



**Automotive Technical Academy (ATA)**

# Faculty of Automotive Electrical & Electronics



## Curriculum with Course Syllabus

**Department: ECU REPAIR & KEY PROGRAMMING**

**Semester 1-4 | Core Courses + ATA 2040 Electives + SIWES + Capstone with Course Codes (ECU 101-ECU 405)**

### ECU 101 – Workshop Safety & Diagnostic Tools

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	Safety practices for handling sensitive ECUs and electronics.
<b>Syllabus / Topics</b>	• ESD precautions • Diagnostic scanners • Test benches
<b>Practical Activities / Lab Work</b>	• Safe handling drills, oscilloscope use
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Apply ECU safety and tool handling.
<b>Accreditation Mapping</b>	NBTE NID Safety   ASE
<b>AI/Future Module ↘</b>	VR Diagnostic Lab

### ECU 102 – Fundamentals of Automotive Electronics

<b>Credit Hours</b>	<b>3 (2T/1P)</b>
<b>Course Description</b>	Semiconductors, ICs, microcontrollers.
<b>Syllabus / Topics</b>	• Diodes • Transistors • Microcontrollers
<b>Practical Activities / Lab Work</b>	• Build simple microcontroller circuit
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Explain basics of automotive electronics.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI Chip Analyzer



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## ECU 103 – Introduction to Engine Control Units

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	ECU basics, architecture, functions.
<b>Syllabus / Topics</b>	• ECU architecture • Pinouts • Functions
<b>Practical Activities / Lab Work</b>	• Explore ECU pinouts
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Understand ECU architecture and operation.
<b>Accreditation Mapping</b>	NBTE NID   IMI-UK
<b>AI/Future Module ↘</b>	AR ECU Explorer

## ECU 104 – Introduction to Immobilizer & Key Systems

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	Basics of car key systems, RFID, transponders.
<b>Syllabus / Topics</b>	• Immobilizers • RFID • Transponders
<b>Practical Activities / Lab Work</b>	• Key signal test
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Understand key system fundamentals.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI Key Signal Analyzer

## ECU E1 – CAD/Sim for ECU Circuit Boards (Elective)

<b>Credit Hours</b>	<b>2 (0T/2P)</b>
<b>Course Description</b>	Introductory CAD/Simulation for ECU boards.
<b>Syllabus / Topics</b>	• CAD basics • Circuit simulation
<b>Practical Activities / Lab Work</b>	• Design ECU circuit board in CAD
<b>Assessment Methods</b>	Project 100%
<b>Learning Outcomes</b>	Design ECU boards using CAD tools.
<b>Accreditation Mapping</b>	NBTE Elective   IMI-UK
<b>AI/Future Module ↘</b>	CAD Circuit Simulator

## ECU 201 – ECU Diagnostics & Troubleshooting I

<b>Credit Hours</b>	<b>3 (1T/2P)</b>
<b>Course Description</b>	Use of scanners, fault codes, OBD-II.
<b>Syllabus / Topics</b>	• Scanners • DTCs • OBD-II
<b>Practical Activities / Lab Work</b>	• Diagnose sample ECU faults
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Apply ECU diagnostics with OBD-II.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI Code Interpreter



# Automotive Technical Academy (ATA)

## ECU 202 – ECU Hardware Repair I

<b>Credit Hours</b>	<b>3 (1T/2P)</b>
<b>Course Description</b>	Soldering, replacing ICs, repairing circuits.
<b>Syllabus / Topics</b>	• Soldering • IC replacement • Circuit repair
<b>Practical Activities / Lab Work</b>	• Reflow soldering on ECU board
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Repair ECU hardware circuits.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI Rework Trainer

## ECU 203 – Key Programming Fundamentals

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	Immobilizer communication, EEPROM basics.
<b>Syllabus / Topics</b>	• EEPROM • Immobilizer data • Transponders
<b>Practical Activities / Lab Work</b>	• Program EEPROM with key data
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Perform basic key programming tasks.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	Smart EEPROM Trainer

## ECU 204 – ECU Software & Flashing Basics

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	ECU software, firmware, maps.
<b>Syllabus / Topics</b>	• Firmware • Flashing basics • ECU maps
<b>Practical Activities / Lab Work</b>	• Flash ECU with stock file
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Understand ECU software and flashing.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI ECU Map Analyzer

