ELECTRONICS TRAINING EQUIPMENT SOLUTION

Ver: 02

Content

ETEK
TOTAL AUTOMATION SOLUTIONS

ETEK
TOTAL AUTOMATION SOLUTIONS

Requirements

Requirements

Building a set of training equipment to meet the needs of social reality, technology trends and training programs:

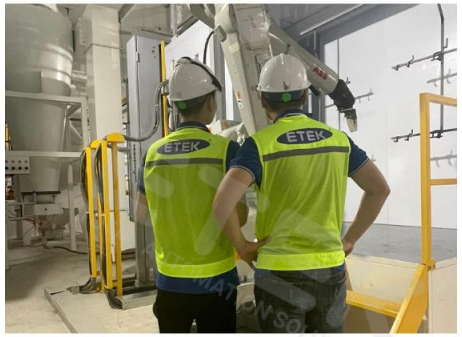
Societal needs

The demand for human resources in the industrial electronics industry is currently very large, focusing mainly in the following fields:

- Installation of electronic systems, including control systems, automation systems, monitoring systems, etc.
- Operate electronic systems, ensuring they operate stably and efficiently.
- Maintain electronic systems, detect and fix technical problems.
- Repair damaged electronic systems.

Technology trends

- New technologies are continuously developed and applied in the industrial electronics industry, improving processes, researching and developing more fast processing chips.



ETEK
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ETEK Solutions

ETEK total equipment solutions

4 functional classrooms from basic to advanced:

1. Basic electronics practice room	• Knowledge of basic electronics, electronic components and applied circuits
2. Power electronics training room	• Knowledge of power electronic components and power control circuits
3. Microcontroller training room	• Programming microcontrollers, embedded programming, IOT
4. Practice room for designing and manufacturing printed circuits board (PCB)	• Knowledge of the actual printed circuit design and production process

I. BASIC ELECTRONICS TRAINING ROOM

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TOTAL AUTOMATION SOLUTIONS

FUNCTION

- Practice identifying different types of electronic components
- Practice DC and AC circuits
- Practice applied circuits of semiconductor devices
- Practice applications of operational amplification
- Practice pulse technique
- Digital practice

Main module for practicing basic electronics

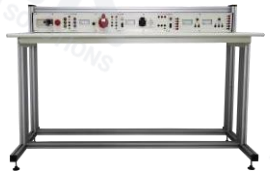
Basic electronics practice module with computer connection

Basic experiment module for DC circuits

Experimental module of theorems on DC circuits

Basic AC circuit experiment module - 1

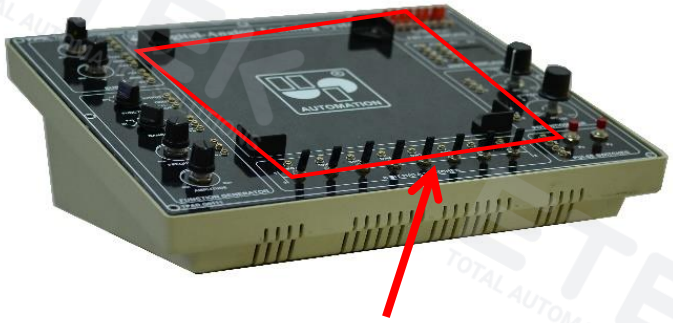
Basic AC circuit experiment module - 2



Electronic practice table

I. BASIC ELECTRONICS TRAINING ROOM

Solution for mounting modules during practice:



Main module

Function modules

Practice set

I. BASIC ELECTRONICS TRAINING ROOM

1. Main module for practicing basic electronics

Specifications:
- Input power supply for module: 220VAC/50Hz
- Output source block:
 + Adjustable power source: 0 ~ ± 15V/500mA adjustable by rheostat
 + Fixed source: ±5V/500mA, ±12V/500mA
- Fixed AC output: 12V/1A/50Hz
- Fixed AC output: 6V/1A/50Hz
- Pulse generator block
 (A) Frequency range
 + 10 Hz ~ 100 Hz
 + 100 Hz ~ 1 kHz
 + 1 kHz ~ 10 kHz
 + 10 kHz ~ 100 kHz
 (B) Output sine wave amplitude: 0 – 8 Vpp variable
 + Output triangle wave: 0 - 6 Vpp variable
 + Square wave output: 0 – 8 Vpp variable
 + TTL level: 0 - +5 V

I. BASIC ELECTRONICS TRAINING ROOM

2. Main module for practicing basic electronics with computer connection

Specifications:

- Box size: 330 x 264 x 109 (WxDxH)
- Quality Management Standard ISO 9001:2015
- Input power supply for module: 220VAC/50Hz
- DC output power block: ±5V/500mA, ±12V/500mA
- Module design uses standard plastic box
- Standard M2 type pin
- The printing pattern guides the printing of the film on the module surface, ensuring aesthetics and the longevity of the device

I. BASIC ELECTRONICS TRAINING ROOM

3. Basic experiment module for DC circuits

Training contents:
- DC power source in series and parallel
- Dual DC source
- Determine the type of switching
- Concept of circuit reversal
- Ohm's Law: Resistance, current, circuit voltage
- Resistance, current, voltage in series resistor circuits
- Resistance, current, voltage in a parallel resistor circuit
- Resistance, current, voltage in mixed resistor circuits
- Power in series, parallel and mixed resistor circuits

4. Theorems of DC circuits training module

Training contents:

- Current in a 2-element branch circuit
- Nodal current in a 2-element branch circuit
- Voltage in a 3-element series circuit
- Add voltage in series circuit
- Circular equation
- Node equation
- Kirchhoff's voltage law for circuits with 2 sources
- Kirchhoff's current law with 2-source circuits
- Network method with 2-source circuit
- Stacking method with 2-source circuit
- Millman's theorem with 2-source circuit
- Thevenin method with one-source network
- Thevenin method with dual source network
- Thevenin bridge circuit resistor
- Thevenin bridge circuit voltage
- Convert Thevenin to Norton
- Convert Norton to Thevenin
- Tee, Wye, Pi and Delta networks
- Switch Delta and Wye Networks networks

I. BASIC ELECTRONICS TRAINING ROOM

5. AC - 1 Basic circuit training module

Training contents:

- AC waveform generator
- Measure AC amplification
- Measure AC voltage, current and impedance with an oscilloscope
- Measure and set frequency
- Inductance
- Phase angle
- Inductance in series and parallel

Basics of resistance

- Inductance and impedance
- Serial RL circuit
- Parallel RL circuit
- Electromagnetic fields
- Transformer coil
- Symptoms
- Turns ratio and voltage of the transformer
- Secondary load of transformer
- Capacitor
- Capacitors in series and parallel circuits
- Basic effects of capacitors
- Series RC circuit
- Parallel RC circuit
- RC time coefficient
- RC/RL waveform
- Basics of troubleshooting

I. BASIC ELECTRONICS TRAINING ROOM

6. AC - 2 Basic circuit training module

Training contents:
- Serial RLC circuit
- Parallel RLC circuit
- Series resonant circuit
- Q and series RLC circuit frequency range
- Resonant frequency in parallel LC circuit
- Q and frequency range
- Power division
- Power factor
- Low pass filter
- High pass filter
- Band filter
- Stop band filter
- Basics of troubleshooting

I. BASIC ELECTRONICS TRAINING ROOM

7. Semiconductor training module

Training contents:

- Identify semiconductor devices
- Semiconductor switching control
- Diode and DC characteristics
- Half-cycle rectification
- Full cycle bridge rectifier using Diode
- Filter the power source
- Voltage doubler
- Waveform using Diode
- Zener diode
- Adjust Zener Diode voltage
- Check Transistor function
- Current control circuit uses PNP Transistor
- Emitter-Base bias voltage
- Collector upstream bias
- DC circuit voltage using Transistor
- Load line uses Transistor
- Optical isolation IC
- Optical resistance
- Basics of troubleshooting

8. Transistor amplifier circuit training module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Introducing multi-stage amplification
- DC/AC operation of common Base circuit
- DC/AC operation of common Emitter circuit
- DC/AC operation of common Collector circuit
- Temperature influence on fixed polarity circuits
- Temperature influence on voltage divider bias circuit
- Transistor parameter range
- Use the Transistor parameter table
- RC coupled amplifier DC operation
- RC coupling gain and phase angle relationship
- RC coupled amplifier frequency response
- DC/AC operation of transformer coupled amplifier
- Transformer coupled amplifier frequency response
- DC/DC operation of direct coupled amplifier
- Direct coupled amplifier frequency response
- Basics of handling and troubleshooting circuit problems

I. BASIC ELECTRONICS TRAINING ROOM

9. Transistor power amplifier training module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Introduction to Transistor power amplification
- DC single output power amplifier operation
- Single AC output voltage and power amplification
- Phase-separated DC operation
- Voltage amplification and input/output signal phase relationship
- DC operation symmetrical power amplifier
- AC symmetrical voltage and power amplification
- DC operation power compensation amplifier
- AC compensation voltage and power amplification
- Amplify push-pull power
- Darlington pair current amplification characteristics
- Darlington pair input and output impedance
- Basics of handling and troubleshooting circuit problems

I. BASIC ELECTRONICS TRAINING ROOM

10. Transistor feedback circuit experiment module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Series feedback amplification operation
- Effect of feedback on AC amplification
- Effect of negative series feedback on frequency range
- Effect of series feedback on input and output impedance
- Effect of parallel feedback on AC amplification
- Effect of parallel amplification on frequency range
- Effect of parallel amplification on input and output impedance
- Multi-stage current amplification in series and parallel
- Multi-stage output amplification in series - parallel
- Multi-stage voltage amplification in series - parallel
- Multi-stage output impedance connected in series - parallel
- Differential amplifier operation
- Differential and unipolar gain characteristics
- Differential gain coefficient
- Basic concepts of handling and troubleshooting feedback amplifier circuits.

11. Power source regulation circuit training module

Training contents:

- Recognize, become familiar with and locate components in the circuit
- Introducing power supply adjustment
- Parallel adjustment operation
- Line adjustment
- Adjust load
- Serial adjustment operation
- Pressure feedback adjustment operation
- Load regulation using voltage feedback
- Reverse current limit protection circuit
- Line adjustment operation
- Adjust the line using a line regulator
- Adjust load using current regulator
- 3-pin IC adjustment and voltage adjustment activities
- Adjust 3-pin IC current and performance
- DC to DC conversion characteristics
- Regulates DC to DC conversion voltage and performance
- Basic concepts of handling and troubleshooting power source regulation circuits.

I. BASIC ELECTRONICS TRAINING ROOM

12. Thyristor and power control training module

Training contents:

- Learn the principles and practice of half-wave SCR DC Gate circuits
- Learn the principles and practice of full-wave SCR DC Gate circuits
- Learn the principles and practice of AC power control circuits using Triac

Learn the principles and practice of controlled rectifier circuits

- Learn the principles and practice of half-wave SCR AC Gate circuits
- Learn the principles and practice of full-wave SCR AC Gate circuits

I. BASIC ELECTRONICS TRAINING ROOM

13. Basic experimental module of operational amplification

Training contents:

- Basic characteristics and parameters of operational amplifiers.
- Learn the principles and practice of inverting amplifier circuits
- Learn principles and practice with non-inverting amplifier circuits
- Learn principles and practice with inverter amplifier circuits Learn the principles and practice with non-inverting additive amplifier circuits.
- Learn principles and practice with voltage repeater circuits
- Learn the principles and practice with sine wave to square wave conversion circuit
- Learn principles and practice with differential amplifier circuits
- Learn principles and practice with open loop circuits
- Learn principles and practice with gate amplifier circuits
- Learn principles and practice with exponential amplifier circuits
- Learn principles and practice with subtractive amplifier circuits

14. Experimental module of applications of operational amplification

Training contents:

- Basic characteristics and parameters of operational amplifiers.
- Learn the principles and practice with full-wave bridge diode control circuits
- Learn principles and practice with integrator circuits Learn principles and practice with differential circuits
- Learn the principles and practice with low-pass filter circuits
- Learn principles and practice with high-pass filter circuits
- Learn the principles and practice with bandpass filters
- Learn principles and practice with limited circuits
- Learn principles and practice with latching and sampling circuits
- Learn the principles and practice with window comparator circuits

I. BASIC ELECTRONICS TRAINING ROOM

15. Basic training module for FET transistors

Training contents:

- Learn the principles and operating characteristics of JFET
- Learn principles and practice with JFET amplifier circuits
- Learn principles and practice with JFET CURRENT circuit practice DC source current operation/load voltage variation with JFET
- Learn principles and practice with Colpitts oscillator circuit
- Learn the principles and practice the operation of the HARTLEY oscillator
- Learn principles and practice with thermistor circuits
- Learn the principles and practice of waveform generation and control characteristics using UJT
- Learn principles and practice with photoresistor circuits
- Learn principles and practice with fiber optic transceiver conversion circuits
- Learn the principles and practice of operating modes and dual gate MOSFET adder
- Basic troubleshooting and troubleshooting in circuits.

