



**MCAST**

**MQF Level 4**

**MV4-A7-21**

**Advanced Diploma in Light Vehicle Maintenance  
Course Specification**

## **Course Description**

This qualification is for candidates wanting to develop some of the essential skills and understanding in motor vehicle systems. Students will be able to identify hazards and risks in the automotive environment and work safely with equipment, materials and products.

Students should also gain a good knowledge of tools and measuring devices as well as routine light vehicle maintenance. Students will be expected to develop an understanding of the construction and operation of common steering, suspension engines and all important systems (including mechanical and electrical) as well as procedures involved in the inspection, serviceability, adjustments, removal and replacement of components and the evaluation of their performance.

Applicants coming in through the 0-Level route may be requested to complete an additional Level 4 preparatory year if they do not already have prior exposure and experience within the area in question. This course includes work-related training and practice. Applicants have to be able to work within the industries concerned.

## **Programme Learning Outcomes**

At the end of the programme the learner will be able to:

- 1. Work effectively within the organisational structure of the automotive work environment*
- 2. Work safely when carrying out light vehicle engine diagnostic and rectification activities*
- 3. Understand how light vehicle transmission and driveline systems operate*
- 4. Understand how light vehicle auxiliary electrical systems operate*

## **Entry Requirements**

MCAST Diploma in Automotive Light Vehicle Servicing  
or  
MCAST Diploma in Mechanical Engineering  
or  
MCAST Diploma in Aircraft Maintenance  
or  
4 SEC O-levels/SSC&P (Level 3) passes

Compulsory: One subject from Mathematics or Physics, and one subject from Engineering Technology, Design and Technology, Chemistry, Mathematics or Physics.

### **Other Entry Requirement**

Applicants may be required to undergo an aptitude test/interview before being accepted to join the course.

### **Current Approved Programme Structure**

<b>Unit Code</b>	<b>Unit Title</b>	<b>ECVET/ECTS</b>	<b>Year</b>
ETAUT-403-1501	Contribute to Housekeeping in a Motor Vehicle Environment	3	1
ETH&S-406-1507	Reduce the Risks in Health and Safety in Motor Vehicle Environments	3	1
ETAUT-403-1502	Maintain Working Relationships in Motor Vehicle Environments	3	1
ETAUT-403-1503	Use of Tools and Equipment in Motor Vehicle Engineering	3	1
ETAUT-406-1504	Vehicle Technology-Mechanical Systems	6	2
ETAUT-406-1505	Inspect Light Vehicles	6	1
ETAUT-406-1506	Carry Out Routine Vehicle Maintenance	6	1
ETAUT-406-1507	Diagnose and Rectify Light Vehicle Engine and Component Faults	6	3
ETAUT-406-1508	Diagnose and Rectify Faults on the Systems found on Light Vehicles	6	3
ETAUT-406-1509	Diagnose and Rectify Light Vehicle Electrical Unit Engine and Component Faults	6	3
ETAUT-406-1510	Overhaul Light Vehicle Engine Units	6	3
ETAUT-406-1511	Remove and Fit basic MET components and Non Permanently Fixed Motor Vehicle Body Panels	6	1
ETAUT-406-1512	Vehicle Technology-Electrical and Electronic Systems	6	2
ETAUT-406-1513	Overhaul Light Vehicle Mechanical Units	6	2
ETAUT-406-1514	Overhaul Light Vehicle Electrical and Auxiliary Systems	6	2
ETAUT-406-1515	Workshop Practice	6	2

ETAUT-406-1801	Vehicle Technology-Engine Management Systems	6	3
ETAUT-406-1516	Diagnose and Rectify Transmission and Drive line System Faults	6	3
CDKSK-406-2007	Mathematics	6	1
CDKSK-406-2001	English	6	1
CDKSK-404-1915	Employability and Entrepreneurial Skills	4	3
CDKSK-402-2104	Community Social Responsibility	2	3
ETCMP-406-1604	Vocational Competences in LV Maintenance	6	2&3
Total ECVET/ECTS		120	

## ETAUT-403-1501 Contribute to Housekeeping in Motor Vehicle Environment

Unit level (MQF): 4  
Credits : 3

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### Unit Description

This unit will provide the required underpinning knowledge to carry out and maintain housekeeping within a motor vehicle environment.

The learner will know how to interpret legislation pertaining to health and safety within the workplace and know their own and their employers' responsibilities. They will also know the procedure of reporting errors or defects in order to maintain a safe environment.

