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ROBOTICS

Scara Robot

SCARA Training Cell with PLC, HMI and IIOT

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SCARA Robot: A Key Solution in Industrial Robotics Training

The SCARA robot is one of the most widely used robots in industry due to its versatility, precision, and efficiency. For training applications, it offers an economical and practical solution for teaching industrial robotics.

Features of the Hytech SCARA Training Cell:

1. Integration with Industrial Systems

- The SCARA robot is seamlessly integrated with PLC, HMI, and IIoT, offering students hands-on experience with industry-standard practices.
- This integration bridges the gap between education and industry, preparing students for real-world automation challenges.

2. Flexibility in Training

- Trainees can design and implement their own PLC and HMI configurations to suit various experiment requirements.
- The training cell fosters creativity and problem-solving skills by allowing complete customization.

3. Introduction to IIoT

- Students can collect data from PLCs and HMIs and integrate it with IIoT systems.
- This enables the creation of custom dashboards and insights, providing exposure to smart factory concepts and data-driven decision-making.

4. Expandable Connectivity

- I/O-Link Connectivity allows for future system expansion, accommodating additional sensors, actuators, or devices as needed.
- This feature ensures the training cell remains relevant as technologies evolve.

Benefits for Trainees

- **Practical Industry Skills:** Provides a comprehensive understanding of robotic integration with automation systems.

- **Innovation And Creativity:** Encourages students to experiment with custom configurations and IIoT applications.

- **Career-Readiness:** Equips trainees with the knowledge and skills to excel in robotics and automation roles.

The Hytech SCARA Training Cell serves as an ideal entry point into robotics training, offering a robust foundation in PLC, HMI, and IIoT integration. It prepares students to meet the demands of Industry 4.0 and beyond.

Core Components That Drive Performance

1. SCARA Robot:

The training kit includes an industrial SCARA Robot 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 SCARA robots, providing students with a realistic industrial experience. The smart light can be programmed independently and then seamlessly synchronized with the robot 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. Workstation:

The training kit includes a workstation equipped with a TV screen and an LED monitor, pre-installed with all necessary software. Users can display the SCARA robot's digital twin on the TV screen while simultaneously accessing the programming window on the monitor, enabling an efficient and immersive learning experience.

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 SCARA 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 SCARA robot 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.

Process 1: Weight-Based Sorting

WEIGHT PALLETIZING TABLE

Upon selecting the weight based sorting application on the HMI the process begins with Components are placed onto the conveyor using an auto feeder. The SCARA robot picks each component and places it onto a load cell, which measures the actual weight and transmits the data to the PLC. The measured weight is displayed on the HMI for real-time monitoring. Based on the weight—such as steel, brass, or aluminium—the SCARA robot sorts the component into the corresponding cell. Each sorting cell is equipped with a photo sensor to detect whether it is empty or occupied, ensuring accurate placement and continuous monitoring of the sorting status.

Pallet 1 – Weight Based Sorting	Analog output based load cell with amplifier for weight detection
	Pallet with photosensors mounted at the bottom for job detection (6 Qty)
	Workpieces in three different weights for load based sorting (Qty: 06)

Process 2: Colour-Based Sorting

COLOUR PALLETIZING TABLE

Upon selecting the colour sorting application on the HMI, the process begins with components being automatically loaded onto the conveyor via an auto feeder. As each component passes through the inspection area, a colour sensor detects its colour—such as red, green, or blue— and the detected colour is visually indicated via a smart lamp. The SCARA robot then picks the component and places it into the corresponding colour-specific cell. Similar to the weight-based sorting process, each cell is equipped with a photo sensor to monitor its status, detecting whether it is empty or occupied to ensure accurate and efficient stacking.

Pallet 2 – Colour Based Sorting	I/O Link based Colour sensor
	Pallet with photosensors mounted at the bottom for job detection (6 Qty)
	Workpieces in 3 different colours for colour based sorting (Qty: 06)

Technical Specifications:

Structure	Structure made in Aluminium Extrusions
	Outer Dimensions of 1800 x 720 x 800 (Ht). 1000mm width is made up of Aluminium extrusions and remaining width is made up of MDF.
	4 Castor Wheels with Brakes and anti vibration mounts
	Complete transparent enclosure with 4 doors and door latching switches
	Horizontal worksurface made in Aluminium extrusions
	SCARA Pedestal made in Mild Steel with mounting arrangements
SCARA Robot	KUKA / FANUC / Mitsubishi ROBOT with Teach Pendant
	Minimum Payload: 3 KG
	Minimum Reach: 400mm
	Vacuum Gripper with Vacuum Generator
Digital Twin Integration	Provision of complete setup in STP format for offline programming
	Complete integration with Siemens Tecnomatix and Visual Components for Offline Robot Programming

