VICTRON
Training Equipment Solution Provider

VICTRON VENTURE

PRODUCT CATALOG

INDUSTRY 4.0

- *IR 4.0 "Components"*
- *Introduction to Mechatronics*
- *Control Systems*
- *Robot Operations*
- *Introduction to IoT*
- *Smart Factory*

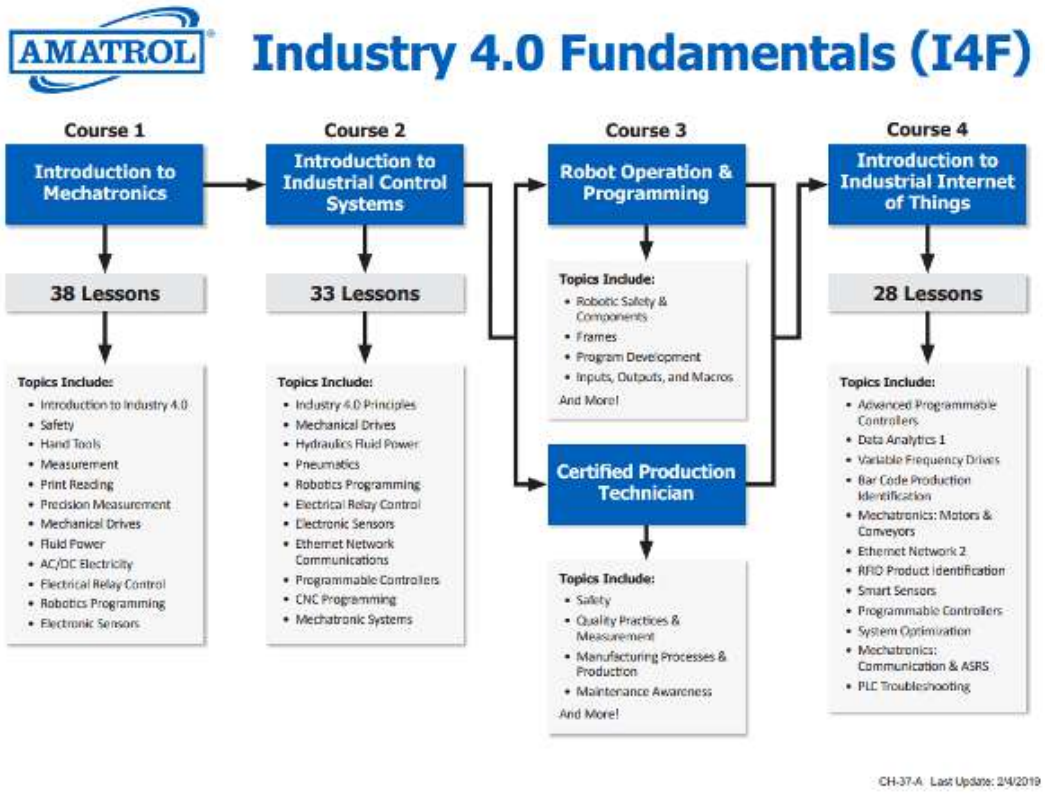
TAKING INDUSTRY 4.0 TRAINING TO THE NEXT LEVEL

IR4.0 "Components"

IR4.0 is never be in the syllabus of any institute around the world. In order to start the IR4.0 teaching, We always suggest it is good to learn with IR4.0 components as to make student recognise their function and applications. This will also able to build student interest in developing more knowledge and involve in IR4.0. For this objective we suggested the portable equipment as below. They are easy to carry and with reasonable price.

1. IoT Training Kit
2. Big Data Trainer
3. Smart Farming Trainer
4. Raspberry PI AIoT Trainer
5. Drone Education System Trainer
6. Smart Manufacturing Learning System
7. Smart Process Sensor Learning System
8. Smart Machine Sensor Learning System
9. Artificial Intelligence Computer Vision Trainer

Industry 4.0 Fundamentals



Course 1: Introduction to Mechatronics

This course is designed to introduce the basic tools and processes of mechatronics technology used in Industry 4.0. Lessons include: machine safety, dimensional measurement, mechanical power, basic electrical circuits, electrical control diagrams, basic robot programming, etc.

- Electricity and Electronics Training System
- Electrical Control
- Pneumatics
- Skill-Boss
- Robotics
- Logistics Palletizing Workcell

Course 2: Introduction to Industrial Control Systems

This course is designed to control systems of mechatronics technology used in Industry 4.0. Lessons include: manufacturing metrics, power efficiency, fluid force and frictions, basic material handling, PLC project development, PLC motor control, CNC machining, PLC event sequencing, etc.

- Robotics
- Hydraulics
- Inventory Station of Table Mechatronics
- CNC Machines

Course 3: Industrial Robot Operations and Programming

This course can follow two separate paths. The first path covers robot programming and operations of an industrial robot. The second path uses MSSC's certified production technician training to cover topics like safety, quality practices and measurement, manufacturing processes and production, maintenance awareness, etc.

- The Industrial Robot Operations and Programming option will use a FANUC robot

Course 4: Introduction to Industrial Internet of Things

This course covers how to collect from manufacturing processes and use the data to adjust, control, and improve the processes. Lessons include: lean production concepts, VFD operation and control, network security and preferences, database concepts, ASRS, PLC diagnostic indicators, etc.

- IoT Application Training for Machines Predictive Maintenance
- VFD Training with Integrated PLC & Controller

True Connected System Training - *Smart Factory*

Smart Factory Enterprise was designed to meet the need for hands-on training with a seamless system in which all the parts work together, just like learners will face on the job. For example, it's one thing for a worker to know how to program an individual robot. It's another thing entirely for a worker to know how to program multiple robots to interact and share data in a working mechatronics system that also interfaces with autonomous robots and a smart conveyor system. Using Smart Factory Enterprise System, learners will gain real, relevant Industry 4.0 skills and experience, because they'll be working with industry-standard components integrated in an enterprise system that replicates an authentic Smart Factory.

The Smart Factory represents a ground breaking approach to teaching Industry 4.0 skills with a multi-station automated manufacturing system that integrates mechatronics, robotics, conveyors, autonomous robots, and a variety of other Smart Factory technologies.

Building upon the foundation of Smart Factory Mechatronics training system, the Smart Factory adds the following real industrial components:

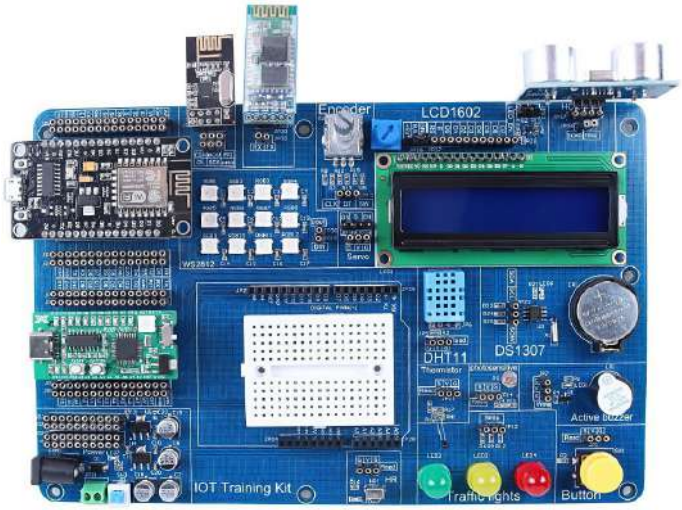
- Robot System:
- Smart Robot Workcells
- Smart Conveyor System

The Smart Factory can be customized to include additional industrial components that satisfy particular needs. For example, a CNC machine or CNC simulator can be added to incorporate machining skills into your Industry 4.0 training.

VICTRON
Training Equipment Solution Provider

IR4.0 "COMPONENTS"

INTERNET OF THINGS TRAINING SYSTEM **EAIL-IOT-2023**



A comprehensive and reliable training system that teaches and demonstrates the Internet of Things (IoT) capabilities, one of the 9 pillars to embrace Industry 4.0. The training system covers teaching of hardware interfacing, programming and computing. It is also a fantastic starting point for the development of the Internet of Things (IoT) projects.

In this IoT training system, Arduino board, ESP board, input and output devices/modules are bundled and integrated in an organized way for the ease of getting start to develop an IoT's projects for Edge and Cloud Computing. Development tools and lab exercises are provided to enable user to get their project started without much hassle.

FEATURES

- A comprehensive Arduino Internet of Things (IoT) learning platform, from Zero to Hero
- Designed to meet the skills and training requirement in the era of Digital Transformation and Industry 4.0 Revolution
- Deployment of IoT experiments using various input and output devices on a single board
- Get to know Edge Computing and Cloud Computing
- 28 experiments provided
- Comprehensive experiments manual with board layout, experiments descriptions, wiring diagram, schematic diagram and sample codes with explanation

SPECIFICATIONS

1. MCU Module :
   - Arduino Nano board (Compatible)
   - ESP8266 NodeMCU WiFi board (Compatible)
2. Internet of Things Training System Board :
   - Arduino Nano interface port with extended connection/wiring pins
   - ESP8266 NodeMCU interface port with extended connection/wiring pins
3. Power supply module
   - +5VDC supply with connection/wiring pins
   - +3.3VDC supply with connection/wiring pins
   - GND with connection/wiring pins
   - 2-ways terminal block for external wiring
   - On/off push button switch
4. Mini prototyping breadboard with Arduino shield footprint
5. Bluetooth module interface port (with HC-06 bluetooth module)
6. 2.4GHz RF wireless transceiver module interface port (with NRF24L01 RF wireless transceiver module)
7. WS2812B addressable RGB LED module - 12 RGB LED
8. Rotary encoder module
9. 16x2 1602 LCD display module with adjustable contrast
10. Ultrasonic transceiver module interface port (with HC-SR04 ultrasonic transceiver module)
11. DS1307 RTC module
12. DHT11 humidity and temperature sensor module
13. Thermistor temperature sensor module

EMBEDDED AND ARTIFICIAL INTELLIGENCE LABORATORY

RASPBERRY PI AIOT ALL-IN-ONE TRAINING SYSTEM EAIL-AIOT-RP03

FEATURES

- A comprehensive Raspberry Pi training platform, all-in-one for beginner to advance users and for those who intend to pursue and learn IoT and artificial intelligence
- Designed to meet the skills and training requirement in the era of Digital Transformation and Industry 4.0 Revolution
- Various programming environment such as MU IDE, Spyder IDE, Geany IDE, Scratch and Node-RED
- Learning of the principle, control and applications of input and output devices such as sensors, display, motors and etc on a just using a single applications trainer board
- Exposure to real AI and IoT applications by doing
- Exposure to Edge Computing and Cloud Computing
- Configurable as mini computer

LEARNING OBJECTIVES

- To study the principle and operation of sensors and actuators
- To study and familiarize with Raspberry Pi 4B and Raspbian
- To study Python programming language in various programming environments
- To study Scratch visual / graphical programming software
- To control various on-board input and output devices/applications modules on a single applications trainer board using Raspberry Pi 4B
- To study and explore Edge Computing and Cloud Computing
- To deploy the Internet of Things (IoT) using Raspberry Pi 4B
- Introduction to Artificial Intelligence - Machine Learning and Deep Learning
- To explore OpenCV and Tensorflow
- Implementation of colour detection, motion detection, object tracking, face tracking and recognition, position tracking, gesture recognition, object recognition and barcode recognition based on OpenCV and Tensorflow
- DIY projects

A. HARDWARE

RASPBERRY PI 4 MODEL B

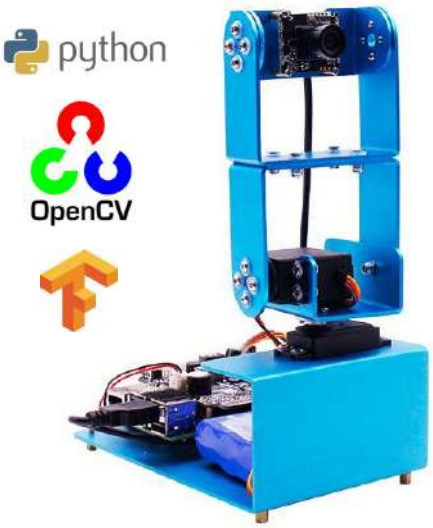
- SoC: Broadcom BCM2711
- Quad-core ARM Cortex-A72 (ARM v8), 64-bit SoC @ 1.5GHz
- 2.4GHz and 5.0GHz IEEE 802.11b/g/n/ac wireless LAN
- Bluetooth 5.0, BLE
- Gigabit Ethernet
- 4GB LPDDR2 SDRAM
- Micro-SD format for loading operating system and data storage
- 4-pole stereo output and composite video port
- 2-lane MIPI CSI camera port
- 2-lane MIPI DSI display port
- H.265 (4kp60 decode)
- H.264 (1080p60 decode, 1080p30 encode)
- OpenGL ES 3.0 graphics
- 2 x USB 3.0 ports and 2 x USB 2.0 ports
- Raspberry Pi standard 40 pin GPIO header
- 2 x micro-HDMI ports
- Power over Ethernet (PoE) enabled
- 11.6” HDMI display with base stand
- 5V DC via USB-C connector, min. 3A
- 5V DC via GPIO header, min. 3A
- Wireless keyboard and wireless mouse with shared receiver adapter

EMBEDDED AND ARTIFICIAL INTELLIGENCE LABORATORY

ARTIFICIAL INTELLIGENCE (AI) COMPUTER VISION TRAINER EAIL-CV-01

FEATURES

- The Artificial Intelligence Computer Vision Training and Development System is a platform that based on Raspberry Pi 3B+ and its AI expansion board with image recognition and voice processing capabilities.
- The machine vision programming is based on Python programming using OpenCV and Tensorflow in advance level.
- The system support Android and IOS Mobile Control App. Apart from mobile app, the system can be controlled via PC. It can perform AI functions such as face detection and recognition, colour tracking and recognition, audio broadcasting, face expression recognition, QR code recognition scanning, stranger image capturing, alerting and etc.
- The system is a 2-DOF 180° rotation motions system equipped with wide angle HD camera with 640 x 480p resolution and servo motors. The chassis of the system is made of aluminium alloy.