Learners will understand the hazards in the workplace, such as slips, trips and falls and will be able to determine what is required of them so that they can develop a plan of operation in order to maintain the working environment to the required safety standard

Furthermore they will be able to understand Care of Substances legislation and be able to identify what is a hazardous substance.

This unit will also give the underpinning knowledge on the use, protection and storage of materials including those hazardous to health and establish confidence in using these materials.

The learner will be able to assess and use skills in manual handling and give the underpinning knowledge for the delegate to assess the risks in manual handling. The learner will be able to assess a situation whether lifting, pulling or pushing and take the action required to complete the task.

### Learning Outcomes

On completion of this unit the learner will be able to:

1. *Explain the legislation and the duties of everyone within a motor vehicle repair environment.*
2. *Perform routine maintenance of a work area within a Motor Vehicle repair environment.*
3. *Explain the legislation of the Care of Substances Hazardous to Health (COSHH)*
4. *Perform a manual handling assessment and operation.*

## **ETH&S-406-1507 Reduce the Risks in Health and Safety in Motor Vehicle Environment**

**Unit level (MQF):** 4  
**Credits:** 3

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### **Unit Description**

This unit will provide the underpinning knowledge to understand and apply when required, risk assessments in a motor vehicle environment.

Learners will be able to assess conditions and carry out individual risk assessments before commencing any unfamiliar work. It is therefore intended to provide the underpinning knowledge on all the health and safety issues that may arise in the work area.

It explains safety regulations relating to noise in the workplace so that the learner can follow guidelines already in place or assess their own situation when carrying out an operation when Personal Protective Equipment (PPE) and warning others may be a consideration.

It provides guidance on accident prevention, alarms and evacuation procedures and highlights the risks associated with fire, explosion and other risks that may occur in a motor vehicle environment.

Vehicle movement is explained and how it must be controlled in a motor vehicle environment highlighting the importance to follow guidelines already in place. This will give the learners the required skills to determine what is required of them and they can develop a plan of operation in order to maintain best working practices in their working. It will furthermore give the underpinning knowledge to enable the learner to assess and, if required, plan or suggest vehicle movement reviews.

It presents the underpinning knowledge for the delegate to assess PPE so that the risks in this area can be assessed and controlled. Where required the learner will be able to select, assess, use and review any PPE required for a particular task.

### **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Contribute to the safe running of the motor vehicle environment.*
- 2. Perform individual risk assessment in a motor vehicle environment.*
- 3. Explain how to prevent accidents in the motor vehicle environment.*
- 4. Use Personal Protective Equipment when required to do so.*

## ETAUT-403-1502 Maintain Working Relationships in Motor Vehicle Environments

Unit level (MQF): 4  
Credits: 3

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### Unit Description

This unit will provide the required underpinning knowledge for the learner to establish their role in the organisation. They will identify the organisational structure and define clear roles within the organisation and the departments within it.

It will allow the learner to establish a positive working relations with their colleagues, between departments and set up clear lines of communication. This will work toward good customer care by defining operating standards for general operations and reporting additional work or delays.

It will allow the learner to communicate directly with customers, highlight the importance of first impressions and portraying a good personal and company image. It will furthermore underpin why good customer handling is important when dealing with customer requests. It will also provide instruction and confirm the learners understanding of documentation used in the different departments. It will explain the correct recording methods when working with warranty, retail and internal repair orders. It will also provide guidance in finding and correctly using manufacturer information such as safety and service bulletins, manuals and specification information.

Together it will give an understanding of customer needs and expectations so that servicing and repairs can be carried out effectively. It will also highlight the need for everyone within an organisation to play a positive role in retaining customer loyalty. Explain their company structure and know why their position in the company is important.

### Learning Outcomes

On completion of this unit the learner will be able to:

1. *Describe why effective communication between departments, colleagues and others is important.*
2. *Describe how effective customer communication will lead to fulfilling customer expectations.*
3. *Use documentation available in the working environment to support your job role and promote effective communication.*

## **ETAUT-403-1503 Use of Tools and Equipment in Motor Vehicle Engineering**

**Unit level (MQF):** 4  
**Credits:** 3

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### **Unit Description**

This unit will provide the required underpinning knowledge required to understand and apply when required, the use of tools and equipment in vehicle engineering.

It will provide underpinning knowledge for the use of personal protective equipment required with certain tools and equipment. Where required the learner will be able to select, assess, use and review any PPE required for a particular task.

Learners will be able to assess hand tool condition and be aware of the common misuse in using these tools. They will be able to select the correct tool for the correct application and use them correctly.

