

# Industry 4.0 Fundamentals

---

FOUR-COURSE-ROTATION AND HANDS-ON EQUIPMENT

A solid orange horizontal bar at the bottom of the slide.

# Course Syllabus

---

---

**Overall Concept:** The course consists of these elements:

- Group Blocks, total 10 hours
- Pod Rotations, 8 groups, 6 hours each, total 48 hours
- Mini Projects, total approximately 3-6 hours
- Field Trips, total approximately 4-6 hours

The approximate time to complete the activities in this course is 65 hours.

Topic	Lesson Title	Lesson Hours	Hands-on Hours
Introduction to Industry 4.0	1. Introduction to Advanced Manufacturing	1	0
	2. Technology and Advanced Manufacturing	1	0
	3. Industrial Internet of Things	1	0
Safety	4. Safety Responsibilities	1	0
	5. Machine Safety	1	0
	6. Practicing Safety in the Workplace	1	0
	12. Types of PPE	1	0
Print Reading	18. Introduction to Print Reading	1	0
	19. Multiview Drawings	1	0
Mechanical Drives	25. Mechanical Power	1	0

<b>Introduction to Mechatronics Systems</b>	
<b>Topics</b>	<b>Lesson Titles</b>
Introduction to Industry 4.0	1. Introduction to Advanced Manufacturing
	2. Technology and Advanced Manufacturing
	3. industrial Internet of things
Safety	4. Safety Responsibilities
	5. Machine Safety
	6. Practicing Safety in the Workplace
	7. Emergency and Accident Response
	8. Hazard Materials Standards
	9. Hazardous Material Handling and Storage
	10. Fire and Electrical Safety
	11. Work Area Safety
	12. Types of PPE
	13. Equipment Safety
	14. Material Handling Safety
Hand Tools	15. Hand Tools 1
Measurement	16. Dimensional Measurement
	17. Measurement Conversion
Print Reading	18. Introduction to Print Reading
	19. Multiview Drawings
	20. Blueprint Dimensions and Notes
	21. Tolerancing
Precision Measurement	22. Manufacturing Drawings and Scales
	23. Caliper Measurement
Mechanical Drives	24. Micrometer Measurement
	25. Mechanical Power
Fluid Power	26. Introduction to Fluid Power
	27. Pneumatic Power
	28. Basic Cylinder Circuits
AC/DC Electricity	29. Basic Electrical Circuits
	30. Electrical Current and Voltage Measurements
	31. Electrical Resistance Measurements
	32. Power in Electrical Circuits
Electrical Relay Control	33. Control Logic Circuits
	34. Electrical Control Diagrams
	35. Relay Control Circuits
Robotics Programming	36. Basic Robot Operation
	37. Basic Robot Programming
Electronic Sensors	38. Introduction to Electrical Sensors

Pod Rotation Groups	Topic	Lesson Title	Lesson Hours	Hands-on Hours	Equipment
A	Hand Tools Measurement	15. Hand Tools 1	1	1	95-MSB2AB
	Safety	13. Equipment Safety	1	1	
		14. Material Handling Safety	1	0.5	
B	Precision Measurement	23. Caliper Measurement	1	0.5	990-MES1
		24. Micrometer Measurement	1	0.5	
	Print Reading	20. Blueprint Dimensions and Notes	1	0	
		21. Tolerancing	1	0	
		22. Manufacturing Drawings and Scales	1	0	
C/D	AC/DC Electricity	29. Basic Electrical Circuits	1	1	990-ACDC1
		30. Electrical Current and Voltage Measurements	1	1	
		31. Electrical Resistance Measurements	1	1	
		32. Power in Electrical Circuits	1	1	
	Safety	10. Fire and Electrical Safety	2	0	
	Electronic Sensors	38. Introduction to Electrical Sensors	1	1	990-SN1
E	Fluid Power	26. Introduction to Fluid Power	1	1	990-PN1
		27. Pneumatic Power	1	1	
		28. Basic Cylinder Circuits	1	1	
F	Electrical Relay Control	33. Control Logic Circuits	1	1	990-EC1
		34. Electrical Control Diagrams	1	1	
		35. Relay Control Circuits	1	1	