SPECIFICATIONS

- Controller : Raspberry Pi 4B
- Programming Language : Python
- Power Supply : 12.6V battery pack
- Operation Time : 3 hours
- Motion : 2-DOF 180°
- Remote Control Method : Via Wi-Fi
- Input : 100° wide angle HD camera, ultrasonic sensors, audio input
- Output : 6 channels servo motor interface, RGB LED, GPIO 2-way LED, audio output, 2 channels DC motor, buzzer and multi-colour LEDs interface.
- Chassis Material : Aluminium alloy

COURSEWARE AND ACCESSORIES

- Camera connecting cable
- Speaker connecting cable
- Lithium battery pack
- MicroSD card
- DC adaptor
- Experiment / Operation manual in CD
- Sample program


Face Detection


Object Movement Tracking


Colour Tracking


Colour Recognition


Network Cable Connection


Wi-Fi Connection

Specifications subject to change without notice.

BENEFITS

- As a teaching lab,as well as for student projects and
- Conduct Data Science Certification programme for students
- Conduct professional training classes for industry
- Industry collaboration in Big Data use cases

WHAT IS BIG DATA ANALYTICS (BDA)?

Big Data ▶ Advanced Analytics ▶ Valuable Insights

- Structured or Unstructured

- Statistical Methods
- Machine Learning
- Artificial Intelligence

- Identify Patterns
- Predict & Forecast
- Optimization
- Decision Making

WHAT'S INCLUDED?

- Introduction to Big Data Analytics (BDA)
- Overview of Data Mining
- Overview of Hadoop Framework
- Big Data Processing with Spark
- BDA with Rapidminer (Part 1)
- BDA with Rapidminer (Part 2)
- Big Data Extraction and Predictive Analytics
- BDA Case Studies

READY TO SET-UP THE LAB?

Big Data Analytics

- **[Hardware]** Hadoop cluster (4 high-end servers), analytics server (1), workstations (10), server rack, network switch, server management console, power supplies, cabling
- **[Software]** RapidMiner Studio and Radoop (Education version), RapidMiner Server Medium for analytics server, Hadoop cluster (Cloudera Express) and data science platform
- 8 Teaching lab exercises covering various topics in Big Data Analytics
- 10-day intensive training in Big Data Analytics

Talk to us

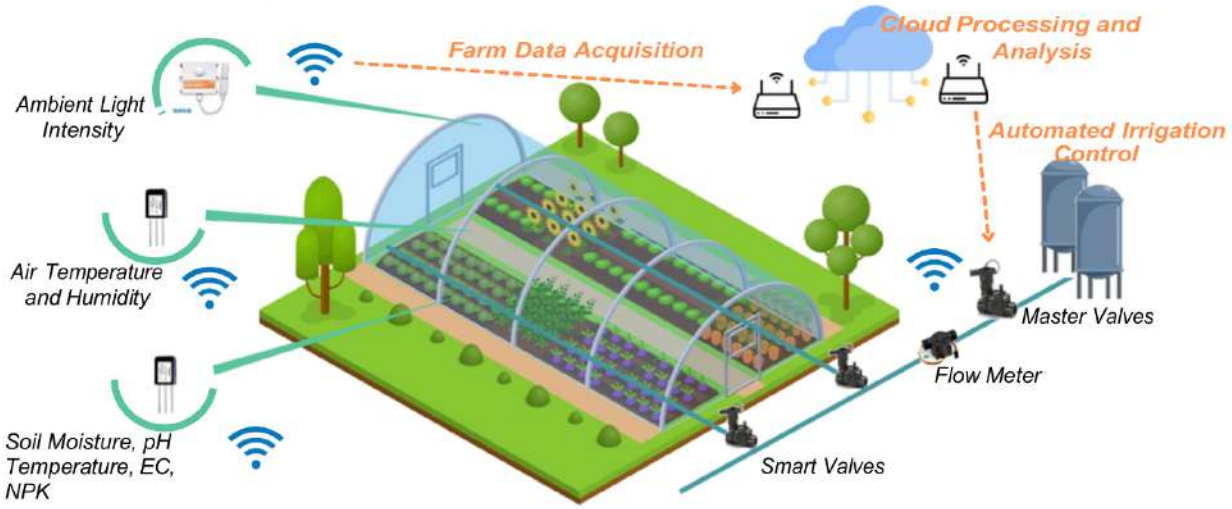
Datachamp

IOT FOR SMART FARMING

The Internet of Things (IoT) refers to enhanced objects that have processing, sensors, and other technology that can send and receive data from other networks.

Implementing IoT on a farm can help farmers monitor a variety of conditions, including weather, soil pH, moisture, nutrients, and more.

Lab Setup Overview: Miniature Greenhouse



WHAT'S INCLUDED?

- Introduction to IoT Understanding
- Weather Sensors
  (Temperature, humidity, pressure, rain-gauge, light intensity, solar irradiant sensors)
- Understanding Soil Sensors
  (Soil pH, NPK, temperature, moisture, EC sensors)
- IoT Data Collection and Analysis
- Automated Control and Design
- IoT Dashboard Design and Data Presentation

READY TO SET-UP THE LAB?

IoT for Smart Farming

- Teaching lab setup with miniature greenhouse system (1250 x 750 x 400 mm), equipped with various types of sensors, valves, and embedded system to demonstrate a typical smart farming environment
- 6 Teaching lab exercises covering various topicsin IoT
- 3-days intensive training in IoT

Talk to us

Datachamp

[E] Electrical Engineering

Drone Education System Model

Model: E4021
Technical datasheet [rev 0]

[TECHNICAL SPECIFICATION]

[A] FLYING DRONE

The Flying Drone Model comes with regular Drone structure installed with 4 units of DC high speed brushless motors. A Single-Board Computer is installed as the controller of this flying drone and interact with the sensors below.

1. On-Board Sensors

- Gyroscopes
- Accelerometers
- Barometer
- IR Sensors
- Optical Flow Sensor
-

2. Capabilities

- Self-Stabilization
- Altitude Hold
- Bluetooth Smart
- Phone Control
- Sensor Data
- Feedback
- Drive Kit Add On
- Camera Add On

[B] DRONE COTROLLER

1. Single-Board Computer (Smart Inventor)

- Digital IR Sensors x7
- Analog IR Sensors x3
- DC Motor Ports x4
- Analog SVG Pins x5
- Digital SVG Pins x5
- Buzzer x1
- LEDs x8

[C] Augmented Reality (AR) *(Optional)*

Model E4021 offers the **Augmented Reality** software to be installed in user's Android/ IOS mobile device. This AR software application is able to display the 3D model of Flying Drone as well as the basic components involved.

[F] Automation

IoT Basics Trainer

Model: F1191

Technical datasheet [rev 3]

[TECHNICAL SPECIFICATION]

[1] PORTABLE LOCAL STRUCTURE

Material : Aluminium Composite Board and Aluminum Frame with easy installable IOT modules
Size : approx. 520 x 370 x 160 m (LWH)
Other : Comes with hand carrying handles for easy re-allocation

[2] ALUMINIUM FRAME HOLDER

Material : Aluminkium Alloy frame structure
Dimension : 480mm x 260mm x 540mm (LWH)

[3] IOT BLE DEVICE

Model : ATmega328, Battery / BLE Module

[4] IOT WI-FI DEVICE

Model : ATmega328, Battery / Wi-fi module

[5] IOT GATEWAY

Manufacturer : Siemens or other manufacturers
Type : Wi-fi, BLE, Gateway program

[6] IOT CAMERA

Type : Wi-fi, USB Camera

[7]USB CHARGER

Type : 4 ports

[8] SET OF SENSORS AND ACTUATORS

- Relay
- Grayscale
- Pushbutton
- Voltage Divider
- Infrared motion
- RED LED
- Temperature
- Light Sensor
- Servo motor
- Sound sensor
- Magnetic

[F] Automation

Portable IOT Training Kit

Model: F1131
Technical datasheet [rev 1]

[FEATURES]

- *Mobile and compact unit*
- *Easy to handle and operate*
- *Comes with PLC programming station*
- *Custom designed for education and teaching purposes*
- *Works with Existing Equipment*
- *Installed with manual switches to simulate all PLC inputs*
- *Installed with LED indicators to simulate all PLC outputs*
- *Open system, can communicate with any PLC workstation*
- *Can be connected to any mades of industrial standard PLC*
- *With comprehensive experiment manual with step-by-step procedures*
- *Integrated with safety interlocks and short-circuit protection*
- *Easy to connect motor sensors, valves and switches via standard banana jacks*
- *Can be integrated with other control system relating to industrial sensors and others training equipment.*
- *Can be upgrade with the following technologies:*
  - » ***Augmented Reality (AR)***

TVET

HOTWORK Hands - On Training

AR Augmented Reality

Smart Manufacturing Learning System

Develop Vital IIoT & Industry 4.0 Skill Sets

990-SM10

AT AUTOMATION

Smart Manufacturing Workstation (990-SM10)

BorgConnect Dashboard Software

Hand-On Skills:

- Intro to Smart Manufacturing
- Data Capture
- Function of I/O Layer
- Wired/Wireless Sensors to Edge to App
- PLC Operation
- Function of HMI/SCADA
- Edge and Cloud Solutions
- Cybersecurity
- Smart Manufacturing Platform
- Production Monitoring
- Energy Monitoring
- Asset Utilization
- Product and Process Quality
- Equipment Diagnostics

Amatrol's Smart Manufacturing Learning System (990-SM10) was developed in partnership with CESMII - The Smart Manufacturing Institute, to answer the call for hands-on learning in Smart Manufacturing and Industry 4.0 technologies. Combining hardware, industrial software products and solutions, and an in-depth exercises, this system has been designed to educate and equip learners at all levels of expertise, from the novice 'Citizen OT-IT Technologist' to the expert architect and implementer of smart manufacturing systems. This system covers smart manufacturing principles and technologies, starting with the most basic and continuing to the advanced. The 990-SM10 uses wired and wireless sensors, OPC Unified Architecture (OPC UA) and MQ Telemetry Transport (MQTT), a PLC, several types of edge gateways, and a variety of on-premise and cloud-based infrastructure and applications that facilitate both OT and IT-centric use case development and training.

The 990-SM10 is an ideal training system for equipping individuals at all skill levels with the practical, hands-on skills they need to begin or advance their Smart Manufacturing journey, teaching them how to envision, develop, and sustain practical solutions using real-world, best-in-class smart manufacturing capabilities and methodologies.