The unit will provide guidance on the use of gasket material and sealer and its correct application. The learner will know what to use and the limitations of products used in vehicle engineering.

The use of electrical equipment will be a part of the unit providing guidance and practice in the use of electrical equipment commonly used in vehicle engineering. Furthermore air tools and there use will also be provided.

In some instances special tools will have to be used along with normal tools and equipment used in vehicle repair and rectification. The learner will be able to establish when to use such tools in order to complete the task.

Electrical diagnosis will be introduced with the underpinning knowledge of multi meters, amps clamps and battery and charging system equipment being provided. Measuring equipment will be used and skills already gained in reading micrometres, Vernier gauges and dial gauges will be confirmed.



## Learning Outcomes

On completion of this unit the learner will be able to:

1. *Use hand tools and equipment safely in vehicle engineering.*
2. *Select, use and maintain common hand tools used in motor vehicle engineering.*
3. *Select, use and maintain equipment and materials used in motor vehicle engineering.*
4. *Select, use and maintain different measuring devices used in motor vehicle engineering.*

## ETAUT-406-1504 Vehicle Technology Mechanical Systems

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit will provide the required underpinning knowledge for the technician to examine new technology being developed for different systems in a modern vehicle and will give support for further training where required.

It will provide information on new configurations in engine design to include cylinder configurations and the pros and cons of new designs. It will examine new cylinder head design and how the drive mechanisms for the valve assembly have changed.

Variable valve timing developments will be explored and how they are changing the power output and the emissions in our small engines. Furthermore, it will explain how multi lift and multi air valve systems are now being used.

The means of fuel mixture is changing and this unit will provide underpinning knowledge of the new systems, in petrol and diesel technology. It will give an understanding of how fuel systems and alternatives to petrol have developed and their application in the modern dealership.

This unit will identify different steering systems now used and how they have revolutionised options and accessories now available. Such as self-parking, line departure warnings and stability controls.

It will explain the development in suspension and braking systems and how this has changed the safety features now available on a vehicle.

It will allow the technician to recognise and operate different systems in a variety of manufacturers' vehicles and be able to find specific information to aid repair and diagnosis of these systems.

With this technology comes new safety concerns, these are identified and explained fully so that any technician working on these systems will be aware of the hazards and the correct working procedures.

## Learning Outcomes

On completion of this unit the learner will be able to:

1. *Explain how technology has changed in modern vehicle mechanical systems.*
2. *Identify evolving technology in different vehicle systems.*
3. *Explain the technology now used in transmission and drivetrain.*
4. *Explain how different vehicle systems operate to assist in diagnosis.*

## ETAUT-406-1505 Inspect Light Vehicles

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit will provide the underpinning knowledge required to perform light vehicle inspections and explain where to find and use the specifications required in order to evaluate systems and components.

The unit will explain the different types of inspections that can be carried out and how vehicles and systems should be inspected.

The correct routine to inspect vehicles will be discussed and practiced in order to make inspections efficient, furthermore work identified should be followed up by the correct means. Ensuring vehicles stay safe and service related items are identified prior to failure.

Air conditioning basics and systems will be explained to provide underpinning knowledge in order to inspect them.

Braking systems, steering and suspension system inspections will be explained including damage inspections. Exterior checks on bodywork and paint and how they should be recorded will also be a part of this unit.

The unit will explain the documentation used and how check sheets and repair orders should be completed to record findings.

The unit will also cover specifications and means of measuring or estimating wear on system components. How to find the specifications for torque, oils, fluids and lubricants. How we can check performance related issues, such as exhaust emissions, engine idle and performance, start stop system, transmissions both manual and automatic.

Inspections on clutches and torque convertors as well as semi-automatic transmission inspections.

The learner will have the underpinning knowledge to carry out a variety of vehicle inspections in their workplace where this knowledge can be assessed and understanding confirmed.

## Learning Outcomes

On completion of this unit the learner will be able to:

1. *Work safely while carrying out light vehicle inspections.*
2. *Use different types of inspections to inspect a light vehicle.*
3. *Use documentation to support inspections on light vehicles.*
4. *Use the correct process and procedures when inspecting light vehicles.*

## ETAUT-406-1506 Carry Out Routine Vehicle Maintenance

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit will provide the underpinning knowledge for the technician to carry out routine maintenance on vehicles, vehicle systems and components.

It will provide information on the various types of routine maintenance and guidance on the tools and equipment required.

This unit should run sequentially from unit Inspect Light Vehicles as knowledge of inspections prior to routing maintenance is essential.