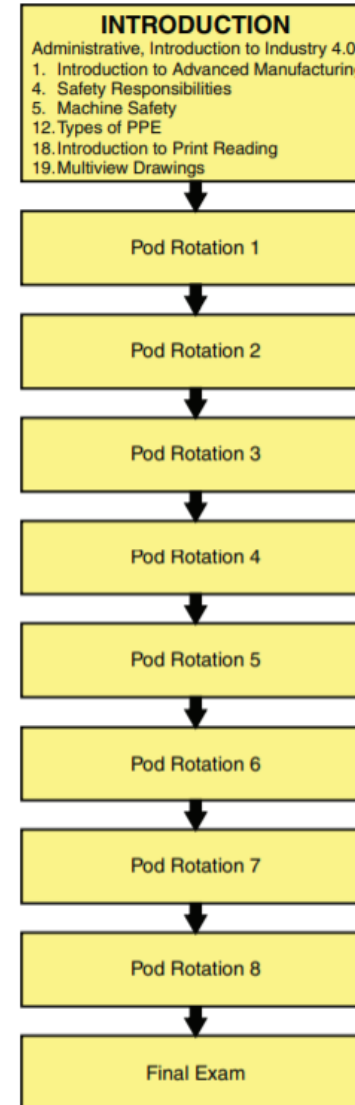
## Industry 4.0

with 6 Hour Group Rotations

## INTRODUCTION TO MECHATRONICS

G	Robotics Programming	36. Basic Robot Operation	1	1	14551-HS
		37. Basic Robot Programming	1	1	
	Safety	11. Work Area Safety	1	0	
		7. Emergency and Accident Response	1	0	
H	Measurement	16. Dimensional Measurement	1	1	990-MES1
		17. Measurement Conversion	1	1	
	Safety	8. Hazard Materials Standards	1	0	
		9. Hazardous Material Handling and Storage	1	0	

(Continued from previous page)



**NOTE:** Group Block Lessons and Mini Projects can be used between Rotations

### Mini Projects

Skill Boss: Safety, Production, Quality, and Maintenance  
Skill Boss: Safety  
Skill Boss: Quality  
Skill Boss: Production Processes  
Skill Boss: Maintenance Awareness  
Robot Programming  
Industry Internet of Things

### Group Block Lessons

2. Technology & Advanced Manufacturing  
3. Industrial Internet of Things  
6. Practicing Safety  
25. Mechanical Power

### Field Trips

Area Manufacturing Companies

Give the student point scores for each skill on the following basis:

- 4..... **Mastered Skill** - with no assistance on first try
- 3..... **Mastered Skill** - with no assistance on second or more tries
- 2..... **Can Perform Skill** - with no assistance, given enough time
- 1..... **Can Perform Skill** - with assistance
- 0..... **Cannot Perform Skill**

The screenshot shows a window titled "Skill Assessment Wizard" with the AMATROL logo in the top right corner. The content area displays the following information:

- Content Title:** Basic Electrical Circuits
- Basic Electrical Circuits**
- Skills For:** Rob Tarr
- Grade:** 2.9 (7/7)
- Recorded on:** 07/12/18

Two assessment items are listed:

- #1. Use a Circuit Tester to Check a Wall Outlet for Electricity**  
Radio buttons for scores: No Score, 0, 1, 2, 3, 4. The score "4" is selected and highlighted in blue.
- #2. Connect and Operate a Power Supply**  
Radio buttons for scores: No Score, 0, 1, 2, 3, 4. The score "2" is selected and highlighted in blue.

**Evaluation Rubric:**

- 4.....Mastered Skill - Completed skill with no assistance in a timely manner.
- 3.....Not Mastered, Can Perform Skill Given Time - Completed skill with no assistance, but excessive time was required or more than one attempt.
- 2.....Not Mastered, Can Perform Skill with Assistance - Completed skill with some assistance.
- 1.....Not Mastered, Can Only Perform Minimal Portions of the Skill
- 0.....Not Mastered, Cannot Perform Skill

At the bottom of the window are three buttons: "Back", "Finish", and "Cancel".

Figure 12. Skill Assessment within the LMS

# Course 1: Intro to Mechatronics

95-MSB2AB

Skill Boss Allen-Bradley



33934

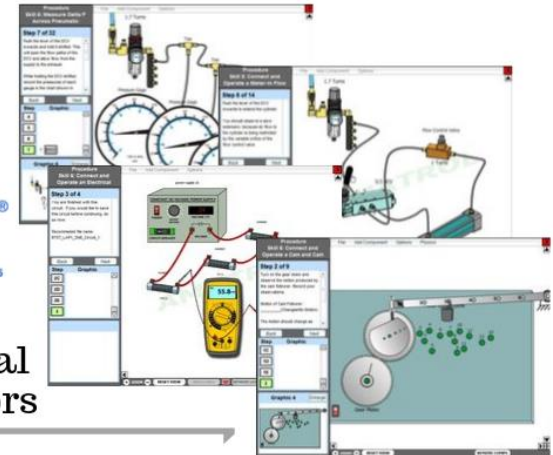
Hand Tool Kit Package-Skill Boss





eLearning



Virtual  
Simulators



PART NUMBER	DESCRIPTION OR PHOTO
990-ACDC1	<p data-bbox="927 119 1569 154">Portable AC/DC Electrical Learning System</p>  <p>The image shows a blue portable AC/DC electrical learning system. The front panel is labeled "990-ACDC1 AC/DC ELECTRICAL SYSTEMS" and features the AMATROL logo. It includes a central analog meter, several switches, a digital display, and various electrical components like resistors and capacitors. The system is housed in a black carrying case.</p>
990-EC1	<p data-bbox="927 676 1712 711">Portable Electrical Control Systems Learning System</p>  <p>The image shows a blue portable electrical control systems learning system. The front panel is labeled "990-EC1 ELECTRIC RELAY CONTROL SYSTEM" and features the AMATROL logo. It includes a complex wiring diagram with numerous terminals, switches, and relays. The system is housed in a black carrying case.</p>



