HYTECH DIDACTIC

ROBOTICS

Collabrative Robot

COBOT Training Cell with PLC, HMI and IIOT

www.hytechdidactic.com

Cobot: A Key Solution in Industrial Robotics Training

The Hytech COBOT Cell is a comprehensive training platform integrated with a Central Control Unit featuring PLC, HMI, and IIoT connectivity. It enables users to learn both standalone COBOT operations and advanced applications involving PLC and HMI integration with IIoT capabilities.

At the core of the cell is the **Mitsubishi ASSISTA COBOT**, equipped with a **pneumatically operated automatic tool changer.** The COBOT can autonomously switch between **three different pneumatic gripper tools**, enabling it to perform a variety of tasks without manual intervention. The training setup includes **four experiment tables** mounted on a robust aluminium extrusion frame.

The COBOT can be operated through a **teach pendant** or a **touch pad**, providing users with diverse control methods. A built-in **3D simulation software** functions as a digital dynamic twin, allowing for offline programming and virtual testing of COBOT operations. Additionally, the complete 3D environment and real-time COBOT movement are dynamically displayed on a **TV screen** mounted on the training cell, offering an engaging and interactive learning experience.

Centralized Control and Real-World Automation Training

The Hytech COBOT Training Cell features a dedicated **Central Control Unit** equipped with a PLC (Programmable Logic Controller) and HMI (Human-Machine Interface), providing seamless integration with the COBOT system. This setup allows trainees to operate complete robotic cycles within an industrial automation context, offering a deep understanding of real-world robotic architecture and control logic.

Customization and Experimentation Capabilities

The platform supports user-driven **PLC programming** and **custom HMI screen development**, enabling personalized control of robot operations. Trainees can work with a variety of industrial automation components— such as:

- RFID reader/writers for object identification and tracking,
- Colour sensors for inspection and sorting based on visual parameters,
- Load cells for weight-based measurement and sorting applications, and
- switch between multiple grippers and perform varied tasks without manual intervention.

all integrated through the PLC-HMI framework. This allows learners to simulate real-world manufacturing processes and automation workflows.