The unit will explain the preparation required before conducting routine maintenance and its influence in efficiency and cost. Knowledge of using tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will know the properties of oils and fluids used in a light vehicle in order to diagnose degradation of these properties during replenishment. Furthermore knowledge already gained on the correct disposal procedures will be confirmed.

Filters and other systems used to maintain light vehicle systems will be explained so that the learner will understand the reasons for changing or upgrading these systems.

They will be able to replace components during routine maintenance and carry out adjustments whenever necessary.

The learner will understand the customers' expectations and whenever possible exceed these.

They will understand the instructions on repair orders and react to ID codes used by some manufacturers. Diagnostic equipment will be used to obtain system information and if required provide updates in software as part of routine maintenance.

Service schedules and check lists will be followed and completed before, during and after routine maintenance in compliance with manufacturer recommendations.

The learner will have an understanding of the reporting procedures to report any other work required, other than routine or any delays they may have encountered. They will understand the need for time scales and relation to profit.

The tie between warranty and routine maintenance will be explained and the learner will understand the need for record keeping in the form of service records for maintenance and bodywork.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely while carrying out routine maintenance.*
- 2. Use processes and procedures when carrying out routine maintenance.*
- 3. Maintain vehicle systems and components routinely.*
- 4. Use information sources and documentation used for routine maintenance.*

## **ETAUT-406-1507 Diagnose and rectify Light Vehicle Engine and Component Faults**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit will provide the underpinning knowledge for the technician to carry out diagnosis and rectification on engines, engine systems and components.

It will provide information on the engine management system and how the sensors and actuators operate in order to maintain efficiency and performance. Furthermore, it will provide knowledge of the sensor and actuator properties in order to support diagnosis.

Engine fault codes generated from the various engine systems will be explained and how they can assist in diagnosis. The unit will further explain live data available from the engine components and how to evaluate this data against vehicle specifications. The unit will confirm understanding of engine and engine systems operation already gained and will show common faults found in these systems. Equipment used in mechanical fault diagnosis will be explained and practiced by the learner in order to provide the required skills in diagnosing internal combustion faults. This will give the underpinning knowledge for the learner to recommend further internal examination, rectification or replacement of engines and engine systems.

Other external systems will be explained and investigated such as induction and exhaust systems used to enhance performance and lower emissions. This will include turbochargers and intercooler systems now used with almost all compression ignition engines and now more often with spark ignition.

Both spark ignition normally and turbo aspirated engines will be explained as well as turbo aspirated compression ignition engines, including high and low pressure fuel systems for both.

The tie between warranty, diagnosis and rectification will be explained. They will understand the instructions on repair orders and react to ID codes used by some manufacturers.

The unit will explain the preparation required before conducting any diagnosis and rectification and its influence in efficiency and cost. The learner will be able to estimate time realistic time scales for rectification.



Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge can be confirmed.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely while carrying out diagnosis and repair on engines.*
- 2. Perform diagnosis and rectification on engine units.*
- 3. Perform diagnosis and rectification on spark ignition engine systems.*
- 4. Perform diagnosis and repair on compression ignition engine systems.*

## **ETAUT-406-1508 Diagnose and Rectify Faults on Systems found in Light Vehicles**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit provides the required underpinning knowledge for the technician to carry out diagnosis and rectification on chassis systems and components. It will provide the basics in vehicle diagnosis and will highlight procedures used in diagnostics against the subject matter.

The unit will confirm understanding of chassis systems operation already gained and will give guidance on diagnosing, rectifying or replacing system components. Diagnosis methods and equipment will be explained and demonstrated, then practiced by the learner. It will also give the required underpinning knowledge in order for the learner to recommend further examination, rectification or replacement of chassis system components. The tie between warranty, diagnosis and rectification will also be explained.

The unit will provide knowledge of braking systems and brake efficiency to support diagnostics. Furthermore the rectification or replacement of braking system components will be explained, demonstrated and performed by the learner. The unit will explain the operation, diagnosis and rectification of other braking systems normally offered as options on different specifications of vehicles.

Steering geometry will be explained and the measures taken to eliminate roll, warp, pitch and heave in different types of light vehicles. Wheels and tyres will also be explained, the legal requirement and using the condition of tyres as an aid to diagnosis.

It will provide the underpinning knowledge for the learner to use four-wheel alignment equipment. To measure steering angles and calculate the different units of measurement used.