Technical Specifications:

PLC And HMI Controller	Integrated structure with SCARA Robot cell. Controller has a MDF base mounted on the top of it.
	Complete Electrical panel with PLC
	Transparent doors on front side with door latching switch
	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
	TV Screen with minimum size of 40 inches to display the digital twin
	LED Monitor with minimum 20 inches screen size to display PLC and Robot programming screen
	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)

Industry 4.0 / IIOT With Siemens Industrial Edge

Industrial IIOT / Industry 4.0	Siemens Industrial Edge with Node Red based programming and pre installed dashboards for data access and monitoring

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

1. Centralized Control with PLC and HMI Integration

- The robotic training cells feature a separate Central Control Unit comprising a PLC (Programmable Logic Controller) and HMI (Human-Machine Interface).
- Robots 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.
- The 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 Scara:

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 robot 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 robots, 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.
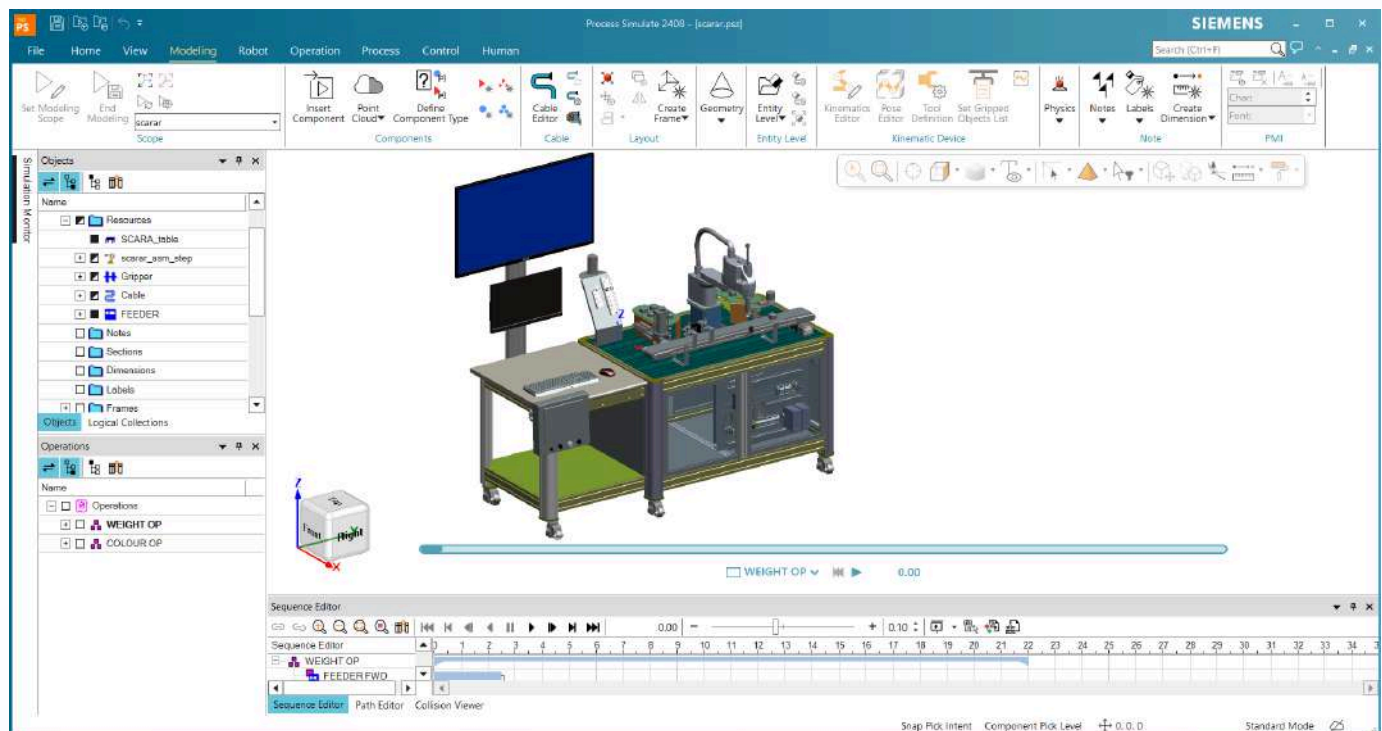
9. Simplified Maintenance