990-PN1

Portable Pneumatics Learning System



990-MES1

Portable Measurement Tools Learning System



990-SN1

Portable Electronic Sensor Learning System



87-TVCAB

Tabletop Smart Factory Visual Communications Learning System - Allen-Bradley

Functional software used as standalone software used for web-based data acquisition, production monitoring, and maintenance management.



87-TENAB82

Tabletop Mechatronics Smart Factory Ethernet Learning System – AB Micro820





**Optional Equipment for this course**

96-ROB1

Robotics 1 Learning System



# Course 2: Intro to Industrial Controls

95-MSB2AB	Skill Boss Allen-Bradley 
33934	Hand Tool Kit Package-Skill Boss 



eLearning



CERTIFIED ISO 9001:2015

Virtual Simulators



PART NUMBER	DESCRIPTION OR PHOTO
990-SN1	<p data-bbox="970 129 1630 165">Portable Electronic Sensor Learning System</p>  <p>The image shows a black plastic carrying case with a handle and latches. Next to it is a variety of electronic components including several cables of different colors (black, blue, green), small printed circuit boards (PCBs), a red and white rectangular module, a black circular component, and various connectors and sensors.</p>
990-PN1	<p data-bbox="970 688 1567 723">Portable Pneumatics 1 Learning System</p>  <p>The image shows a blue carrying case with a black handle and latches. The front panel of the case is labeled "990-PN1 PNEUMATICS SYSTEM" and "AMATEC". It features a complex arrangement of pneumatic components including several pressure gauges, solenoid valves, flow control valves, and two air cylinders. The components are mounted on a blue panel with various ports and connections.</p>

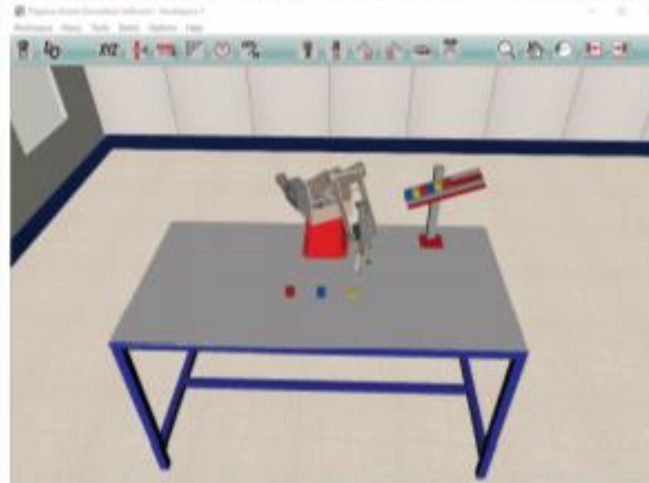
990-EC1

Portable Electrical Control Systems 1 Learning System



14554-HS

Pegasus Robot Simulation Software  
Functional software used as standalone simulation software