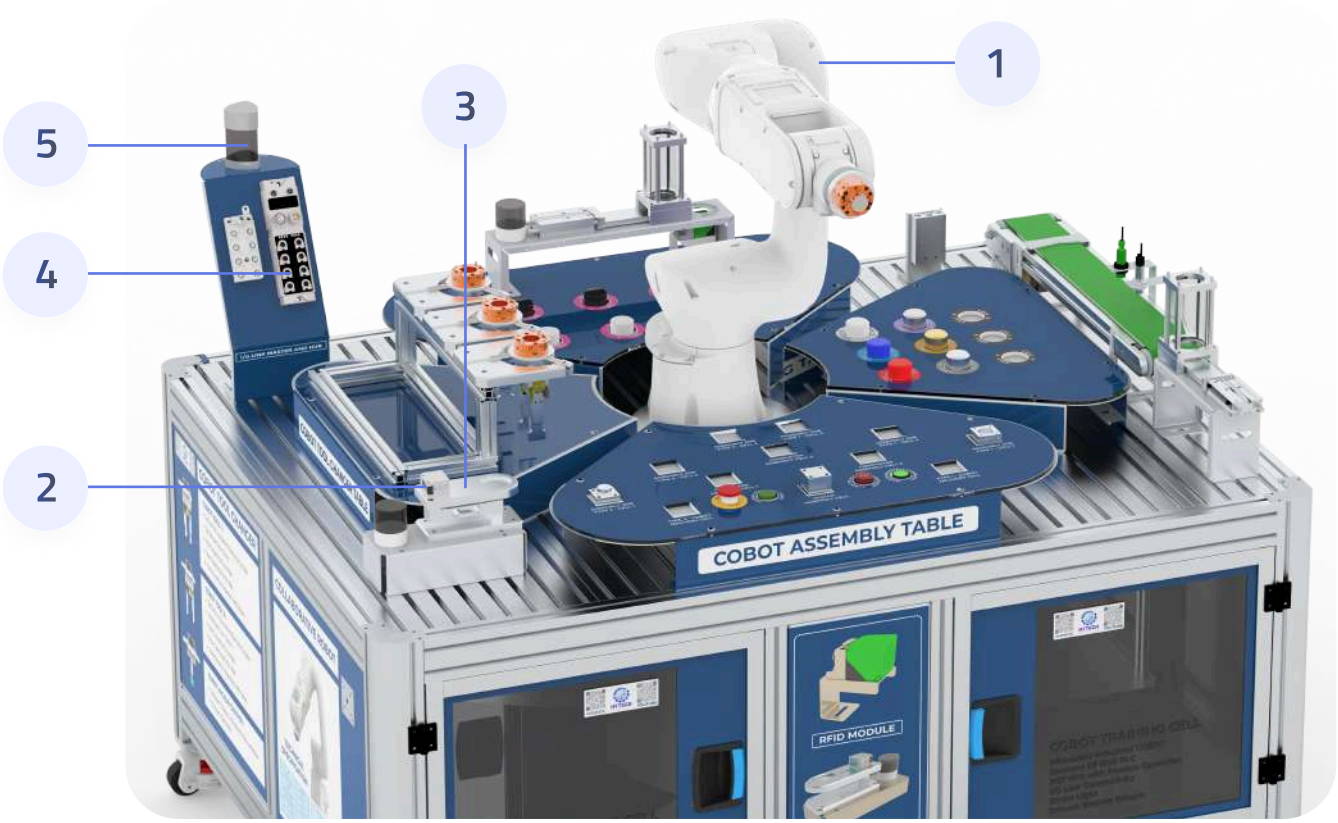
Industrial IoT (IIoT) Integration

The system incorporates Siemens Industrial Edge technology to deliver advanced IIoT functionality. Trainees gain valuable experience in data acquisition, analysis, and remote monitoring—critical competencies for modern smart manufacturing and connected factory environments.

Complete Licensing and Ready-to-Use Setup

All required software licenses for PLC, HMI, and Industrial Edge are pre-installed and fully functional. A dedicated workstation is included with the training setup, ensuring a seamless, plug-and-play learning environment for trainees and educators alike.

Core Components That Drive Performance



1. Cobot:

The training kit includes an industrial Cobot from Mitsubishi/KUKA with a teach pendant, fully integrated with digital twin technology. It offers offline programming capabilities, enabling simulation and optimization of robotic operations before execution.

2. Colour Sensor:

The training setup features an I/O-Link-based color sensor integrated with an I/O-Link master and PLC. Students can program and configure the sensor, gaining hands-on experience in industrial automation and sensor technology.

3. Load Cell:

The training kit features a load cell with analog output integrated with PLC and HMI, enabling robotic weight-based sorting. It provides students with hands-on training in load cell operations and PLC-HMI integration, enhancing their skills in advanced industrial automation.

4. I/O Link master:

The training kit features an I/O-Link infrastructure with an I/O-Link master, offering flexibility for future expansion. Users can seamlessly integrate various I/O-Link-based advanced sensors, enabling adaptability and scalability in training and industrial applications.

5. I/O Link based Smart Light:

The training kit includes an I/O-Link smart light that can be integrated with PLC and Cobots, providing students with a realistic industrial experience. The smart light can be programmed independently and then seamlessly synchronized with the Cobot for advanced automation tasks.

Core Components That Drive Performance

6. Aluminium Extrusion based structure:

The training cell is mounted on an aluminum extrusion-based work surface, ensuring ease of movement without positive locking. The aluminum construction enhances aesthetics and provides a durable, rust-free platform, ensuring a long-lasting and visually appealing training solution.

7. Conveyor with Auto Feeder:

A conveyor system equipped with an auto feeder is a critical component in robotics training, simulating real-world industrial automation processes. It provides trainees with practical exposure to material handling, process automation, and system integration, enabling them to develop essential skills for modern manufacturing and logistics environments.

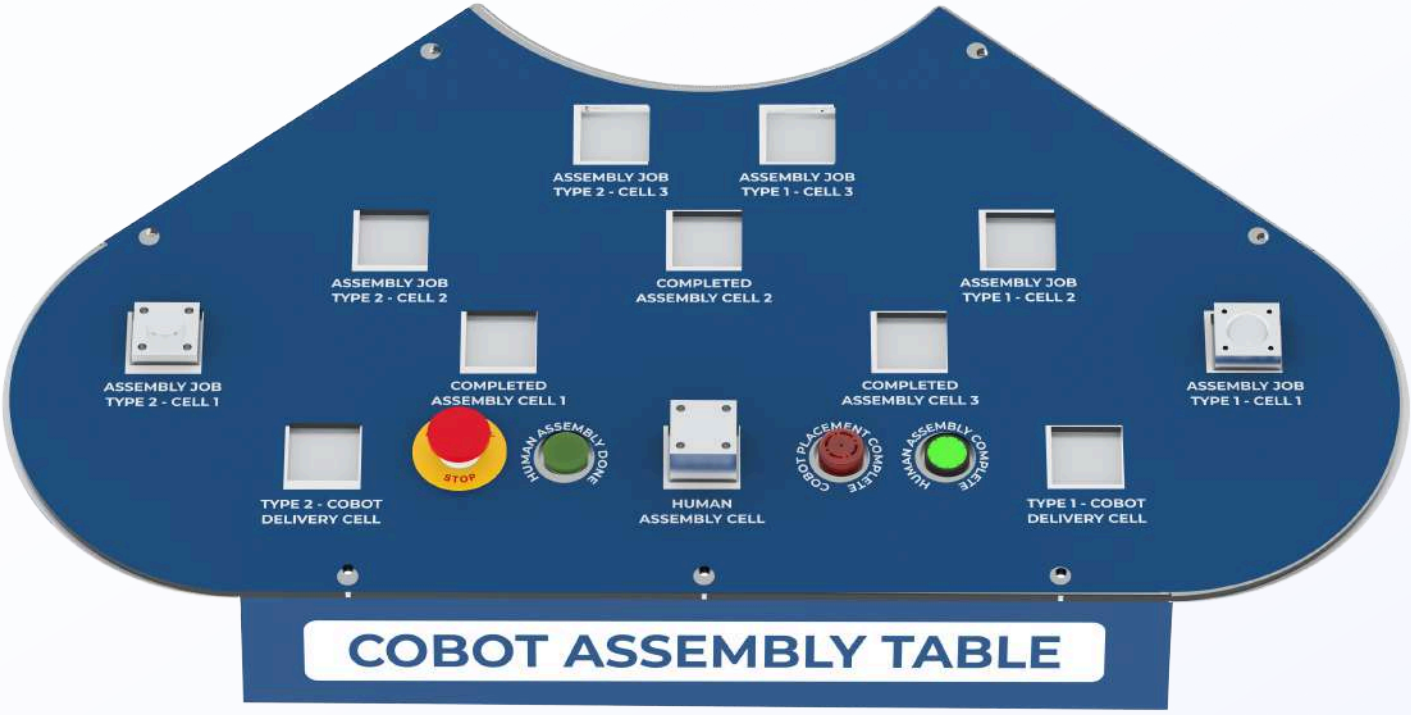
8. HMI:

The training kit includes a 7-inch HMI that trainees can program according to experimental requirements. It comes with a backup of at least 12 pre-designed exercises, allowing students to operate the Cobot training cell in seamless integration with the HMI, enhancing hands-on learning.

9. Control panel with PLC and IIOT:

The training cell includes PLC and IIoT hardware, enabling students to operate the Cobot in integration with the PLC, replicating industrial practices. Students can design custom dashboards to remotely access, display, and monitor selected parameters, fostering real-world automation and IIoT skills.

Table 1: Collaborative Assembly Table



COBOT Table 1 features a collaborative workstation where the operator and the COBOT work in coordination. The COBOT initially picks and places two separate raw parts into designated cells. A buzzer signals the completion of the COBOT operation. The operator then assembles the parts using an automatic screwdriver. Once assembly is complete, the operator initiates the next sequence by pressing a push button. The COBOT then picks the assembled job and places it in the final designated cell. The system ensures seamless human-robot collaboration, enhancing both productivity and safety. Real-time monitoring through the HMI allows tracking of process status and error diagnostics.

Table 1 - Collaborative Assembly	
	Pallet with Photosensors (Qty: 08)
	Automatic Screw Driver for Workpiece Assembly
	Workpieces for assembly Application
	Bolts for assembly

Table 2: Cobot Tool Changer Table

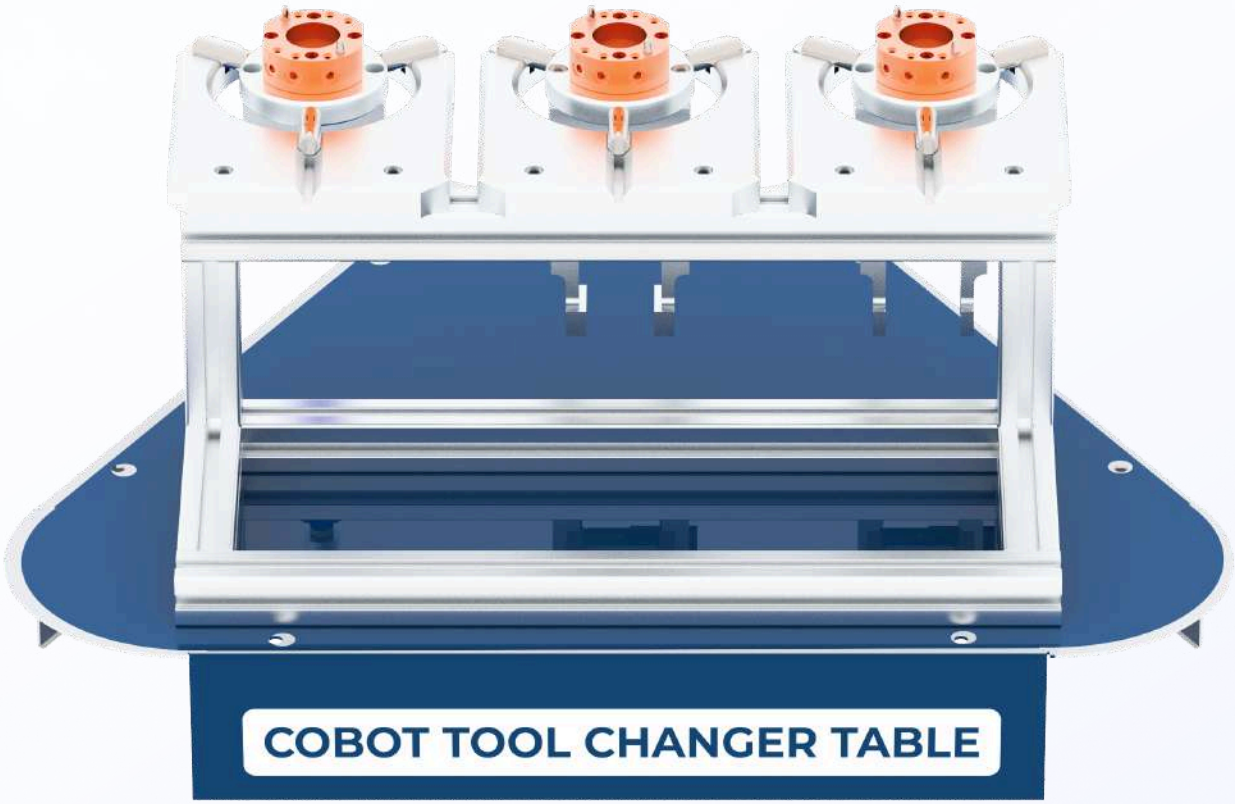


Table 2 is a COBOT Tool Changer Station equipped with multiple COBOT tools designed for various operations. Based on task requirements, the COBOT autonomously selects the appropriate tool and performs precise pick-and-place operations. The station features quick-change tool holders and automatic tool recognition systems to enhance operational efficiency. This setup enables the COBOT to seamlessly switch between tasks such as gripping, suction, and material handling without any manual intervention.

Table 2 - Cobot Tool Changer	Cobot Side Tool (1 Qty)
	Tool Side Clamping (Qty: 03)
	Vacuum Gripper with Vacuum Generator
	Pneumatic Parallel Gripper
	Mounting arrangement for grippers made in aluminium extrusions

Table 3: RFID Based Sorting Table

Table 3 is equipped with RFID technology and fully integrated with a PLC system, enabling efficient read/write operations on RFID tags for real-time object identification and tracking. The process begins when the user inputs the desired tag ID via the HMI and presses the start button. A pneumatic auto-feeder then dispenses a random object embedded with an RFID tag. The RFID reader scans the tag ID of the object, and based on the scanned data, the COBOT picks up the object and places it into the predefined target cell corresponding to the tag ID.

Table 3 - Conveyor With RFID Based Sorting	
	Conveyor with DC Geared Motor and Pneumatically actuated Auto Feeder
	Minimum travel length: 500mm
	Minimum width: 70mm
	I/O Link based RFID Reader and Writer
	RFID Tags (8 Qty)
