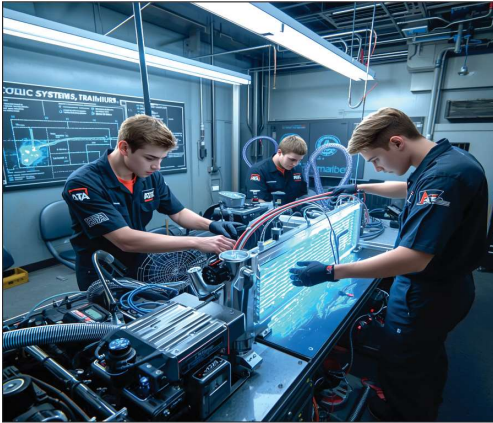




Faculty of Automotive Electrical & Electronics



Curriculum with Course Syllabus

Department: COOLING SYSTEM

Semester 1-4 | Core Courses + ATA 2040 Electives + SIWES + Capstone with Course Codes (CLS 101-CLS 404)

CLS 101 – Workshop Safety & Cooling Tools

Credit Hours	2 (1T/1P)
Course Description	Safety in handling coolant, refrigerants, and cooling tools.
Syllabus / Topics	• PPE • Pressure gauges • Coolant flushing tools
Practical Activities / Lab Work	• Coolant flush & refill
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Apply safety measures in cooling system handling.
Accreditation Mapping	NBTE NID Safety ASE
AI/Future Module ↘	VR Safety Lab

CLS 102 – Fundamentals of Heat Transfer

Credit Hours	3 (2T/1P)
Course Description	Thermodynamics principles of conduction, convection, radiation.
Syllabus / Topics	• Heat transfer modes • Thermodynamics basics
Practical Activities / Lab Work	• Heat transfer experiments
Assessment Methods	CA 20% Practical 40% Exam 40%



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Learning Outcomes	Explain and demonstrate heat transfer principles.
Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	AI Heat Transfer Simulator

CLS 103 – Automotive Cooling System Basics

Credit Hours	2 (1T/1P)
Course Description	Radiators, hoses, thermostats, fans.
Syllabus / Topics	• Radiators • Thermostats • Cooling fans
Practical Activities / Lab Work	• Radiator inspection & service
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Understand and service basic cooling systems.
Accreditation Mapping	NBTE NID IMI-UK
AI/Future Module ↘	AR Cooling System Visualizer

CLS 104 – Fluids & Refrigerants I

Credit Hours	2 (1T/1P)
Course Description	Properties of coolants, refrigerants, safety protocols.
Syllabus / Topics	• Coolant properties • Refrigerant safety
Practical Activities / Lab Work	• Coolant/refrigerant testing
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Identify and handle fluids and refrigerants safely.
Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	Smart Fluid Analyzer

CLS E1 – CAD Radiator Design Basics (Elective)

Credit Hours	2 (0T/2P)
Course Description	Basics of CAD radiator and cooling system design.
Syllabus / Topics	• CAD basics • Radiator modeling
Practical Activities / Lab Work	• Create CAD radiator design
Assessment Methods	Project 100%
Learning Outcomes	Apply CAD to cooling system design.
Accreditation Mapping	NBTE Elective IMI-UK
AI/Future Module ↘	CAD Cooling System Designer

CLS 201 – Water Pumps & Circulation Systems

Credit Hours	3 (1T/2P)
Course Description	Design and function of water pumps and circulation paths.



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Syllabus / Topics	• Water pump design • Circulation principles
Practical Activities / Lab Work	• Disassembly & rebuild of water pump
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Service and rebuild water pumps.
Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	AI Flow Analyzer

CLS 202 – Advanced Cooling System Components

Credit Hours	3 (1T/2P)
Course Description	Expansion tanks, pressure caps, heater cores.
Syllabus / Topics	• Expansion tanks • Pressure caps • Heater cores
Practical Activities / Lab Work	• System leak testing
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Diagnose advanced cooling system components.
Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	AR Component Analyzer