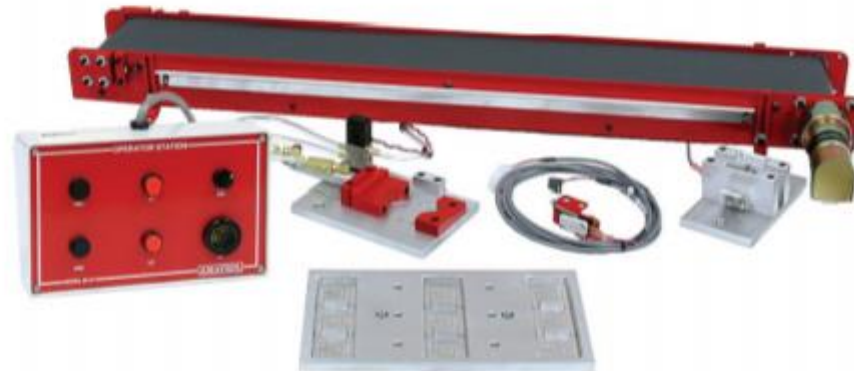
96-ROB1

Robotics 1 Learning System



96-ROB2A

Robotics 2 Learning System

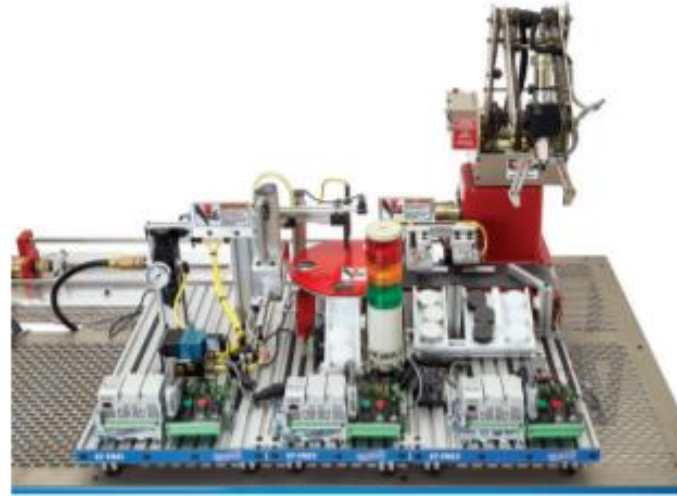






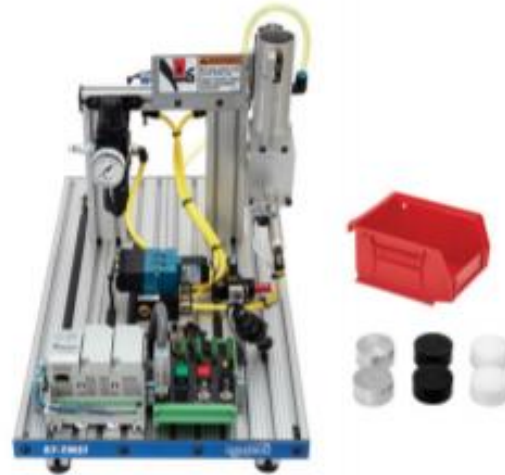
870-PTAB82

Table Top Mechatronics Learning System – AB Micro820



87-TMS1

Inventory Station - Tabletop Mechatronics



