

Edexcel BTEC Level 4 HNC Diploma units in Automotive Diagnostics and Management Principles (QCF)

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Unit 1: Vehicle Fault Diagnosis

Unit code: H/601/1375

QCF level: 4

Credit value: 15

Aim

This unit will develop learners' understanding of vehicle fault diagnosis and will give them the practical skills needed to diagnose vehicle faults and assess serviceability.

Unit abstract

This unit will provide learners with an advanced understanding of vehicle fault diagnosis and will enhance their ability to diagnose faults and select appropriate equipment from given data in a number of disciplines. They will also learn about techniques of measurement when determining the performance of a vehicle system.

Learning outcome 1 will enable learners to increase their knowledge of fault diagnostic techniques and the interpretation of fault symptoms. Learning outcome 2 considers the principles of measurement and testing to determine the performance of vehicle systems. Learning outcome 3 is concerned with the evaluation and presentation of test results and the production of a fault location guide for a given vehicle.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Understand vehicle systems fault diagnosis criteria and techniques
- 2 Be able to use fault diagnostic techniques and equipment to determine the performance of vehicle systems
- 3 Be able to evaluate and present findings of a vehicle fault diagnostic test and produce a fault location guide.

Unit content

1 Understand vehicle systems fault diagnosis criteria and techniques

Diagnosis specifications: prioritised list of technical and non-technical requirements for carrying out fault diagnosis; symptoms; repair recommendations eg for mechanical, electrical, electronic or computer-based vehicle systems

Diagnostic techniques: eg symptom-fault-cause-location diagnostic sequence, historical knowledge of system faults, application of problem solving techniques

Factors: factors that contribute to diagnosis eg logical process, diagnostic and specialist equipment required, on-board computer-based and telemetry diagnostic systems, equipment costs, likely time saving, ability to upgrade, ease of use, manufacturers' back-up, workshop manuals, technical (phone/fax/email/internet, technical bulletins)

2 Be able to use fault diagnostic techniques and equipment to determine the performance of vehicle systems

Test equipment: equipment eg cylinder leakage tester, exhaust gas analyser, electronic meter, fuel pressure gauge, engine analyser, computer based and telemetric devices

Fault diagnosis: diagnosis on the agreed vehicle systems; diagnostic aids

Symptoms: fault symptoms eg loss of power, high fuel consumption, poor acceleration

Repair recommendations: type of repair eg adjustment, replacement, repair; justification of solution(s) eg based on cost, serviceability, reliability, safety

3 Be able to evaluate and present findings of a vehicle fault diagnostic test and produce a fault location guide

Technical report: word-processed technical report including nature and setting of the fault eg vehicle, symptoms, setting (road side or workshop), suspected system or systems, description of techniques and equipment used, test results, interpretation of results, conclusions and known data for that system, references used

Present findings: presentation eg to peers and/or supervisor/tutor; use of suitable visual aids eg sketches, graphs, charts, drawings, spreadsheets; use of presentation packages where appropriate

Fault location guide: prepared for a given vehicle system and including expected test readings, description of the system with an explanation of its use, theory of operation, instruments and special tools required, test instructions, step-by-step fault location guide to fault diagnostic procedure

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 systems fault diagnosis criteria and techniques	1.1 identify and justify a diagnosis specification for a mechanical or an electrical or an electronic vehicle system 1.2 use, explain and record the results of at least two suitable vehicle systems diagnostic techniques 1.3 compare the factors that contribute to quick and effective diagnosis of a given vehicle system
LO2 Be able to use fault diagnostic techniques and equipment to determine the performance of vehicle systems Be able to use fault diagnostic techniques and equipment to determine the performance of vehicle systems	2.1 select and use appropriate test equipment 2.2 carry out a systematic fault diagnosis 2.3 interpret faults from given symptoms and justify repair recommendations
LO3 Be able to evaluate and present findings of a vehicle fault diagnostic test and produce a fault location guide	3.1 produce a written report of the test results 3.2 interpret and justify the test results in terms of the known data for that system 3.3 create an effective fault location guide for a mechanical or an electrical or an electronic system.

Guidance

Links

This unit has links with *Unit 2: Vehicle Electronics* and *Unit 3: Vehicle Systems and Technology* and *Unit 4: Engine and Vehicle Design and Performance*

Essential requirements

A number of suitable diagnostic aids are essential for the delivery of this unit including a compression tester, cylinder leakage tester, engine analyser and multimeters. Access to manufacturers' manuals and vehicle data is also required.

Employer engagement and vocational contexts

Delivery of this unit would benefit from guest speakers from industry and visits to motor industry test facilities.

