Debugging Commands

Task: Adding Debugging Tools and Delays to a Program

Making Commands Non-Executable

Task: Making Ring Bell Commands Non-Executable

Activity 7: Block Alignment Project

Aligning a Block

Task: Recording Positions

Task: Programming

Task: Running and Evaluating the Program

Task: Programming a Continuous Cycle

Activity 8: Feeders and Templates

Introduction to Feeders and Templates

Using a Feeder and Template in a Production Process

Task: Running RoboCell

Task: Recording Positions

Turning Outputs On and Off

Task: Programming and Running the Program

Task: Using a Template to Move Parts in a Workcell

Activity 9: Roll, Pitch, and Yaw

Degrees of Freedom

Task: Running RoboCell and Loading the Project

Adjusting the Roll

Task: Modifying Rx, Ry and Rz

Task: Running the Program

Activity 10: Programming the Robot to Execute Linear Movements

Robot Machine Operators

Task: Recording Two End Positions and Running the Program

Controlling the Robot Trajectory

Task: Recording a Middle Position

Linear Movement

Task: Observing the Effects of the Go Linear Command

Task: Observing the Encoder Values for a Linear Trajectory

Lab Activity VI: Linear Interpolation

Activity 11: Programming the Robot to Execute Circular Movements

Controlling the Robot Trajectory

Using the Go Linear to Position and Go Circular to Position

Task: Recording Positions to Write the Letter B

Task: Programming the Robot to Write B

Task: Running the Program

Lab Activity VII: Circular Interpolation

Lab Activity VIII: Continuous Path Training

Activity 12: Project: Drawing a House

Drawing a House

Task: Recording Positions

Task: Programming the Robot to Draw a House

Task: Running and Evaluating the Program

Challenge

Task: Programming and Running the Challenge

Video: Material Handling

Lab Activity IX: Loops

Lab Activity X: User Coordinates

Lab Activity XI: Optimization

Lab Activity XII: Interference Zones

Activity 13: Conclusion

The Structure and Relationship of Jobs

Master Jobs

Collision Detection

Introduction to the Practical Exam

Lab Activity XIII: Challenges

Practical and Theoretical Exams