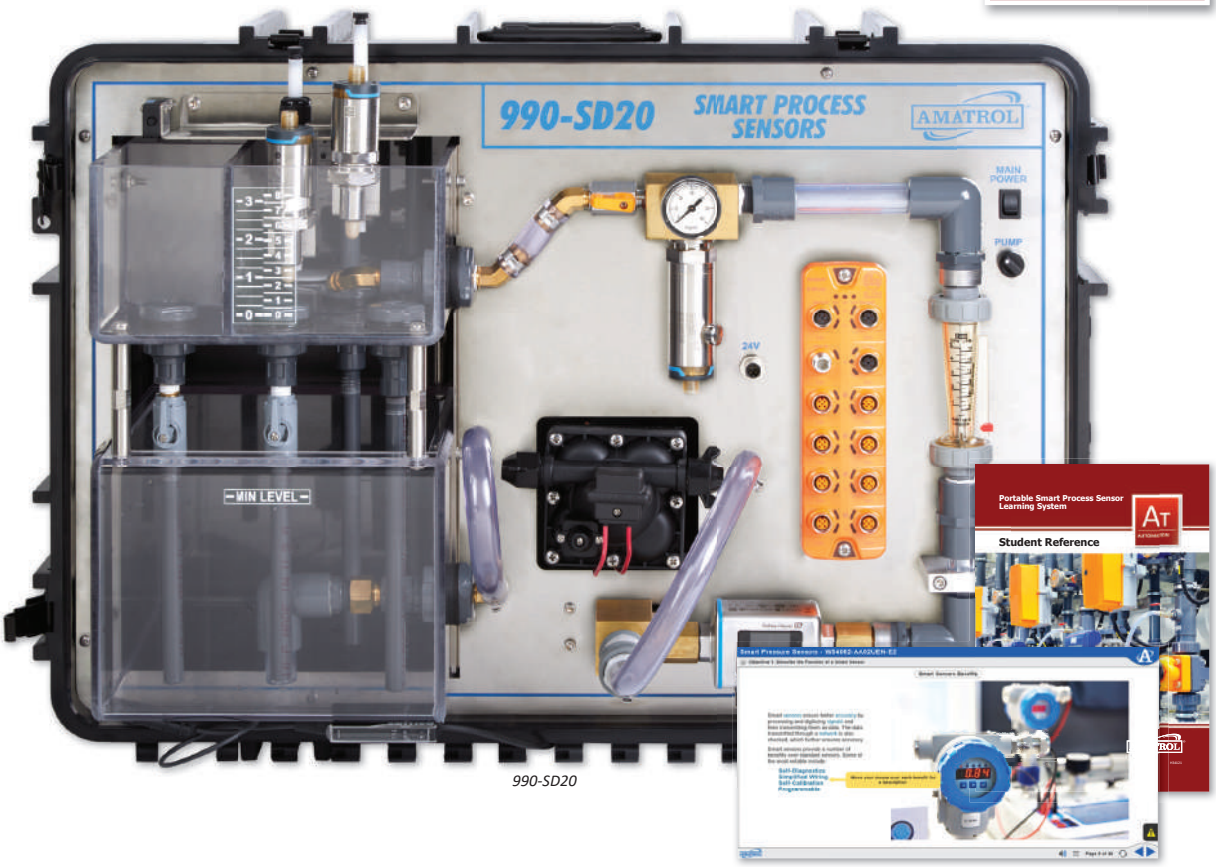
AMATROL®

**990-SM10's Activity & Installation Guide included with system. Curriculum currently under development.*

Portable Smart Process Sensor Learning System

990-SD20

AUTOMATION



990-SD20

Interactive Multimedia eLearning Curriculum and Student Reference Guide

Learning Topics:

- Industrial Internet of Things (IIoT)
- Cloud Computing
- Edge and Fog Computing
- Function & Operation of an IO-Link Master
- IO-Link PC Software
- Smart Analog Pressure Sensors
- Smart Electromagnetic Flow Sensors
- Smart Ultrasonic Level Sensors
- Smart Point Level Sensors
- IO-Link Bluetooth Applications

Amatrol's Portable Smart Process Sensor Learning System (990-SD20) teaches the operation and function of a variety of smart process sensors, including smart analog pressure sensors, smart electromagnetic flow sensors, smart ultrasonic level sensors, and smart point level sensors. Students will also gain an understanding of the Industrial Internet of Things (IIoT) and cloud computing.

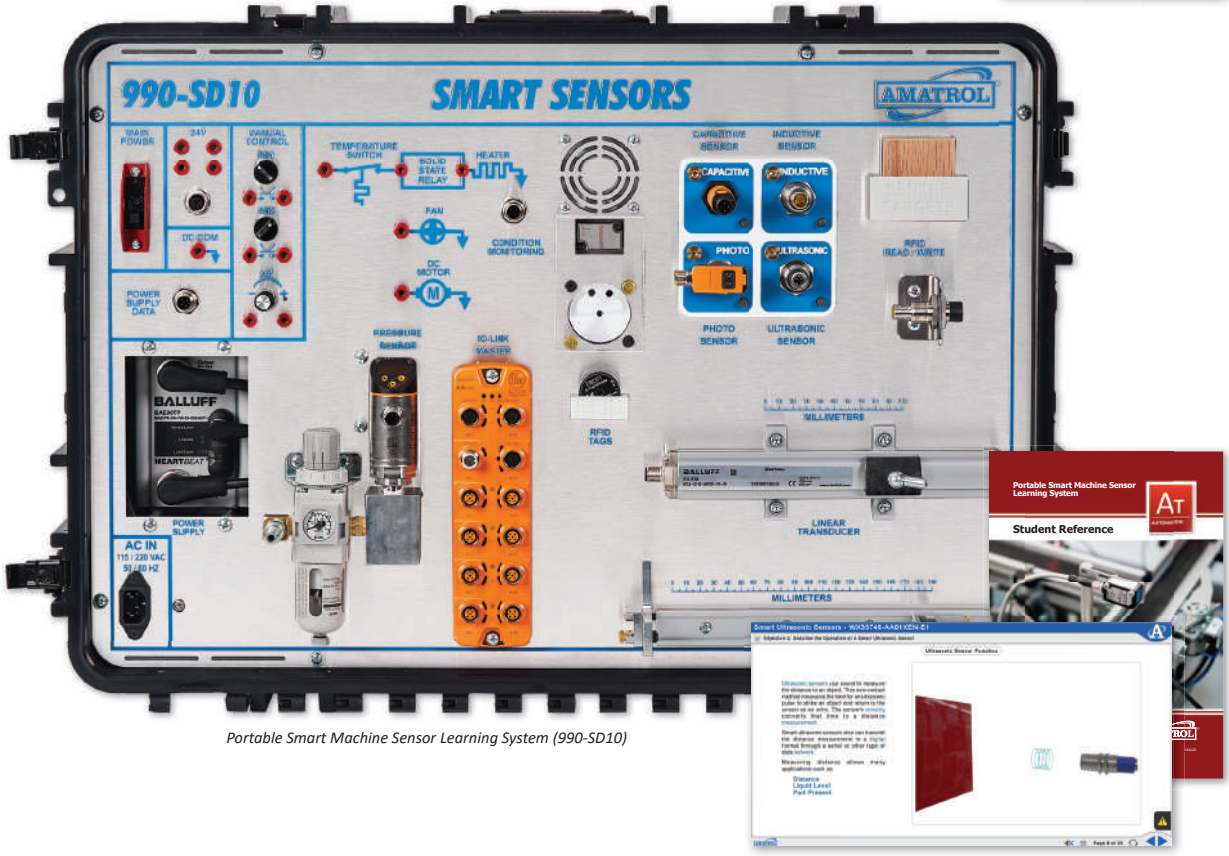
This portable system provides hands-on experience with real-world components, including an IO-Link Master, smart sensor PC software, and applications for analog flow, analog level, and hi/lo level sensing. Students will study industry-relevant applications and learn hands-on skills that will build a strong foundation for a successful career in a variety of industries that use advanced process control technologies.

AMATROL®

Portable Smart Machine Sensor Learning System

990-SD10

AUTOMATION



Portable Smart Machine Sensor Learning System (990-SD10)

Interactive Multimedia & Student Reference Guide

Learning Topics:

- Industrial Internet of Things
- Cloud Computing
- Photoelectric Sensor Configuration
- Smart Sensor Configuration
- IO-Link Master Function
- Smart Condition Monitoring Sensors
- Multi-Function Smart Sensor Testing
- Smart Vibration Sensors
- Smart Temperature Sensors
- Smart Ultrasonic Sensors
- Smart Linear Position Sensors
- Smart RFID Readers

Amatrol's Portable Smart Machine Sensor Learning System (990-SD10) offers a comprehensive training device for building skills with smart capacitive sensors, inductive sensors, photo sensors, ultrasonic sensors, and more all within an easily portable case. The Smart Machine Sensor training system is instrumental for learners to understand Industry 4.0 concepts and practice with components commonly found in Industrial Internet of Things (IIoT) environments.

The Portable Smart Machine Sensor Learning System covers topics like an introduction to IIoT, cloud computing, photoelectric sensor configuration, smart sensor configuration and monitoring, smart condition monitoring sensors, and smart RFID readers. Within these topics, learners will study about data analytics, IO-Link Master function and operation, configuring a variety of smart sensors, as well as practice skills like monitoring and testing the output of a smart power supply, configuring and testing smart sensors using an IO-Link Bluetooth application, and operating an RFID system.

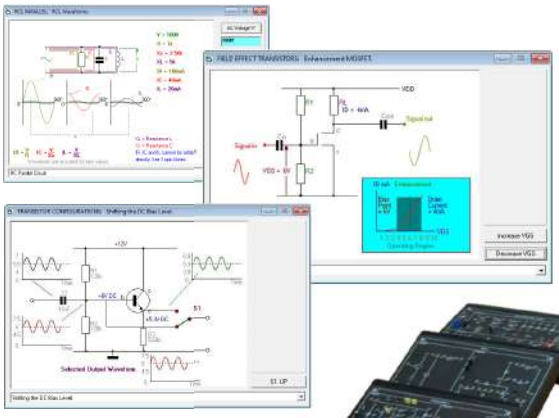
AMATROL®

VICTRON
Training Equipment Solution Provider

IR4.0 FUNDAMENTALS

COURSE 1: MECHATRONICS

AEL9400 ELECTRICITY AND ELECTRONICS TRAINING SYSTEM



Computer Aided Learning Package

New ! Built-In 2MHz LCD Display DDS Signal Generator / Counter

The AEL9400 is a unique, robust, user-friendly and self contained modular based electricity and electronic training system that teaches the basic fundamental theory of electricity and electronics, concept, theory, construction of electricity and electronic circuits and its applications. This system is widely used in conducting practical electronics courses.

This system is suitable and ideal for basic up to advance studies of electronics principles and hands on experimentation.

The base unit is equipped with various instruments, input and output devices on the main system board to facilitate construction of circuits with ease. The system also comes with a comprehensive set of modular experiment board modules that covers most electricity and electronics circuit theory practices and application.

Each experiment modules comprises of clearly labeled component mimic diagrams and dedicated blocks to clearly show users the circuit connection and function of dedicated blocks. Built-in wiring points and test points to ease circuit connection and signal measurements.

The experiments modules that come with the system are well organized where the students are able to follow and understand easily. Bundled with the comprehensive student workbook and instructor's guide, the AEL9400 is indeed a proven tool in helping users to get their electronics courses started immediately.

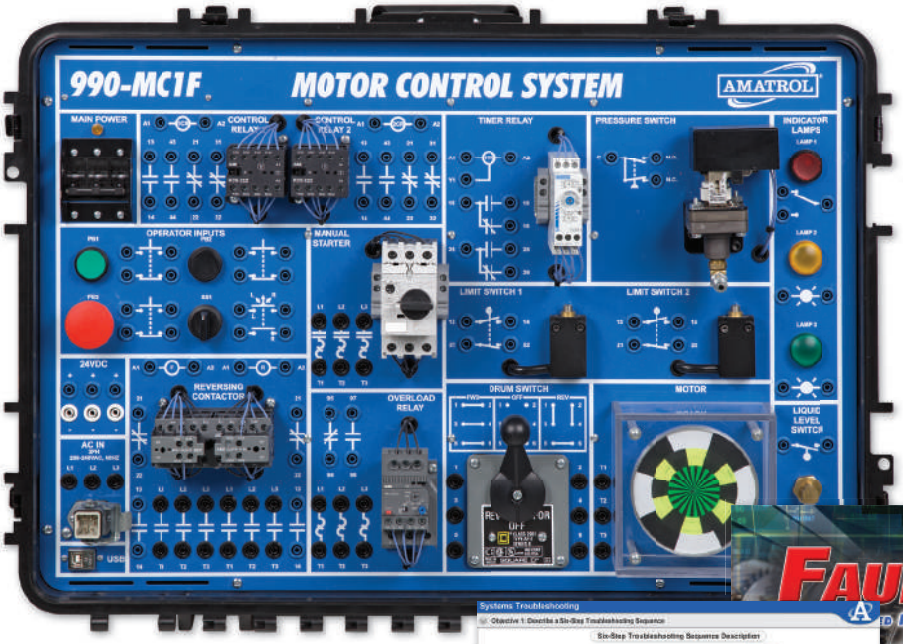
FEATURES

- High quality system that suitable for all electricity and electronics experiments
- Large, portable, clearly defined prototyping area
- Built-in wide ranges of DC power supply to cater for experiments
- Built-in AC power supply
- Wide ranges of interchangeable experiment modules to cover most electricity and electronics syllabus
- Built-in test points for signal measurements
- Overload protection
- Comprehensive student workbook for student and instructor's guide with experiments results
- Built-in digital multimeter and analogue multimeters for precise signal measurement
- Robust and durable construction