I. BASIC ELECTRONICS TRAINING ROOM

16. Analog electronics basic experiment module

Training contents:

- Learn the principles and practice of analog switching circuits using 4051, 4066
- Learn the principles and practice of signal amplifier circuits using LM358, BJT2N3904
- Learn the principles and practice of the PNP transistor amplifier circuit using the 2N3906 transistor
- Learn the principles and practice of logarithmic amplification using IC LM358
- Learn the principles and practice of the transformer coupled Armstrong oscillator, LC resonance

I. BASIC ELECTRONICS TRAINING ROOM

17. Digital practice module

Training contents:
- Learn circuit principles and practice with MULTIPLEXER multiplexing and DEMULTIPLEXER multiplexing circuits
- Learn the principles and practice with BCD/DECIMAL, BCD PRIORITY circuits
- Learn the principles and practice with ADC/DAC conversion circuits
- Learn the principles and practice with the 7-SEGMENT DRIVER/DISPLAY circuit
- Learn the principles and practice with the ASYNCHRONOUS RIPPLE COUNTER circuit

18. Pulse technique practice module

Training contents:

- Practice stable multivibrator circuits using transistors

Learn principles and practice with monostable oscillator circuits using OP-AMP

- Learn the principles and practice with unstable oscillator circuits using OP-AMP
- Learn principles and practice with bistable oscillator circuits using OP-AMP
- Learn principles and practice basic applications of IC555
- Learn principles and practice with IC555 - PWM circuit
- Practice creating pulses with the IC555 chip
- Learn principles and practice with Wien bridge circuits
- Learn principles and practice with IC555 linear circuits
- Learn principles and practice with trimmer circuits
- Learn principles and practice with pin circuits
- Learn principles and practice with differential circuits
- Learn principles and practice with integrator circuits
- Learn the principles and practice with frequency to voltage conversion circuits
- Learn the principles and practice with voltage to frequency conversion circuits
- Practice pulse generator circuit using UJT
- Practice pulse shortening circuit
- Practice pulse circuit using IC 74122
- Practice multivibrator circuits

19. Analog electronic circuit assembly practice kit

Training contents:
- Semiconductor, light-emitting diode in 1-way circuit
- Semiconductor diodes in AC circuits, half-cycle and full cycle rectifiers
- Use bridge diodes in DC and AC circuits
- Filter circuit, adjusting one-way pulse source
- The power circuit uses a PI filter
- Voltage multiplier circuit uses diode and capacitor
- Common E current amplifier circuit, stage amplifier, Single-End type audio amplifier
- Pull-push type audio amplifier circuit, pull-push symmetric compensation amplifier
- Zero-Phase oscillator circuit, phase shift
- Oscillator circuits ARMSTRONG, Hartley, Colpitts
- Digital circuits of AND, OR, OR– AND gates
- NAND and NOR digital circuits
- Inverting circuit, adding circuit

I. BASIC ELECTRONICS TRAINING ROOM

20. Digital electronic circuit assembly practice kit

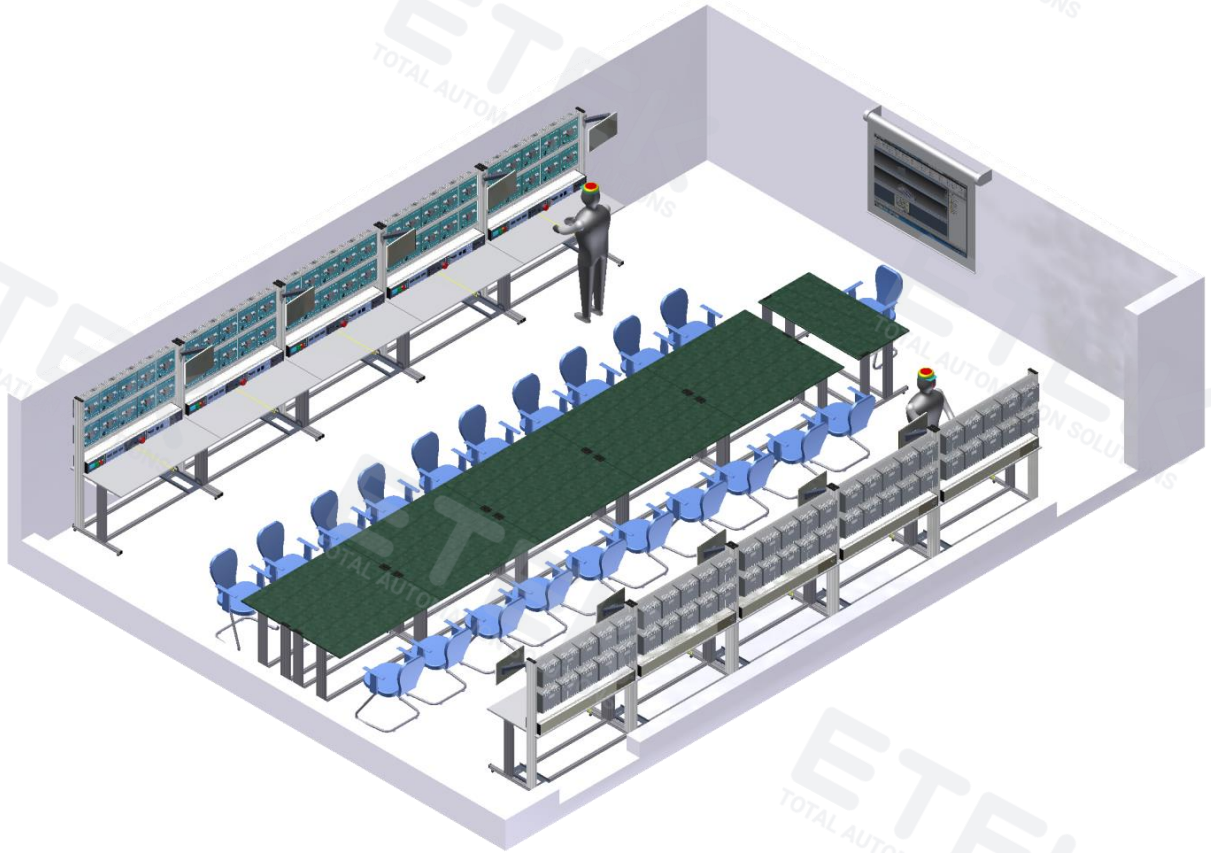
Training contents:

- Basic logic functions, Demoorgan theorems 1, 2, 3, 4
- Boolean algebra and simplifying logical expressions 1, 2 ,3, 4, 5, 6
- Definition and operation of TTL NAND/NOR gate 1, 2
- XOR logic function and its applications 1 - 7
- Full adder and full subtractor 1, 2, 3, 4, 5
- Binary counter and binary number system 1, 2
- Divide by -n counter and decimal counter 1 - 5
- Random access memory working memory area
- Digital-to-digital (D/A) and digital-to-digital (A/D) converters 1-2

II. POWER ELECTRONICS TRAINING ROOM

FUNCTION

- Laboratory test on UJT
- Experiment on SCR
- Laboratory test on DIAC and TRIAC
- Experiment on automatically adjusting light bulbs and adjusting AC motor speed using TRIAC
- Experiment on rectifier circuits using SCR
- Experiments on JFET and MOSFET
- Single-phase, half-cycle, two-half-cycle power rectification
- Single-phase bridge rectifier, 3-phase beam rectifier, 3-phase bridge rectifier
- Practice inverting current
- Practice adjusting AC voltage
- Practice adjusting DC voltage



Power electronic components training bench

Uncontrolled rectifier training bench

Controlled rectifier training bench

Inverter training bench

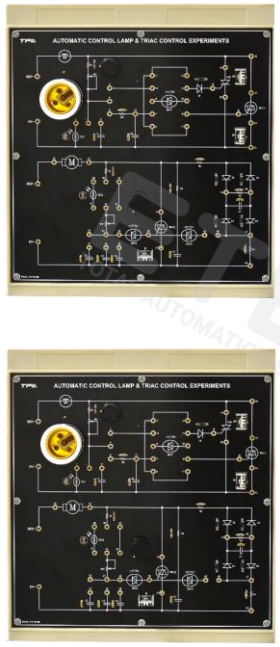
AC voltage regulation training bench

DC voltage regulation training bench

Electronic practice table with chair

II. POWER ELECTRONICS TRAINING ROOM

Solution for mounting A4 modules during practice:



Equipment

Table frame

Training set

II. POWER ELECTRONICS TRAINING ROOM

1. Power electronic components training bench

Training Contents:
- Laboratory test on UJT
- Experiment on SCR
- Laboratory test on DIAC and TRIAC
- Experiment on automatically adjusting light bulbs and adjusting AC motor speed using TRIAC
- Experiment on rectifier circuits using SCR
- Experiments on JFET and MOSFET

II. POWER ELECTRONICS TRAINING ROOM

2. Uncontrolled rectifier training bench

Training Contents:
- Half-cycle single-phase power rectification
- Power rectification in two half cycles
- Single phase bridge rectifier
- 3-phase beam rectifier
- 3-phase bridge rectifier

II. POWER ELECTRONICS TRAINING ROOM

3. Controlled rectifier training bench

Training Contents:

- Overview of power rectifier control circuit
- Single-phase half-cycle uncontrolled rectifier (Half-wave rectifier)
- Single-phase uncontrolled rectifier for the whole cycle (Full-wave rectifier)
- Rectifier with 1-phase half-cycle control (rectifier with half-cycle control)
- The rectifier has single phase control for the entire cycle
- 1-phase full-cycle symmetrical semi-controlled rectifier
- 1-phase full-cycle asymmetric semi-controlled rectifier
- 3-phase ray-shaped uncontrolled rectifier
- The rectifier does not control 3 phases throughout the cycle
- Rectifier with 3-phase beam control
- Full-cycle 3-phase semi-controlled rectifier
- The rectifier has 3-phase control for the whole cycle

II. POWER ELECTRONICS TRAINING ROOM

4. Inverter training bench

Training Contents:
- Basic characteristics of inverters and frequency conversion principles
- Practice 1-phase PWM control circuit
- Practice 3-phase PWM control circuit

II. POWER ELECTRONICS TRAINING ROOM

5. AC voltage regulation training bench

Training Contents:
- General concept of AC pressure regulation
- Single-phase AC voltage control
- Three-phase AC voltage control

II. POWER ELECTRONICS TRAINING ROOM

6. DC voltage regulation training bench

Training Contents:

- Learn the principles of controlling the speed of a DC motor using a DC-DC converter

Connect the DC motor speed control circuit using a DC-DC converter

- Measure and check voltage and current values in the circuit
- Step-down DC voltage converter (Buck)
- Booster type DC voltage converter (Boost)
- Push-pull DC voltage converter (Buck - Boost)

II. POWER ELECTRONICS TRAINING ROOM

7. AC voltage regulation training bench

Training Contents:
- Understand the principles of AC voltage regulation circuits using thyristors.
- Generation of control pulses for AC and signal waveform analysis.
- Techniques for measuring and analyzing circuits.
- Understand the impact of inductive loads on AC voltage regulation circuits.
- Signal conversion and isolation methods in high-voltage measurement.
- Use of electrical measurement tools.
- Electrical safety skills.

II. POWER ELECTRONICS TRAINING ROOM

8. Controlled inverter training bench

Training Contents:

- Understand the principles of SinPWM and 6-step inverters.
- Identify and differentiate the advantages and disadvantages of each type.
- Familiarize with control pulse waveform and motor output waveform.