	Workpieces with mounting arrangement for RFID Tags (Qty: 08)
	Pallet for workpieces

Table 4: Load And Colour Based Sorting Table

Table 4 is equipped with an advanced dual-mode sorting system that combines weight-based and colour-based sorting using high-precision sensors. Components are automatically loaded onto a conveyor via an auto feeder. The COBOT picks each component and first places it onto a load cell for weight measurement. which calculates the actual weight and displays it on the HMI. Based on the measured weight—such as steel, brass, or aluminium—the COBOT sorts the component into the appropriate cell.

For colour-based sorting, the COBOT places the component onto a colour sensing module equipped with an IO-Link-enabled colour sensor. The sensor detects the object's colour—such as red, white, or blue—and confirms the result through a smart light indicator. The COBOT then transfers the component to the corresponding cell on the colour palletizing table.

Table 4 - Load Based Sorting And Colour Based Sorting	I/O Link based Colour sensor
	Load Cell with Analog output and digital set point
	Workpieces in 3 different colours for colour based sorting (Qty: 06)
	Workpieces in three different weights for load based sorting (Qty: 06)
	Pallet for workpieces

Technical Specifications:

Structure	Structure made in Aluminium Extrusions
	Outer Dimensions of 1700 x 1300 x 800 (Ht)
	4 Castor Wheels with Brakes and anti vibration mounts
	Horizontal worksurface made in Aluminium extrusions
	Cobot Controller arrangement with electrical control panel for Cobot Operations. Transparent door with door latching switch for Cobot Controller
Cobot	KUKA / FANUC / Mitsubishi COBOT with Teach Pendant
	Minimum Payload: 5 KG
	Minimum Reach: 900mm
	Electrical Gripper for COBOT (Schunk)
Digital Twin Integration	Provision of complete setup in STP format for offline programming
	Complete integration with Siemens Tecnomatix and Visual Components for Offline Cobot Programming

Technical Specifications:

Central Control Unit	Separate Structure made in Aluminium Extrusions with top surface of 720mm x 100mm. Top surface made partially in Aluminium extrusions and partially in MDF
	4 Castor Wheels with Brakes and anti-vibration mounts
	Complete Electrical panel with PLC
	Transparent doors on front side with door latching switch
	Aluminium extrusion based mounting arrangement for LED TV, LED Monitor and HMI
	Siemens S7 1200 / Mitsubishi FX 5 PLC
	Siemens MTP 700 HMI / Mitsubishi GT 2110 HMI
	Siemens TIA License (Latest Version - Perpetual)
	IIOT - Siemens Industrial Edge (Optional)
	I/O Link Master with minimum 8 Ports
	I/O Link based Smart Light
	HMI Mounting unit with push buttons for Cycle Start, Cycle Reset, Emergency Stop
	Workstation (Intel i5) with 21-inch monitor preconfigured with the system / High Performance Laptop preconfigured with the system
	Wireless Keyboard and Mouse
Conveyor With Auto Feeder	Conveyor with DC Geared Motor and Pneumatically actuated Auto Feeder Minimum travel length: 500mm Minimum width: 70mm
	Inductive proximity Sensor for detection of metallic components
	Capacitive proximity sensor for detection of nonmetallic components