Unit 2: Vehicle Electronics

Unit code: T/601/1364

QCF level: 4

Credit value: 15

Aim

This unit will develop learners' understanding of vehicle electrical and electronic systems, circuits and components and will develop the skills needed to carry out tests, find faults and repair systems.

Unit abstract

The increasing use of electronic circuitry in motor vehicle control systems has contributed to advances in safety, comfort and economy. New applications, often incorporating microprocessor hardware, continue to be introduced. It is thus essential for motor vehicle engineers to be familiar with the operation of electronic circuits and methods of fault diagnosis.

Learning outcome 1 will provide learners with knowledge of electronic principles, circuit components and test procedures. In learning outcome 2, learners are introduced to the various types of sensors, actuators and display units used in motor vehicle control and driver information systems. Learning outcome 3 provides knowledge of microprocessor hardware applications and the suppression methods used to prevent interaction between systems. Learning outcome 4 will provide learners with the opportunity to apply their knowledge of vehicle electronics and circuitry to the systematic testing and fault diagnosis of vehicle control and information systems.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Be able to analyse and test vehicle electrical and electronic circuits
- 2 Understand the operation of vehicle sensors, actuators and display units
- 3 Understand the operation of microprocessor hardware and suppression methods used in vehicle circuits
- 4 Be able to carry out systematic fault diagnosis and repairs on vehicle electronic systems.

Unit content

1 Be able to analyse and test vehicle electrical and electronic circuits

Electrical calculations: voltage; emf; current; power; resistance; capacitance; inductance; series and parallel circuits

Semiconductor devices: electrical properties and characteristics of semiconductor material; P-N junction diode; Zener diode; N-P-N junction transistor; P-N-P junction transistor and thyristor; analyse the operation of a semiconductor based circuit, eg electronic ignition amplifier

Circuit diagrams: electrical and electronic component and circuit symbols; circuit diagram layouts

Systematic testing: test procedures; correct use of multimeters and oscilloscope for measuring circuit and component values

2 Understand the operation of vehicle sensors, actuators and display units

Sensors: principles of operation and electrical characteristics of sensors used in vehicles eg sensors used in anti-lock braking systems (ABS), electronic fuel injection (EFI), engine management systems, airbags, security, driver information and vehicle condition monitoring systems); relevant test procedures for sensors

Actuators: principles of operation and electrical characteristics of vehicle actuators eg relays, solenoids, electro-hydraulic/pneumatic valves, rotary actuators, stepper motors; relevant tests procedures for actuators

Information display devices: types of devices eg analogue gauges, light emitting diodes, liquid crystal displays, vacuum fluorescent displays, cathode ray tubes; relevant test procedures for displays

3 Understand the operation of microprocessor hardware and suppression methods used in vehicle circuits

Microprocessor hardware: implementation, operation and relevant developments of microprocessor systems in vehicles eg computer area network (CAN) bus links; packaging; microcontrollers; integrated circuits; reliability; electromagnetic compatibility

Suppression methods: resistive suppression of oscillations; screening; use of inductors; capacitors and filter networks in interference suppression

4 **Be able to carry out systematic fault diagnosis and repairs on vehicle electronic systems**

Systematic testing: testing of input/output sensors, cables, supplies, earths, output actuators, display devices and microprocessor systems

Self diagnosis: signal plausibility checks; open and short circuit checks; processor operation and memory test routines; error/trouble codes; standardisation of connectors and codes; continuity checks; sensor output; resistance checks

Fault repairs: correct procedures for removal/refitting eg following manufacturer's recommendations; repair and replacement of system components

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Be able to analyse and test vehicle electrical and electronic circuits	1.1 carry out calculations to solve problems in series and parallel automotive electrical circuits 1.2 explain the properties and characteristics of common semiconductor devices 1.3 read and interpret electrical and electronic circuit diagrams 1.4 perform systematic testing of vehicle electronic systems and record results
LO2 Understand the operation of vehicle sensors, actuators and display units	2.1 explain the principles of operation and electrical characteristics of different sensors when used in vehicles 2.2 explain the principles of operation and electrical characteristics of different actuators when used in vehicles 2.3 examine the operation and relevant test procedure of a driver information display device
LO3 Understand the operation of microprocessor hardware and suppression methods used in vehicle circuits	3.1 analyse microprocessor hardware operation in vehicle systems 3.2 analyse the operation of a suppression method
LO4 Be able to carry out systematic fault diagnosis and repairs on vehicle electronic systems	4.1 carry out systematic test procedures on vehicle microprocessor, sensor and suppression systems and record results 4.2 evaluate the use of a vehicle self diagnosis system 4.3 identify and repair faults on a vehicle microprocessor, sensor/actuator and suppression system

Guidance

Links

This unit links with *Unit 1: Vehicle Fault Diagnosis* and *Unit 3: Vehicle Systems and Technology*.