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 Scara 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.
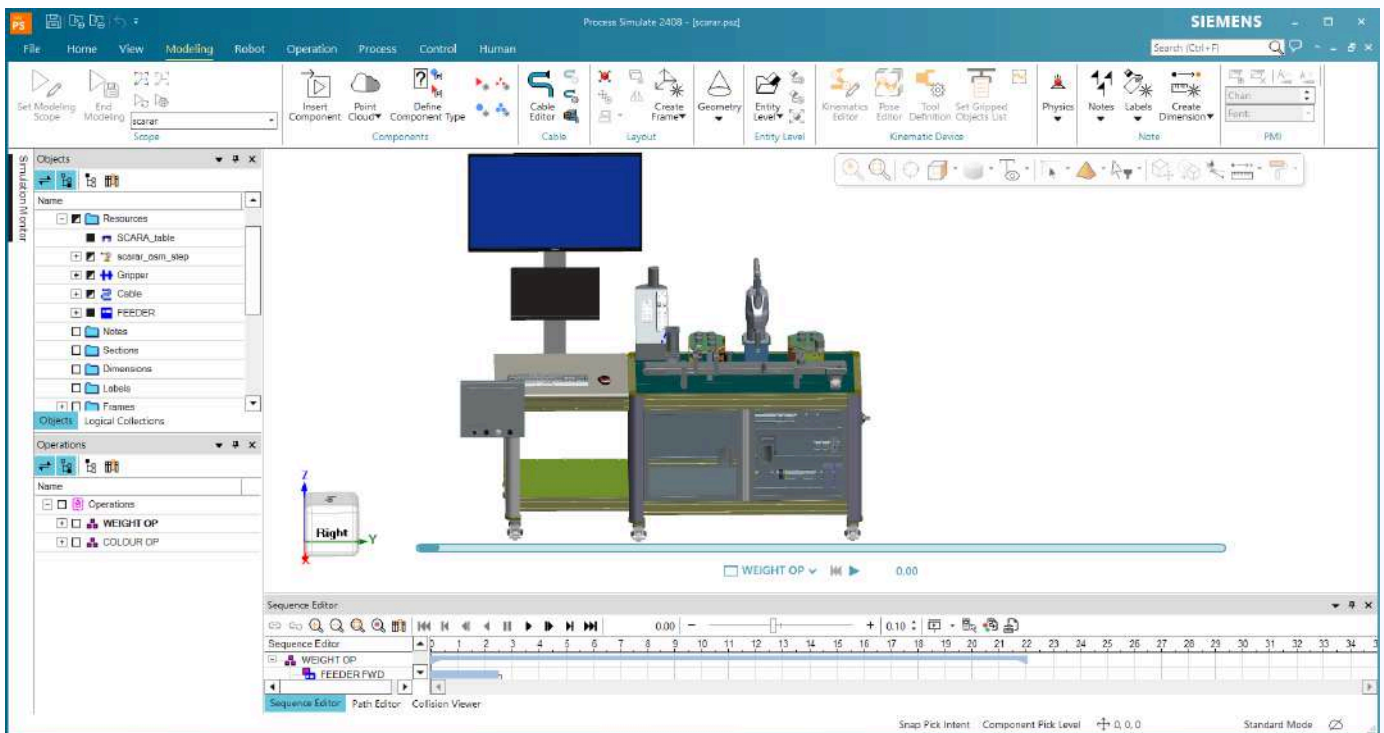
- **Real-Time Performance Analysis:**

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 Scara 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.

Key Features of the Hytech Scara Training Cell

The fully integrated training cell is designed to provide a comprehensive industrial robotics training experience by seamlessly combining PLC, HMI, and SCARA robot integration. Trainees gain hands-on exposure to SCARA robot operations, programming, and control, replicating real-world industrial practices. The integration with PLC and SCADA ensures that students develop a strong understanding of automation workflows, enabling them to perform tasks like process control, data acquisition, and system monitoring.

