

ATA-E200 CURRICULUM FRAMEWORK

AUTOMOTIVE TECHNICAL ACADEMY (ATA)

ATA-E200

ECU Repair & Key Programming

Curriculum Framework (Version 1.0)

Programme Status: Proposed for Locking

Programme Information

Programme Code:

ATA-E200

Programme Title:

ECU Repair & Key Programming

Qualification Level:

Professional Diploma – Level 3

Duration:

48 Weeks

Training Days:

5 Days per Week

Hours Per Day:

8 Hours

Total Contact Hours:

1,920 Hours

Teaching Philosophy

- **70% Practical = 1,344 Hours**
 - **30% Theory = 576 Hours**
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Entry Requirement

Successful completion of:

- **ATA-E100 – General Automotive Electrical**

OR

Approved Recognition of Prior Learning (RPL).

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Programme Goal

To produce highly competent Automotive Electronics Specialists capable of diagnosing, repairing, programming, configuring, testing, verifying, and documenting modern automotive electronic control systems, immobilizers, smart keys, and embedded electronic modules using OEM and professional aftermarket diagnostic equipment.

Graduate Competency Profile

Graduates shall be able to independently:

- Diagnose ECU failures.
 - Repair multilayer PCBs.
 - Replace SMD components.
 - Rebuild damaged ECU circuits.
 - Use oscilloscopes professionally.
 - Interpret automotive waveforms.
 - Read electronic schematics.
 - Program immobilizers.
 - Program smart keys.
 - Clone ECUs where legally and technically appropriate.
 - Configure replacement modules.
 - Perform EEPROM operations.
 - Read and write Flash memory.
 - Perform Boot Mode operations.
 - Use BDM/JTAG (foundation to intermediate).
 - Perform CAN diagnostics.
 - Diagnose LIN communication faults.
 - Use bench power supplies safely.
 - Verify repairs using structured testing.
 - Produce professional repair reports.
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Programme Structure

Module	Title	Weeks	Hours
E200-01	Automotive Electronics Workshop Practice & ESD Protection	3	120
E200-02	PCB Technology, Electronic Components & Circuit Analysis	6	240
E200-03	ECU Hardware Architecture & Embedded Electronics	6	240
E200-04	SMD Rework, Micro-Soldering & PCB Repair	7	280
E200-05	ECU Diagnostics, Testing & Fault Isolation	7	280
E200-06	EEPROM, Flash Memory & ECU Programming	5	200
E200-07	Immobilizer, Smart Key & Security Systems	5	200
E200-08	Vehicle Communication Networks & Module Integration	4	160
E200-09	Advanced ECU Repair Projects & Quality Assurance	3	120
E200-10	Industrial Attachment, Capstone Project & Final Assessment	2	80
TOTAL		48 Weeks	1,920 Hours

Module 1

Automotive Electronics Workshop Practice & ESD Protection

Duration: 3 Weeks

Core Areas

- Electrostatic Discharge (ESD) control
- Electronics laboratory safety
- Bench organization
- Component handling
- Bench power supply operation
- Documentation standards
- Repair workflow
- Professional ethics
- Data security

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- Customer property protection
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Module 2

PCB Technology, Electronic Components & Circuit Analysis

Duration: 6 Weeks

Topics

- Multilayer PCB construction
 - PCB materials
 - Copper traces
 - Through-hole technology
 - SMD technology
 - Passive components
 - Active components
 - Integrated circuits
 - Power electronics
 - Circuit tracing
 - Electronic schematic interpretation
 - Signal flow analysis
 - Common ECU failure patterns
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Module 3

ECU Hardware Architecture & Embedded Electronics

Duration: 6 Weeks

Topics

- ECU internal architecture
- Microcontrollers
- CPU fundamentals
- Memory architecture
- EEPROM
- Flash memory
- SRAM
- Oscillators
- Clock circuits

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- Voltage regulation
 - Input conditioning
 - Output driver stages
 - Sensor interface circuits
 - Actuator drivers
 - Power management
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Module 4