Portable Motor Control Troubleshooting Learning System

990-MC1F

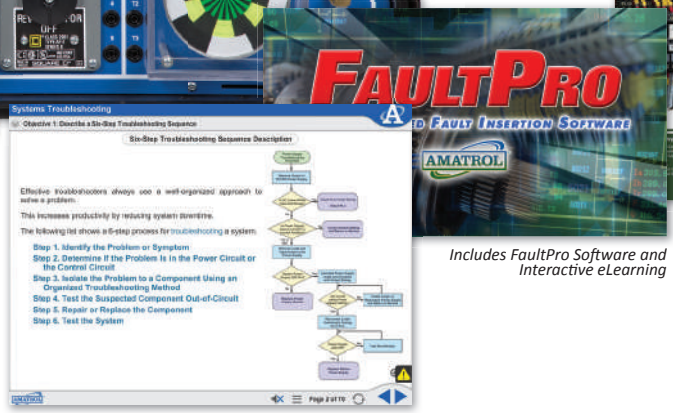
EL
ELECTRICAL



990-MC1F

Portable Workstation

Student Reference Guide



Includes FaultPro Software and Interactive eLearning

Learning Topics:

- Control Relay Troubleshooting
- Reversing Contactor Troubleshooting
- Limit Switch Troubleshooting
- Pushbutton Troubleshooting
- Manual Motor Control
- Overload Protection
- Control Ladder Logic
- Control Relays
- Motor Starters
- Troubleshooting
- Reversing Motor Control
- Automatic Input Devices

Amatrol's Portable Motor Control Troubleshooting Learning System (990-MC1F) features standard industry components like a 3-phase AC squirrel cage motor and uses 3-phase AC for power and 24 VDC for control all packed within a space-saving, portable product. These real-world motor control components will prepare learners for work opportunities in industries where motor control is used in applications like conveyor control and driving large utility pumps. Teach students how to read and interpret ladder diagrams. The 990-MC1F also uses FaultPro, Amatrol's unique electronic fault insertion, to teach motor control troubleshooting skills, such as control relay, reversing contactor, limit switch, and pushbutton troubleshooting.

The 990-MC1 uses industrial components to cover the operation, installation, and applications for electric relay control of AC motors all within this portable, durable learning system that can be set up nearly anywhere. This system also builds knowledge and skills across topics like manual motor control, control ladder logic, motor starters, and automatic input devices. Nowhere else can you find this breadth of training in a portable platform!

AMATROL®

C&L

Electrical Pneumatic Practical System

ELC PNU 201-P1

Overview

ELC PNU 201-P1 is type electrical pneumatic training device is at the request of modern pneumatic professional teaching experiment, according to “the hydraulic and pneumatic transmission ", "the pneumatic control technology", etc., general teaching material contents design. The system in addition to regular pneumatic basic control circuit experiment, still can be simulate the pneumatic control technology application experiment, pneumatic technology curriculum design, is the typical experiment equipment that the mechanical combine with electrical perfectly.

The system adapt in "hydraulic and pneumatic transmission", "pneumatic control technology" which offer by mechanical engineering, mechatronics or automation major in colleges and universities, technical school, vocational school. It is also can be used as the comprehensive experimental platform of machine, electricity and pneumatic integration, can reflect comprehensively the most advanced pneumatic technology and machine, light, electricity, the sensor technology which used in manufacturing process of factory mechatronics. Students via the experiment and the course design can grasp accurately structure of pneumatic components, the control principle of the pneumatic circuit and design method, control principle, etc.

Technical Parameter

1. DC power: input, AC220V, 50Hz/60 Hz Output: DC 24V/3A
2. Air compressor (basic equipment minimal machine): power: AC 220V±10% 50Hz/60Hz motor power: 600W
3. Nominal volume: 9L normal output voltage 0.7 MPa, noise degree: 66 dB
4. Groove interval: 25mm
5. Table top structure: 1
6. With crack slot truckle: 4

Skill Boss Manufacturing: Training & Assessment

"CPT Plus" Certification Assessment

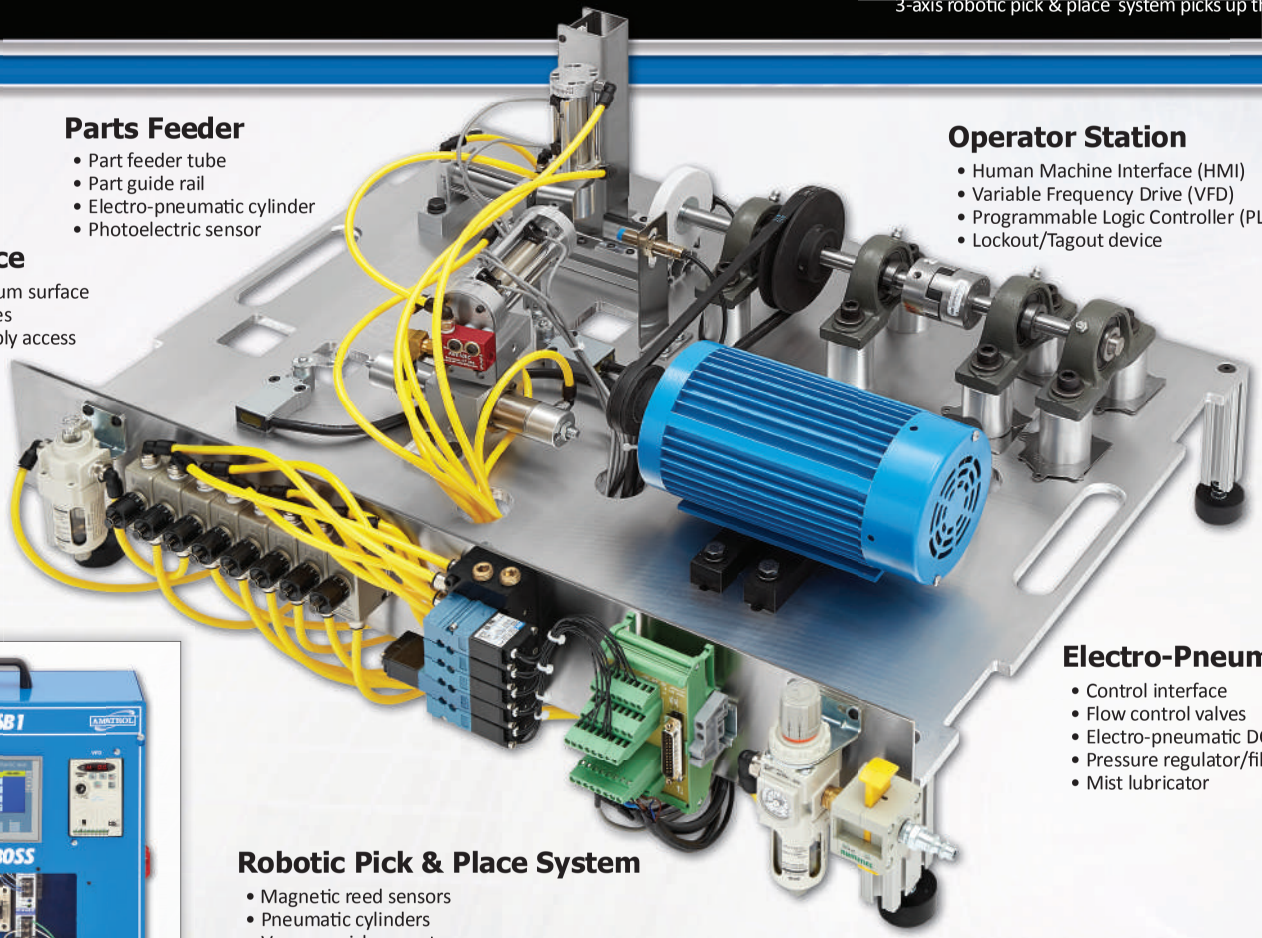
CPT Plus certification provides employers further proof of an individual's skill set by requiring successful demonstration of hands-on skills in electronic, electrical, fluid power, and mechanical systems.

Skill Boss Manufacturing, designed to meet MSSC standards, is a hands-on skill training and assessment system that integrates seamlessly into any manufacturing programs and is required for CPT Plus certification.

Develop/Evaluate Individuals' Skill Sets

Skill Boss Manufacturing provides the tool you need to teach or evaluate an individual's skills as they install, adjust, and trouble-shoot components on this fully functional mechatronics system, applicable to both discrete parts and process manufacturing.

Performing a real-world sorting & finishing process, Skill Boss Manufacturing automatically feeds parts into the system where they are rejected or accepted to continue the process. If accepted, the parts are buffed with a polishing wheel before a 3-axis robotic pick & place system picks up the part and moves it into "finished goods" based on its material.



Parts Feeder

- Part feeder tube
- Part guide rail
- Electro-pneumatic cylinder
- Photoelectric sensor

Work Surface

- Precision aluminum surface
- Machined handles
- Risers for assembly access

Operator Station

- Human Machine Interface (HMI)
- Variable Frequency Drive (VFD)
- Programmable Logic Controller (PLC)
- Lockout/Tagout device

Electro-Pneumatic System

- Control interface
- Flow control valves
- Electro-pneumatic DCVs
- Pressure regulator/filter combo
- Mist lubricator

Also Available in Siemens Model

Robotic Pick & Place System

- Magnetic reed sensors
- Pneumatic cylinders
- Vacuum pick-up system
- Rotary actuator
- Limit switches
- Inductive sensor

Mechanical Drive System

- Electric motor (0.28 kW)
- Multi-shaft drive
- Flexible coupling
- Pillow block bearings
- Bearing lubrication (oil & grease)
- Interchangeable V-belt & Chain drive
- Jack bolt alignment screws
- Polishing wheel

Included Belt & Chain Drive Components

AUTOMATION LABORATORY

IR 4.0 AND AI ROBOTIC TRAINING SYSTEM AL-IR4-02-MECHARM

This Robotic Training System is a multifunctional and intelligent 6-axis desktop robotic system for robot education and training to prepare for Industrial Revolution 4.0 and artificial intelligence challenges and careers. Equipped with different end-effectors, the robotic training system can fulfill and perform plenty of operations such including 3D printing, laser engraving, pick-n-place and etc. The robotic system support extended development by extensible interfaces, it's high accuracy, customizable end-effector and various programming languages which unleashes users creativity and imagination without limitation. Users can explore more application scenarios through software programming integrated with hardware development.

FEATURES

- 6-axis + 1 end-effector compact articulated robotic training system offer 6 DOF high precision motion control performance
- Raspberry Pi 4B based robotic arm with multi I/O ports
- Open source interfaces
- Perform operations such as pick up and move objects, draw, write, track objects and etc.
- Image recognition using OpenCV software library
- Customizable end-effector using 3-D printing with LEGO type plug and play connection form factor end-effector attachment and detachment
- Teach and playback function
- Support ROS (Robot Operating System) simulation
- Support various developments environment for experiments and projects developments such as Blockly, C++, C#, Python, ROS and etc.
- Designed to meet the skills and training requirement in the era of Industrial 4.0 Revolution such as artificial intelligence, simulation, autonomous robots, additive manufacturing, intelligent manufacturing and IoT

SPECIFICATION

A. MULTIFUNCTIONAL INTELLIGENT 6-AXIS ARTICULATED ROBOTIC ARM

- Degree of freedom : 6
- Payload : 250g
- Weight : 1000g
- Working radius : 270mm
- Repeatability accuracy : ±0.3mm
- Maximum movement speed : 120°/s
- End-effector connection type : LEGO plug and play type connection
- Working lifespan : 500H
- On/off button
- Input power : DC 8.4-14V, 5A
- Joint Rotation Angle Range
  - ⇒ J1 : -160°~+160°
  - ⇒ J2 : -90°~+90°
  - ⇒ J3 : -180°~+45°
  - ⇒ J4 : -160°~+160°
  - ⇒ J5 : -100°~+100°
  - ⇒ J6 : -180°~+180°
- Main Controller - Raspberry Pi 4 Model B
  - ⇒ Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
  - ⇒ 2GB LPDDR4-3200 SDRAM
  - ⇒ 2.4 GHz and 5.0 GHz IEEE 802.11ac wireless LAN
  - ⇒ Bluetooth 5.0, BLE
  - ⇒ Gigabit Ethernet
  - ⇒ Standard 40 pin GPIO header interface
  - ⇒ 2 x USB 3.0 ports; 2 x USB 2.0 ports
  - ⇒ 1 x USB Type C port
  - ⇒ 2 x micro-HDMI ports
  - ⇒ Micro-SD card slot for loading operating system and data storage
- Auxiliary Controller - ESP32
  - ⇒ 240 MHz dual core Tensilica LX6 microcontroller with 600 DMIPS
    Integrated 520 KB SRAM
  - ⇒ Integrated 4MB flash RAM
  - ⇒ I/O function interface

⇒ Grove interface
⇒ Gripper servo interface
⇒ USB Type C port

- End-Effectors

1. Suction Cup and Pump Module

⇒ Material : ABS injection molding
⇒ Suction cup size : 20mm
⇒ Pickup payload : 250g
⇒ Control interface : I/O control
⇒ End-effector connection type : LEGO plug and play type connection
⇒ Input power : DC 5V

2. Gripper Module

⇒ Material : ABS injection molding
⇒ Clamping width : 20~45mm
⇒ Max. clamping force/weight : 150g
⇒ Repeatability accuracy : ±1mm
⇒ Drive mode : Electronic control
⇒ Control interface : I/O control
⇒ Transmission method : Gear link
⇒ End-effector connection type : LEGO plug and play type connection

3. Camera Module

⇒ Material : ABS injection molding
⇒ Lens focal length : 1.7mm
⇒ View angle : Approx. 60°
⇒ Interface : USB 2.0
⇒ OS compatibility : Windows 7/8/10, Linus and Mac
⇒ End-effector connection type : LEGO plug and play type connection

B. CONVEYOR AND SENSORS PROJECT KIT

In order to unleash the creativity and imagination of the student/user, the system come with conveyor and sensors project kit to be integrated with the 6-axis robotic arm for fun projects and experiments.