II. POWER ELECTRONICS TRAINING ROOM

9. DC Voltage Regulation Training bench

Training Contents:

- Study the principle of DC motor speed control using a DC-DC converter
- Wire the DC motor speed control circuit using a DC-DC converter
- Measure and check voltage and current values in the circuit
- Buck-type DC-DC converter
- Boost-type DC-DC converter
- Buck-Boost-type DC-DC converter

III. MICROCONTROLLER TRAINING ROOM

FUNCTION

- Practice learning the structure of microcontrollers 8051, AVR, PIC
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.
- Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice standard computer communication programming
- RS232 communication
- Practice programming computer communication standard RS485 communication

AVR microcontroller implementation

8051 microcontroller implementation module

PIC microcontroller implementation module

Computer communication practice module

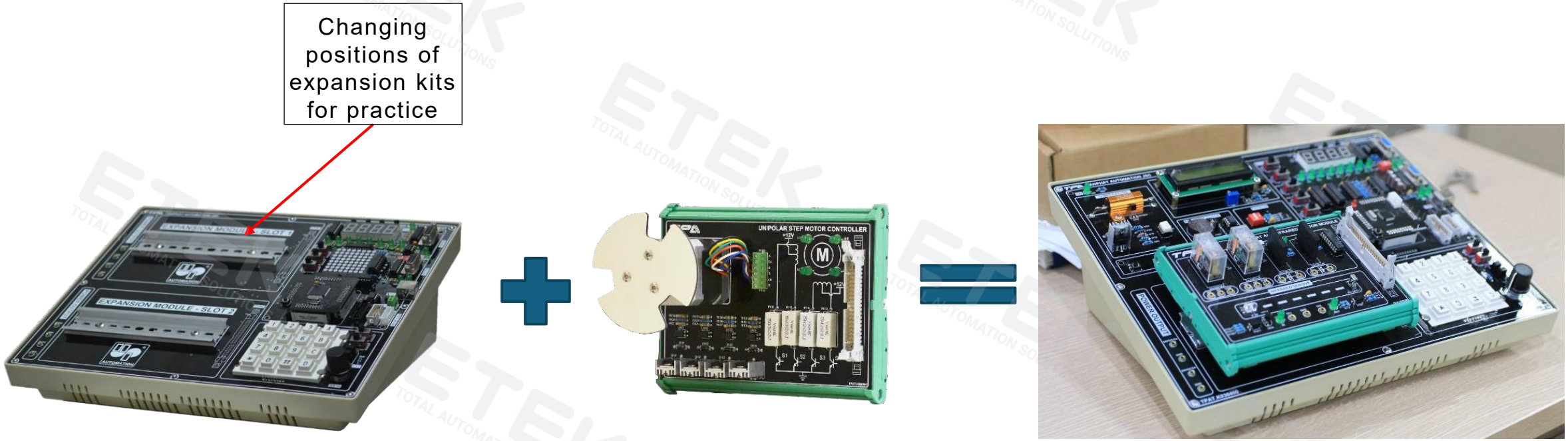
FPGA digital circuit programmer

Arduino programming practice module

Electronic practice table

III. MICROCONTROLLER TRAINING ROOM

Structure and solutions for mounting modules during practice:



Main kit

Expanded function module

Practice set

III. MICROCONTROLLER TRAINING ROOM

1. AVR microcontroller training module

Training Contents:

- Practice learning the AVR microcontroller structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.

Practice programming with external interrupts

- Practice programming to read and process ADC conversions.
- Practice programming the controller to create PWM pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

III. MICROCONTROLLER TRAINING ROOM

2. 8051 microcontroller training module

Training Contents:
- Practice learning the structure of the 8051 microcontroller
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.
Practice programming with external interrupts
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

III. MICROCONTROLLER TRAINING ROOM

3. PIC microcontroller training module

Training Contents:

- Practice learning PIC microcontroller structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.

Practice programming with external interrupts

- Practice programming to read and process ADC conversions.
- Practice programming the controller to create PWM pulses.
- Practice programming to read and write internal ROM.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

III. MICROCONTROLLER TRAINING ROOM

4. DsPIC microcontroller training module

Training Contents:

- Practice learning the structure of the 16-bit dsPIC microcontroller
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls. Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

III. MICROCONTROLLER TRAINING ROOM

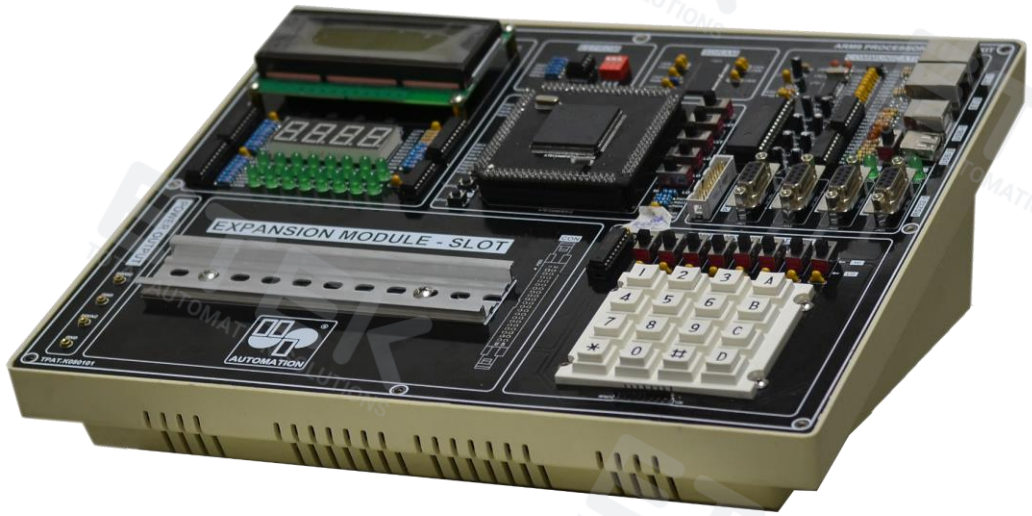
5. Multi-microcontroller training module