Total For Robot Training Cell

Digital Twin Software - Option 1	Siemens Technomatix 1 Seat - 1 year subscription Based License (License will deactivate after 1 year)
Digital Twin Software - Option 2	Visual Components 15 Seats - Perpetual License with 1 year AMC (License will be active permanently but updates will be available only for 1 year)

Hytech Cobot Training Cells: Central Control With PLC – HMI And IIOT

1. Centralized Control with PLC and HMI Integration

- The Cobot training cells feature a separate Central Control Unit comprising a PLC (Programmable Logic Controller) and HMI (Human-Machine Interface).
- Cobots are seamlessly integrated with the PLC and HMI, enabling trainees to operate complete robotic cycles within an industrial automation context.
- This setup provides comprehensive exposure to industrial robotic architecture and hands-on experience with state-of-the-art robotics.

2. Customization and Experimentation

- Users can design and implement various PLC programs and develop custom HMI screens for controlling robot operations.
- Trainees can experiment with diverse industrial automation components, such as:
  - RFID Reader/Writer: For tracking and automation applications.
  - Color Sensors: For detecting and responding to color variations in automated workflows.
- These components are integrated with the robot via the PLC-HMI framework, providing real-world automation scenarios.

3. Industrial IoT (IIoT) Integration

- Siemens Industrial Edge technology is incorporated to offer advanced IIoT capabilities.
- Trainees gain essential skills in data collection, analysis, and remote monitoring—key aspects of modern industrial environments.

4. Comprehensive Licensing

- All required software licenses for PLC, HMI, and Industrial Edge are pre-installed and fully operational.
- The workstation included with the setup ensures a seamless and efficient training experience.

Importance Of PLC – HMI Integration With Robot:

1. Seamless System Control

PLCs manage inputs/outputs, while HMIs provide a user-friendly interface, ensuring smooth communication and integration with equipment like conveyors and sensors.

2. Enhanced Monitoring & Diagnostics

HMIs display real-time PLC data, helping operators monitor performance, identify faults, and take quick corrective actions.

3. Flexibility & Programming

PLC-HMI integration simplifies Cobot programming and allows quick parameter adjustments through HMI touchscreens.

4. Industrial Relevance

Used widely in automation, PLC-HMI-robot setups prepare trainees for real-world applications like pick-and-place, welding, and packaging.

5. Centralized Control

One HMI can manage multiple PLCs and Cobots, enabling centralized control of complex systems like inspection or tracking.

6. User-Friendly Interaction

HMIs simplify system use for beginners with GUI-based control, reducing the learning curve.

7. IIoT & Industry 4.0 Integration

Supports real-time analytics, remote monitoring, and prepares trainees for modern tech like predictive maintenance.

8. Safety & Reliability

Safety features like alarms and interlocks are managed through HMI for efficient emergency handling and operator protection.