They will understand the instructions on repair orders and react to ID codes used by some manufacturers. Diagnostic equipment will be used to obtain system data. The unit will explain the preparation required before conducting any diagnosis and rectification and its influence in efficiency and cost. The learner will be able to estimate realistic time scales for rectification.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge can be confirmed.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely while carrying out diagnosis and repair on chassis systems.*
- 2. Carry out diagnosis and rectification in steering and suspension systems.*
- 3. Carry out diagnosis and rectification in braking systems.*
- 4. Explain steering geometry and the equipment used and how wheels and tyres would affect vehicle stability and performance.*

## **ETAUT-406-1509 Diagnose and Rectify Light Vehicle Electrical Unit and Component Faults**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit provides the required underpinning knowledge for the technician to carry out diagnosis and rectification on engine electronic systems and components. It will provide the basics in vehicle diagnosis and will highlight procedures used in diagnostics against the subject matter.

The unit will confirm understanding of engine electrics already gained and will give guidance on diagnosing, rectifying or replacing system components. Diagnostic methods and equipment will be explained and demonstrated, then practiced by the learner. It will also give the required underpinning knowledge in order for the learner to recommend further examination, rectification or replacement of engine electrical system components. The tie between warranty, diagnosis and rectification will also be explained.

The unit will confirm knowledge of basic electrics and will provide further underpinning knowledge on how the basics are used in vehicle electrical circuits, using resistors and semi-conductors to control voltage.

A logical approach will be explained and demonstrated and this will be the basis for future units where this approach can be adopted. The unit will give guidance on the battery and the charging system, explaining the operation and the methods of diagnosing common faults with these systems. Furthermore the starting system will be explained, the components, their operation and the diagnostics and rectification required for that system.

It will also provide knowledge on the cooling fan systems now being used and how pulse width modulation has been used as opposed to a simple on and off version.

They will understand the instructions on repair orders and react to ID codes used by some manufacturers. Diagnostic equipment will be used to obtain system data.

The unit will explain the preparation required before conducting any diagnosis and rectification and its influence in efficiency and cost. The learner will be able to estimate realistic time scales for rectification.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge can be confirmed.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely while carrying out diagnosis and repair on engine electrical systems.*
- 2. Use basic electrical knowledge to aid engine electrical unit diagnosis.*
- 3. Carry out diagnosis and rectification on the starting and charging system.*
- 4. Carry out diagnosis and rectification on the battery and cooling fan system.*

## ETAUT-406-1510 Overhaul Light Vehicle Engine Units

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit provides the underpinning knowledge for the technician to carry out diagnosis and rectification on engine units and its components. The unit will explain the preparation required before conducting any work on the engine unit and its influence in efficiency and cost.

It will explain the process and the procedures to remove the engine unit, and in some cases the transmission unit from the vehicle.

It will provide guidance on the removal of the cylinder head assembly from the engine and the knowledge required to evaluate the cylinder head condition.

The unit will provide the underpinning knowledge to dismantle, examine and assess cylinder head components and furthermore will provide guidance on measuring, assessing and servicing cylinder head components prior to and during assembly.

It will explain the crankcase assembly and its components, measuring, assessing and calculating the engine block and the crankcase components.

It will provide the basics in vehicle diagnosis and will highlight procedures used in diagnostics against the subject matter.

The unit will confirm understanding of engine units and components already gained, diagnostic methods and equipment will be explained and demonstrated, then practiced by the learner.

They will understand the instructions on repair orders and react to ID codes used by some manufacturers. Diagnostic equipment will be used to obtain system data and bring the engine unit back into service.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge can confirmed.

## Learning Outcomes

On completion of this unit the learner will be able to:

1. *Work safely while carrying out diagnosis and repair on engine units.*
2. *Remove the engine unit and transmission from the vehicle.*
3. *Dismantle and assess the cylinder head assembly and components.*
4. *Dismantle and assess the crankcase assembly and components.*

## **ETAUT-406-1511 Remove and Fit Basic Electrical and Trim (MET) Components and Non-Permanently Fixed Motor Vehicle Body Panels**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit provides the underpinning knowledge for the technician to carry out removing, refitting and testing mechanical, electrical and body related equipment to support bodywork repairs.

The unit will explain the preparation required before conducting any work on the vehicle and its influence in efficiency and cost.

It will provide guidance on the removal of exterior and interior trim, including assemblies such as heating and ventilation systems, electric windows and door mirrors.

Lighting systems and components will be removed, refitted and rectified where necessary and guidance will be provided for systems such as Xenon HD lighting.

The unit will confirm understanding of mechanical and electrical components already gained; diagnostic methods and equipment will be explained and demonstrated, then practiced by the learner.

