EN

TRAINING

Our offer

Index

SUGGESTED TRAINING PATHS

- **ARM**
  - Use and Programming
    - **Maintenance**
      - Electrical
      - Mechanical
    - **Programmers/Integrators**
      - PDL2
      - Fieldbus
      - RoboSAFE functionality
    - **Applications**
      - Smart Arc
      - Smart Spot
      - ... and applications for various process types
- **AGV** (Agile 1500 and the subsequent models)
  - **Users**
    - Use and Maintenance
  - **Programmers/Integrators**
    - Programming and Installation

The Comau offer includes training courses dedicated to Robots and AGVs respectively. In the following pages each course is described in detail.

Training Catalog

Formation and training courses on robotic systems management, programming and maintenance techniques

Teachers and qualified instructors with experience in the field

Possibility for some training paths to choose between classroom learning and distance learning (online)

Logistic support for hotel accommodation and transportation

Documentation related to the attended course

Certificate of attendance

USE AND PROGRAMMING

Introduction course to robotic system use and programming.

THE COURSE IS INTENDED FOR:

- Anyone wishing to launch themselves into robotics and automation or expand their knowledge in this field.

RECOMMENDED MINIMUM REQUIREMENTS:

- Basics knowledge of mathematics and computer science
- Knowledge of basic measurement quantities of the International System
- Knowledge of computer use basics

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: the course is available in 3 different ways (see page 9)

Didactic Support:

- Multimedia material
- Practical exercises and virtual simulations

OBJECTIVES:

- To understand the composition of a robotic system and its possible integrations in automation
- To create motion programs and basic management programs
- To solve simple error states by means of special procedures

Course content

Robotic systems and basic procedures

What the robotic system is made of

- Robotic system
- Teach Pendant
- Graphical interfaces
- Basic procedures

Fieldbus and reference systems

How does the robotic system work

- Fieldbus and distributed control system
- Tridimensional reference frames
- Local and remote system
- Position variables
- Automatic calculation of the Tool:
  - Standard method
  - 4 points method
- Automatic calculation of the Uframe
- Definition of the load and payload identification

Programming and motion

How to move the ARM

- Introduction to the programming language
- Creation of programs
- Motion control and verification of programs
- In-depth analysis of the programming language
- Collision detection

Special procedures and in-depth analysis

Useful information for best using the robotic system

- System memory structure
- Backup
- Special procedures
- WINC5G
- Available SW options
- Tips & tricks

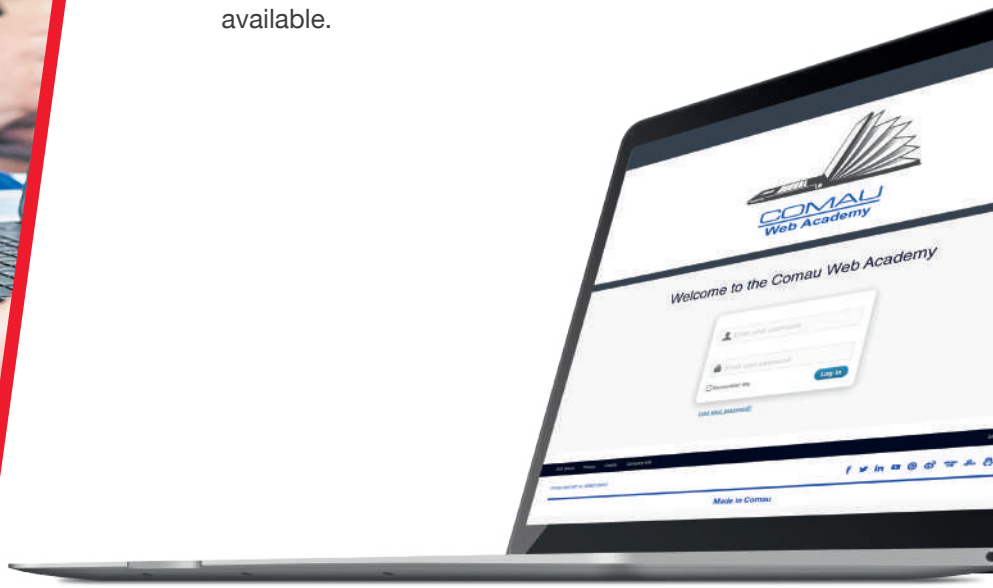
Comau Web Academy

The *Comau Web Academy* gathers the Comau online training offer.