The conveyor and sensors kit consists of :

- Conveyor (1 unit)

⇒ Belt width : 70mm
⇒ Conveyor length : 600mm
⇒ Conveyor height : 80mm
⇒ Sensors attachable
⇒ Conveyor motor : DC 12~24V Stepper motor / DC motor or AC 220~240V AC motor

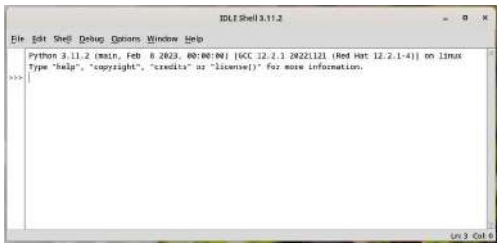
- Sensors (3 units)
  - ⇒ Diffuse photoelectric sensor
  - ⇒ Contact : N.O.
  - ⇒ Input power : DC 5V
  - ⇒ Installation brackets set
- Relay module (1 unit)
  - ⇒ Coil voltage : DC 2.5~5V
  - ⇒ Contact voltage : Max. AC 250V/DC 30V, 10A
  - ⇒ Output contact : N.O., N.C., COM
  - ⇒ Connections : Terminal block

C. OPERATING SYSTEM

- Linux - Ubuntu
- Windows 7/10/11

D. DEVELOPMENT ENVIRONMENT AND PROGRAMMING LANGUAGES

- Python IDLE



Pegasus II Robotic Learning System

880-RA21B

AUTOMATION

880-RA21B

Interactive Multimedia Curriculum and Student Reference Guide

Learning Topics:

- Basic Robot Operation
- Power Up and Shutdown
- Manual Operation
- Homing
- End Effector Operation
- Basic Robot Programming
- Teaching Points
- Movement Commands
- End Effector Commands

Amatrol's Pegasus II Robotic Learning System (880-RA21B) teaches articulated arm servo robotics and how it's applied in industrial tasks like assembly, material handling, machine tending, gluing, and inspection. This learning system includes 5-axis articulated servo robot arm with a 360 degree work envelope, industrial controller, and state-of-the-art teach pendant which are used to practice over 140 executable commands using the powerful MCL II language.

The 880-RA21B also includes world-class curriculum which covers major topic areas like basic robot operation and programming to accomplish hands-on skills such as jogging a servo robot using the teach pendant, entering and editing a basic robot program, and designing a robot program to perform a basic material handling task. The combination of theoretical knowledge and hands-on practice allows learners to gain both conceptual and practical knowledge, which broadens their competency in robotic applications. This is just one reason why Amatrol is the world-leader in skills-based, interactive technical learning.

AMATROL®

[F] Automation

Mobile Robot Trainer

Model: F2131
Technical datasheet

TECHNICAL SPECIFICATION

Easy Forklift Technical data

- ☐ Load bearing capacity up to 4 kg
- ☐ Maximum stroke 160 mm
- ☐ 2 proximity sensors for end-position monitoring
- ☐ 1 diffuse sensor for pallet control
- ☐ 2 self-centring pallets
- ☐ Connection via motor controls and encoder input
- ☐ Compatible with motor drive control board

4.0 INDUSTRIAL REVOLUTION

Engineering and Equipment provider
with **Passion of Technology**
TUV NORD ISO9001.2015 **Certified**

VICTRON
Training Equipment Solution Provider

IR4.0 FUNDAMENTALS

COURSE 2: CONTROL SYSTEMS

Robotics & Computer Programming Learning System

94-RCP-1

94-RCP-1

Interactive Multimedia Curriculum and Student Reference Guide

Learning Topics:

- Interfacing External Devices
- Basic Robot Programming
- Basic Robot Operation
- Quality Control
- Data Outcome Based Control
- Production Control
- Conditional Command Operation
- Flexible Manufacturing Cells
- Application Development
- Command Operation
- Material Handling Control

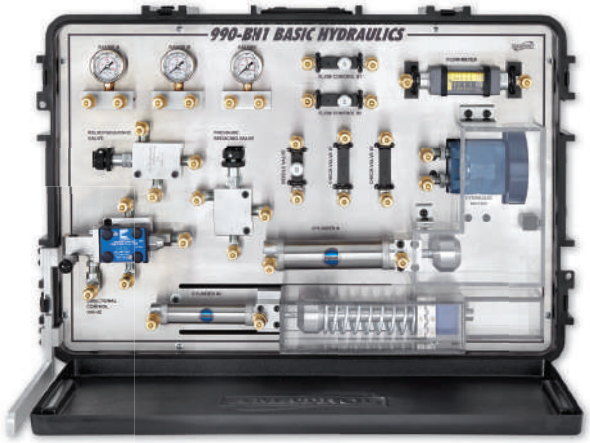
Amatrol's Robotics & Computer Programming System (94-RCP1) allows learners to gain skills in interfacing external devices, programming and operating robots, controlling production, and more. The 94-RCP1 will allow learners to practice and study how to identify robot and robot axis components, design programs for robots, explain how robots operate, developing workcells, and more.

This robotics and computer programming system features Pegasus Robotic Simulation Software Integrated Workstation expand the capabilities of 94-RCP-1 Optional Flexible Manufacturing Learning System 1, 94-FMS-1 and more! Learners will use these and other components to practice programming, operating, developing, and controlling of real-world robotics and computer equipment. Amatrol uses components that learners will find on-the-job in order to give the best opportunity to build confidence and industrial competencies.

Portable Basic Hydraulics Learning System

990-BH1

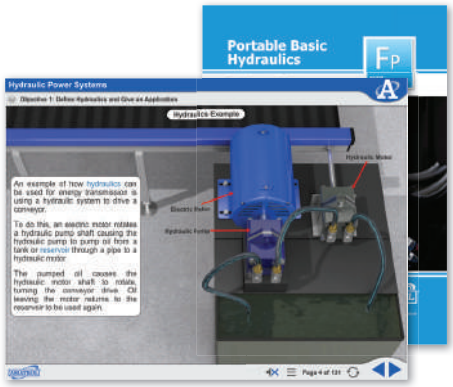
FP
FLUID POWER



Portable Basic Hydraulic Learning System

Portable Workstation

990-BH1 Student Reference Guide



Interactive Multimedia Curriculum

Learning Topics:

- Hydraulic Power Systems
- Basic Hydraulic Circuits
- Principles of Hydraulic Pressure & Flow
- Hydraulic Speed Control
- Pressure Control Circuits
- Pumps and Valves
- Hydraulic Schematics

Amatrol's Portable Basic Hydraulics Training System (990-BH1) allows learners to gain skills by studying topics like basic hydraulic circuits, pressure control circuits, hydraulic schematics, and sequence valves. Also, given the compact nature of the Portable Basic Hydraulics system, for the first time you can teach hydraulics in a limited space. This learning system allows learners to study and practice how to read a pressure gauge, as well as liquid level and temperature in the reservoir, connecting hydraulic circuits, operating a bi-directional hydraulic motor, converting between absolute and gauge pressure, and connecting and adjusting the pressure setting of a pressure relief valve (PRV).

The mobile Basic Hydraulics training includes gauges, manifolds, cylinders, valves (relief/sequence, pressure reducing, check, directional control, etc.), flow meter, and hydraulic motor. The components of this portable trainer are all industrial quality, not only to ensure durability, but also to help learners become better prepared for what they will encounter on the job. All Amatrol products are made from top-notch materials and carefully crafted to create tough, attractive, well designed learning systems that facilitate learning and will serve teachers and learners for years. Amatrol uses components that learners will find on-the-job in order to give the best opportunity to build confidence and industrial competencies.

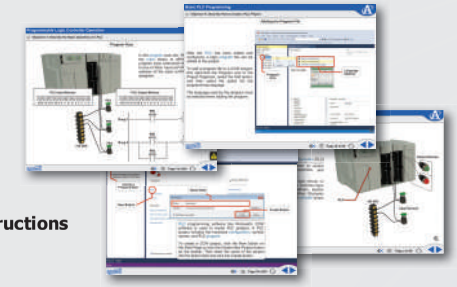
AMATROL®

COMPREHENSIVE MECHATRONICS CURRICULUM

Tabletop mechatronics covers basic PLC programming, motor control, pick and place feeding, indexing, sorting, and parts storage, as well as robot material handling.

PLC Programming Curriculum For Allen-Bradley

Learn PLC programming and ladder logic using Allen-Bradley PLCs



Automation Operation
- Control System Concepts
- Mechatronics Safety
- Machine Operator Functions

PLC Operation
- PLC Programming Software
- PLC Program Execution

PLC Event Sequencing
- Continuous Cycle Logic
- Stop Functions
- Time-Driven Sequencing

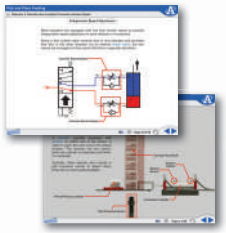
PLC Programming
- PLC Addressing
- Editing and Documentation

PLC Motor Control
- Controlling Discrete Inputs
- Seal-In Program Logic
- Safety Interlocks

PLC Timer and Counter Instructions
- On-Delay Timers
- Off-Delay and Retentive Timers
- Counter Instructions

Mechatronic Station Curriculum

Each station includes push button start/stop, on/off switch, quick connect terminal with test points, and PLC.



Inventory Feeding

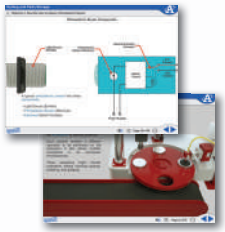
Station 1 (87-TMS1)

Pick and Place Feeding
- Material Feeding Systems
- Powered Parts Feeder Operation
- Pick and Place Pneumatic Manipulation
- Electro-Pneumatic Valve Adjustment
- Actuator Speed Adjustment
- Vacuum Adjustment

Inspection and Indexing

Station 2 (87-TMS2)

Indexing
- Index Station Operation
- Adjustment of Fork, Homing, and Proximity Sensors
- Stepper Motor Programming
- Homing Sensor Adjustment
- Stepper Motor Index Table Sequencing
- Index Station Sequencing



Sorting and Distribution

Station 3 (87-TMS3)

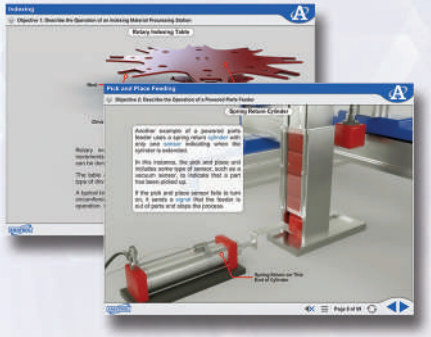
Sorting and Parts Storage
- Sorting Module Operation
- Parts Storage Operation
- Flat Belt Conveyor Adjustment
- Thru-Beam Photoelectric Adjustment
- Sorting Module Sequencing
- Multiple Station Operation

Servo Robotics

Station 4 (87-TMS4)

Servo Robot Material Handling
- Robot Station Operation
- Robot Traverse Axis
- Robot Work Envelope
- Conditional Commands
- Robot Sequencing

2400 Centennial Blvd.
Jeffersonville, Indiana 47130 U.S.A.
Phone: 812.288.8285 • Fax: 812.283.1584
Toll Free in USA & Canada: 800.264.8285
Email: contact@amatrol.com • www.amatrol.com



AMATROL®

TABLETOP MECHATRONICS

Powerful Automation Training for PLC, Electrical, Mechanical and Pneumatic Applications!