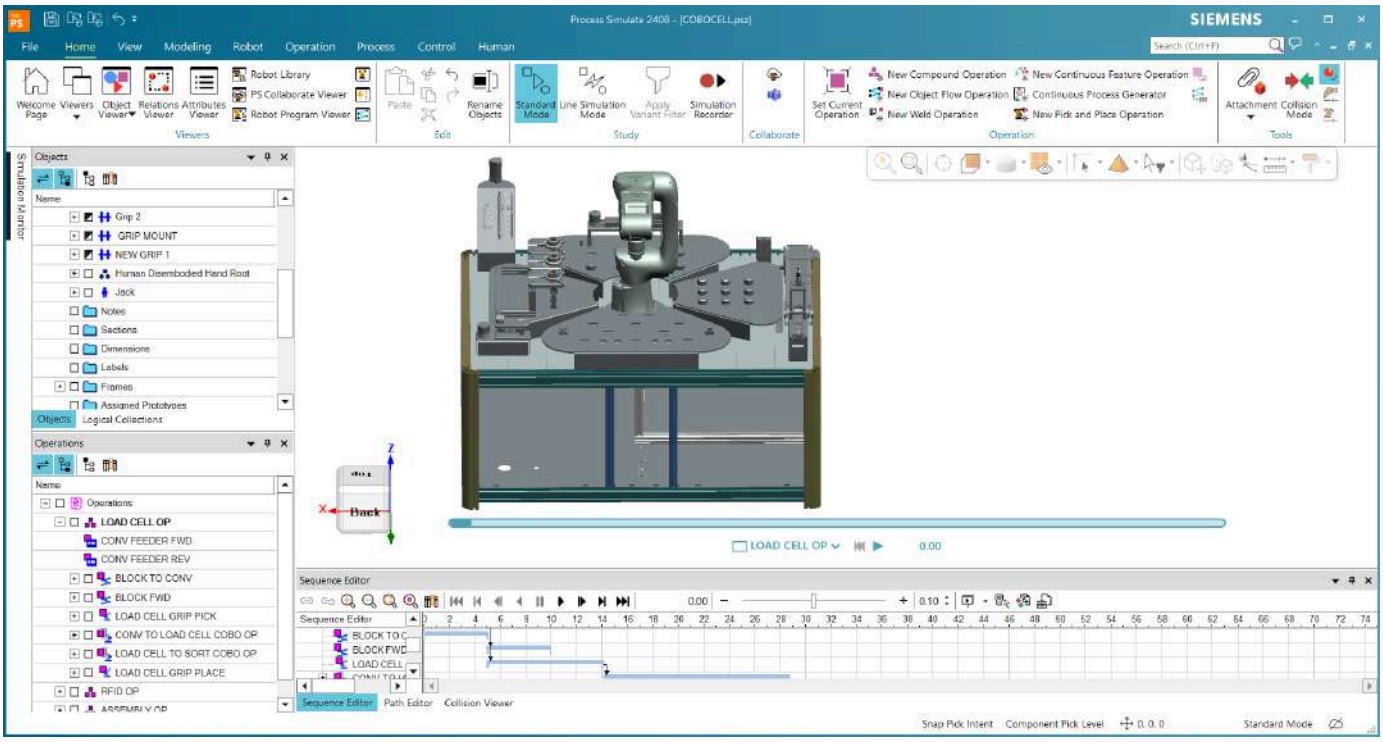
9. Simplified Maintenance

Visual cues from HMIs help schedule preventive maintenance and reduce downtime.

10. Better Problem-Solving

The integration builds diagnostic and troubleshooting skills using live system feedback and logic-based analysis.

Digital Twin Integration In Hytech Cobot Training Cells



Digital Twin technology is a critical innovation in modern robotics training systems, offering a virtual replica of real-world systems to enhance learning and operational efficiency. Hytech robotic training cells leverage this technology to provide a comprehensive, state-of-the-art training experience.

Importance Of Digital Twin Technology

- **Enhanced Learning Experience:**

Digital Twin technology allows trainees to visualize and interact with robotic systems in a virtual environment, bridging the gap between theoretical knowledge and practical application.

- **Risk-Free Experimentation:**

Trainees can design, simulate, and test robotic programs in the digital twin environment without risking damage to physical equipment.

- **Improved Operational Efficiency:**

By simulating and optimizing operations virtually, users can streamline workflows and reduce setup time on actual equipment.

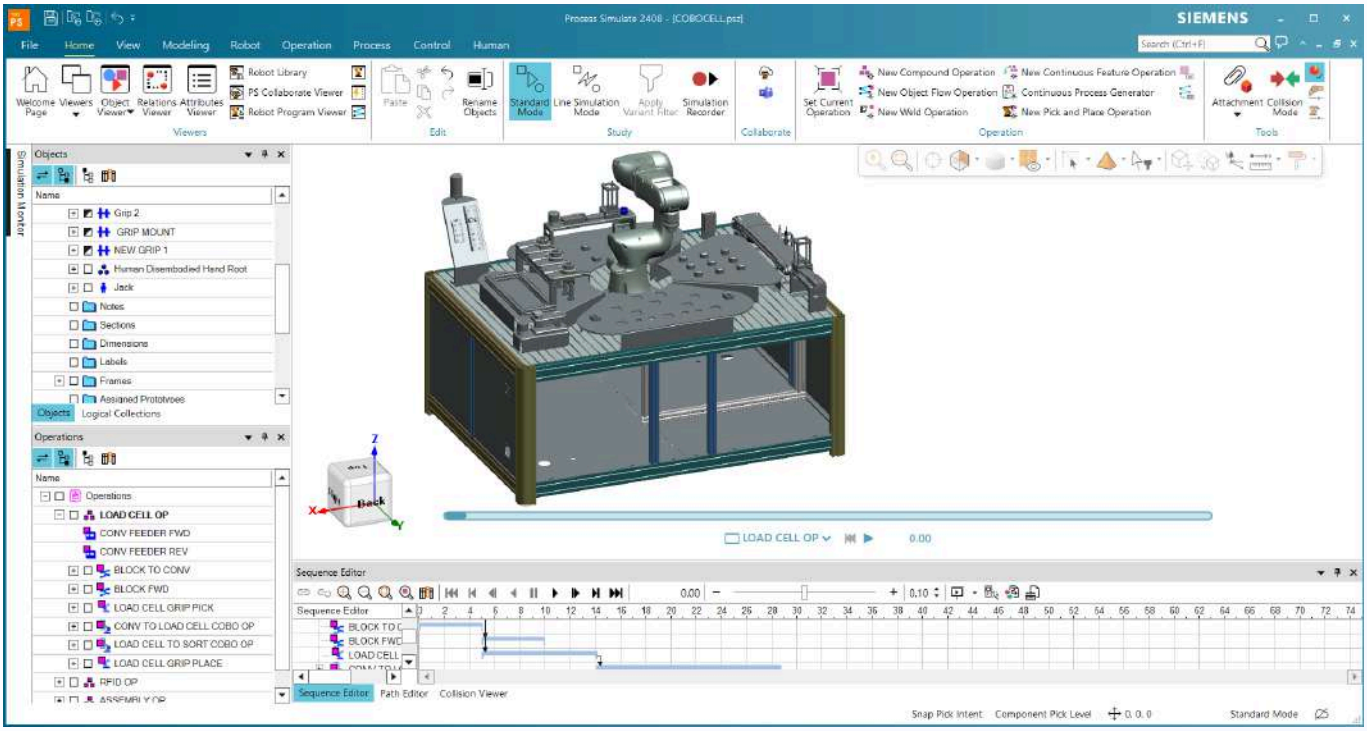
- **Real-Time Performance Analysis:**

Digital Twin enables real-time data analysis, helping trainees understand system performance and make informed decisions.