They will understand the instructions on repair orders and react to ID codes used by some manufacturers.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge can confirmed.

### **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely when working on light vehicles.*
- 2. Carry out quality checks when working on light vehicles.*
- 3. Carry out electrical maintenance on light vehicles.*
- 4. Carry out interior and exterior body repair work on light vehicles.*



## ETAUT-406-1512 Vehicle Technology Electrical and Electronic Systems

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit will provide the underpinning knowledge for the technician to carry out diagnosis and rectification on electrical and electronic systems fitted as standard or in most cases as an option on a light vehicle.

The unit explains how this latest electronic technology operates and the components used in the systems. It explains how these systems share information, allowing components to be made smaller.

The unit will describe how these systems are networked, or connected in different formats and how data is transferred through wiring by the means of voltages.

Types of data transfer and methods of transfer will be explained in order to confirm the learners understanding, as well as evaluating signal information to confirm systems are operating correctly.

The unit covers the measuring, diagnosing and rectification of these communication systems and will be practiced by the learner.

Signal and wiring connections will be verified by using multi meters and the introduction and use of an oscilloscope will be explained fully and how it can be used to evaluate signals and data transmission waveforms from a variety of sources.

The latest in battery technology will be explained and how battery and charging systems are now controlled by the engine control unit. Alternators and batteries now being controlled to lower emissions and increase power and torque.

The unit will explain how security systems on a vehicle operate and the options we now have to secure and open our vehicle. Furthermore safety systems now being fitted and offered will be explained, most of which share the communication systems we describe. Vehicle lighting technology and aids to parking, driving and stopping the vehicle will also be explained

Any diagnosis methods and equipment will be explained and demonstrated, then practiced by the learner. This will give the required underpinning knowledge in order for the learner to recommend further internal examination, rectification or replacement electrical system components.

The tie between warranty, diagnosis and rectification, already covered, will be confirmed.

Furthermore engine systems will be fully investigated, learners gathering data to support diagnosis. Workshop manuals, specifications and repair instructions will be used throughout.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge are confirmed.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely with the latest electronic and electrical systems.*
- 2. Explain vehicle electrical and electronic principles.*
- 3. Explain how the latest battery and charging systems operate.*
- 4. Explain how light vehicle electrical systems operate.*

## ETAUT-406-1513 Overhaul Light Vehicle Mechanical Units

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit provides the underpinning knowledge for the technician to carry out overhaul procedures on mechanical units on a light vehicle. The unit will explain the preparation required before conducting any work on mechanical units and its influence in efficiency and cost.

The unit will explain different mechanical systems operation and how they should be evaluated for replacement or overhaul. Test processes will be explained for a number of different systems and components.

Common faults in these systems will be explored and how they are recognised and rectified.

Diagnosing fluid condition to aid diagnosis and assess the level of repairs required will be explained. To reinforce decisions to overhaul or replace components and also to assess consequential damage that may have occurred.

This unit should be used in conjunction with other units in the programme as knowledge gained in those units will be tested and reinforced during the initial stages of overhaul repairs.

The unit will provide understanding on how the individual components within the braking system can be replaced or overhauled and the procedure for adjusting them after repair.

Furthermore the underpinning knowledge required to dismantle and reassemble components in the braking system will be provided. Including guidance on measuring, assessing and servicing these components prior to and after assembly.

Diagnostic equipment will be used in order to evaluate and when required, bring into service braking system components.

The unit will also explain the steering and suspension system and how components on these systems operate and how we evaluate them for replacement or overhaul.

Test processes will again be explained for these systems as well as the dismantling and reassembly procedures for all their components.

Other systems will be explained and practiced such as coolant pump faults, diagnosis and replacement as well as auxiliary drive and timing assembly components.

The unit will confirm understanding of mechanical units already gained, diagnostic methods and equipment will be explained and demonstrated, then practiced by the learner.

They will understand the instructions on repair orders and react to ID codes used by some manufacturers. Diagnostic equipment will be used to obtain system data and bring the engine unit back into service.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered this underpinning knowledge can confirmed.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely while overhauling mechanical components.*
- 2. Identify mechanical components for overhaul in a light vehicle.*
- 3. Dismantle, repair and rebuild light vehicle mechanical components.*
- 4. Test, evaluate and adjust light vehicle mechanical components.*

## **ETAUT-406-1514 Overhaul Light Vehicle Electrical and Auxiliary Systems**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit will provide the underpinning knowledge for the technician to carry out diagnosis and rectification on electrical and auxiliary systems fitted on light vehicles. The unit explains the testing and evaluating of the starter motor and its components as well as explaining the starter circuit.

