

AUTOMOTIVE TECHNICAL ACADEMY (ATA)

ATA-AC100

Automotive Cooling Systems Technology

Curriculum Framework (Version 1.0)

Programme Status: Proposed for Approval

Programme Information

Programme Code:

ATA-AC100

Programme Title:

Automotive Cooling Systems Technology

Qualification Level:

Professional Diploma

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**

Training emphasizes workshop competence through real-vehicle diagnostics, servicing, repair, performance testing, and system verification using professional equipment and OEM-informed procedures.

Entry Requirement

Successful completion of:

ATA-E000 – Automotive Electrical & Electronics Foundation

or

Recognition of Prior Learning (RPL) in accordance with ATA admission policy.

Programme Goal

To produce highly competent technicians capable of diagnosing, servicing, repairing, testing, and optimizing automotive engine cooling systems, heating, ventilation and air conditioning (HVAC) systems, climate control electronics, and thermal management systems used in conventional, hybrid, and electric vehicles.

Graduate Competency Profile

Graduates will be able to:

- Diagnose engine overheating and cooling performance faults.
 - Service radiators, water pumps, thermostats, coolant passages, hoses, and expansion tanks.
 - Diagnose electric and mechanically driven cooling fans.
 - Pressure-test cooling systems and identify leaks.
 - Flush, refill, and maintain cooling systems using manufacturer-approved procedures.
 - Diagnose and repair automotive HVAC systems.
 - Recover, recycle, evacuate, and recharge refrigerants using approved service equipment.
 - Service compressors, condensers, evaporators, receivers/driers, accumulators, and expansion devices.
 - Diagnose automatic climate control systems.
 - Test HVAC sensors, actuators, blower motors, and electronic control modules.
 - Understand hybrid and electric vehicle thermal management fundamentals.
 - Perform professional workshop documentation and quality assurance.
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Programme Structure

Module	Title	Weeks	Hours
AC100-01	Thermal Systems Workshop Safety, Professional Practice & Service Equipment	3	120
AC100-02	Engine Cooling Systems & Heat Transfer Principles	6	240

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Module	Title	Weeks	Hours
AC100-03	Cooling System Diagnosis, Pressure Testing & Repair	6	240
AC100-04	HVAC Fundamentals, Refrigeration Principles & Refrigerant Handling	7	280
AC100-05	Automotive Air Conditioning Components & Service Procedures	7	280
AC100-06	Automatic Climate Control, HVAC Electronics & Diagnostics	6	240
AC100-07	Hybrid & Electric Vehicle Thermal Management Systems	4	160
AC100-08	Workshop Management, Environmental Compliance & Quality Assurance	3	120
AC100-09	Integrated Cooling & HVAC Projects	4	160
AC100-10	Industrial Attachment, Capstone Project & Final Assessment	2	80
TOTAL		48 Weeks	1,920 Hours

Module 1

Thermal Systems Workshop Safety, Professional Practice & Service Equipment

Duration: 3 Weeks

Topics

- PPE
- Workshop safety
- Refrigerant handling safety
- Pressure hazards
- Hot coolant hazards
- Environmental responsibilities
- Equipment inspection

- Leak detection safety
- Professional ethics
- Workshop organization

Practical Competencies

Students will:

- Operate cooling and HVAC service equipment safely.
 - Apply environmental protection procedures.
 - Prepare vehicles for thermal system servicing.
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Module 2

Engine Cooling Systems & Heat Transfer Principles

Duration: 6 Weeks

Topics

- Heat transfer fundamentals
- Engine cooling circuits
- Radiators
- Water pumps
- Thermostats
- Coolants
- Expansion tanks
- Hoses
- Cooling fans
- Cooling system design

Practical Competencies

Students will:

- Identify cooling system components.
 - Service engine cooling systems.
 - Replace defective components.
 - Verify proper coolant circulation.
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Module 3

Cooling System Diagnosis, Pressure Testing & Repair

Duration: 6 Weeks

Topics

- Overheating diagnosis
- Pressure testing
- Leak detection
- Combustion gas testing
- Thermostat testing
- Fan operation diagnosis
- Coolant flushing
- Cooling system performance testing

Practical Competencies

Students will:

- Diagnose overheating complaints.
 - Perform pressure and leak tests.
 - Repair cooling system faults.
 - Validate repairs through operational testing.
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Module 4

HVAC Fundamentals, Refrigeration Principles & Refrigerant Handling

Duration: 7 Weeks

Topics

- Refrigeration cycle
- Refrigerants
- Recovery
- Recycling
- Evacuation
- Charging procedures
- Refrigerant oils
- Vacuum systems
- Leak detection
- Environmental regulations

Practical Competencies

Students will:

- Recover refrigerant safely.
- Evacuate systems correctly.
- Recharge systems to specification.