- **Alignment With Industry 4.0:**

The integration of digital twin technology aligns training methodologies with the latest industrial standards and practices.

Digital Twin Integration In Hytech Cobot Training Cells



Key Features In Hytech Training Cells

1. Seamless Integration With Digital Twin Software

- The training setup is fully compatible with advanced platforms such as Visual Components and Siemens Tecnomatix, offering cutting-edge simulation capabilities.

2. 3D Setup And Comprehensive Resources

- A complete 3D model setup is provided, ensuring trainees have all the tools to replicate real-world environments virtually.
- Software includes tools for creating programs tailored to the specific make and model of the robot.

3. Simulation And Post-Processor Capabilities

- Trainees can simulate their programs in the digital twin software to validate functionality.
- A dedicated post-processor ensures smooth translation of simulated operations into executable programs for the robot.

4. Dynamic Communication And Real-Time Execution

- The system supports real-time, dynamic communication between the digital twin software and the physical robot.
- Programs developed virtually can be directly executed on the robot, allowing seamless transitions from virtual to physical environments.

This integration of Digital Twin technology in Hytech robotic training cells not only equips trainees with robust skills in robotics but also prepares them to excel in Industry 4.0-driven workplaces.

Key Features of the Hytech Cobot Training Cell

Seamless Integration

- Integrated with **PLC, HMI,** and **IIoT** for a comprehensive industrial automation experience.
- Equipped with an **I/O link-based master**, enabling easy future expansions and modular upgrades.

Industrial-Grade Components

- Experiment tables include:
  - I/O link-based color sensors for sorting and process control applications.
  - Analog output load cells for weight-based automation tasks.
  - I/O link-based RFID readers and writers for inventory and asset tracking.
- Encourages trainees to work on diverse industrial applications using cutting-edge technologies.

Dynamic Digital Twin Software

- Fully integrated with digital twin software, offering:
  - Real-time simulation of robotic operations.
  - A platform for trainees to experiment virtually, reducing hardware dependency.
  - Engagement of multiple students simultaneously, enhancing collaborative learning.

Offline Programming Tool

- Allows trainees to program and validate robot operations in a virtual environment before implementation.
- Facilitates error detection and operational optimization without disrupting physical systems.

Robust and Flexible Hardware

- Constructed using aluminum extrusions, ensuring durability and ease of assembly.
- Worksurface made from aluminum extrusions for a clean and industrial-grade finish.
- Polycarbonate-based enclosure:
  - Provides full visibility from all sides for enhanced safety and supervision.
  - Protects trainees from moving parts and the system from external contamination
- Equipped with castor wheels with brakes, ensuring mobility and stability for flexible training setups.

Centralized Control System

- A dedicated central control unit with:
  - PLC and HMI in a separate control panel, making it easier to manage and operate the system.
  - User-friendly interfaces for programming and monitoring robotic operations.

Pre-Installed Workstation

- Comes with a pre-installed workstation, loaded with the necessary software for:
  - Digital twin simulations.
  - Offline programming.
  - Control and monitoring of robotic experiments.