Basic electrical knowledge gained in previous units by the learner will be used to diagnose faults in starter, alternator and auxiliary circuits. This knowledge will be reinforced by using wiring diagrams, repair instructions and manufacturers documentation.

Knowledge of starter and engine management relays and switches will be introduced to aid diagnostics.

The unit will explain how the starter and alternator operate and how to remove, dismantle, diagnose and repair both units.

Other circuits on a light vehicle will be explained such as the wiper motor, its electrical circuit, its components and its operation. The learner will have the knowledge to diagnose faults and carry out rectification to the motor and its components, the horn system and how to rectify faults in the circuit, components and the sound and tuning of the horn. It will look at washer systems and how they operate.

Vehicle lighting both exterior and interior is covered with knowledge on how the lighting circuits operate and how to diagnose them. The learners will use digital ammeters, multi meters and vehicle diagnostic equipment to measure and evaluate all auxiliary systems.

Operation and diagnosis of heated windows is also covered in this unit with the learner having the knowledge to determine replacement where required. Any diagnosis methods and equipment will be explained and demonstrated, then practiced by the learner.

This will also give the underpinning knowledge in order for the learner to recommend further examination, rectification or replacement of system components.

The tie between warranty, diagnosis and rectification, already covered, will be confirmed. Engine systems will be fully investigated, learners gathering data to support diagnosis. Workshop manuals, specifications and repair instructions will be used throughout.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units.

The learner will already have an understanding of the reporting procedures to report any work required, or any delays they may have encountered.

## **Learning Outcomes**

**On completion of this unit the learner will be able to:**

- 1. Work safely with electrical and auxiliary systems.*
- 2. Diagnose and rectify faults with starters and alternators on a light vehicle.*
- 3. Diagnose and rectify faults with wiper, washer and horn units on a light vehicle.*
- 4. Diagnose and rectify faults with other electrical and auxiliary systems on a light vehicle.*

## ETAUT-406-1515 Workshop Practice

**Unit level (MQF):** 4  
**Credits:** 6

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### Unit Description

This unit will provide the knowledge and practical skills in order to carry out diagnosis and rectification on light vehicles and light vehicle systems.

It will provide the skills in identifying manufacturer repair instructions, wiring diagrams, inspection sheets and periodic maintenance. The learner will be able to interpret this information while carrying out repairs and rectification tasks on a light vehicle.

This unit will also provide practice for the learner to replace vehicle components, they will assess and evaluate at all times demonstrating their underpinning knowledge. The learner will carry out inspections on vehicles and identify faults, where present in vehicle systems, both for safety and recommendation reasons. They will check torque settings and refer to the manufacturer repair instructions to confirm all specifications.

Tyre pressure and tread depth measurements will be taken as well as demonstrating their underpinning knowledge on wheel and tyre safety. Students will evaluate evidence from tyre wear and match wear against vehicle alignment issues. Service documentation will be used, the learner will record their findings and report this information in the proper way on the service documentation. Students should be encouraged to record times on service documentation but not to work to the published times as these are based on trained technicians.

Periodic maintenance will be carried out and the learners will assess fluids and oil condition with a view to diagnosis. Periodic adjustments will be carried out on vehicle systems.

Electrical systems will be explained and then tasks will be set so that the learner can practice electrical diagnosis. They will be encouraged to use processes and procedures that have been recommended by the manufacturers. They will be encouraged to interpret wiring diagrams as an aid to diagnosis. A logical approach will be adopted to assist in diagnosis and this will be practiced on both mechanical and electrical rectification.

Tools and equipment will be used to fabricate materials used in motor vehicle repair and the safe use of these tools and equipment will be encouraged. They will use measuring devices such as Vernier gauges to assess component condition and match their findings against specification.

Braking systems will be assessed and components removed, evaluated and replaced. The braking system will then be bled and tested to bring it back to the required roadworthiness standard.

Engine units will be assessed using compression and cylinder leakage equipment, the learner will then evaluate their findings with the manufacturer specification for the vehicle.

Transmission units will be assessed including clutch and gear change operation. Engine and transmission units will be removed and refitted from a vehicle.

Engines and transmission units will be dismantled, measured, reconditioned where required and rebuilt. The systems will then be checked, using diagnostic equipment. Fault codes and vehicle information will be gathered, interpreted and checked against specification.