Essential requirements

Learners will need access to sufficient test equipment to support a range of practical tests on vehicle electrical and electronic systems.

Employer engagement and vocational contexts

The delivery of this unit will benefit from centres establishing strong links with employers willing to contribute to the delivery of teaching, work-based placements and/or detailed case study materials.

Unit 3: 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.

For learning outcome 3 learners will cover 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 3.4 explain the service and repair procedures of an advanced central locking and security system 3.5 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 1: Vehicle Fault Diagnosis* and *Unit 2: Vehicle Electronics*. 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.

Unit 4: Engine and Vehicle Design and Performance

Unit code: A/601/1494

QCF level: 5

Credit value: 15

Aim

This unit will develop learners' knowledge of engine and vehicle design and will enable them to evaluate engine and vehicle performance.

Unit abstract

In this unit learners will examine the aspects of design that relate to the function of engines, with a particular emphasis on performance. Learners will examine vehicle design for light and heavy vehicles with a view to understanding performance curves and other data used to evaluate vehicle performance. Learners will also study possible future developments in vehicle engineering and in particular the use of new technologies, materials and design method.

Learners will be introduced to engine design features, operating parameters and the likely effects when these are varied or altered. They then investigate engine performance and will analyse the data obtained from engine trials. Learners will be introduced to the design features of light and heavy vehicles with particular emphasis on aerodynamics and transmission systems. They will then evaluate vehicle performance under different operating conditions and interpret vehicle performance curves.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Understand engine design features
- 2 Be able to evaluate engine performance
- 3 Understand vehicle design features
- 4 Be able to evaluate vehicle performance.

Unit content

1 Understand engine design features

Engine design features: eg cylinder bore diameter, stroke length, con-rod to crank ratio, the number and arrangements of cylinders, overall engine dimensions, piston design, compression ratio, combustion chambers, camshaft design, crankshaft design, use of emerging technologies in engine design, new materials, alternate and multi fuel engine design (electric, Compressed Natural Gas (CNG), Liquid Natural Gas (LNG), gasoline-electrical hybrid)

2 Be able to evaluate engine performance

Performance characteristics: torque; power; mechanical efficiency; thermal efficiency; volumetric efficiency; mean effective pressure; specific fuel consumption; emission control assessment

Engine performance mapping: graphical account of the role of map data; mapping procedure; visual interpretation of a fuel map and ignition map; fuel/ignition maps for different engine performance applications eg economy, power and torque

Performance curves: curves eg for spark ignition (SI), combustion ignition (CI) and pressure charged, rotary engines; engine test at various engine speeds; critical evaluation of air/fuel ratio; torque, power; exhaust emissions; fuel consumption; significance of the standards used to measure engine power eg BSAU, DIN, SAE, EEC; application of engine performance curves and design to the selection of appropriate power units for specific tasks

3 Understand vehicle design features

Features of vehicle design: light and heavy vehicles; body type; body shapes and design; aerodynamic devices; transmission; 5-speed; 6-speed; range change; splitter; four-wheel drive; multiple axles; chassis; laden weight; unladen weight; power to weight ratio; use and applications of new technologies, materials and design methods

4 Be able to evaluate vehicle performance

Performance monitoring: tractive effort; tractive resistance; air; rolling and gradient eg power available, power required

Performance characteristics: performance curves for different vehicles; tractive effort available for different combinations; tractive effort required for types of vehicle eg in laden, unladen conditions; acceleration possible with different combinations of engines; transmissions and vehicles; gradeability; the change in engine speed that results when changing from one gear ratio to another eg various gear ratios and transmission units; the effects of a change in engine speed produced by a gear change on engine torque, power and fuel consumption, the road speed of a vehicle

Vehicle performance curves: for selecting appropriate vehicles from data calculated

Air resistance: air resistance using the formula $RA = K V^2A$; air resistance variation with engine speed and its effects on fuel economy; C_d , C_dA , typical values for light and heavy vehicles; methods used to reduce air resistance of vehicles

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 engine design features	1.1 identify and discuss the engine design features that contribute to the selection of an engine for a given application 1.2 analyse the effects of altering engine design features for a given application
LO2 Be able to evaluate engine performance	2.1 determine the performance characteristics of a given engine 2.2 carry out and record the outcomes of an engine performance mapping procedure 2.3 interpret performance curves and select and justify the use of an appropriate engine for a given application
LO3 Understand vehicle design features	3.1 discuss the features of vehicle design that contribute to the selection of a vehicle for a given application 3.2 analyse the effects of altering the features of vehicle design for a given application
LO4 Be able to evaluate vehicle performance	4.1 explain the terms used in vehicle performance monitoring 4.2 determine the performance characteristics of a given vehicle 4.3 perform calculations to determine vehicle air resistance and explain the effects of air resistance on engine speed and fuel economy 4.4 interpret performance curves and select an appropriate vehicle from given information.