Industrial-Grade SCARA Robot

- The SCARA robot is integrated with PLC and HMI, enabling trainees to simulate industrial operations such as pick-and-place, sorting, and assembly.
- Offline programming and digital twin capabilities allow students to optimize operations in a virtual environment before implementing them on the physical robot.

Customizable PLC and HMI Programming

- Trainees have the flexibility to modify and create PLC programs and HMI screens according to experimental or application-specific requirements.
- This fosters creativity and problem-solving skills while providing practical knowledge of system design.

IIoT Hardware Integration

- Equipped with IIoT hardware, the training cell allows trainees to design custom dashboards for real-time data access and monitoring.
- Students gain hands-on experience with the latest IIoT technologies, understanding how to connect physical devices to digital systems.

I/O-Link Infrastructure

- The system includes an I/O-Link infrastructure, offering the flexibility to integrate advanced sensors and devices for future expansion.
- This ensures the training kit remains scalable and adaptable to evolving industrial technologies.

Pre-Installed Licenses

- All required software licenses are pre-installed, ensuring a seamless training experience without additional setup.
- This includes software for PLC programming, HMI design, and SCADA integration.

Benefits For Trainees:

- **Realistic Industrial Exposure:** The training kit mirrors industrial automation setups, preparing students for careers in advanced manufacturing and robotics.
- **Practical Learning:** With the ability to customize programs, design dashboards, and integrate additional components, trainees gain comprehensive, hands-on experience.
- **Scalable Training Solution:** The modular design and I/O-Link infrastructure ensure long-term usability and adaptability.

This training cell is a future-ready solution, bridging the gap between academic learning and industrial practices, and equipping trainees with the skills needed to excel in Industry 4.0 environments.

SCARA Training Cells
(Learning Management System)

Robotics technology is an advanced and continuously evolving field. Training of trainers plays a pivotal role in equipping them to impart effective training to students. Hytech SCARA training cells come equipped with a comprehensive Learning Management System (LMS) designed to enhance the learning experience.
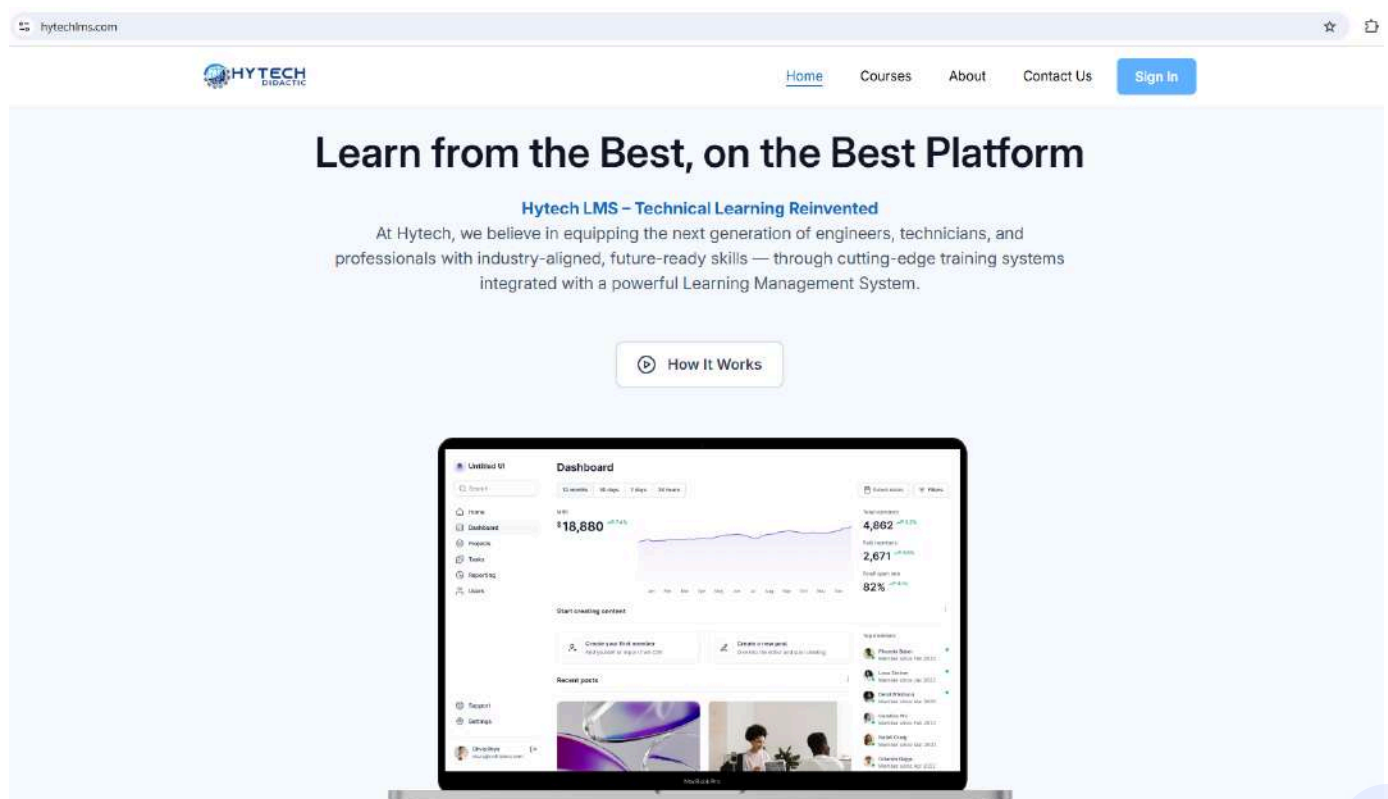
Key Features Of The Hytech LMS:

- **Step-By-Step Guidance:** Trainers receive a structured, step-by-step guide to understand various robotic technologies.

- **Up-To-Date Training Content:** Courses within the LMS are continually upgraded to align with the latest advancements in robotics technology.

- **Customizable Content:** Trainers can create their own training modules, conduct examinations, and issue certifications directly through the LMS.

- **Support For Management:** The LMS is an invaluable tool for addressing trainer attrition and ensuring consistent training and handholding for trainers.

SCARA Training Cell Courses In The LMS:

The Hytech LMS offers courses that focus on both theoretical knowledge and practical applications in SCARA Cell. These courses are designed to build a strong foundation and enhance hands-on skills for trainers and students alike

Contact us today for a free demonstration of the Hytech LMS and explore how it can transform robotics training at your institution.
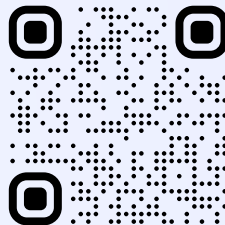
SCARA Robot Training Courses in the LMS:

Day	Course	Duration
Day 1	Electrical & Control System Fundamentals	8 Hours
	Electrical Wiring, Power Sources, SCARA Wiring, Components	
Day 2	PLC Basics & Hardware Setup	8 Hours
	Intro to PLCs, Ladder Logic, PLC Selection, S7-1200, TIA Portal	
Day 3	PLC Programming & Simulation	8 Hours
	I/O Configuration, Advanced Instructions, PLCSIM	
Day 4	Human-Machine Interfaces (HMI)	8 Hours
	HMI Intro, Project Creation, Screen Design, Inputs/Outputs	
Day 5	PLC & HMI Integration – Part 1	8 Hours
	Communication, Tag Mapping, Integrated Program	
Day 6	PLC & HMI Integration – Part 2	8 Hours
	Debugging, Testing, Finalizing Integrated Project	
Day 7	SCARA Robot Systems – Basics	8 Hours
	SCARA Overview, Teach Pendant, Coordinate Systems	
Day 8	SCARA Programming with RT ToolBox3	8 Hours
	Offline Programming, Simulation, Hands-on	
Day 9	Industrial Communication & IO-Link	8 Hours
	Protocols, IO-Link, IODD/GSDML, Integration with PLC & HMI	
Day 10	Sensors & Actuators – Part 1	8 Hours
	Sensor Types, Digital/Analog Integration, Pneumatics	
Day 11	Sensors & Actuators – Part 2	8 Hours
	Reed Switch, Sensor Feedback, Mini Project	
Day 12	Full System Integration	8 Hours
	PLC-HMI-Robot Sync, I/O Mapping, Process Execution	
Day 13	Advanced Applications: Sorting Systems	8 Hours
	Color Sensor, Load Cell, Sorting with Robot	
Day 14	Backup, Maintenance & Troubleshooting – Part 1	8 Hours
	Backup/Restore, General Maintenance, PLC Troubleshooting	
Day 15	Backup, Maintenance & Troubleshooting – Part 2 + Review	8 Hours
	HMI, Robot, Sensor Troubleshooting, Course Recap	

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