Training Contents:

- Practice learning the structure of microcontrollers 8051, AVR, PIC
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls. Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming to create PWM motor control pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

III. MICROCONTROLLER TRAINING ROOM

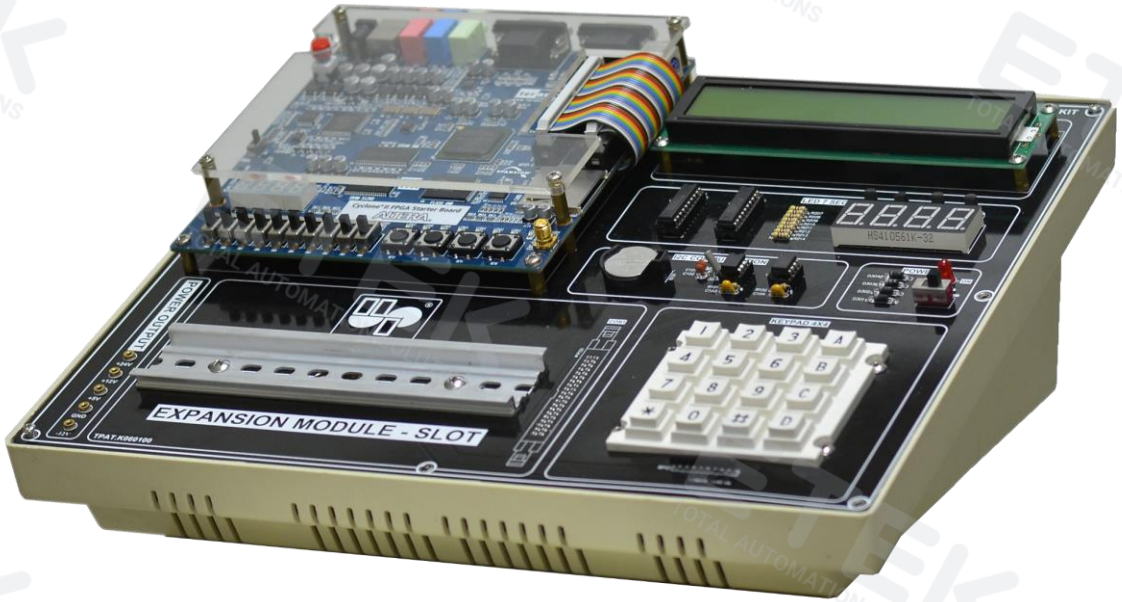
6. Computer communication training module



Training Contents:
- Practice RS232 standard computer communication
- Practice USB 2.0 standard computer communication
- Practice Ethernet standard computer communication
- Practice LPT standard computer communication
- Practice communicating with IC 82C55A
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.

III. MICROCONTROLLER TRAINING ROOM

7. FPGA training module



Training Contents:
- Learn the structure of the FPGA digital circuit programmer
- Learn VHDL programming language and exercises:
+ Practice basic logic gate programming
+ Practice programming combinational logic circuits
+ Practice programming sequential logic circuits
+ Practice programming to control a single LED display.
+ Practice programming to control a 7-segment LED display.
+ Practice programming LCD display controls.
+ Practice programming to read single keyboard.
+ Practice programming to read the matrix keyboard.
+ Practice programming computer communication standard RS232 communication

III. MICROCONTROLLER TRAINING ROOM

8. ARM microcontroller training module

Training Contents:

- Practice learning the ARM 32-bit microcontroller structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.
- Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming DAC conversion control.
- Practice programming to create PWM motor control pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication
- Practice programming computer communication standard RS485 communication

III. MICROCONTROLLER TRAINING ROOM

9. PSoC training module

Training Contents:

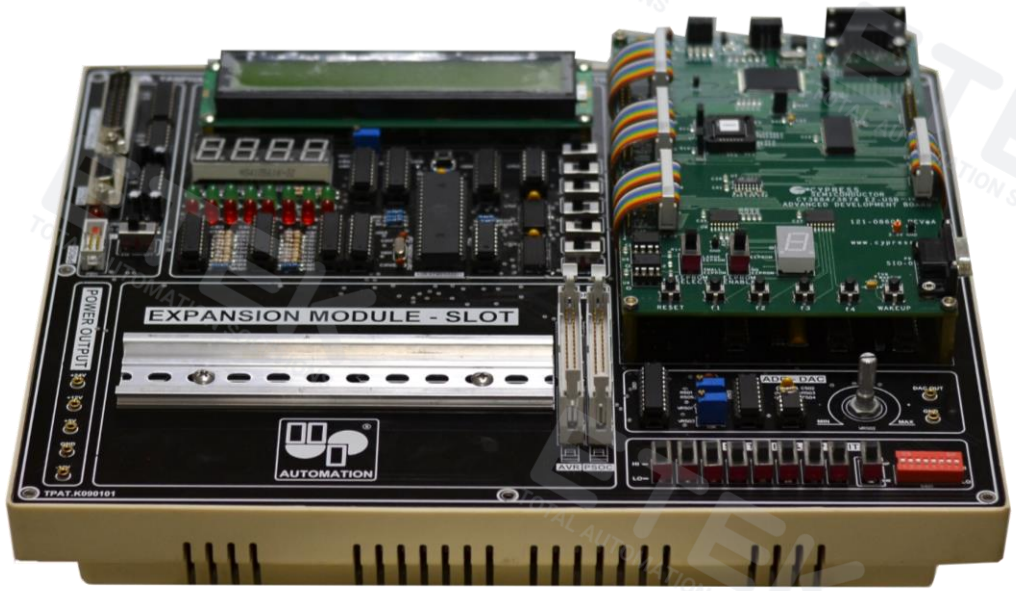
- Practice understanding the PSoC family structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.