Guidance

Links

This unit has links with *Unit 1: Vehicle Fault Diagnosis*, *Unit 2: Vehicle Electronics* and *Unit 3: Vehicle Systems and Technology*

Essential requirements

Centres will need to provide access to suitable engine test facilities and manufacturers' manuals and performance data.

Employer engagement and vocational contexts

Delivery would benefit from visits to motor industry test facilities for engines and/or vehicles and the attendance of guest speakers with experience of engine/vehicle design, testing or refurbishment.

Unit 5: Plan and Co-ordinate Vehicle Maintenance

Unit code: L/601/1371

QCF level: 5

Credit value: 15

Aim

This unit aims to develop learners' knowledge and understanding of the planning, coordination and control of vehicle fleet maintenance.

Unit abstract

This unit introduces the learner to the various types of maintenance contracts used and the management practices necessary to ensure that vehicles are maintained safely, economically and that legal obligations are complied with.

Learners will be given the opportunity to study various fleet management systems used to plan and control vehicle maintenance. They will develop the ability to select or design an appropriate fleet maintenance system.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Understand the legal and operational implications of a vehicle maintenance contract
- 2 Understand fleet maintenance management systems
- 3 Understand the legal implications relating to vehicle maintenance
- 4 Understand how to control the maintenance of a vehicle fleet.

Unit content

1 Understand the legal and operational implications of a vehicle maintenance contract

Types of vehicle maintenance contract: eg contract hire, lease hire, rental, manufacturer contract, power by the hour, fleet maintenance

Legal and operational implications: contract law; supply of services; construction and use regulations; Transport Act; plating and testing; environmental legislation

Vehicle maintenance contracts: controls; staffing; records; financial considerations; company taxation; operational factors; operator licensing

2 Understand fleet maintenance management systems

Management systems selection criteria: eg based on fleet size, fleet type, type of operation, cost, time, location

Management systems: mileage; time; scheduled; unscheduled; corrective; emergency

Customer requirements: eg frequency, reporting requirements, documentation, emergency situations, overnight servicing/repairs, vehicle inspections

3 Understand the legal implications relating to vehicle maintenance

Legal requirements: eg operator's licence, construction and use regulations, plating and testing, MOT testing, environmental considerations

Implications and processes: responsibilities; staff qualifications; facilities; equipment; human resource; competence; planning; vehicle inspections; defect reporting and rectification; environmental requirements for waste disposal; staff training; licences (MOT)

4 Understand how to control the maintenance of a vehicle fleet

Maintenance control systems selection criteria: eg type of operation, fleet type, fleet size, cost, location of fleet, power by the hour contract

Fleet maintenance control systems: eg centralised, decentralised, manual card operation, computerised operation, computer-based systems and relevant software and hardware

Planning and controlling fleet maintenance: driver defect reporting; vehicle inspection reporting; vehicle maintenance servicing schedules; vehicle testing; maintaining vehicle records

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 the legal and operational implications of a vehicle maintenance contract	1.1 explain three different types of vehicle maintenance contract and evaluate their legal and operational implications 1.2 discuss the methods used to satisfy the requirements of a vehicle maintenance contract 1.3 assess the suitability of a vehicle maintenance contract to meet specific requirements
LO2 Understand fleet maintenance management systems	2.1 evaluate different management systems for fleet maintenance and identify the criteria for selecting a management system 2.2 design a fleet maintenance management system to satisfy a customer's requirements
LO3 Understand the legal implications relating to vehicle maintenance	3.1 explain the legal requirements when undertaking fleet maintenance 3.2 discuss the implications and processes needed to satisfy legal requirements
LO4 Understand how to control the maintenance of a vehicle fleet	4.1 produce criteria for the selection of a maintenance control system 4.2 evaluate a control system for the maintenance of a vehicle fleet 4.3 explain the procedures used when planning and controlling the maintenance of a vehicle fleet.

Guidance

Links

This unit can be linked with *Unit 1: Vehicle Fault Diagnosis* and *Unit 3: Vehicle Systems and Technology*.

Essential requirements

Learners will need access to a range of relevant legal and operational documentation.

