

Fundamentals of Robotics with the MHJF

COURSE OUTLINE

Catalogue Number	77-5001-0000
Category	Robotics
Duration	15 Hours
Additional Content with Hardware Package	10 Hours
Software Supplied	RoboCell Robotic Simulation Software

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

Course Introduction

Activity 1: Introduction to Robotics

What is a Robot?
History of the Industrial Robot
Applications of Industrial Robots
Flexible Manufacturing Systems

Activity 2: How Robots Work

Robotic System Components
Types of Robot Joints
Types of Robots
Manipulator Driving Axes
Robotic Control Systems
Programming Language: RoboCell Robotic Software
The FS100 Programming Pendant

Activity 3A: Using Robotic Control 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 Control Software: Part 2

Running Programs

Task: Running a Sample Program

Manipulating the Robot

Task: Robot Working Limits

Lab Activity A: Getting Started

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 B: Teaching a Job

Lab Activity C: Linear & Circular Motion

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

Lab Activity D: Position Variables

Lab Activity E: 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

Lab Activity F: The Control Sub-menu

Lab Activity G: General Administration

Activity 7: Block Alignment Project

- Aligning a Block
- Task: Recording Positions
- Task: Programming
- Task: Running and Evaluating the Program
- Task: Programming a Continuous Cycle

Lab Activity H: Tool Coordinates

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

Lab Activity I: Interference Areas

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

Lab Activity J: User Coordinates

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

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 K: Position Level

Activity 12: Final 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

Additional Practice (Hardware Optional)

Sample Activities for Programming

Conclusion

The Structure and Relationship of Jobs

Master Jobs

Collision Detection

Introduction to the Practical Exam

Practical Exam