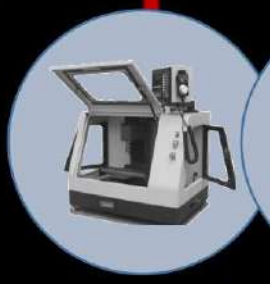
BUATAN MALAYSIA | MADE IN MALAYSIA | MITI CERTIFIED

MTS EDU

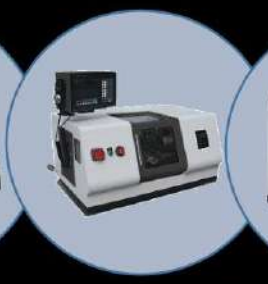
CNC Machinery & Maintenance

1. Machinery & System for Training ***Employability Skill*** on ***CNC machinist & Service/Maintenance Technician***
2. System Electrical Module is following ***Malaysia Electrical Commission Standard***
3. Employability Skill Modules is recognized by ***Industrial Employments***

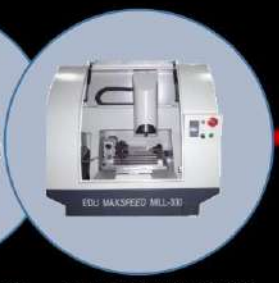
EDU CNC EMULATOR For Machine Setup, Controller Panel Operation, MDI / Jog Datum & Program & Simulation



EDU CNC VB200 MILL
Desktop Mill



EDU CNC VB210 LATHE
Desktop Lathe



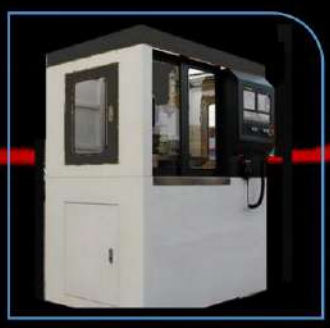
EDU CNC MAXSPEED
High Speed Engraving

EDU CNC VR1.5 Mill
Compact Mill w/ ATC

EDU CNC VR1.5 LATHE
Compact Lathe w/Turret

EDU CNC w/ TB & MWX
able to be configured with
TB_Troubleshooting Board &
MWX_Machine Wiring Xperiences Board

EDU CNC VR3 Mill (TB)
Configured with Trouble Shoot & Maintenance Board



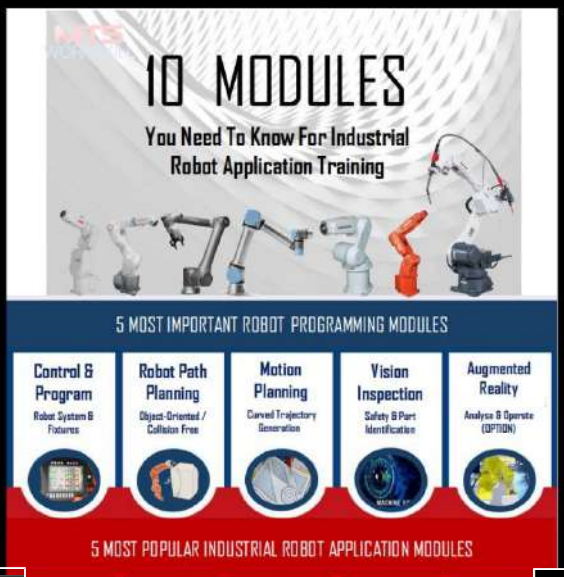
EDU CNC VB300 3 AX / 5 AX
Compact Mill 3 & 5 Axis

VICTRON
Training Equipment Solution Provider

IR4.0 FUNDAMENTALS

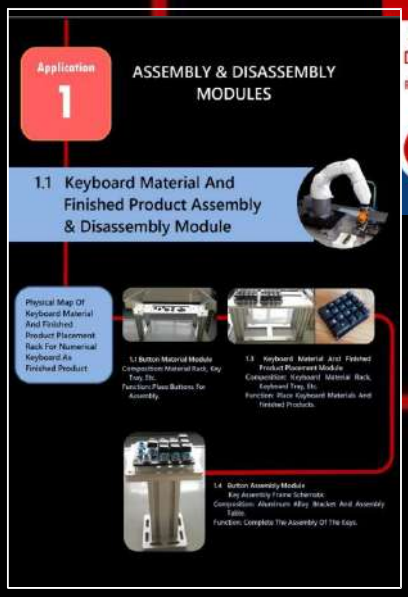
COURSE 3: ROBOT OPERATIONS

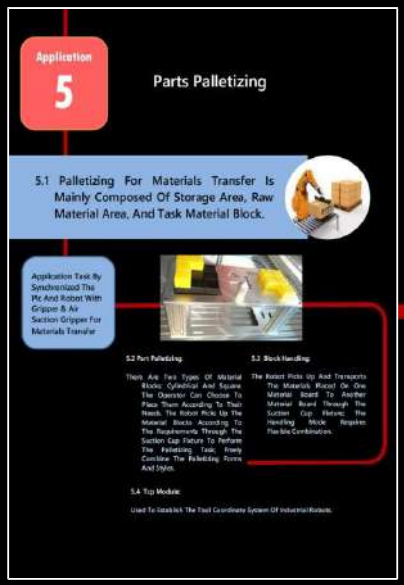
Robot Programs & Applications

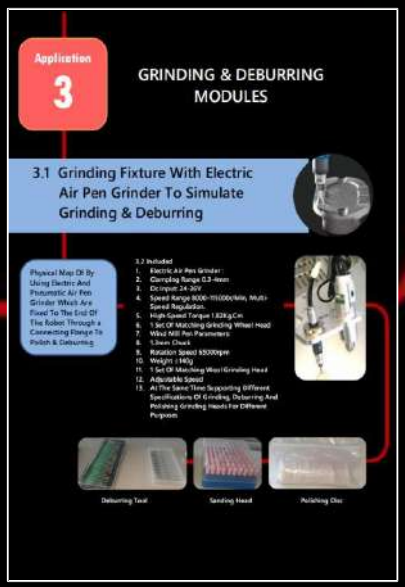


MTS IR 15 -600

Can Be Configured With Preferable Brand Of Robots







Smart Robot Logistics Palletizing Workcell

87-SWPF1V

AT AUTOMATION

87-SWPF1V Smart Robot Logistics Palletizing Workcell Shown with 95-MSB3 Skill Boss Logistics and 87-MRL1 Mobile Robot Logistics System

Learning Topics:

- Robot Startup and Jogging
- Manual and Automatic Robot Operation
- Palletizing Robot Workcell Operation
- Robot Programming
- Operate and Test a Safety PLC
- Managed Ethernet Switch Operation
- Network Security and Performance
- Basic Industrial Ethernet Operation
- Basic Ethernet/IP Operation
- Robot Vision System Programming

Manufacturers are increasingly turning to smart technology to automate more of their processes. This includes using smart robots to de-palletize and palletize anything from raw materials for production to finished goods for packaging and shipping. These robots still need human operators to function properly though, and many manufacturers struggle to find qualified individuals to operate and maintain these complex machines. Amatrol's Smart Robot Logistics Palletizing Workcell remedies this by equipping students with the skills they need in order to work with such robots and pursue successful careers in advanced manufacturing.

The 87-SWPF1V Smart Robot Logistics Palletizing Workcell teaches students how to operate, program, maintain, and troubleshoot a robotic palletizing workcell. Students will learn how to power-up and jog an industrial robot workcell using an HMI, operate the workcell both manually and automatically, enter and interpret commands, configure robot vision settings, track robot performance, and ensure safety devices are functioning correctly.

The 87-SWPF1V includes a mobile workstation with a FANUC 6-axis robotic arm, Allen-Bradley safety PLC, dual transport conveyors, and physical safety guards. Five 3D-printed pallets, twenty boxes, and barcode labels are included for sorting. Amatrol's proven PC-based interactive, multimedia student curriculum is included, as well as an install guide, instructor's guide, and skills PDF.

AMATROL®

VICTRON
Training Equipment Solution Provider

IR4.0 FUNDAMENTALS

COURSE 4: INTRODUCTION TO IOT

MTS WORKSKILL

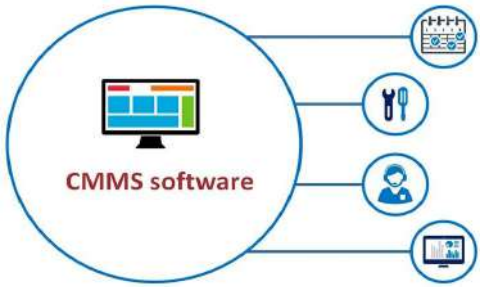
Competency Meet

Employability WORKSKILL

EDU CNC CMMS

Compurerized Maintenance Management Training Systems

IOT Application Training for Machines Predictive Maintenance



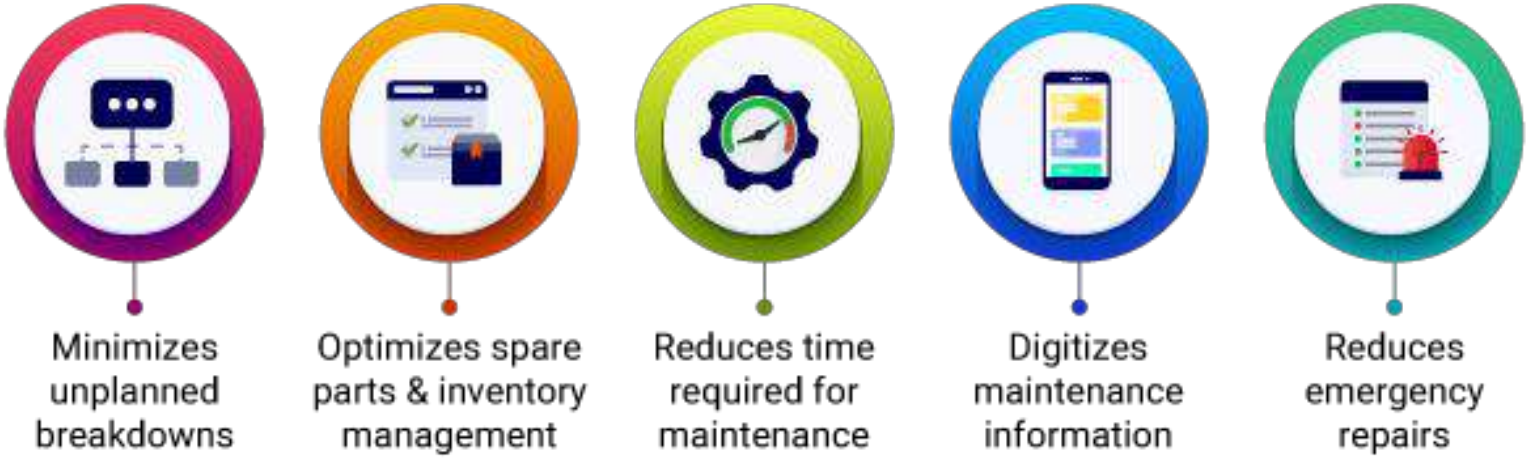
MITI CERTIFIED

BUATAN MALAYSIA

EDU PRECISION

Web-Based Backstage

iMobile Service



Learning Features:

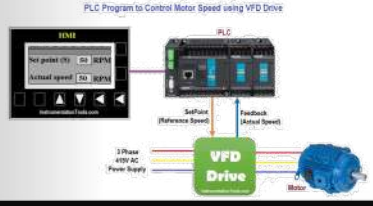
1. **Able to self-customize Dashboard configuration to perform Maintenance Monitoring System**
2. **Able to show machine alarm code, alarm detail and alarm log file**
3. **Able to self-customize Dashboard configuration to monitor machine, servo drive and spindle drive performance**
4. **Able to self-customize Dashboard configuration to monitor machine status condition including, air pressure, lubricants level, coolant level, machine temperature and etc.**
5. **Able to self-customize Dashboard configuration to monitor machine component life-time such as servo motor pulley timing belt, spindle motor pulley belt, cutting tools usage time and etc**

Competency Meet

Employability WORKSKILL

VFD Training with Integrated PLC & Controller

EDU MWX-VFD



EDU MWX - VFD
Variable Frequency Drive with Integrated PLC & Controller Training Solutions

Description

This trainer is specially designed for electrical panel installation and wiring training. The trainer come together with a Sub Distribution Board which is attached at the back of the trainer. For load, we using single phase and three phase motor. At the same time, this trainer also could add on PLC and using for automation system wiring and programming training usage. With the help of Solid Schematic software, trainee will able to learn circuit design and install their designed circuit on to EDU MWX for installation, testing and commissioning training.

