

Unit 75: Vehicle Systems and Technology

Unit code: D/601/1374

QCF level: 5

Credit value: 15

- **Aim**

This unit will develop learners' understanding of the operating principles associated with advanced vehicle systems and will give them the skills needed to carry out diagnostic procedures on these systems.

- **Unit abstract**

This unit will develop learners' knowledge of electronic power steering systems and active suspension control systems. Learners are then introduced to anti-locking braking systems, traction control systems and integrated dynamic stability control systems.

Learning outcome 3 is concerned with advanced central locking and security systems, integrated heating and air conditioning and driver and passenger impact protection. Finally learners will carry out and record the results of practical fault diagnosis tests on advanced vehicle power steering, suspension and central body systems. This will also require them to interpret the results from the fault diagnosis tests and evaluate the serviceability of a system and its components.

- **Learning outcomes**

On successful completion of this unit a learner will:

- 1 Understand vehicle electronic power steering and active suspension systems
- 2 Understand vehicle anti-lock braking, traction control and integrated dynamic stability control systems
- 3 Understand vehicle security, environmental control and passenger protection systems
- 4 Be able to carry out diagnostic procedures on power steering, suspension and central body systems.

Unit content

1 Understand vehicle electronic power steering and active suspension systems

Advanced power steering: components of integral power steering with electronic control; principles of operation; electrical and hydraulic circuit diagrams; control systems; service and repair procedures and safety aspects; system operation under various conditions eg parking, negotiating bends

Active suspension and ride control: components of active vehicle chassis management system including self-levelling suspension, ride control, electronic damper control and active rear suspension/axle control; electrical and hydraulic circuit diagrams; system operation under various conditions eg cruise, acceleration, braking, cornering

Service and repair procedures: manufacturers' recommendations for service and repair; safety aspects to be considered; specialist equipment and tools required; correct test conditions; inter-relationships of systems

2 Understand vehicle anti-lock braking, traction control and integrated dynamic stability control systems

Anti-lock braking (ABS): principles of operation and components of an anti-lock braking system eg electrical and hydraulic circuits, system operation under various conditions such as emergency braking, ice

Traction control – Anti Slip Regulations (ASR): principles of operation and components of a traction control system eg electrical and hydraulic circuits; system operation during acceleration, cornering and braking

Service and repair procedures: manufacturers' recommendations for service and repair; safety aspects to be considered; specialist equipment and tools required; correct test conditions; inter-relationships of systems

Integrated dynamic stability control: functional description of system to include operational criteria eg under-steer, lateral acceleration, vehicle rotation speed, steering angle and wheel speeds; corrective strategies eg braking control and engine power regulation; sensing components and electrical/hydraulic circuits

3 Understand vehicle security, environmental control and passenger protection systems

Central locking and security: components of microprocessor-controlled central locking and thief proofing system; operating principles including infrared control, Doppler movement sensing, crash sensing, failsafe and safety features; system operation under various conditions eg attempted break-in, accident; developments in vehicle security systems

Environmental control: components of integral heating and air conditioning system; operating principles; sensing and control functions; system operation under various conditions; developments in vehicle environmental control systems

Passenger protection: components of air bag systems eg front and side impact systems; operating principles; operation of system during frontal and side impact; passenger restraints eg seat belt tensioners and head restraint; developments in driver and passenger impact protection

Service and repair procedures: manufacturers' recommendations for service and repair; safety aspects to be considered; specialist equipment and tools required; correct test conditions

4 Be able to carry out diagnostic procedures on power steering, suspension and central body systems

Fault diagnostic tests: testing eg visual inspection, functional tests and system condition monitoring systems, electrical tests using multi-meters, oscilloscopes and dedicated test equipment on sensors, actuators and control units associated with the above systems, pressure tests on hydraulic systems

Present results: written, verbal and visual techniques

Serviceability: make recommendations for component repair/replacement and serviceability

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Understand vehicle electronic power steering and active suspension systems	1.1 explain the principles of operation and identify major components of an advanced power steering system 1.2 explain the principles of operation and identify major components of an active suspension and ride control system 1.3 explain service and repair procedures for an advanced power steering system and an active suspension and ride control system
LO2 Understand vehicle anti-lock braking, traction control and integrated dynamic stability control systems	2.1 explain the principles of operation and identify major components of an anti-lock braking system 2.2 explain the principles of operation and identify major components of a traction control system 2.3 examine the service and repair procedures for an anti-lock braking system and a traction control system 2.4 examine the function of an integrated stability control system
LO3 Understand vehicle security, environmental control and passenger protection systems	3.1 explain the operating principles and identify major components of an advanced central locking and security system 3.2 explain the operating principles and identify major components of an environmental control system 3.3 examine the operation of a passenger protection system 3.3 explain the service and repair procedures of an advanced central locking and security system 3.4 explain the service and repair procedures of an environmental control system
LO4 Be able to carry out diagnostic procedures on power steering, suspension and central body systems	4.1 carry out fault diagnosis tests on advanced vehicle power steering, suspension and central body systems and record the results 4.2 interpret and present results from a fault diagnosis test 4.3 report on the serviceability of a system and the major components in that system.

Guidance

Links

This unit has links with *Unit 79: Vehicle Electronics* and *Unit 74: Vehicle Fault Diagnosis*. If evidence relates to more than one unit care must be taken to ensure it is tracked so it is clear which unit it relates to.

Essential requirements

Learners will need access to a range of stand-alone vehicle systems, simulators and equipment to support practical investigations and testing. Access to manufacturers' manuals is also required.

Employer engagement and vocational contexts

The unit would benefit from an input by guest speakers from industry and visits to motor industry test facilities.