The courses are accessible from PC and tablet. The participants can access the courses for which they are registered whenever they wish and can interrupt and resume the use of content according to their needs.

Each course consists of a training part and an evaluation part (test) useful to verify the progressive learning of the content.
At the end of the online course, a final test is scheduled and a certificate of attendance is issued.

The material of each online course is available on the *Comau Web Academy* platform at the end of its utilization. Materials for in-depth study are also available.



USE AND PROGRAMMING

A customised solution for effective results

Our course "Use and Programming" mixes consistently:

- challenging practical activities
- tools
- theoretical contents

We adopt an innovative learning methodology, combining classroom training, business experience and multimedia tools.

Solution 1: e-learning

E-learning - *to explore processes and behaviours, practice, reflect and receive feedback*

- Theoretical contents (videos, animations, texts)
- Practical contents (exercises and simulations)
- In-depth study
- Test + feedback

Solution 2: e-learning + in-person training

(16 h online + 1 day in classroom)

E-learning - *to explore processes and behaviours, practice, reflect and receive feedback*

- Theoretical contents (videos, animations, texts)
- Practical contents (exercises and simulations)
- In-depth study
- Test + feedback

In-person training - *to share knowledge and practice on robotic systems*

- Practical activities and real exercises in Comau offices
- Reflection and sharing with Comau experts

Solution 3: in-person training with multimedia support

(4 days in classroom)

During the classroom training, the teacher and the participants can share contents, exercises and tests through multimedia tools (smart board, tablet and PC). This solution increases the involvement of the participants, who are active and share knowledge and experience.

Multimedia classroom - *contents shared with multimedia tools*

- Theoretical contents (videos, animations, texts)
- Practical contents (exercises and simulations)
- In-depth study
- Test + feedback

In-person training - *to share knowledge and practice on robotic systems*

- Practical activities and real exercises in Comau offices
- Reflection and sharing with the Comau experts

PDL2 ADVANCED PROGRAMMING

PDL2 Advanced Programming course for robotic systems.

THE COURSE IS INTENDED FOR:

Professional technicians, programmers and to an anyone who wishes to deepen their knowledge of the PDL2 Programming Language.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

RECOMMENDED MINIMUM REQUIREMENTS:

- Basic knowledge of programming principles (PC, CNC, PLC, etc.)

WHAT TO BRING WITH YOU:

- A laptop computer

THE COURSE:

- Duration: 4 days

Didactic Support:

- “PDL2 Programming Language” manual

OBJECTIVES:

- To recognize the PDL2 syntax and the best programming methods
- To enhance motion programs and complex management programs
- To familiarize yourself with the functions made available by the advanced programming language and to distinguish when and how to use them

Course content

Introduction to PDL2 programming language

Description of data types
- Typology: variables, constants, types
- Declarations: local, global, exportate
- Operation types: arithmetic, logic, bit, etc.

Program analysis
- Program structure
- Difference between HOLDABLE and NOHOLDABLE programs

Movement control
- Trajectory typologies
- Movement clauses: NEAR, AWAY, RELATIVE
- Optional clauses: TIL, ADVANCE, WITH
- Continuous movements: FLY typologies
- Movement programming using PATH (NODE)
- Cancel and restart of movements
- Movement programming without auto teach

Communication between the Control Unit and external devices
- Description of all available I/Os (system and user)
- Remote robot control and communication with external peripherals (PLCs, additional keyboards, etc.)

PDL2 instructions for controlling the program execution
- Control of program flow (IF, WHILE, REPEAT, etc.)
- Check of program state (ACTIVATE, PAUSE, etc.)