Technical Specification

1. Power supply: Single-phase AC 220V } 7%, 50 Hz;
2. MWX Panel Overall Size: 1300mm x 740mm x 1700mm
3. The apparent power of machine consumption: ≤ 1.5 kVA
4. Required Power Supply: 3-phase 415VAC, 20A, 50Hz.
5. PLC: OMRON CP or CJ series

VICTRON

Training Equipment Solution Provider

SMART FACTORY

Competency Meet

Employability WORKSKILL

EDU SMART CIM - Series

For Simulating Smart Factory Production Environment

Modular Production System (MPS)

Model: EDU SAMRT CIM - MPS IND205

Flexible Manufacturing System (FMS)

Model: EDU SMART CIM - FMS VB

Automatic Storage & Retrieve System (AS/RS)

Model: EDU SMART CIM - MPHS S2 series

Smart Manufacturing Factory is segmented into ;

✓ ***Model: EDU SMART CIM - MPS IND205***

✓ **Modular Production System** ; Composed of

1. Distribution Station,
2. Testing Station,
3. Pick & Place Station,
4. Fluidic Muscle Press (Hydro press) Station
5. Sorting station

✓ ***Model: EDU SMART CIM - FMS VB***

✓ Flexible Manufacturing System ; Composed of

1. EDU CNC VB Mill
2. EDU CNC VB Lathe
3. 6 axis Articulator Robot Arm
4. Linear Slider
5. Quality Control with Machine Vision

Model: EDU SMART CIM - MPHS S2 - AS/RS

✓ Automatic Storage & Retrieve System (AS/RS)

1. With IAI 3-Axis Cartesian Robot
2. Finished Product Storage Rack: 20 cell
3. Raw Material Rack for Milling
4. Raw Material Rack for Turning
5. With OMRON RFID R/W head

✓ **Materials Transfer Systems; Optional with**

1. AGV with Articulator Robot Or Collaborative Robot (Cobot)
2. Conveyor

✓ Main Control System ; Optional with

1. PLC
2. SCADA System
3. IR4.0 MMS (Machine Monitoring System)

Competency Meet

Employability WORKSKILL

✓ *Model: EDU SMART CIM - FMS VB*

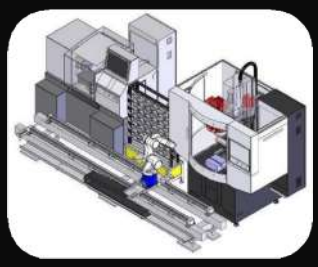
✓ Flexible Manufacturing System ; Composed of ;

Brand: EDU CNC VB210 Milling Machine
I. With Auto Vice
II. With Auto Door
III. With OMRON RFID R/W head (option)
IV. With Ethernet Industrial Communication Protocol (option)

Brand: EDU CNC VB200 Lathe Machine
I. With Auto Chuck
II. With Auto Door
III. With OMRON RFID R/W head (option)
IV. With Ethernet Industrial Communication Protocol (option)

Materials Transfer System
Brand: OMRON Viper 650
i. With EOF Gripper
ii. With Linear Slider
iii. With OMRON Robot Programming Software

EDU SMART CIM - FMS VB



OMRON Viper 650

Specifications

Product name		Viper		
	Size	650		
	Cleanroom/IP	Standard	Cleanroom	IP54/65
Part Number		1720[ ]-36000	1720[ ]-36020	1720[ ]-36010
Mounting		Table/Floor/Inverted		
Number of axes		6		
Reach		653 mm		
Maximum Payload		5 kg		
Repeatability	XYZ	±0.02 mm		
Joint Range	Joint 1	±170°		
	Joint 2	-190°, +45°		
	Joint 3	-29°, +256°		
	Joint 4	±190°		
	Joint 5	±120°		
	Joint 6	±360°		
Inertia Moment (Max.)	Joint 4	0.295 kgm²		
	Joint 5	0.295 kgm²		
	Joint 6	0.045 kgm²		
Joint Speeds	Joint 1	328°/s		
	Joint 2	300°/s		
	Joint 3	375°/s		
	Joint 4	375°/s		
	Joint 5	375°/s		
	Joint 6	600°/s		

Technical Specification EDU CNC VB210 MILL

Repositioning	0.02mm
Resolution	0.001mm
X-Axis	210mm
Y-Axis	95mm
Z-Axis	200mm
A-Axis	Optional A-Axis with Indexer
IO Port	Ethernet, USB, COM Port
Spindle Speed	100 - 3500rpm
Table Size	400x90mm
Max. Drill Hole	13mm
Max. Drill Diameter	60mm
T-Slot Size / Number	12mm / 3
Taper	MT3
Paddle	Electronic Paddle
Controller	Siemens 808D / Tomatech / KY / ADTECH
Ethernet	Able to link with Ethernet
Motor Power	2.2kW
Power Supply	AC220V/50Hz
Weight	150/160kg
Nominal Size (LxWxH)	845x580x850mm
Packaging Size (LxWxH)	950x680x950mm

EDU CNC VB200 LATHE

Repositioning	0.02mm
Resolution	0.001mm
X-Axis	80mm
Z-Axis	290mm
Spindle Speed	100-2000rpm
Swing Over Bed	210mm
Max. Clamp Diameter	1 - 80mm
Spindle Bore	20mm
No. of Turret	4 Tools
Turret Positioning	360° / 0.005mm
Coolant System	Coolant
Threading	Yes
Spindle / Headstock /Taper	MT3
Paddle	Electronic Paddle
Controller	Siemens 808D / others
Motor Power	750W
Power Supply	AC220V/50Hz
Nett / Gross Weight	180 / 200kg
Nominal Size (LxWxH)	1000x700x580mm
Packaging Size (LxWxH)	1100x800x700mm

Competency Meet

Employability WORKSKILL

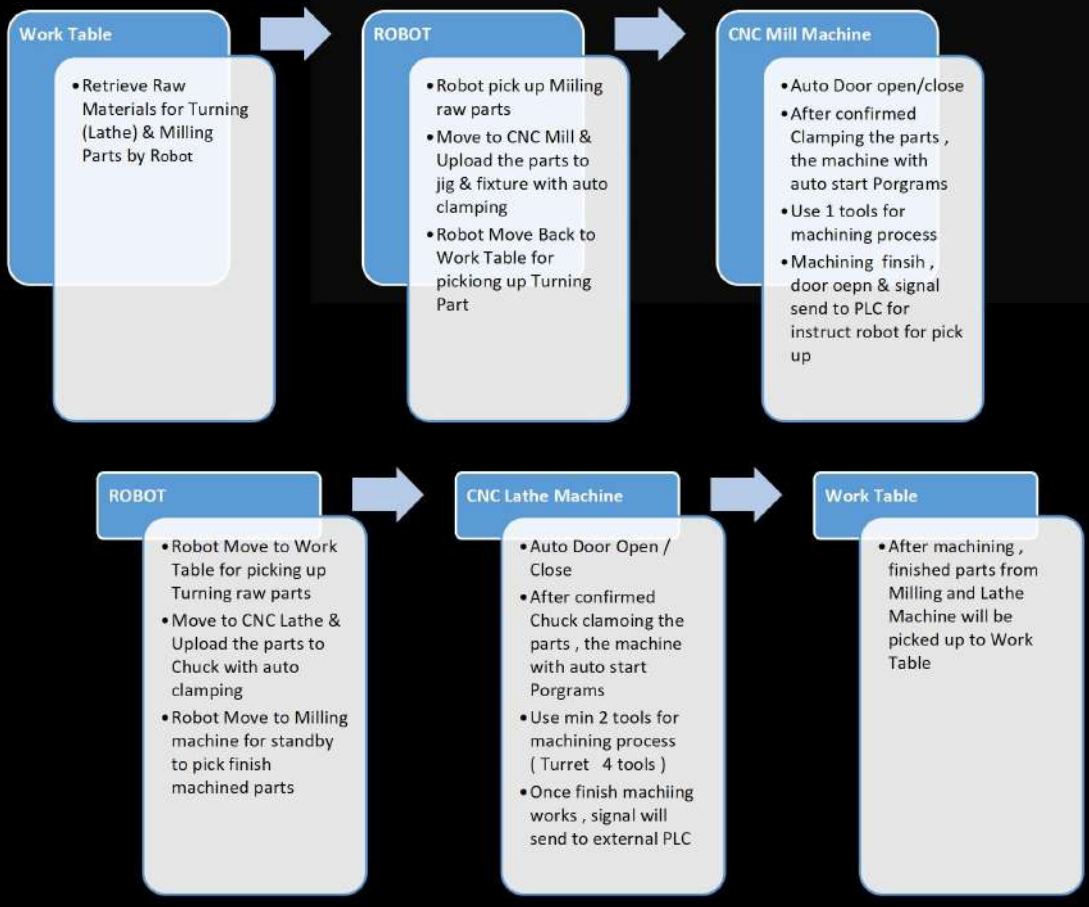
Additional Accessories & System

1. Programmable Logic Controller, PLC
   Brand: OMRON NX102-1020 PLC with OPC/DB
   With SYSMAC PLC Programming Software
2. HMI Touch Screen
   Brand: OMRON NB10W-TW01
   With OMRON HMI NB Designer Software
3. I/O Link Master:
   Brand: OMRON NX-ILM400
4. Electrical Components and wiring
   Brand: Schneider and OMRON Electrical component

Included Documentation

i. CIM Operation Manual
ii. CIM Operation video
iii. CIM Maintenance Manual
iv. CNC Milling Operation Manual
v. CNC Lathe Operation Manual
vi. PLC Programming Manual
vii. Robot Operation Manual

Work Flow Diagram For Simulating Auto Manufacturing Process



Competency Meet

Employability WORKSKILL

EDU SMART CIM - VB IR4 is composed of ;

1. Vision Inspection Station
2. Material Handling Station (1setof 6-Axis Robot with pneumatic gripper)
3. Assembly station (1 set of 6-AxisRobotwithpneumatic gripper)
4. AS/RS - Three axis Cartesian robot(payload: 1kg) x 1 unit
5. Storage Racking System
6. Central Control Station with SCADA Software Systems
7. Each station come with PLC
8. EDU Smart CIM cover with Iron safety fencing
9. Able to Integrate with Achieve IR4.0 MMS (Machine Monitoring System)

Integrate with Achieve IR4.0 MMS (Machine Monitoring System)

Competency Meet

Employability WORKSKILL

EDU SMART CIM IR4.0
INTELLIGENT MANUFACTURING PRODUCTION SYSTEM

Optional integrated with AIV and Cobot

EQUIPMENT OVERVIEW

Intelligent manufacturing has become the development trend of the global manufacturing industry and the core of a new round of industrial revolution. At present, the "intelligent manufacturing unit" technology in the cutting processing field, which is characterized by the organic combination of intelligent manufacturing equipment movement trajectory and manufacturing process, has been widely used in the machinery industry, and plays an important role as a "pioneer" in promoting intelligent manufacturing.

Intelligent manufacturing application technology adopts a typical model of discrete manufacturing --- "intelligent manufacturing" unit in the field of mechanical cutting, combined with CNC machine tools, industrial robots, welding equipment, intelligent sensing and control equipment, intelligent testing equipment, intelligent storage The research and development of equipment for key technologies and equipment for intelligent manufacturing, such as equipment and software systems, demonstrates the functions and ideas of automation, digitization, networking, integration, and intelligence. It involves knowledge and skills in the fields of intelligent control technology, numerical control technology, industrial robot technology, mechatronics technology, industrial engineering technology, software technology, automation technology, and measurement technology.

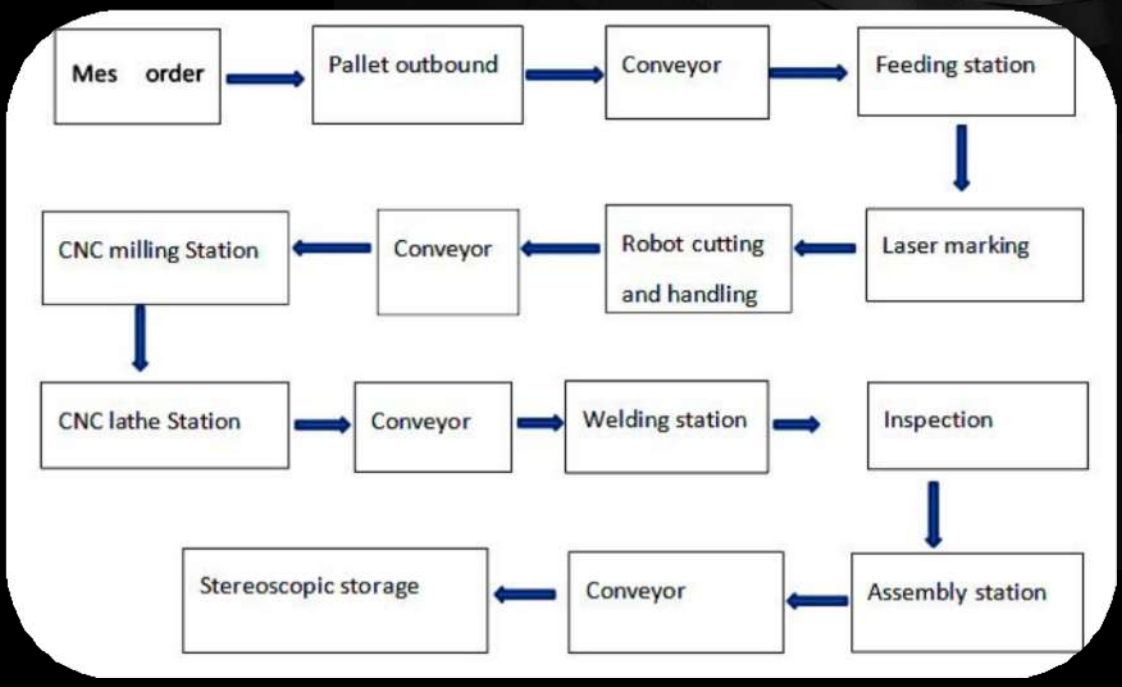
Intelligent manufacturing production application system is mainly composed of storage unit, conveying line, marking unit, machining unit, welding unit, assembly station, visual inspection station, master control unit and related software.