Employer engagement and vocational contexts

It would be helpful for delivery if learners visited one or two industrial locations that use different approaches to vehicle maintenance. Alternatively, suitable guest speakers might be invited to provide an overview of their fleet vehicle maintenance operations.

Unit 6: Customer Service in Vehicle Operations

Unit code: D/503/1145

QCF level: 4

Credit value: 15

Aim

This unit aims to develop learners' understanding of the principles of customer service and their application in a vehicle operations setting.

Unit abstract

This unit introduces learners to the principles and objectives of customer service and its management within vehicle operations. The unit develops an understanding of the nature of a customer service culture and quality service and helps learners to appreciate how information gathered from customers can improve the delivery of customer services.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Understand the use of customer service policies in a vehicle operation
- 2 Understand the purpose of promoting a customer focused culture in a vehicle operation
- 3 Understand customer requirements in a vehicle operation
- 4 Be able to provide customer service in a vehicle operation.

Unit content

1 Understand the use of customer service policies in a vehicle operation

Policies: structure; use; focus; identification; prioritisation and confirmation of customer requirements and expectations; improvement of customer perceptions and satisfaction; monitoring customer service and satisfaction; influences affecting implementation; effective communication

Quality of service: methods eg International Standards Organisation (ISO), Investors in People (IiP), Total Quality Management (TQM); customer expectations; service level agreements; standardised procedures; codes of practice; staffing levels; staff competency; flexibility; reliability and responsiveness

Evaluation: purpose; sources of information eg customers, colleagues, staff, management; types of written and oral feedback (including accuracy, relevance, reliability, validity); methods of data collection; improvements; staff training and development

2 Understand the purpose of promoting a customer focused culture in a vehicle operation

Communication: verbal; non-verbal (body language); written; types of response; use; effect

Role of the customer: customer service culture; identifying and analysing customer requirements and expectations; influences of service provision on customer perceptions

Types of customer: external eg retail, trade, garage, repairers, fleet; internal eg warranty, sales

3 Understand customer requirements in a vehicle operation

Customer information: customer requirements (including levels of customer satisfaction); sources of information eg customers, staff, management, organisation records, past information

Primary research: sampling; qualitative; quantitative; interview (individual, group); survey; observation; contact methods (mail, telephone, personal)

Secondary research: internal eg sales records, financial information, client and customer databases; external eg government publications, trade journals, periodicals, professional associations, national organisations, commercial data, vehicle manufacturers

Role of research: planning how to increase/maintain customer satisfaction levels; strategy; assessment of options using researched information; staffing levels

4 Be able to provide customer service in a vehicle operation

Customer needs: urgent; non-urgent; special requirements; quality of service; price; products and facilities; value for money; cleanliness of vehicle; service level agreements; soft issues eg car parking arrangements, customer waiting areas

Benefits of improved service: improved customer satisfaction; repeat business; improved reputation; increased profit

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 the use of customer service policies in a vehicle operation	1.1 discuss the reasons for using customer service policies 1.2 compare methods of assessing the quality of customer service provision 1.3 explain the purpose of evaluating customer service 1.4 assess how customer service evaluation can assist future training and development in a vehicle operation
LO2 Understand the purpose of promoting a customer focused culture in a vehicle operation	2.1 determine how different types of communication can be used to best effect 2.2 explain the central role of the customer for a given vehicle operation 2.3 establish the types of customer who use a vehicle operation
LO3 Understand customer requirements in a vehicle operation	3.1 analyse sources of customer information 3.2 research customer requirements in a given vehicle operations situation 3.3 explain the role of research in the planning process for vehicle operations
LO4 Be able to provide customer service in a vehicle operation	4.1 determine the different needs of customers who use vehicle operations 4.2 provide customer service in a vehicle operations situation 4.3 explain the benefits of improved customer service to a given vehicle operation.

Guidance

Links

This unit may also be linked to other Higher National units within the BTEC Higher Nationals in Vehicle Operations Management (QCF) qualification in particular *Unit 8: Managing Quality in Vehicle Operations* and *Unit 9: Marketing Vehicle Operations*.

Essential requirements

There are no essential requirements for this unit.

Employer engagement and vocational contexts

Delivery of this unit will benefit from centres establishing strong links with employers willing to contribute to the delivery of teaching, work-based placements and/or detailed case study materials. The use of real examples from local employers will help emphasise the relevance of the unit and show how organisations have developed their customer care policies.

Unit 7: Quantitative Techniques for Vehicle Operations

Unit code: T/503/1149

QCF level: 4

Credit value: 15

Aim

This unit will enable learners to apply a range of statistical and quantitative techniques to solve business problems that may arise in a vehicle operation.