- Verify refrigerant performance.
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Module 5

Automotive Air Conditioning Components & Service Procedures

Duration: 7 Weeks

Topics

- Compressors
- Condensers
- Evaporators
- Expansion valves
- Orifice tubes
- Receiver/driers
- Accumulators
- Blower motors
- Cabin filters
- Performance testing

Practical Competencies

Students will:

- Service A/C components.
 - Replace faulty components.
 - Perform complete HVAC servicing.
 - Verify cooling performance.
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Module 6

Automatic Climate Control, HVAC Electronics & Diagnostics

Duration: 6 Weeks

Topics

- Climate control modules
- Temperature sensors
- Sunload sensors
- Humidity sensors
- Blend door actuators
- Mode door actuators
- Blower control modules

- Scan tool diagnostics
- Fault code analysis
- Functional testing

Practical Competencies

Students will:

- Diagnose electronic HVAC faults.
 - Test sensors and actuators.
 - Configure climate control systems.
 - Validate system operation.
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Module 7

Hybrid & Electric Vehicle Thermal Management Systems

Duration: 4 Weeks

Topics

- Battery thermal management
- Electric coolant pumps
- Power electronics cooling
- Cabin heat pumps
- Thermal control valves
- Integrated thermal management
- High-voltage safety awareness
- Cooling diagnostics

Practical Competencies

Students will:

- Identify EV cooling system components.
 - Inspect thermal management systems.
 - Diagnose basic thermal management faults.
 - Apply safe working procedures around hybrid and EV systems.
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Module 8

Workshop Management, Environmental Compliance & Quality Assurance

Duration: 3 Weeks

Topics

- Job estimation

- Material costing
- Refrigerant records
- Environmental compliance
- Waste management
- Customer communication
- Warranty procedures
- Quality assurance

Practical Competencies

Students will:

- Prepare professional quotations.
 - Maintain service documentation.
 - Record refrigerant usage.
 - Conduct final quality inspections.
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Module 9

Integrated Cooling & HVAC Projects

Duration: 4 Weeks

Students complete comprehensive practical projects including:

- Complete cooling system diagnosis
 - Radiator replacement
 - Water pump replacement
 - Cooling system pressure testing
 - Full refrigerant recovery and recharge
 - Compressor replacement
 - Automatic climate control diagnosis
 - Performance verification and customer handover
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Module 10

Industrial Attachment, Capstone Project & Final Assessment

Duration: 2 Weeks

Students complete:

- Supervised industrial attachment
- Full thermal system diagnosis and repair project
- Practical trade test

- Written examination
 - Technical presentation
 - Portfolio assessment
 - Exit competency assessment
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Required Laboratories & Workshops

- Engine Cooling Systems Laboratory
 - Automotive HVAC Service Workshop
 - Refrigerant Recovery & Charging Laboratory
 - Climate Control Electronics Laboratory
 - Thermal Management Laboratory (Hybrid & EV)
 - Cooling System Pressure Testing Laboratory
 - Quality Inspection & Performance Testing Bay
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Essential Training Equipment

Students should train with:

- Refrigerant recovery, recycling, evacuation, and charging stations
 - Refrigerant identifiers
 - Electronic leak detectors
 - UV dye leak detection kits
 - Vacuum pumps
 - Refrigerant manifolds and hoses
 - Digital thermometers
 - Infrared temperature cameras
 - Cooling system pressure testers
 - Combustion gas testers
 - Coolant refractometers
 - A/C performance analyzers
 - Scan tools with HVAC functions
 - Digital multimeters
 - Automotive oscilloscopes
 - Hybrid/EV thermal management training boards
 - Professional PPE
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Assessment Structure

Assessment	Weight
Continuous Practical Assessment	35%
Practical Trade Tests	30%
Written Examination	15%
Capstone Cooling & HVAC Project	15%
Professional Conduct & Industrial Attachment	5%
TOTAL	100%

Career Opportunities

Graduates may work as:

- Automotive Cooling System Technician
- Automotive Air Conditioning (HVAC) Technician
- Climate Control Diagnostic Technician
- Engine Cooling Specialist
- Hybrid & EV Thermal Management Technician
- Fleet HVAC Maintenance Technician
- Dealership Cooling Systems Technician
- Thermal Systems Technical Instructor
- Workshop Supervisor
- Independent Automotive Cooling & A/C Business Owner