Vehicle communication systems will be identified, measured and tested with faults in place to confirm diagnosis and underpinning knowledge. The vehicle external bodywork will be assessed and body and trim items removed and refitted to practice the use of repair instruction information and trim tools, used to remove fasteners and clips.

Interior trim will be removed and refitted such as seats, carpets and headlining. Wiper motor systems will be evaluated, removed and replaced as well as the horn. Window mechanisms and glass will be removed including electrical systems. The learners will be encouraged to seek information, plan ahead with tools and equipment and carry out the task following process and procedures authorised by the vehicle manufacturers.

## Learning Outcomes

On completion of this unit the learner will be able to:

1. *Evaluate health and safety in the working environment.*
2. *Dismantle, assess and reassemble mechanical systems, units and components on a light vehicle.*
3. *Dismantle, assess and reassemble electrical systems, units and components on a light vehicle.*
4. *Dismantle, assess and reassemble body and trim on a light vehicle*



## **ETAUT-406-1516 Diagnose and Rectify Transmission and Drive Line System Faults**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit provides the required underpinning knowledge for the technician to carry out diagnosis and rectification on transmissions and driveline components. It will provide the basics in vehicle diagnosis and will highlight procedures used in diagnostics against the subject matter.

The unit will confirm understanding of driveline operations already gained and will give guidance on diagnosing, rectifying or replacing system components. Diagnosis methods and equipment will be explained and demonstrated, then practiced by the learner.

It will also give the required underpinning knowledge in order for the learner to recommend further examination, rectification or replacement of transmission and driveline components. The tie between warranty, diagnosis and rectification will also be explained.

The unit will provide knowledge of clutch and automatic transmission efficiency to support diagnostics, and the rectification or replacement of driveline components will be explained, demonstrated and performed by the learner.

This unit will also explain the operation, diagnosis and rectification of other types of driveline systems normally offered as options on different specifications of vehicles. Students will understand the instructions on repair orders and react to ID codes used by some manufacturers. Diagnostic equipment will be used to obtain system data.

This unit will also explain the preparation required before conducting any diagnosis and rectification and its influence in efficiency and cost. The learner will be able to estimate realistic time scales for rectification.

Knowledge of using hand tools and equipment will be assessed and guidance given on any equipment not covered in previous units. The student will already have an understanding of the reporting procedures to report any work required. Any delays they may have encountered during this unit can be confirmed.

## Learning Outcomes

On completion of this unit the learner will be able to:

1. *Work safely while carrying out diagnosis and repair on transmission and driveline systems.*
2. *Perform diagnosis and rectification on manual transmission assemblies.*
3. *Perform diagnosis and rectification on clutch assemblies.*
4. *Perform diagnosis and rectification on other types of transmission assemblies and driveline.*

## **ETAUT-406-1801 Vehicle Technology - Engine Management Systems**

**Unit level (MQF):** 4  
**Credits:** 6

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### **Unit Description**

This unit will provide knowledge for the learner to carry out diagnosis and rectification on electrical and electronic engine management systems.

The unit explains how the Electronic Control Unit (ECU) interfaces with various electronic sensors to manage the internal combustion engine. It also explains the physics behind various sensors found in today's engine management systems in a simple manner, so that the prospective automotive technician will be able to diagnose better the internal-combustion-engine behaviour.

The learner will be able to carry out tests on two types of engines: a fuel injection engine (petrol) and a common rail diesel engine.

The learner will be shown how to use a digital multimeter together with an oscilloscope to diagnose sensors and actuators that form part of the electronic control system.

The learner will also build a simple fuel injection tester/cleaner using the famous 555 timer. This part of the course will give invaluable understanding on how the ECU manages the actuators on an engine, apart from learning how to solder/de-solder electronic components. Troubleshooting oneself faults is an added benefit of this exercise.

This unit also explains the functions of generic electronic components found in ECUs today. These include resistors, capacitors, diodes and transistors. A very intuitive approach is taken when explaining these components to make sure that even those students who have never studied electronics before will understand the concepts of how these very important components work.

Common waveforms produced by the ECU to drive actuators such as transformers, fuel injectors, coil-on-plugs, idle-speed control, etc, will be explained and shown on oscilloscope.

## Learning Outcomes

On completion of this unit the student will be able to:

1. *Work safely with the latest electronic and electrical systems.*
2. *Use a digital multimeter to troubleshoot DC sensors and actuators.*
3. *Use an oscilloscope to troubleshoot AC sensors and actuators.*
4. *Understand the basic electronic components found in electronic control units.*