Unit abstract

This unit develops learners' ability to deal with numerical and quantitative issues found in business. Learners will be able to use statistical, graphical and algebraic techniques to address business problems using appropriate IT software where relevant. The reliable evaluation of numerical results will enable effective decisions to be made.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Be able to use statistical techniques to collect and analyse data for vehicle operations management
- 2 Be able to produce forecasts based on formalised procedures
- 3 Be able to apply quantitative techniques to business situations in vehicle operations

Unit content

1 **Be able to use statistical techniques to collect and analyse data for vehicle operations management**

Data sources: primary and secondary sources; survey methodology; sample frame; sampling methods; sample error; questionnaire design

Interpretation of charts: graphical and diagrammatic presentation

Frequency distributions: generation from raw data; grouping; class boundaries; irregular intervals; histograms; frequency polygons

Representative values: mean; median and mode; calculation from raw data and frequency distributions; appropriate uses

Cumulative frequency: tables and charts; calculation and use of interquartile range (IQR) and percentiles

Measures of dispersion: definition and use of range; IQR and standard deviation; use of spreadsheets

2 **Be able to produce forecasts based on formalised procedures**

Formalised procedures: time series analysis (derivation and use of moving averages, centred trend, seasonal variations and seasonally adjusted data using either the additive or multiplicative model); correlation (scatter graphs, positive and negative correlation, coefficient, significance); regression analysis and derivation of regression equation; forecasting analysis (preparation of forecasts using time series analysis and regression, reliability)

3 **Be able to apply quantitative techniques to business situations in vehicle operations**

Quantitative techniques: inventory control (periodic review, re-order level, Economic Order Quantity (EOQ), demand re-order timing); linear programming (formulating the problem, graphical solution, tight and slack constraints); networking (network diagrams, critical path, slack time, crashing activities, Gantt charts); indexes (simple, aggregate, retail price index (RPI), deflation)

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Be able to use statistical techniques to collect and analyse data for vehicle operations management	1.1 prepare a plan for the collection of primary and secondary information for a given business problem in a vehicle operation 1.2 classify and record relevant data 1.3 solve problems involving the analysis and calculation of statistical quantities from frequency distributions
LO2 Be able to produce forecasts based on formalised procedures	2.1 use formalised methods to forecast results with accuracy 2.2 assess the reliability of the forecasts made
LO3 Be able to apply quantitative techniques to business situations in vehicle operations	3.1 use appropriate quantitative techniques to address business problems in a vehicle operation 3.2 justify the decisions made as a result of using the techniques

Guidance

Links

This unit has links with *Unit 1: Vehicle fault diagnosis*

Essential requirements

Learners will need access to appropriate application software such as spreadsheets, charting and word-processing packages.

Entry requirements for this unit are at the discretion of the centre. However it is advised that before starting the unit learners should have a sound grasp of the rules of arithmetic, negative numbers, percentages, conversion across number systems (fraction, decimal and percentage) and basic algebra including simplifying expressions.

Employer engagement and vocational contexts

The delivery of this unit will benefit from centres establishing strong links with employers willing to contribute to the delivery of teaching, work-based placements and/or detailed case study materials.

Unit 8: Managing Communications, Knowledge and Information

Unit code: L/601/0950

QCF level: 4

Credit value: 15

Aim

The aim of this unit is to show how communications, knowledge and information can be improved within an organisation including making better use of IT systems.

Unit abstract

This unit recognises that communications do not automatically take place effectively in organisations and that both information and work-based knowledge is often insufficient when decisions are made. Learners will look at how managers can improve the planning of their communications processes as well as their communication skills. Learners will study why managers need to adopt a more inclusive approach to stakeholders affected by the decisions they make and why they need to network on a more structured basis. The unit also looks at how managers can make the information and knowledge they gain accessible to other parts of the organisation.

The unit is designed to develop learner understanding of the interaction between communications, knowledge and information. It also covers how IT systems can be used as a management tool for collecting, storing, disseminating and providing access to knowledge and information.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Understand how to assess information and knowledge needs
- 2 Be able to create strategies to increase personal networking to widen involvement in the decision-making process
- 3 Be able to develop communication processes
- 4 Be able to improve systems relating to information and knowledge

Unit content

1 Understand how to assess information and knowledge needs

Sources: internal and external, primary and secondary, formal and informal, team workers, customers and other stakeholders

Types: qualitative and quantitative, tacit and explicit, official and unofficial, policy and opinion

2 Be able to create strategies to increase personal networking to widen involvement in the decision-making process

Sources: stakeholders and useful contacts, internal and external

Methods: formal, informal

Strategies: formal and informal, direct or via media, relating and interacting, trust and confidentiality, forming business relationships, decision making and decision taking