Practice programming with external interrupts

- Practice programming to read and process ADC conversions.
- Practice programming DAC conversion control.
- Practice programming the controller to create PWM pulses.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

III. MICROCONTROLLER TRAINING ROOM

10. DSP training module

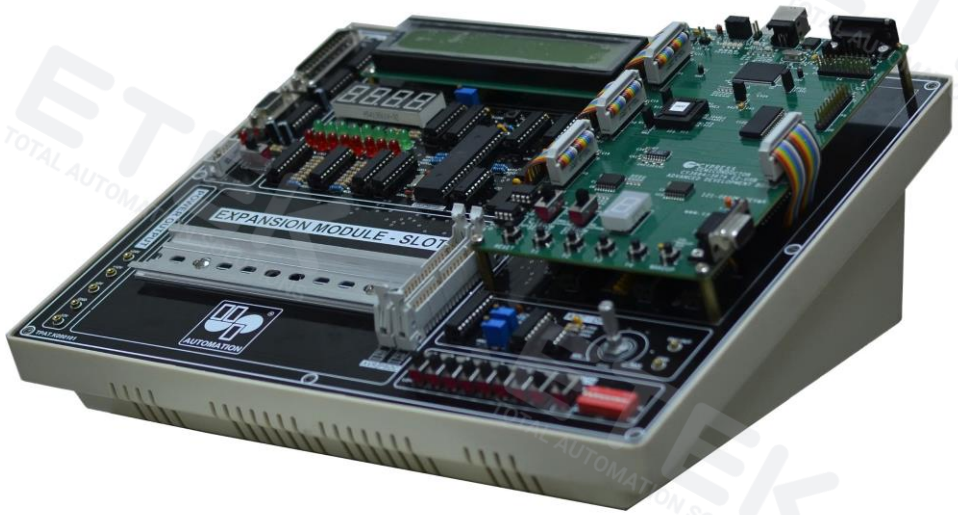


Training Contents:

- Practice learning the structure of DSP programming digital controllers
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice Timer control programming
- Practice programming to read and convert ADC.
- Practice programming to create PWM pulses to control the motor.
- Practice programming to control a single LED display.
- Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming LCD display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard CAN communication

III. MICROCONTROLLER TRAINING ROOM

11. Arduino training module



Training Contents:
- Practice learning the Arduino structure
- Practice learning instruction sets and registers.
- Practice I/O communication programming
- Practice programming Timer and Counter controls.
- Practice programming with external interrupts
- Practice programming to read and process ADC conversions.
- Practice programming the controller to create PWM pulses.
- Practice programming to control a single LED display. Practice programming the 7-segment LED display controller.
- Practice programming LED matrix display controls.
- Practice programming to read the matrix keyboard.
- Practice programming computer communication standard RS232 communication

12. Function modules used for microcontroller practice

Training Contents:

- Practice programming temperature measurement and control with analog input.
- Practice programming temperature measurement and control with digital temperature sensors.
- Practice programming temperature measurement and control with a 12-bit SPI interface ADC.
- Practice programming to control and measure the speed of open-loop DC motors.
- Practice programming to control and measure the speed of a closed-loop DC motor using PID.
- Practice programming half-step and full-step stepper motor controls.
- Practice programming to control industrial standard actuators through relays.
- Practice programming traffic light controls.
- Practice programming to display characters and numbers on a 16x2 LCD screen
- Practice programming to display characters, numbers, and images on the graphic LCD screen

Practice programming the display control to run text on the matrix LED screen.

- Practice programming ADC/DAC conversion using 8bit IC with MCU that does not support internal ADC or DAC.
- Practice programming real-time read communication, read and write external EEPROM data.
- Practice programming RF wireless communication
- Practice programming Bluetooth wireless communication

III. MICROCONTROLLER TRAINING ROOM

13. Sensor training module for microcontrollers

Training Contents:

- Practice programming communication with light sensors: Photoresistor, Photodiot, Transceiver Photransistor, Reflective Phototransistor.
- Practice programming and communication with color sensors
- Practice programming communication with infrared sensors.

Practice programming communication with industrial sensors: Diffuse reflection optical sensors, capacitive proximity sensors, magnetic proximity sensors, fiber optic sensors.

- Practice programming communication with motion sensors (infrared)
- Practice programming magnetic sensor communication
- Practice programming temperature sensor communication: PT100, Can K, NTC, semiconductor.
- Practice programming distance measurement with ultrasonic sensors.
- Practice programming weight measurement with loadcell.
- Practice programming distance measurement using infrared sensors.
- Practice programming pressure sensor communication.
- Practice programming to control remote devices using infrared.

III. MICROCONTROLLER TRAINING ROOM

14. IOT practice set using Arduino

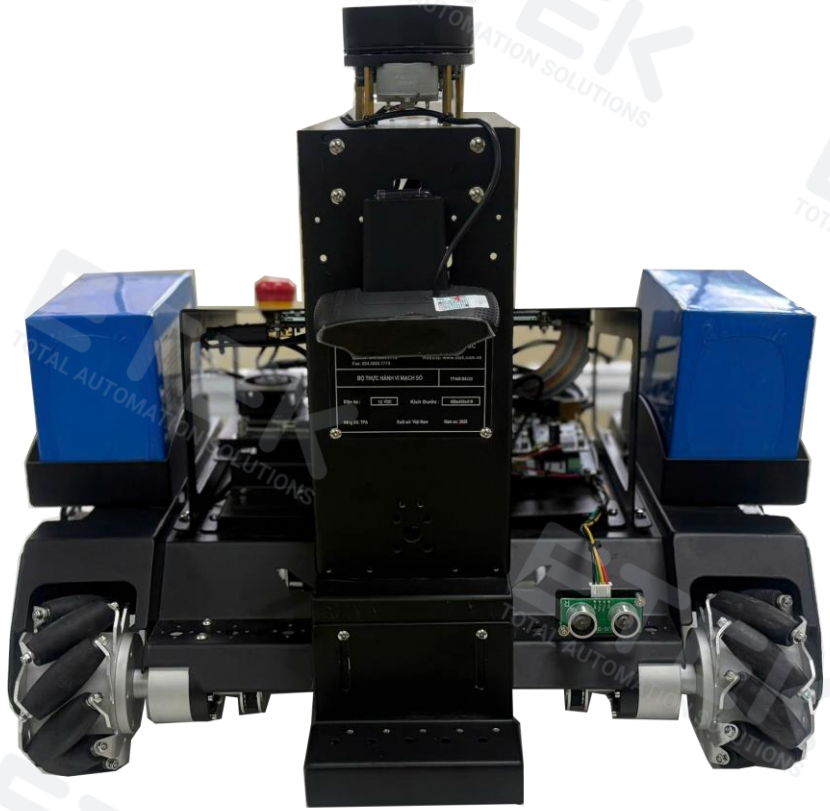
Training Contents:
- Provides basic knowledge about IOT, Arduino circuit board and main applications of Arduino today
- Arduino programming method
- Use the Arduino library
- Programming IO, timer, counter, communication
- Connect sensors to the cloud and program with sensor applications

III. MICROCONTROLLER TRAINING ROOM

15. IOT practice set uses Rasberry

Training Contents:
- Overview of IOT
- IoT smart server configuration and testing environment
- Practice smart sensor control with Raspberry Pi
- Learn the structure of various types of sensors.