SMD Rework, Micro-Soldering & PCB Repair

Duration: 7 Weeks

Topics

- Soldering theory
 - Leaded and lead-free solder
 - Hot-air rework
 - Micro-soldering
 - Component removal
 - Component replacement
 - Pad repair
 - Trace repair
 - Jumper wire installation
 - Conformal coating
 - Cleaning procedures
 - Rework quality inspection
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Module 5

ECU Diagnostics, Testing & Fault Isolation

Duration: 7 Weeks

Topics

- Bench testing
- Oscilloscope diagnostics
- Waveform interpretation
- Sensor simulation
- Actuator simulation

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- Power supply diagnostics
 - Communication diagnostics
 - CAN fault diagnosis
 - LIN diagnostics
 - Voltage analysis
 - Thermal fault diagnosis
 - Intermittent fault analysis
 - Structured fault isolation
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Module 6

EEPROM, Flash Memory & ECU Programming

Duration: 5 Weeks

Topics

- Memory technologies
- Reading and writing EEPROM
- Flash memory programming
- Backup procedures
- Data verification
- Checksum awareness
- Boot mode fundamentals
- BDM fundamentals
- Recovery procedures
- Software verification
- Calibration file management

Scope Note: This module emphasizes authorized servicing, data integrity, and OEM-compliant programming. Any bypassing of security controls or unauthorized modification of software is outside the curriculum.

Module 7

Immobilizer, Smart Key & Security Systems

Duration: 5 Weeks

Topics

- Immobilizer architecture

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- Transponder key technology
 - Smart keys
 - Passive keyless entry
 - Push-button start systems
 - Key registration
 - Module synchronization
 - Security coding concepts
 - BCM/ECU integration
 - Customer key management
 - System verification
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Module 8

Vehicle Communication Networks & Module Integration

Duration: 4 Weeks

Topics

- CAN Bus diagnostics
 - LIN Bus diagnostics
 - FlexRay overview
 - Automotive Ethernet overview
 - Gateway modules
 - Network topology
 - Module replacement procedures
 - Module coding concepts
 - Communication fault isolation
 - Network verification
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Module 9

Advanced ECU Repair Projects & Quality Assurance

Duration: 3 Weeks

Topics

Students complete real-world repair projects involving:

- Water-damaged ECUs
- Burnt driver circuits

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- Connector damage
 - PCB trace restoration
 - Power supply failures
 - Output driver failures
 - Verification testing
 - Repair documentation
 - Quality assurance
 - Customer reporting
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Module 10

Industrial Attachment, Capstone Project & Final Assessment

Duration: 2 Weeks

Students complete:

- Supervised electronics repair placement
 - Major ECU repair project
 - Key programming practical assessment
 - Diagnostic case presentation
 - Technical interview
 - Portfolio defense
 - Final written examination
 - Comprehensive practical trade test
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Specialist Laboratories

ATA-E200 requires dedicated laboratories:

1. Automotive Electronics Laboratory
 2. ECU Repair Laboratory
 3. PCB Rework & Micro-Soldering Laboratory
 4. Oscilloscope & Signal Analysis Laboratory
 5. EEPROM & Programming Laboratory
 6. Immobilizer & Smart Key Laboratory
 7. CAN/LIN Network Laboratory
 8. Quality Assurance & Failure Analysis Laboratory
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Essential Training Equipment

Students train with industry-standard equipment such as:

- Digital oscilloscopes
- Precision multimeters
- Laboratory DC power supplies
- Hot-air rework stations
- Soldering stations
- Stereo inspection microscopes
- PCB preheaters
- Logic analyzers
- ECU bench harnesses
- Automotive diagnostic scan tools
- EEPROM/Flash programmers
- Signal generators
- Component testers
- Battery support units

Assessment Structure

Assessment	Weight
Continuous Practical Assessment	35%
Practical Electronics Trade Tests	30%
Written Examinations	15%
Capstone ECU Repair Project	15%
Professional Conduct & Portfolio	5%
TOTAL	100%

Career Path

- ECU repair laboratories
- Automotive diagnostic centers
- Dealership service departments
- Fleet maintenance organizations
- Automotive electronics workshops
- Advanced vehicle technology support