3 Be able to develop communication processes

Types: meetings and conferences, workshops and training events, internet and email, written, telephone, video conferencing, one-to-one meetings

Approaches: structured and coordinated, planned, formal and informal

Strategy: advantages, disadvantages; informal, face-to-face, formal in writing, emotional, intelligence

4 Be able to improve systems relating to information and knowledge

Type: hard and soft, websites and mailings, access and dissemination

Style: trends and patterns, diagrams and text, consistent and reliable, current and valid; legal and confidential

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 how to assess information and knowledge needs	1.1 discuss the range of decisions to be taken 1.2 examine the information and knowledge needed to ensure effective decision taking 1.3 assess internal and external sources of information and understanding 1.4 justify recommendations for improvement
LO2 Be able to create strategies to increase personal networking to widen involvement in the decision-making process	2.1 identify stakeholders for a decision-making process 2.2 make contact with those identified and develop business relationships 2.3 involve those identified in the decision making as appropriate 2.4 design strategies for improvement
LO3 Be able to develop communication processes	3.1 report on existing processes of communication in an organisation 3.2 design ways to improve appropriateness 3.3 implement improvements to ensure greater integration of systems of communication in that organisation 3.4 create a personal plan to improve own communication skills
LO4 Be able to improve systems relating to information and knowledge	4.1 report on existing approaches to the collection, formatting, storage and dissemination of information and knowledge 4.2 carry out appropriate changes to improve the collection, formatting, storage and dissemination of information and knowledge 4.3 implement a strategy to improve access to systems of information and knowledge.

Guidance

Links

This unit also has links with the Higher National units within the BTEC Higher Nationals in Business (QCF) qualification, in particular the units that make up the management pathway.

Essential requirements

There are no essential or unique resources required for the delivery of this unit.

Employer engagement and vocational contexts

Centres should develop links with local businesses. Many businesses and chambers of commerce want to promote local business and are often willing to provide work placements, visit opportunities, information about businesses and the local business context and guest speakers.

Unit 9: Managing Business Activities to Achieve Results

Unit code: J/601/0946

QCF level: 4

Credit value: 15

Aim

The aim of this unit is to provide learners with the understanding and skills to manage their activities in the business workplace to improve their effectiveness and efficiency.

Unit abstract

This unit focuses on the effective and efficient planning and management of business work activities. It gives learners with understanding and skills needed to design and implement operational systems to improve their effectiveness and efficiency and achieve the desired results for the business.

Learners are encouraged to consider the importance and interrelationship of business processes and the implementation of operational plans, together with quality systems and health and safety, in achieving satisfactory results.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Understand the importance of business processes in delivering outcomes based upon business goals and objectives
- 2 Be able to develop plans for own area of responsibility to implement operational plans
- 3 Be able to monitor appropriate systems to improve organisational performance
- 4 Be able to manage health and safety in the workplace.

Unit content

1 **Understand the importance of business processes in delivering outcomes based upon business goals and objectives**

Functions: interrelationships of functions, mission, aims, objectives and culture; interrelationship with processes

Processes: principles and models of effective process management; types of business process measures, output; quality gateways; how to evaluate suitability

2 **Be able to develop plans for own area of responsibility to implement operational plans**

Areas of responsibility: internal and external customers; customer orientation; market research; product development, principles and methods of short- to medium-term planning; designing plans; PERT; critical path analysis; work flow, prioritising workloads; how to develop SMART objectives; time management; how to analyse and manage risk; how to align resources with objectives; legal, regulatory and ethical requirements

Operational plans: product and service specifications and standards; meeting quality, quantity, time and cost objectives; systems eg Just-in-Time; value-added chains; statistical process control; coordinating activities; working within organisational constraints and limitations

3 **Be able to monitor appropriate systems to improve organisational performance**

Systems: Total Quality Management (TQM), TQM philosophy, principles, methods and techniques; quality systems, quality circles, ISO9000/EN29000 or subsequent current amendments, managing and monitoring quality

Organisational performance: principles of models which underpin organisational performance; types of performance measures and how to determine and set them; cost/benefit analysis; risk analysis; the value of a customer-focused culture; the importance of prevention rather than correction; importance of developing a continual improvement culture and how to involve others; planning, proposing, implementing and evaluating change; identifying wider implications of change within the organisation; Business Process Re-engineering (BPR)

4 **Be able to manage health and safety in the workplace**

Health and safety: legislation and regulations relating to health and safety at work; organisational policies and procedures regarding health and safety; risk assessment and monitoring; practical application of regulations; public attitudes and concerns relating to health and safety