Routine
- Routine declaration: procedures and functions
- Parameter declarations and parameter exchange between routines
- Shared routines

Condition
- How to declare and activate a CONDITION
- How to control events with a CONDITION
- Actions allowed with a CONDITION

Communication devices
- Types of devices
- Instructions for managing the communication (OPEN FILE, READ, WRITE, etc.)

System features final overview
- Main system variable description, built-in, routine and instructions
- Recapitulation with examples

FIELDBUS

Specialized course on the fieldbus.

THE COURSE IS INTENDED FOR:

To professional technicians, robot and PLC programmers, system integrators and anyone wishing to deepen their knowledge of communication means in automation.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

RECOMMENDED MINIMUM REQUIREMENTS:

- Basic notions of electronics, electrical engineering and I/O communication

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 1 days

Didactic Support:

- Standard handbook
- Multimedia material
- Practical exercises and virtual simulations

OBJECTIVES:

- To identify and configure the components integrated in a communication network and to recognize their functions
- To distinguish between the existing communication methods via Input/Output
- To know how to manage a robotic system through remote control

Course content

Input/Output on integrated modules

Input/Output on X20 modules and their activation on the system

Hardware required for Master network and Slave network

Hardware connections between modules and special hardware features of the various networks

Creating a project for Master network

Master network activation

Slave network activation

Mappable Input/Output types

Input/Output mapping on Master and Slave Networks

Creating virtual Input/Output

Creating links between Input/Output

Use of Input/Output in the programs

Setting the Input/Output for remote management for the system and for the application process signals

RoboSAFE FUNCTIONALITY

Specialised course dedicated to the RoboSAFE system.

THE COURSE IS ADDRESSED TO

Professional technicians and all the people who want to learn how to use the RoboSAFE functionality.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course or general experience of basic programming on COMAU Robot systems

RECOMMENDED REQUIREMENTS:

- In order to correctly use the RoboSAFE functionality and create applications aimed at creating certified cells, it is necessary to have experience in risk assessment and to know the safety standards in force in the country where the installation will be carried out or alternatively contact competent persons in this regard

WHAT TO BRING WITH YOU:

- A laptop (recommended but not compulsory)

THE COURSE:

- Duration: 1 day

Didactic support:

- “Use of RoboSAFE Functionality” handbook

OBJECTIVES:

- Describe the hardware architecture of the RoboSAFE system
- List and program the functionality of the RoboSAFE system
- Use the RoboSAFE system restore procedures

Course content

RoboSAFE system structure:

- **HARDWARE**
- **SOFTWARE**

User interfaces:

- on BROWSER
- on TEACH PENDANT

Configuration:

- Joints RoboSAFE functionality
- Cartesian RoboSAFE functionality
- Report Printing
- Suggestions for Report validation

Maintenance:

- Restore after trespass
- Safe Line-Up
- Restore procedures after replacement of Safe components.
- Backup/Restore configuration

ELECTRICAL MAINTENANCE

Specialized course in electrical maintenance of the robotic system. Troubleshooting and electrical components replacement.

THE COURSE IS INTENDED FOR:

To professional technicians, electrical maintenance technicians, line conductors, systems integrators and anyone who wishes to deepen their knowledge of the electrical maintenance.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course
- Certification or qualification to operate on live electrical systems (Example: PES - PAV - REI). Alternatively, many years of experience as electrical maintenance technician.

RECOMMENDED MINIMUM REQUIREMENTS:

- Basic knowledge of electronics, electrotechnics and tools useful for troubleshooting

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 3 days

Didactic Support:

- Circuit Diagrams related to the robotized system

OBJECTIVES:

- To understand the hardware architecture of the robotic system
- To know how to correctly interpret the system alarms and perform an effective troubleshooting
- To learn the procedures for restoring and for special and routine maintenance of the robotic system

Course content

Insights on the control unit and the ARM

- Hardware architecture and available expansions
- Localization and description of the main functional areas
- On-board robot wiring
- Safety description
- Interfacing with plant/cell