## ECU E2 – AR ECU Circuit Fault Finder (Elective)

<b>Credit Hours</b>	<b>2 (0T/2P)</b>
<b>Course Description</b>	AR troubleshooting of ECU boards.
<b>Syllabus / Topics</b>	• AR simulation • ECU circuits
<b>Practical Activities / Lab Work</b>	• Simulate ECU faults with AR tools
<b>Assessment Methods</b>	Project 100%
<b>Learning Outcomes</b>	Apply AR to troubleshoot ECU circuits.
<b>Accreditation Mapping</b>	NBTE Elective   IMI-UK
<b>AI/Future Module ↘</b>	AR ECU Debugger



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## ECU 301 – SIWES Internship

<b>Credit Hours</b>	<b>6 (0T/6P)</b>
<b>Course Description</b>	Supervised internship in ECU/key programming workshops.
<b>Syllabus / Topics</b>	• Workshop exposure • Logbook
<b>Practical Activities / Lab Work</b>	• Industry-based ECU repairs
<b>Assessment Methods</b>	Supervisor Report 50%   Logbook 30%   Oral 20%
<b>Learning Outcomes</b>	Apply ECU and key programming skills in industry.
<b>Accreditation Mapping</b>	NBTE SIWES   ASE
<b>AI/Future Module ↘</b>	IoT Internship Logbook

## ECU 401 – Capstone Project

<b>Credit Hours</b>	<b>6 (0T/6P)</b>
<b>Course Description</b>	Independent project on ECU/key system innovation.
<b>Syllabus / Topics</b>	• Proposal • Execution • Defense
<b>Practical Activities / Lab Work</b>	• Build AI ECU diagnostic prototype
<b>Assessment Methods</b>	Project 50%   Report 30%   Defense 20%
<b>Learning Outcomes</b>	Plan and execute ECU innovation project.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI ECU Optimization Suite

## ECU 402 – ECU Diagnostics & Troubleshooting II

<b>Credit Hours</b>	<b>3 (1T/2P)</b>
<b>Course Description</b>	Advanced diagnostics, live data analysis.
<b>Syllabus / Topics</b>	• Live data • Advanced DTCs • CAN analysis
<b>Practical Activities / Lab Work</b>	• Diagnose ECU with CAN analyzer
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Interpret ECU live data and CAN signals.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI CAN Analyzer

## ECU 403 – ECU Hardware Repair II

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	Advanced chip-off repairs, micro-soldering.
<b>Syllabus / Topics</b>	• Chip-off • Micro-soldering • BGA repair
<b>Practical Activities / Lab Work</b>	• Perform ECU micro-solder repair
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Repair advanced ECU hardware faults.
<b>Accreditation Mapping</b>	NBTE NID   IMI-UK
<b>AI/Future Module ↘</b>	AI Microsolder Trainer



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### ECU 404 – Advanced Key Programming & Security

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	Smart keys, keyless entry, ECU-key synchronization.
<b>Syllabus / Topics</b>	• Smart keys • Keyless entry • Synchronization
<b>Practical Activities / Lab Work</b>	• Program smart key with tools
<b>Assessment Methods</b>	CA 20%   Practical 40%   Exam 40%
<b>Learning Outcomes</b>	Program smart and advanced key systems.
<b>Accreditation Mapping</b>	NBTE NID   ASE
<b>AI/Future Module ↘</b>	AI Key Security Analyzer

### ECU 405 – Entrepreneurship in ECU & Key Programming Services

<b>Credit Hours</b>	<b>2 (1T/1P)</b>
<b>Course Description</b>	Fundamentals of starting, managing, and scaling ECU/Key programming businesses.
<b>Syllabus / Topics</b>	• Business planning • Pricing models • Customer trust
<b>Practical Activities / Lab Work</b>	• Draft startup business plan
<b>Assessment Methods</b>	CA 20%   Business Plan 40%   Exam 40%
<b>Learning Outcomes</b>	Develop entrepreneurship skills for ECU/key services.
<b>Accreditation Mapping</b>	NBTE NID   IMI-UK
<b>AI/Future Module ↘</b>	AI Business Planner & Market Analyzer

### ECU E3 – Cybersecurity in ECU & Key Systems (Elective)

<b>Credit Hours</b>	<b>2 (0T/2P)</b>
<b>Course Description</b>	Cybersecurity issues in ECU and key systems.
<b>Syllabus / Topics</b>	• Hacking risks • Security principles
<b>Practical Activities / Lab Work</b>	• Simulate ECU/key cyberattack defense
<b>Assessment Methods</b>	Project 100%
<b>Learning Outcomes</b>	Apply cybersecurity in ECU/key systems.
<b>Accreditation Mapping</b>	NBTE Elective   IMI-UK
<b>AI/Future Module ↘</b>	AI Cyberattack Simulator