Advanced Cobot Training with Hytech Learning Management System

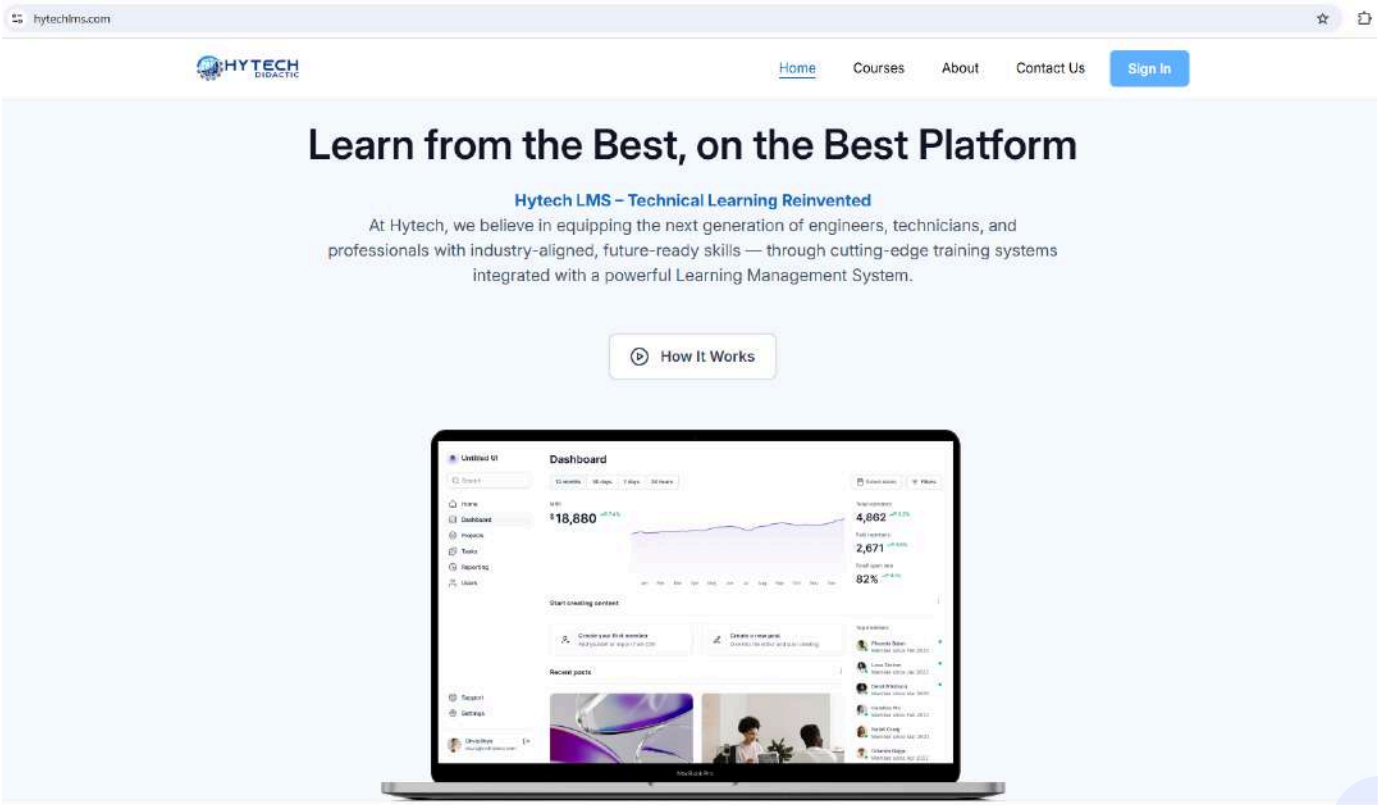
Collaborative robot (cobot) technology is transforming modern industrial automation by enabling safe, efficient human-robot interaction. Effective training of trainers is essential to ensure that they can confidently deliver hands-on, application-based instruction. Hytech Cobot training cells are integrated with a powerful Learning Management System (LMS) to support this objective.

Key Features Of The Hytech LMS:

- **Step-By-Step Guidance:** Trainers receive detailed, structured modules covering cobot programming, safety, and integration with automation systems.
- **Latest Curriculum Updates:** LMS content is regularly revised to reflect evolving trends and capabilities in collaborative robotics.
- **Customizable Learning Paths:** Trainers can tailor training sessions, develop assessments, and award certifications, making the LMS adaptable to various learning levels.
- **Trainer Support And Continuity:** The LMS helps institutions manage trainer transitions by ensuring knowledge retention, standardized content delivery, and continuous upskilling.

Hytech's Learning Management System (LMS) provides comprehensive courses focused on both theoretical understanding and practical skills in Cobot training cell. These courses are carefully designed to strengthen foundational knowledge while enhancing hands-on capabilities for both trainers and students.

Contact us today for a free demonstration of the Hytech LMS and discover how it can revolutionize robotics training at your institution.



COBOT Training Courses in the LMS:

Day 1	Module 1: Introduction to COBOT	8 Hours
	Module 2: Basic Wiring & Connectivity of COBOT Cell	
Day 2	Module 3: COBOT Operations	8 Hours
	Module 4: COBOT Gripper Operations	
Day 3	Module 5: COBOT Operations From Software (RT Toolbox3)	8 Hours
Day 4	Module 6: Offline Programming in RT Toolbox	4 Hours
	Module 7: COBOT Operation From Touchscreen Tab (RT VisualBox)	4 Hours
Day 5	Module 8: Digital Twin Operations	8 Hours
Day 6	Module 9: Basics of Siemens S7-1200 PLC – Part 1 (HW/SW Setup, I/O, GSDML, Communication)	8 Hours
Day 7	Module 9: Basics of Siemens S7-1200 PLC – Part 2 (Programming with Gates, Timers, Counters)	8 Hours
Day 8	Module 10: Collaborative Operation Exercise (Assembly from HMI & Pendant)	4 Hours
	Module 11: Cobot Palletising with Conveyor	4 Hours
Day 9	Module 12: RFID sorting Operation	4 Hours
	Module 13: COBOT & PLC Integrated Operations	4 Hours
Day 10	Module 14: Introduction & Basics of IIOT	4 Hours
	Module 15: IIOT-Based COBOT Operations	4 Hours
Day 11	Module 16: COBOT Writing Exercises (Shapes, Name, Pendant Operation)	8 Hours
Day 12	Module 17: SCADA Design & Integration (PLC–HMI, COBOT, Tag Mapping)	8 Hours
Day 13	Module 18: SCADA and Robotics Integration (Program Calling, Full Operation via SCADA)	8 Hours
Day 14	Module 19: SCADA Runtime Design – Part 1 (Stations 1–3)	8 Hours
Day 15	Module 19: SCADA Runtime Design – Part 2	8 Hours

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