System Diagnostics

- Alarm types and meanings
- Display devices and procedures

Troubleshooting

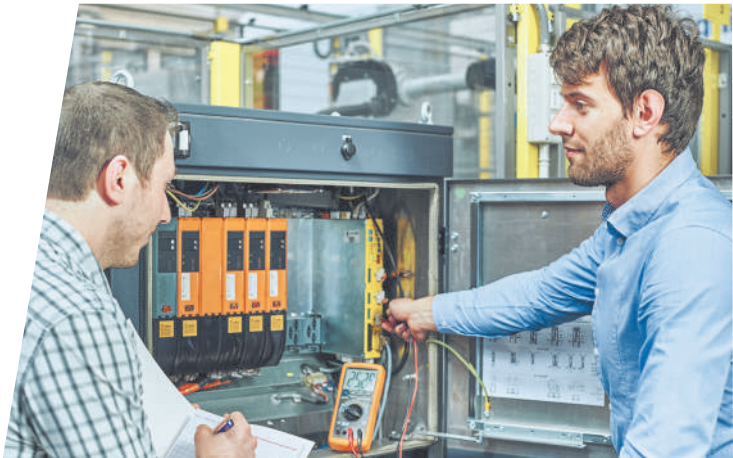
- Troubleshooting procedures
- Utilization of electrical circuit diagrams for troubleshooting
- Main alarms analysis and description
- Modules replacement

Restart Procedures

- Robot restart devices and procedures
- Installation of system software (total/partial)
- Backup and restore of programs and data

Ordinary Maintenance

- Description of programmed interventions on Arm and Control Unit



MECHANICAL MAINTENANCE

Specialized course on the mechanical maintenance related to the robot model. Troubleshooting and components replacement.

THE COURSE IS INTENDED FOR:

To professional technicians, mechanical maintenance technicians, line conductors, system integrators and to anyone who wishes to deepen their knowledge of the mechanical maintenance.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

RECOMMENDED MINIMUM REQUIREMENTS:

- Knowledge of general and applied to robotics mechanics

WHAT TO BRING WITH YOU:

- Footwear, gloves, helmet and protective glasses

THE COURSE:

- Duration: 3 days

Didactic Support:

- Mechanical maintenance manual related to the robot model

OBJECTIVES:

- To understand the mechanical architecture of the robot arm
- To know how to intervene correctly and safely to remedy mechanical problems
- To know the procedures for restoring after ordinary and special maintenance of the robot arm

Course content

Technical characteristics

- Payload capacity on wrist and working area.

Functional and mechanical description of robot components

Robot and auxiliary wiring

Distribution units

- Axis interconnection
- Wiring description

Preventive maintenance operations

Scheduled lubrication

- Lubrication points and types of lubricant

Checking and adjustment

Troubleshooting procedure

Main mechanical component replacement procedure

Esercitazioni pratiche:

- Disassembly and reassembly of the main mechanical components
- Calibration procedure by means of reference notches
- Calibration procedure by means of tools
- Turnset

SMART ARC

(Arc Welding)

THE COURSE IS INTENDED FOR:

To professional technicians and welding technicians, maintenance technicians and line conductors, system integrators and to anyone who wishes to learn to use the application program interface.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 2 days

Didactic Support:

- “Smart Arc” manual

OBJECTIVES:

- To know how to activate, configure and put into operation the SMART ARC application on the robotic system
- To know the technological and service instructions available for process programming
- To increase your skills in using the graphical interface of the application and in managing the process alarms

Course content

Description of the Arc Welding system

- System and basic functions
- Options

Installation/Activation of the Smart Arc application software

User Interface on Teach Pendant

- User pages
- Configuration pages

Use and programming

- Technological instructions
- Service instructions
- Typical messages and alarms

Welding Process Interruption/Reset

Basic Devices

- Generator
- Torch Cleaner unit
- Torch
- Wire feeder

I/O signals from REMOTE

Optional systems

Alarms management

Practical examples

SMART SPOT

(Spot Welding)

THE COURSE IS INTENDED FOR:

To professional technicians and spot welding technicians, maintenance technicians and line conductors, system integrators and to anyone who wishes to learn to use the application program interface.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 2 days

Didactic Support:

- “Smart Spot” manual

OBJECTIVES:

- To know how to activate, configure and put into operation the Smart Spot application on the robotic system
- To know the technological and service instructions available for process programming
- To increase your skills in using the graphical interface of the application and in managing the process alarms

Course content

Description of the Spot Welding system

- Software
- Hardware

Installation/Activation of the Smart Spot application software

User Interface on Teach pendant

- Process management keys
- User pages (softkey Appl): SmartSpot

Technological instructions

- Routine
- Alarms
- Messages

Setup Page: configuration objects (ApplSetup Page)

- ABox (Application Box)
- Air
- Spot
- Timer
- Water
- Gun
- Optional: TipChange, Dress

Welding timer programming

- Use of the Programming Terminal
- Use of the WMS

Practical examples

Optional systems

Alarms management

SMART SPOT SERVO

(Spot Welding with Servo Gun)

THE COURSE IS INTENDED FOR:

To professional technicians and spot welding technicians, maintenance technicians and line conductors, system integrators and to anyone who wishes to learn to use the application program interface.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 2 days

Didactic Support:

- “Smart Spot Servo” manual

OBJECTIVES:

- To know how to activate, configure and put into operation the Smart Spot Servo application on the robotic system
- Familiarize yourself with the electrical gun characterization procedure
- To know the technological and service instructions available for process programming
- To increase your skills in using the graphical interface of the application and in managing the process alarms

Course content

Description of the Spot Welding system

- System and basic functions
- Options

Installation/Activation of the Smart Spot Servo application software

User Interface on Teach pendant

- User pages
- Configuration pages

Use and programming

- Technological instructions
- Service instructions
- Typical messages and alarms

Basic devices

- Application box
- Media panel
- E-Gun
- Tip dresser

Setup of the Electric Gun (Page EgunSetup)

- Gun calibration
- Force-Current characteristic curve

Practical examples

Optional systems

Alarms management

SMART IP

(Interpresse)

THE COURSE IS INTENDED FOR:

To professional technicians and InterPresses process technicians, maintenance technicians and line conductors, system integrators and to anyone who wishes to learn to use the application program interface.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 1 days

Didactic Support:

- “Smart IP” manual

OBJECTIVES:

- To know how to activate, configure and put into operation the Smart IP application on the robotic system
- To know the graphical interface for InterPresses process programming
- To increase your skills in using the graphical interface of the application and in managing the process alarms

Course content

Description of the Interpress system

- Basic system
- Basic functions

Installation/Activation of the Smart IP application software

Description of robot cycle

System integration

I/O configuration

System use

Creation of programs and use of interfaces on Teach pendant

Alarms and reset

Pratical examples

SMART GLUE

(Sealing)

THE COURSE IS INTENDED FOR:

To professional technicians, coating and sealing technicians, maintainers and line conductors, system integrators and to anyone who wishes to learn to use the application program interface.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 1 days

Didactic Support:

- “Smart Glue” manual

OBJECTIVES:

- To know how to activate, configure and put into operation the Smart Glue application on the robotic system
- To know the technological and service instructions available for process programming
- To increase your skills in using the graphical interface of the application and in managing the process alarms

Course content

Description of sealant application system

- Structure
- Software modules

Installation/Activation of the SmartGlue application

User Interface on Teach pendant

- User pages
- Configuration pages

Use and programming

- Technological Instructions
- service instructions
- typical messages and alarms

I/O Configuration

Cosmetic sealing application

Alarms and messages

Practical examples

SMART HAND

(Handling)

THE COURSE IS INTENDED FOR:

To professionals technicians, handling and handling for palletization technicians, maintenance technicians and line conductors, system integrators and to anyone who wishes to learn to use the application program interface.

