

ATA-E300 CURRICULUM FRAMEWORK

AUTOMOTIVE TECHNICAL ACADEMY (ATA)

ATA-E300

Automotive Cooling Systems

Curriculum Framework (Version 1.0)

Programme Status: Proposed for Locking

Programme Information

Programme Code:

ATA-E300

Programme Title:

Automotive Cooling Systems

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 professional Automotive Thermal Management Technicians capable of diagnosing, servicing, repairing, testing, calibrating, and maintaining engine cooling systems, transmission cooling systems, turbocharger cooling systems, hybrid and EV thermal management systems, and electronically controlled cooling systems using OEM procedures and professional workshop equipment.

Graduate Competency Profile

Graduates shall be able to:

- Diagnose engine overheating.
 - Diagnose engine overcooling.
 - Service cooling systems.
 - Pressure-test cooling systems.
 - Diagnose coolant leaks.
 - Repair radiators.
 - Replace radiator cores.
 - Service water pumps.
 - Diagnose thermostat faults.
 - Service cooling fans.
 - Diagnose fan control modules.
 - Diagnose coolant temperature sensors.
 - Service heater systems.
 - Flush contaminated cooling systems.
 - Select correct coolant specifications.
 - Diagnose transmission oil coolers.
 - Diagnose turbocharger cooling systems.
 - Diagnose intercooler systems.
 - Diagnose electronic cooling controls.
 - Perform cooling system performance testing.
 - Produce professional diagnostic reports.
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Programme Structure

Module	Title	Weeks	Hours
E300-01	Thermal Management Fundamentals & Workshop Safety	3	120
E300-02	Engine Cooling System Components & Operation	6	240
E300-03	Radiators, Water Pumps & Coolant Flow Systems	7	280
E300-04	Cooling Fans, Electronic Controls & Sensors	6	240
E300-05	Heating, HVAC Coolant Circuits & Auxiliary Cooling Systems	5	200
E300-06	Transmission, Oil, Turbocharger & Charge-Air Cooling Systems	5	200
E300-07	Hybrid & Electric Vehicle Thermal Management	5	200
E300-08	Advanced Cooling System Diagnostics & Performance Testing	5	200
E300-09	Cooling System Repair Projects & Quality Assurance	3	120
E300-10	Industrial Attachment, Capstone Project & Final Assessment	3	120
TOTAL		48 Weeks	1,920 Hours

Module 1

Thermal Management Fundamentals & Workshop Safety

Duration: 3 Weeks

Topics

- Heat transfer principles
- Conduction, convection and radiation
- Engine operating temperatures
- Thermal efficiency
- Cooling system safety
- Pressure hazards
- Hot coolant handling

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- Workshop PPE
 - Environmental management
 - Coolant recovery and recycling
 - Professional workshop procedures
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Module 2

Engine Cooling System Components & Operation

Duration: 6 Weeks

Topics

- Cooling system design
 - Liquid-cooled engines
 - Air-cooled engines
 - Coolant circulation
 - Radiators
 - Water jackets
 - Expansion tanks
 - Pressure caps
 - Thermostats
 - Bypass circuits
 - Coolant passages
 - Hose systems
 - Coolant specifications
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Module 3

Radiators, Water Pumps & Coolant Flow Systems

Duration: 7 Weeks

Topics

- Radiator construction
- Aluminium radiators
- Plastic tank radiators
- Cross-flow radiators
- Down-flow radiators
- Water pump construction

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- Mechanical pumps
 - Electric coolant pumps
 - Coolant flow analysis
 - Cavitation
 - Pressure testing
 - Radiator repair
 - Radiator replacement
 - Leak detection
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Module 4

Cooling Fans, Electronic Controls & Sensors

Duration: 6 Weeks

Topics

- Mechanical cooling fans
 - Electric cooling fans
 - Fan motors
 - Fan relays
 - Fan control modules
 - PWM fan control
 - Engine coolant temperature sensors
 - Cylinder head temperature sensors
 - Thermostatic switches
 - Electronic thermostats
 - Cooling system wiring
 - Scan tool diagnostics
 - Live data interpretation
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Module 5

Heating, HVAC Coolant Circuits & Auxiliary Cooling Systems

Duration: 5 Weeks

Topics

- Heater core systems
- Blend door operation

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- Heater control valves
 - Auxiliary coolant pumps
 - Cabin heating circuits
 - Defrost systems
 - Rear heater systems
 - Coolant routing
 - HVAC coolant diagnostics
 - Heater performance testing
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Module 6

Transmission, Oil, Turbocharger & Charge-Air Cooling Systems

Duration: 5 Weeks

Topics

- Automatic transmission oil coolers
 - Engine oil coolers
 - Turbocharger cooling
 - Intercoolers
 - Charge-air coolers
 - EGR coolers
 - Heat exchangers
 - Thermal protection strategies
 - Cooling efficiency analysis
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Module 7

Hybrid & Electric Vehicle Thermal Management

Duration: 5 Weeks

Topics

- Battery cooling systems
- Battery heating systems
- Inverter cooling
- Electric motor cooling
- Power electronics cooling
- Heat pumps (overview)

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- Refrigerant-assisted battery cooling (overview)
 - Multi-loop thermal management
 - Coolant isolation principles
 - EV safety precautions
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Module 8

Advanced Cooling System Diagnostics & Performance Testing

Duration: 5 Weeks

Topics

- Pressure testing
 - Combustion gas leak testing
 - Infrared temperature measurement
 - Thermal imaging (introduction)
 - Coolant flow testing
 - Water pump efficiency testing
 - Cooling fan diagnostics
 - Live data analysis
 - Overheating diagnosis
 - Repeat-failure analysis
 - OEM diagnostic procedures
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Module 9

Cooling System Repair Projects & Quality Assurance

Duration: 3 Weeks

Students complete real workshop projects involving:

- Radiator replacement
- Water pump replacement
- Thermostat replacement
- Cooling fan repair
- Coolant contamination diagnosis
- Cylinder head gasket symptom analysis
- Leak detection
- Cooling system flushing

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- Performance verification
 - Customer documentation
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Module 10

Industrial Attachment, Capstone Project & Final Assessment

Duration: 3 Weeks

Students complete:

- Supervised industrial placement
 - Comprehensive cooling system diagnosis
 - Thermal management project
 - Practical trade test
 - Technical presentation
 - Portfolio defence
 - Final written examination
 - Exit competency assessment
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Specialist Laboratories

ATA-E300 requires dedicated laboratories:

1. Engine Cooling Systems Laboratory
 2. Radiator & Heat Exchanger Workshop
 3. Cooling System Diagnostics Laboratory
 4. Thermal Testing Laboratory
 5. Electronic Cooling Control Laboratory
 6. HVAC Coolant Systems Laboratory
 7. Hybrid & EV Thermal Management Laboratory
 8. Quality Assurance & Failure Analysis Laboratory
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Essential Training Equipment

Students train with professional equipment including:

- Cooling system pressure testers
- Vacuum coolant refill machines
- Coolant flushing machines
- Radiator flow testers

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- Cooling system leak detectors
- Infrared thermometers
- Thermal imaging cameras
- Scan tools
- Digital multimeters
- Oscilloscopes (for electronic fan controls)
- Combustion gas testers
- Cooling fan test benches
- Electric coolant pump test rigs

Assessment Structure

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

Careers Path:

- Automotive service dealerships
- Heavy-duty vehicle workshops
- Radiator and heat exchanger specialists
- Fleet maintenance organizations
- Industrial engine maintenance
- Hybrid and EV service centres
- Thermal management system support