**Optional Equipment for this course**

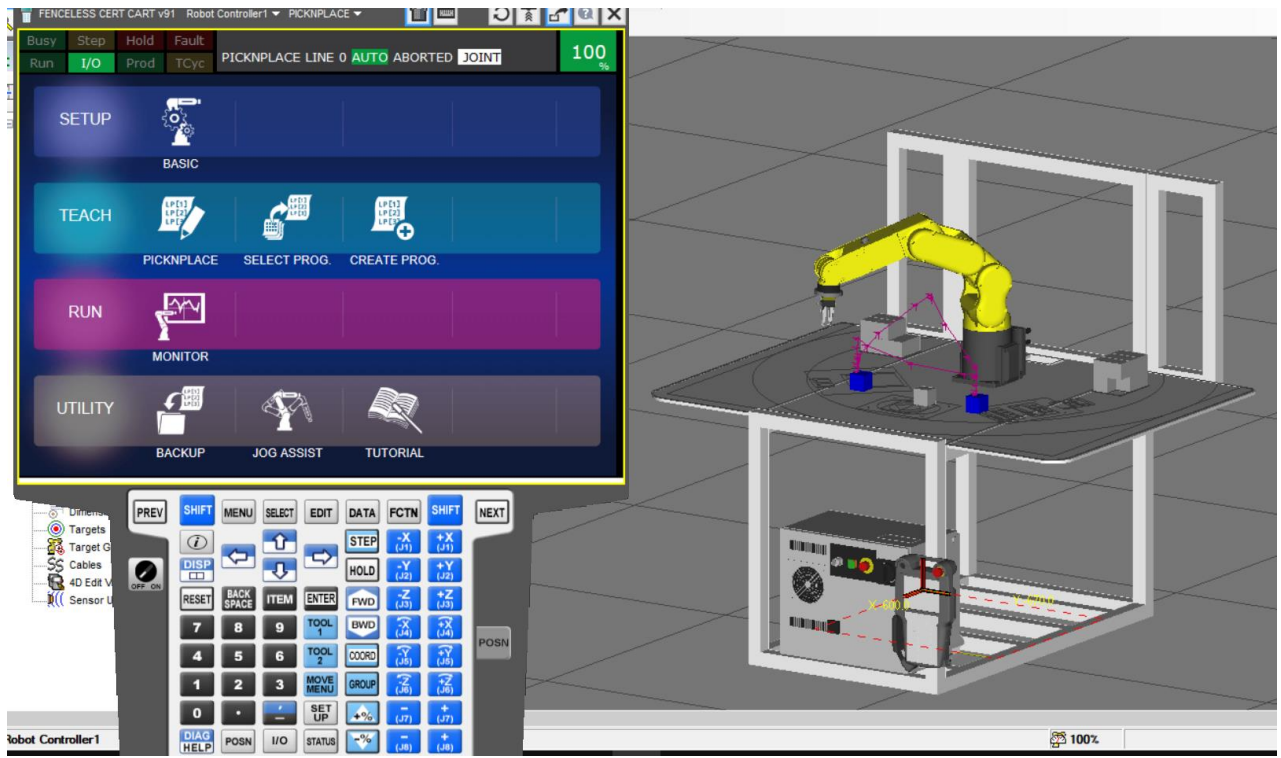
96-CNC1

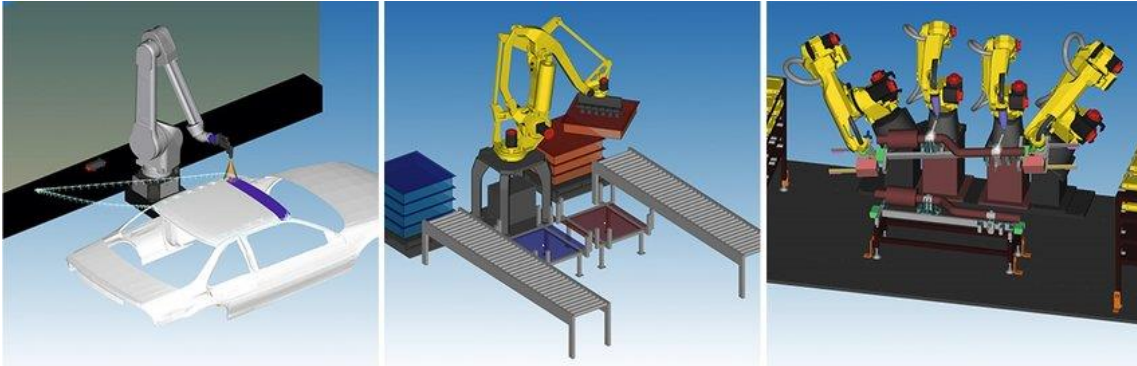
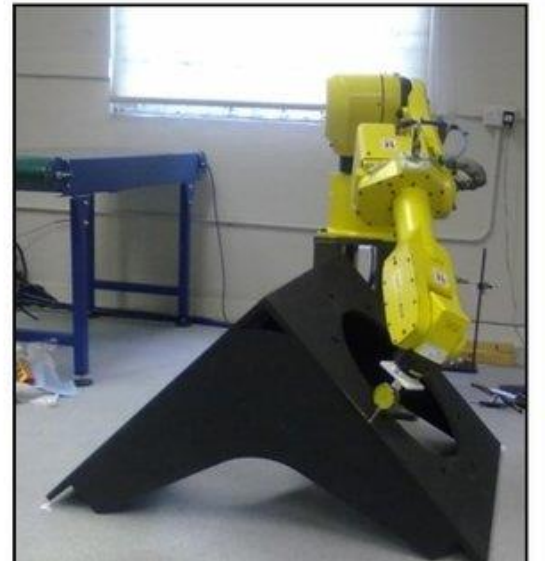
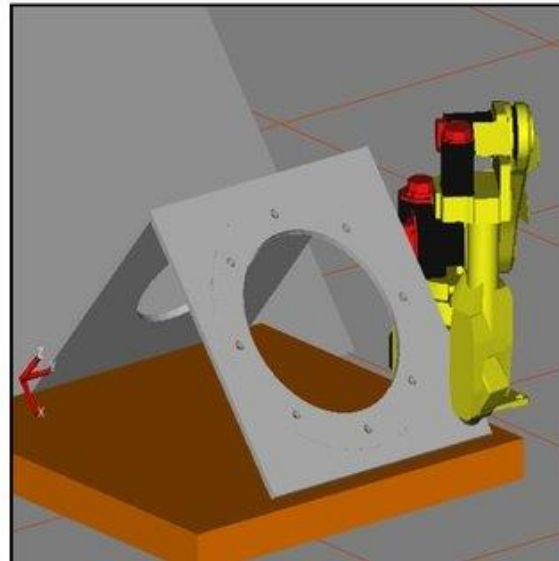
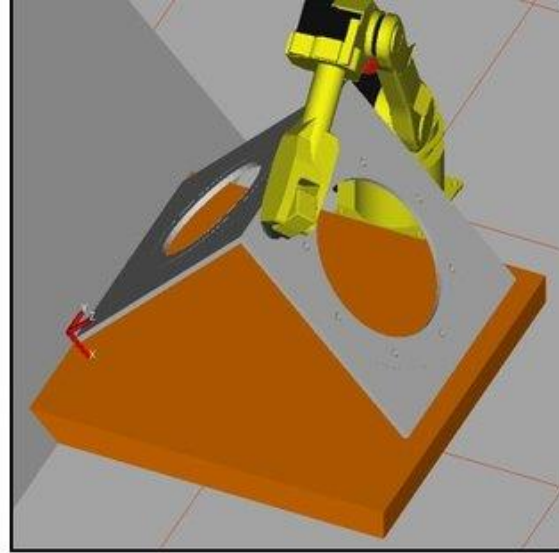
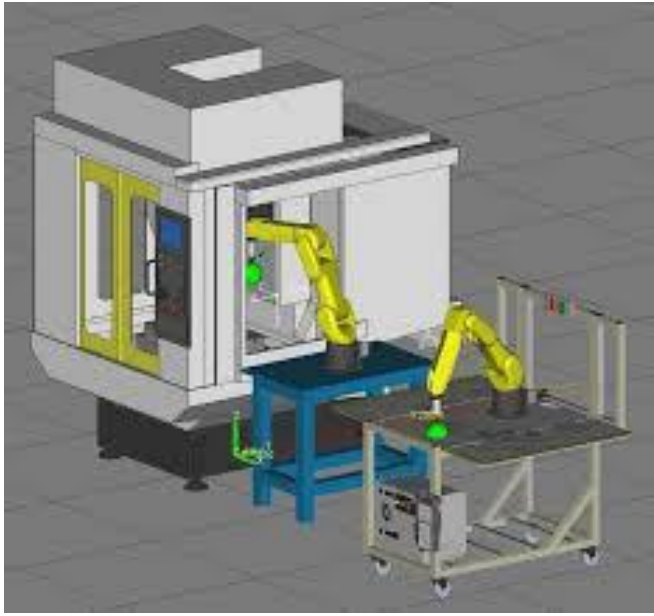
CNC Machines 1 Learning System (Optional)