MINIMUM REQUIREMENTS:

- Participation in the “Use and Programming” course

WHAT TO BRING WITH YOU:

- A laptop computer (recommended but not compulsory)

THE COURSE:

- Duration: 1 days

Didactic Support:

- “Smart Hand” manual

OBJECTIVES:

- To know how to activate, configure and put into operation the Smart Hand application on robotic system
- To know the technological and service instructions available for process programming
- To increase your skills in using the graphical interface of the application and in managing the process alarms

Course content

Description of the Handling system

- Basic system
- Basic functions

Installation/Activation of the SmartHand application

User Interface on Teach pendant

- User pages
- Configuration pages

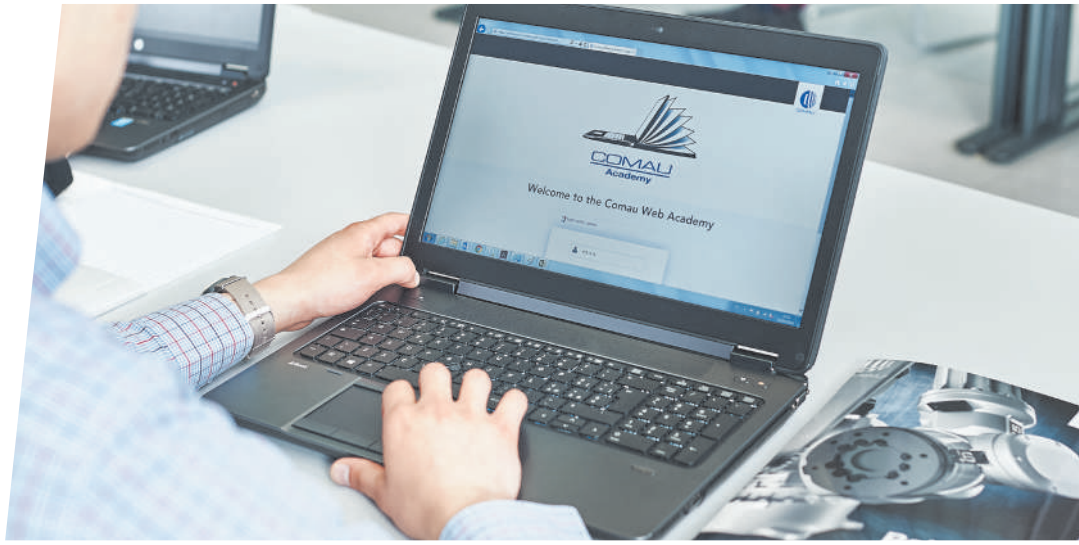
Use and programming

- Technological instructions
- Typical messages and alarms

I/O configuration

Alarms messages

Practical examples



PICKAPP APPLICATION

Specialised course dedicated to the PickApp application.

THE COURSE IS ADDRESSED TO:

Professional technicians and all the people who want to learn how to use and program the PickApp application.

MINIMUM REQUIREMENTS:

Work experience in the industrial sector in the field of automation.
Knowledge of the fundamentals of using tablets and computers

Recommended extra skills

- Depending on the type of I/O management to be used, knowledge of the configuration procedures or participation in the FIELDBUS course
- To create more complex applications, knowledge of the COMAU PDL2 programming language

WHAT TO BRING WITH YOU:

- A tablet or a laptop

THE COURSE:

- Duration: 1 day

Didactic support:

- PickApp application handbook
- PickApp application

OBJECTIVES:

- Identify the devices necessary for the use of the PickApp application and know how to interconnect them
- Know how to configure the PickApp application and any optional devices
- Be good at programming the PickApp application

Course content

PickApp system composition:

- Safeties management
- Manual Jog
- Programming and motion
- Alarm management and diagnostics

Configurations:

- Settings for the connection (router, tablet, R1C)
- Basic application configurations
- Gripper I/O setup and use
- Optional configurations (vision system, conveyor)*

** they depend on the version of the application*

AGV USE AND MAINTENANCE

Introduction course to the use and maintenance of the Comau AGV vehicle.

THE COURSE IS ADDRESSED TO:

Professional technicians and all the people who want to deepen their knowledge of automatic guided vehicles in order to manage and use applications.

MINIMUM REQUIREMENTS:

- Basics of computer science and electronics and knowledge of computer use.