Competency Meet

Employability WORKSKILL

The intelligent production system uses the common acrylic rotating ornaments as a typical carrier, and the product includes a base, a connecting pin, and an acrylic plate.

Process flow chart:

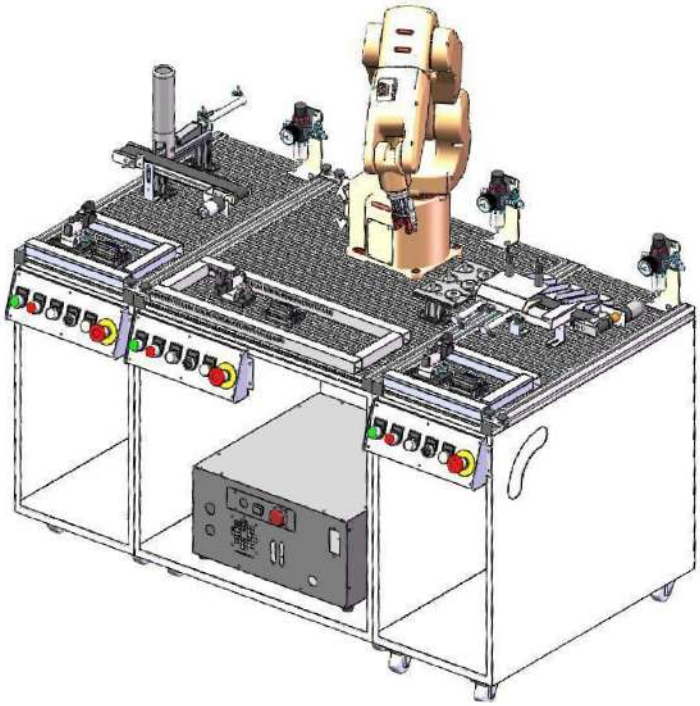


Process description:

1. **MES order:** Manually complete the blank feeding module of marking and processing, MES places an order, and the user can choose his favorite marking pattern, processing size, etc.
2. **Pallet out of the warehouse:** the storage unit stacker takes out the pallet from the storage rack and transfers it to the conveyor line.
3. **Conveying:** The conveying line is started, and the work-piece pallet is conveyed to each work station, and the precise positioning of the pallet is realized by the positioning stop device.
4. **Robot loading and handling:** the robot takes out the blank from the acrylic plate feeding table and places it in the laser marking station.
5. **Laser marking:** The laser marking machine marks the design pattern selected by MES on the surface of the acrylic plate according to the specified procedure.
6. **Robot unloading and handling:** After marking, the robot transports the work-piece to the pallet according to the set procedure.

7. **Conveying:** The conveyor line is started, and the workpiece pallet is conveyed to the next station, and the precise positioning of the pallet is realized by the positioning stop device.
8. **CNC milling:** The work-piece pallet arrives at the milling station, and the robot takes the work piece-base blank from the blank automatic feeding module and places it on the machining tooling of the CNC machining center. The CNC machining center performs milling, drilling and other operations on the work piece according to the set program. The processed work piece is transported by the robot to the work piece pallet and continues to move forward along the conveyor line.
9. **CNC lathe:** When the work piece pallet arrives at the turning station, the robot takes the work piece-connecting pin blank from the bar blank automatic feeding module, places it on the automatic chuck of the CNC lathe and clamps it. The CNC lathe performs the rounding and chamfering of the work piece according to the set program.
10. **Conveying**: The conveyor line is started, and the workpiece pallet is conveyed to the next station , and the precise positioning of the pallet is realized by the positioning stop device.
11. **Robot welding**: The 2-axis manipulator takes out the workpiece-base and connecting pin from the workpiece tray, and places it on the welding tool , the cylinder clamps the workpiece, and the welding robot welds the workpiece according to the set welding program and trajectory. The welded workpiece is transported to the workpiece pallet by a 2-axis manipulator. The conveying line starts to transport the workpiece pallet to the next station.
12. **Inspection:** The inspection and assembly robot transports the welding workpiece and acrylic plate to the visual inspection station and measurement inspection station in sequence to inspect the processing quality of the workpiece, and the qualified workpiece will be assembled by the robot.
13. **Robot assembly**: Detect and assemble robots to complete the assembly of qualified workpieces. And the assembled finished workpiece is placed on the workpiece pallet.
14. **Finished product warehousing:** The pallet loaded with the finished product returns to the storage station along the conveying line, the stacker picks up the pallet, and transports it to the designated storage location according to the set procedure.

SMART MMS- IR 4.0 -
Modular Manufacturing System



(Designed Model Picture is for reference & Conceptual Model only)

Equipment Overview

This system covers the fields involved in the integration of mechanical, electrical, sensor, pneumatic and other disciplines: including PLC control technology, sensor detection technology, pneumatic technology, stepper motor drive technology, mechanical structure and system installation and debugging, fault detection technology, Ethernet communication technology, motion control, etc. At the same time, closely focusing on the latest technological development trend of Industry 4.0, integrating advanced technologies such as "digital twin simulation", "logistics technology", and "MES" can enable students to learn and master the latest knowledge and skills of Industry 4.0.

The training system consists of a ***distribution station***, *a* ***robot assembly station***, and a ***sorting station***. The main mechanisms are modular and installed on aluminum substrates with slots. By utilizing Ethernet communication and simple mechanical docking between various modules, an automated production line can be formed. The software consists of PLC programming software, MES, and digital twin software. Students can master the professional skills of Industry 4.0 through systematic and comprehensive learning. It can minimize the gap between the training process and the actual production process.

Technological process:

Feeding: The feeding module cylinder pushes the material from the silo to the feeding conveyor according to the command. The sensor on one side of the conveyor detects the material in place signal, the conveyor motor starts, and the material is transported along the conveyor belt to the next station.

Detection: the sensor on one side of the detection conveyor detects the incoming signal of the material, blocks the opening of cylinder 1, stops the positioning of the material, rotates the rotating cylinder of the detection and handling manipulator to the handling station, the lifting cylinder drops, the parallel fingers open, grabs the material according to the command, then the lifting cylinder rises, the rotating cylinder rotates 90 ° to the detection platform and puts down the workpiece, the dual axis cylinder of the detection module drops, and the electronic ruler detects the depth of the material.

The tested material is picked up by the testing and handling robotic arm and transported to the testing conveyor. The conveyor starts and transports the material to the waste removal station. If it is qualified, the material will be transported along the conveyor belt to the next station. If it is not qualified, it will block the opening of cylinder 2 and guide the material to the waste chute.

Sorting: The materials are transported to the sorting conveyor, and the capacitors and photoelectric sensors sequentially detect the material and color. Based on the detection results and the set program, the materials that meet the requirements are pushed to the corresponding storage tank.

EDU Smart CIM IR4.0_ DT130

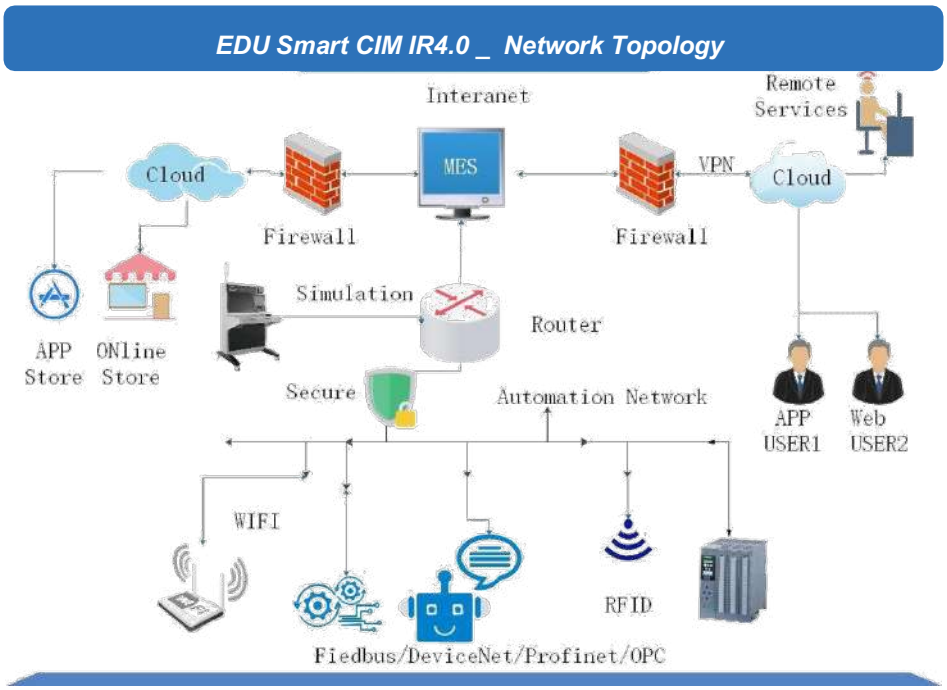
Digital Twin Smart Manufacturing Solutions

Digital Twin Smart Manufacturing Solutions

(*All Pictures In This Technical Document Are For Design Reference Only)*

EDU Smart CIM IR4.0_ DT130 *Digital Twin Manufacturing Technology application system* hardware platform includes ;

1. Transfer Station, Base Distribution Unit,
2. Cover Distribution Unit, Assembly Unit,
3. Processing Unit, Detection Unit,
4. Drilling And Milling Unit,
5. Storage Unit,
6. Conveying Unit / Steering Conveying Unit,
7. Collaborative Robot Station (Cobot)
8. AIV / AGV /MR Is Composed Of Cobot Unit, (or MR Mobile / Auto Intelligent Vehicle robot + Cobot)
9. Material Station,
10. Independent Interactive Test Bench
11. Master Control And Display Unit,
12. 3D Printing Station & Etc.
13. Software Platform Consists Of Plc Programming Software, Mes Manufacturing Execution Management System And Digital Twin Software.
14. Integrates with ***"MES", "Smart Sensor", "PLC Control Technology", "Smart Electro-mechanical Equipment", "Digital Twin Simulation", "Logistics Technology", "IT Technology And safety" and other advanced technologies*** can enable trainees to learn and master the latest knowledge and skills of Industry 4.0.



2.0) EDU Smart CIM IR4.0 _ Network Topology

Students using this system can learn to master the following skills:

1. ***Height measuring sensors,*** etc. commonly used in industrial automation . On this device, students can get to know each sensor and master how to use each sensor.

2. ***Electrical control system,*** The drawings of the electrical part are designed according to industrial standards. Students can learn circuit principle analysis, PLC I/O address checking and equipment circuit analysis methods on this equipment.

3. ***Motor drive technology,*** including stepper motors, DC motors, etc. Students can understand and master the use of each motor on this device.

4. ***Siemens PLC technology,*** students can practice PLC wiring, programming and debugging on this device.

5. ***Configuration technology,*** students can practice programming of Siemens configuration software and communication between configuration software and PLC on this device.

6. ***System maintenance and fault detection technology,*** This part focuses on the content and methods of daily maintenance of mechatronics equipment, as well as common fault analysis and troubleshooting methods.

7. ***Digital twin technology: digital 3D model building and layout*****,** virtual PLC debugging, virtual production line beat optimization, etc.

8. ***Industry 4.0 production line through MES*** .

9. ***Logistics technology ,*** not only transshipment, handling, assembly, and warehousing technologies, but also identification, data transmission and tracking technologies.

10. ***IT technology ,*** mainly includes network planning, network wiring, firewall, VPN, gateway, router settings, etc.

11. ***Information security,*** The main two LANs are interconnected, the network firewall is configured, and the gateway provides filtering and security functions.