# Course 3: Intro to Industrial Robotics

---





# An Integrated Method for the Geometric Inspection of Wind Turbine Hubs with Industrial Robot

Journal of Intelligent Computing Vol. 7

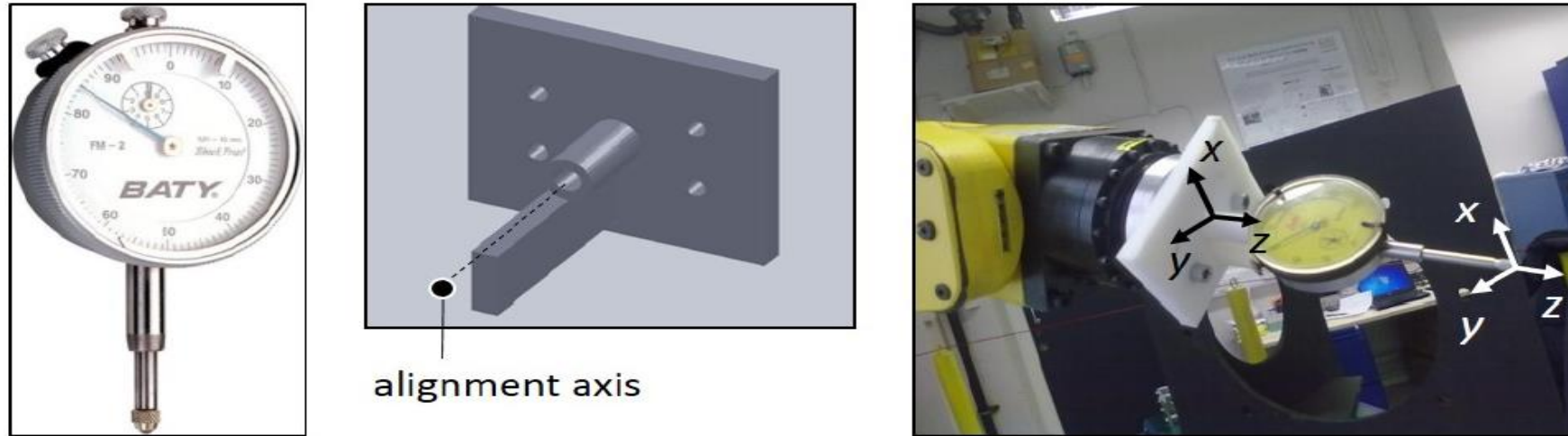


Figure 5. The robot-HLC registration set-up: a Baty CL1 dial test indicator (left panel) is mounted on the end-effector flange of Fanuc M6-iB Robot Arm (right panel) by means of an ABS customized support (central panel)