16. Mobile robot model using AI and Vision



Training Contents:

Students practice exercises and experience with self-propelled robots applying AI and LiDAR technology

- Practical exercises with microcontrollers include:

+ 'Practice ARM programming to control DC motor speed.
+ Practice ARM programming to stabilize motor speed using PID algorithm.
+ Practice programming kinematic equations for multi-directional four-wheel control.
+ Practice ARM programming to balance the speeds of 4 motors.
+ Practice ARM programming to read ultrasonic and infrared distance sensors.

Practice ARM programming to control robots with sensors to avoid obstacles.

+ Practice ARM programming communicating with Jetson Xavier card

- General practice exercises:

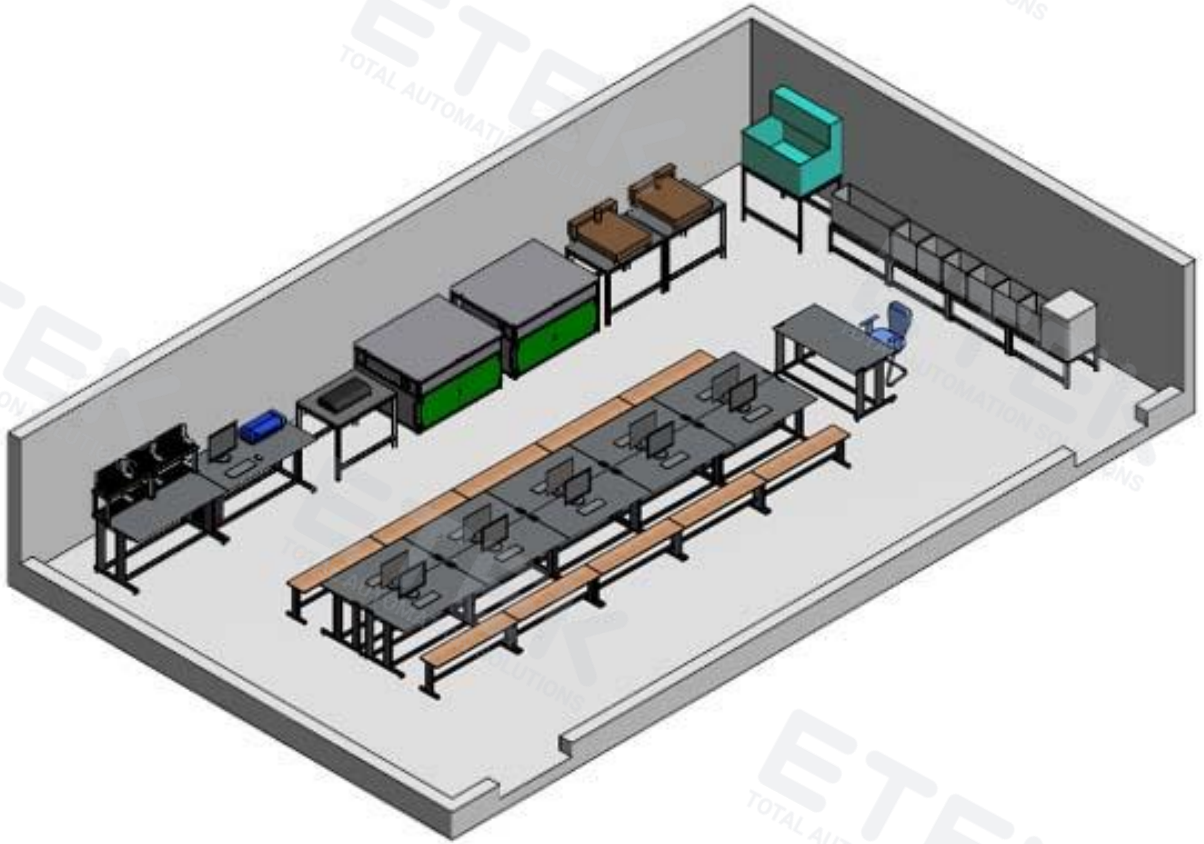
+ Practice face detection (Face detection)
+ Practice facial recognition (Face recognition)
+ Practice object detection
+ Practice recognizing signal signs
+ Practice controlling the robot to follow the Lane
+ Practice controlling robot operations according to signal signs
+ Practice applying LiDAR sensors in map building

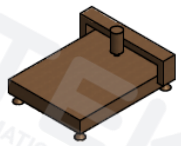
IV. TRAINING ROOM FOR DESIGNING AND MANUFACTURING PRINTED CIRCUITS

ETEK
TOTAL AUTOMATION SOLUTIONS

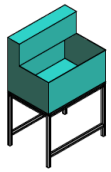
FUNCTION

- Used to learn basic electronics theory
- Practice printed circuit manufacturing processes
- Practice the printed circuit design process
- Practice content about printed circuit design and manufacturing software for electronic circuit assembly tasks

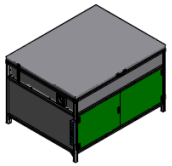




Circuit milling machine

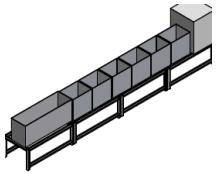


Hole plating equipment



UV imaging table

Quality control table



Corrosion and neutralization tank system

Theoretical desk

IV. TRAINING ROOM FOR DESIGNING AND MANUFACTURING PRINTED CIRCUITS

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Actual images at schools

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TOTAL AUTOMATION SOLUTIONS

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