CLS 203 – Air Conditioning Systems I

Credit Hours	2 (1T/1P)
Course Description	Fundamentals of AC cycles, compressors, condensers.
Syllabus / Topics	• AC cycles • Compressors • Condensers
Practical Activities / Lab Work	• AC compressor servicing
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Understand and service basic AC systems.
Accreditation Mapping	NBTE NID IMI-UK
AI/Future Module ↘	Smart AC Diagnostic Tool

CLS 204 – Sensors & Actuators in Cooling Systems

Credit Hours	2 (1T/1P)
Course Description	Temp sensors, fans, actuators.
Syllabus / Topics	• Temperature sensors • Fans • Actuators
Practical Activities / Lab Work	• Test fan relay and sensor outputs
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Test and service sensors/actuators in cooling systems.
Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	IoT Cooling Sensor Analyzer



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CLS E2 – AR AC System Troubleshooting (Elective)

Credit Hours	2 (0T/2P)
Course Description	AR-based diagnosis of AC system faults.
Syllabus / Topics	• AR simulation • AC circuits
Practical Activities / Lab Work	• Simulate AC troubleshooting
Assessment Methods	Project 100%
Learning Outcomes	Use AR for AC troubleshooting.
Accreditation Mapping	NBTE Elective IMI-UK
AI/Future Module ↘	AR AC Fault Finder

CLS 301 – SIWES Internship

Credit Hours	6 (0T/6P)
Course Description	Six-month supervised internship in cooling/AC workshops.
Syllabus / Topics	• Workshop training • Supervisor reports
Practical Activities / Lab Work	• On-the-job diagnostics and repair
Assessment Methods	Supervisor Report 50% Logbook 30% Oral 20%
Learning Outcomes	Apply practical cooling/AC system repair skills.
Accreditation Mapping	NBTE SIWES ASE
AI/Future Module ↘	IoT Internship Logbook

CLS 401 – Capstone Project

Credit Hours	6 (0T/6P)
Course Description	Independent project in cooling/AC innovation.
Syllabus / Topics	• Proposal • Execution • Defense
Practical Activities / Lab Work	• Design smart AC or predictive cooling system
Assessment Methods	Project 50% Report 30% Defense 20%
Learning Outcomes	Plan and execute innovation project in cooling/AC systems.
Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	AI Cooling Optimizer

CLS 402 – Advanced Air Conditioning Systems II

Credit Hours	3 (1T/2P)
Course Description	HVAC integration, multi-zone climate systems.
Syllabus / Topics	• HVAC systems • Climate control
Practical Activities / Lab Work	• Diagnose HVAC system faults
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Service advanced HVAC systems.



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Accreditation Mapping	NBTE NID ASE
AI/Future Module ↘	AI HVAC Simulator

CLS 403 – Hybrid & EV Cooling Systems

Credit Hours	2 (1T/1P)
Course Description	Cooling for batteries, inverters, motors.
Syllabus / Topics	• EV battery cooling • Inverter cooling • Motor cooling
Practical Activities / Lab Work	• Inspect EV cooling circuits
Assessment Methods	CA 20% Practical 40% Exam 40%
Learning Outcomes	Service EV cooling systems.
Accreditation Mapping	NBTE NID IMI-UK
AI/Future Module ↘	AI EV Cooling Analyzer

CLS 404 – Entrepreneurship in Cooling & AC Services

Credit Hours	2 (1T/1P)
Course Description	Business development in AC and cooling workshops.
Syllabus / Topics	• Business setup • Customer service • Pricing models
Practical Activities / Lab Work	• Draft business plan for cooling/AC service
Assessment Methods	CA 20% Business Plan 40% Exam 40%
Learning Outcomes	Develop entrepreneurship skills in cooling/AC services.
Accreditation Mapping	NBTE NID IMI-UK
AI/Future Module ↘	AI Business Planner

CLS E3 – Smart AC & Climate Control Systems (Elective)

Credit Hours	2 (0T/2P)
Course Description	Smart AC and climate control innovations.
Syllabus / Topics	• Smart AC • Climate control integration
Practical Activities / Lab Work	• Simulate smart AC system
Assessment Methods	Project 100%
Learning Outcomes	Design smart AC and climate control solutions.
Accreditation Mapping	NBTE Elective IMI-UK
AI/Future Module ↘	AI Smart Climate Trainer