# Course 4: Intro to IIoT

95-MSB2AB

Skill Boss Allen-Bradley



33934

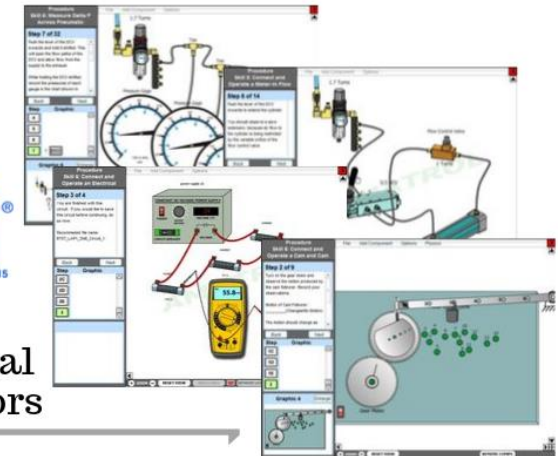
Hand Tool Kit Package-Skill Boss


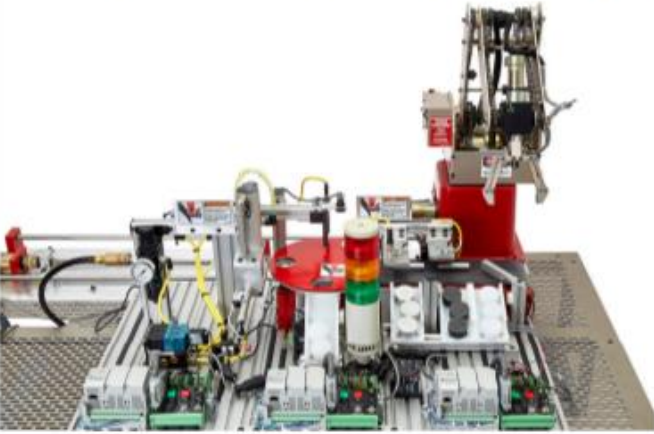


eLearning



Virtual  
Simulators



PART NUMBER	DESCRIPTION OR PHOTO
<p>87-TVCAB</p>	<p>Table Top Smart Factory Visual Communications Learning System - Allen-Bradley</p> <p>Functional Software used as standalone software used for web-based data acquisition, production monitoring, and maintenance management.</p> 
<p>87-TMS1-4 with 870-PTAB82 at Stations 1-3</p>	<p>Table Top Mechatronics Learning System - AB Micro820</p> 

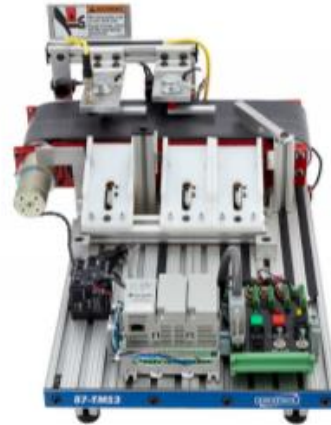
87-TMS2  
(with 870-PTAB82)

Inspection Station Table Top Mechatronics





87-TMS3  
(with 870-PTAB82)

Distribution Station Table Top Mechatronics

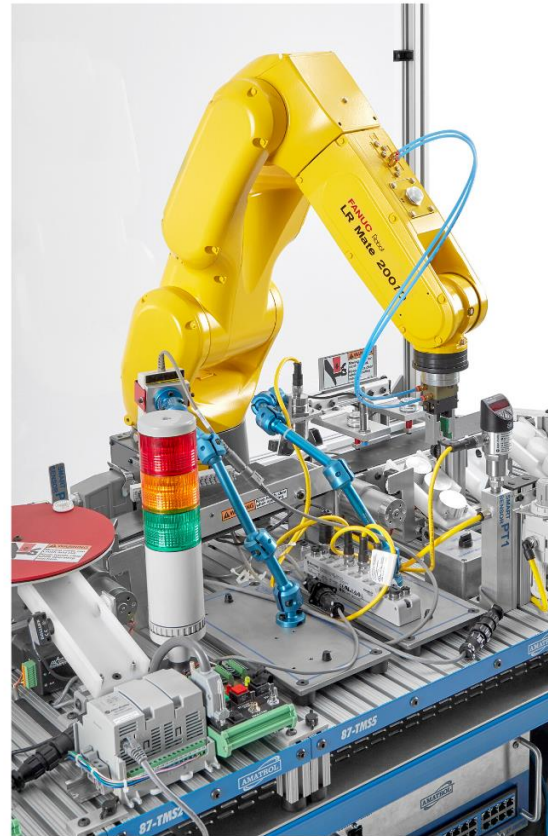
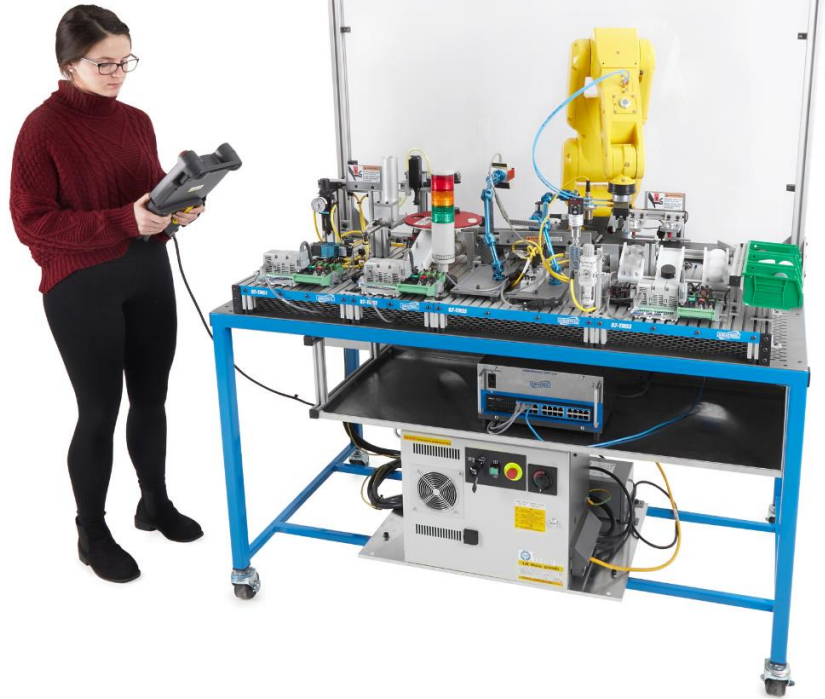