RECOMMENDED REQUIREMENTS:

- Work experience in industry sector or second-grade secondary school diploma
- Skills in PLC
- Knowledge of at least one programming language (e.g. C, C ++, Java, etc.)

Recommended extra skills (for programmers/integrators):

- Knowledge of notions of operation of the NDC8 system of the KOLLMORGEN

WHAT TO BRING WITH YOU:

- A laptop

THE COURSE:

- Duration: 3 days

Didactic support:

- Comau AGV handbooks
- KOLLMORGEN handbooks

OBJECTIVES:

- Describe the basic principles of operation of the AGV system.
- Know the procedures and interfaces useful for the maintenance and modification of simple existing applications

Course content

Description of the types of navigation:

- Natural
- Magnetic
- Reflector

Components:

- Hardware Architecture
- Software Architecture

Basic programming:

- Layout creation and modification
- Creation and modification of the AGV PLC program
- Fleet management

Maintenance:

- Blackbox creation and reading
- Backup and Restore
- Fleet management

AGV PROGRAMMING AND INSTALLATION

Specialisation course for programming and installation of AGV systems.

THE COURSE IS ADDRESSED TO:

Professional technicians and all the people who want to deepen their knowledge of automatic guided vehicles in order to create applications.

MINIMUM REQUIREMENTS:

- Basics of computer science and electronics
- Knowledge of computer use
- Basic knowledge of programming principles (PC, CNC, PLC, etc.)
- Work experience in the industrial sector.

RECOMMENDED REQUIREMENTS:

- Skills in PLC
- Knowledge of at least one programming language (e.g. C, C ++, Java, etc.)

WHAT TO BRING WITH YOU:

- A laptop

THE COURSE:

- Duration: 5 days
- Online part on web platform (8 sessions in non-continous period)

Didactic support:

- Comau AGV handbooks
- KOLLMORGEN handbooks

OBJECTIVES:

- Describe the basic principles and functionality of the AGV system.
- Know the procedures and interfaces useful for maintenance.
- Know the procedures and software necessary for putting into service an AGV system.

Course content

Description and use of the types of navigation:

- Natural
- Magnetic spot
- Reflector

Components:

- Hardware Architecture
- Software Architecture

Programming:

- Manual vehicle control and steering (MCD8)
- Layout creation and modification (Layout Designer)
- Creation and modification of the AGV PLC program and communication via I/O
- Mapping of the surrounding environment for Natural navigation (Natural Surveyor Tool)
- Mapping of the surrounding environment for Reflector navigation (Reflector Surveyor Tool)
- Implementation of automatisms (System Application Designer)
- Safeties management (Safety fields)
- Tuning of AGV parameters
- AGV Simulator
- Fleet management (System Manager)

Maintenance:

- Error diagnostics (Vehicle Diagnostic Tool)
- Operator Interface (Cway)
- Blackbox creation and reading
- Backup and Restore


COMAU
Academy
Managing
Challenges

REGISTRATION PROCEDURES

On-site courses

The courses are held at the COMAU Robotics headquarters in Via Rivalta 30 - Grugliasco (TURIN).

Schedules

Monday to Friday from 8:30 to 17:00; mealtime at noon from 12:00 to 13:00

Off-site courses

On request, the courses can be held at the customer location with the price to be quantified on offer.
To carry out an off-site course it is necessary to have, inside your own company, a room equipped with a projector, notebook/pc for classroom exercises and at least one off-line robot (not in production) to carry out practical exercises.
Furthermore, depending on the type of course, further specific equipment may be necessary (e.g. overhead crane in the case of the Mechanical Maintenance course).

Rental

Comau provides its products: you can rent them and use them in your company. Costs vary depending on the robot model chosen and the place of dispatch.

Comau courses are the ideal solution for teaching the fundamental principles of robotics and industrial automation, where and how you want.

For registration and information, contact:

Comau Robotics
Customer services - Training
Tel. **+39 011 0045 479**
service.robotics@comau.com

Reservations can be made by phone. An offer will be sent to confirm the proposed dates of organisation of the courses through an ORDER, which must be received at least 10 days before the course start date.

robotics.comau.com

Made in Comau