

Industrial Robotics: Course-Series Outline

FUNDAMENTALS OF ROBOTICS

Course Name	Fundamentals of Robotics
Catalogue Number	TBD
Category	Automation and Industrial Robotics
Duration	15 Hours + Lab Activities

Section 1: Robot Structure and Function

Video: Welcome to Fundamentals of Robotics

Lesson: Course Introduction

- Fun Fact Quiz
- Course Introduction
- Overview of Course Components

Lesson: The History of Robotics

- Origins of the Robot
- The Robot Industry
- Timeline of Key Milestones

Lesson: Introduction to Industrial Robotics

- Defining Industrial Robots
- Robots and Cobots
- Industrial Robot Components
- Common Industrial Robot Applications

Quiz: Introduction to Industrial Robots

Lesson: Navigation in the RoboX Simulator

- What are Robot Simulators?
- Explaining Digital Twins
- Tour of the Simulator
- Navigational Functions

Video: Introducing RoboX Missions**Mission: Navigation and the Simulation Camera****Quiz: Navigation and the Simulation Camera****Lesson: Robot Geometries and Your Robot**

Type of Robot Joints

Robot Classifications

The Robot Used in this Course – Structure and Components

Safety Considerations When Working with Industrial Robots

The Laser Safety Scanner

Lab Activity: Getting Started with Your Robotic Arm**Quiz: Robot Geometries****Section 2: Coordinate Systems****Video: Robot Coordinate Systems**

The Four Main Coordinate Systems: Overview

Lesson: Robot Coordinate Systems

Defining Coordinate Systems

Joint Coordinates

Cartesian Coordinates

Tool Coordinates

User Coordinate Systems

Jogging a Robot

Tool Center Point

Joint Limits, Collisions, and the Work Envelope

Hand-Guidance

Mission: Joint Coordinates**Mission: Cartesian Coordinates****Quiz: Coordinate Systems****Mission: Lead-By-Nose*****Lab Activity: Teaching a Job***

Section 3: Positions and Motion

Motion Sequences

From Jogging to Automation

Understanding Positions and Motion Sequences

Quiz: Positions and Motion Sequences

Lesson: Positions and How to Teach Them

Teaching Positions in RoboX

Position Components

Position Tool Bar

Yaskawa Positions and Position Variables

Understanding Position Variables

Lesson: Introduction to Programming

Pseudocode

Programming Languages

Instructions and Jobs

Yaskawa INFORM Instructions

Playback Modes

Important Program Components

Quiz: Introduction to Programming

Mission: Introduction to Block Programming

Mission: Introduction to Block Programming 2

Mission: Introduction to Block Programming 3

Mission: Positions and Motion Planning

Mission: Positions and Motion Planning 2

Lab Activity: Position Variables

Section 4: Pick-and-Place

Video: Introducing the Gripper

Lesson: Operating the Gripper

Material Handling Applications

Types of Grippers

Two State Vs Servo Grippers

Pneumatic Actuation

Your Robot's Gripper

Quiz: The Gripper

Mission: The Pneumatic Gripper

Lesson: Pick-and-Place

Positions in a Pick-and-Place Task

Steps to Teaching the Positions

Creating the Job

Mission: Programming with the Gripper

Lab Activity: The Gripper and Pick-and-Place Jobs

Mission: The Vacuum Gripper

Section 5: Interpolation

Video: Interpolation

Lesson: Interpolation Types

MOVJ (Point-to-Point Motion)

MOVL (Linear Motion)

MOVJ (Circular Motion)

MOVS (Curved Motion)

Applications

Interpolation Types and Speeds

Mission: Programming with MOVL

Quiz: Interpolation

Mission: The Vacuum Gripper 2

Lab Activity: Linear and Circular Motion

Section 6: Material Handling

Video: Introduction to Material Handling

Mission: Programming with the Gripper 2

Lesson: Program Cycles and Forever Loops

Deployment and Auto Cycles

Introduction to Programming Loops

The RoboX Forever Loop

Mission: Program Cycle

Lesson: Options for Rotating

Degrees of Freedom

Roll, Pitch, Yaw

Rx, Ry, Rz

Using Joint Coordinates

Mission: A Rotated Target

Lesson: Stacking

Teaching Positions for Stacking Operations

Stacking Applications

Mission: Stack Cubes

Mission: Align Cubes

Lab Activity: The Control Sub-Menu

Section 7: Additional Lab Activities

Lab Activity: General Administration

Lab Activity: Tool Coordinates and Tool Registration

Lab Activity: Interference Areas

Lab Activity: Fixtures and User Coordinates

Lab Activity: Position Level

Lab Activity: Path Training

ⓘ **Important Note:** *This outline is subject to change.*