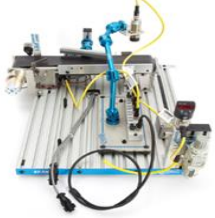
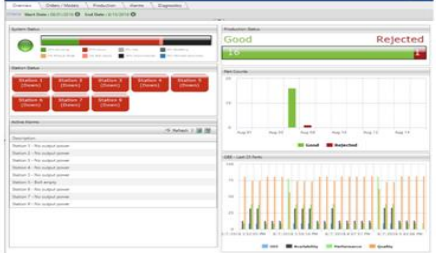


PART NUMBER	DESCRIPTION OR PHOTO
87-TMS5AB1	Tabletop Smart Factory RFID/ Sensors Learning System – AB L16 <div data-bbox="1217 172 1574 601" data-label="Image"> </div>
87-TMEAB	Tabletop Smart Factory Manufacturing Execution Learning System (IGear Pulse Software) <div data-bbox="1021 719 1760 1219" data-label="Figure"> <p>The screenshot displays the IGear Pulse software interface with the following components:</p> <ul style="list-style-type: none"> <li><b>System Status:</b> A horizontal bar with a green indicator on the left and a red indicator on the right.</li> <li><b>Production Status:</b> A section showing 'Good' (16) and 'Rejected' (1) counts with a corresponding bar chart.</li> <li><b>Station Status:</b> A grid of buttons for Stations 1 through 9, all labeled '(DOWN)'. Stations 1-3 are in the first row, and Stations 4-6 are in the second row. Stations 7-9 are in the third row.</li> <li><b>Station Alarm:</b> A list of alarm messages, all stating 'Station X - No output power' for Stations 1 through 9.</li> <li><b>Part Counts:</b> A bar chart showing production counts for 'Good' (green) and 'Rejected' (red) parts from August 27 to August 31.</li> <li><b>Last 25 Parts:</b> A bar chart showing performance metrics (Uptime, Availability, Performance, Quality) for the last 25 parts produced.</li> </ul> </div>

PART NUMBER	DESCRIPTION OR PHOTO
82-8RSM RS or 82-800	RS Logix 500 Mini or Studio 5000  The image shows the box art for Rockwell Studio 5000 software. The text on the box includes "Rockwell Software", "Studio 5000", "Automation Engineering & Design Environment", and the Rockwell Automation logo at the bottom right.
990-PABCL1F	Portable PLC Troubleshooting Learning System – AB CompactLogix includes FaultPro  The image shows the 990-PABCL1F Programmable Controller System. It is a rugged, black, rectangular unit with a white faceplate. The faceplate is labeled "990-PABCL1F PROGRAMMABLE CONTROLLER SYSTEM" and "AMATRON". It features a central color LCD screen, a red emergency stop button, a green start button, and various indicator lights and connectors. The system is designed for portable PLC troubleshooting and learning.

# Capstone: Intro to IIoT



PART NUMBER	DESCRIPTION OR PHOTO
87-TMS5AB1	Tabletop Smart Factory RFID/Sensors Learning System – AB L16 
87-TMEAB	Tabletop Smart Factory Manufacturing Execution Learning System (iGear Pulse Software) 
990-PABCL1F	Portable PLC Troubleshooting Learning System – AB CompactLogix includes FaultPro 