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 the importance of business processes in delivering outcomes based upon business goals and objectives	1.1 evaluate the interrelationship between the different processes and functions of the organisation 1.2 justify the methodology to be used to map processes to the organisation's goals and objectives 1.3 evaluate the output of the process and the quality gateways
LO2 Be able to develop plans for own area of responsibility to implement operational plans	2.1 design plans which promote goals and objectives for own area of responsibility 2.2 write objectives, which are specific, measurable, achievable, realistic and time-based to align people and other resources in an effective and efficient way 2.3 implement appropriate systems to achieve objectives in the most efficient way, on time, to budget and meeting organisational standards of quality 2.4 carry out work activities meeting the operational plan through effective monitoring and control
LO3 Be able to monitor appropriate systems to improve organisational performance	3.1 design systems to manage and monitor quality standards specified by the organisation 3.2 demonstrate a quality culture to ensure continuous monitoring, evaluation and development of the process 3.3 recommend improvements which align with the organisation's objectives and goals and which result in improvements 3.4 report on the wider implications of proposed changes within the organisation

Learning outcomes	Assessment criteria for pass
On successful completion of this unit a learner will:	The learner can:
LO4 Be able to manage health and safety in the workplace	4.1 carry out risk assessments as required by legislation, regulation and organisational requirements ensuring appropriate action is taken 4.2 demonstrate that health and safety regulations and legislation applicable in specific work situations are correctly and effectively applied 4.3 carry out a systematic review of organisational health and safety policies and procedures in order to ensure they are effective and compliant 4.4 carry out practical application of health and safety policies and procedures in the workplace.

Guidance

Links

This unit also has links with the Higher National units within the BTEC Higher Nationals in Business (QCF) qualification, in particular the units that make up the management pathway.

Essential requirements

Tutors must build a bank of resource materials to ensure there is a sufficient supply of relevant information across a range of activities and processes.

Employer engagement and vocational contexts

Learners can generate evidence from a work placement or work experience. Some learners may have access to information from family owned and run businesses.

Centres should develop links with local businesses. Many businesses and chambers of commerce want to promote local business and are often willing to provide work placements, visit opportunities, information about businesses and the local business context and guest speakers.

Unit 10: Working with and Leading People

Unit code: M/601/0908

QCF level: 5

Credit value: 15

Aim

The aim of this unit is to develop the skills and knowledge needed for working with and leading others, through understanding the importance of recruiting the right people for the job.

Unit abstract

An organisation's success depends very much on the people working in it, and recruiting the right people is a key factor. Organisations with effective recruitment and selection processes and practices in place are more likely to make successful staffing appointments. In competitive labour markets this is a major advantage that well-organised businesses will have over their competitors. It is important, therefore, for learners to appreciate that the processes and procedures involved in recruitment and selection to meet the organisation's human resource needs are legal. This unit aims to develop learner knowledge and understanding of the impact of the regulatory framework on the recruitment process.

There are many benefits for both the individual and the organisation of working in teams, most importantly that the task is carried out better and more efficiently. An understanding of team development and the leadership function is crucial when working with others. A motivated workforce is more likely to be efficient and can contribute to the long-term profitability of the business. In this unit learners will examine these key areas and appreciate how an effective team leader can motivate and develop individuals within teams.

Sometimes when people work in teams they have their own types of communication, which can affect others and cause conflict or tension. In this unit learners will have the opportunity to develop their own leadership skills as well as building on the skills and knowledge needed to manage and lead people and teams in an organisation. Learners will explore ways to manage teams and individuals as well as motivating staff to perform better whilst meeting the aims of the organisation.

Learning outcomes

On successful completion of this unit a learner will:

- 1 Be able to use recruitment, selection and retention procedures
- 2 Understand the styles and impact of leadership
- 3 Be able to work effectively in a team
- 4 Be able to assess the work and development needs of individuals.

Unit content

1 Be able to use recruitment, selection and retention procedures

Legislation and requirements relating to recruitment and selection: internal and external recruitment processes; selection processes including job descriptions, person specifications, interviewing, use of CVs, assessment centres; diversity issues, including legal requirements and obligations and business and ethical cases regarding diversity; legislation and requirements relating to employment, workers' welfare and rights, health and safety, retention, succession planning

2 Understand the styles and impact of leadership

Theories, models and styles of leadership and their application to different situations: impact of leadership styles; theories and practices of motivation eg Maslow, McGregor, Herzberg; influencing and persuading others; influence of cultural environment within the organisation; differences between leadership and management; leadership power and control eg French and Raven; delegation; emotional intelligence eg Higgs and Dulewicz

3 Be able to work effectively in a team

Teamworking and development: flexible working practices; team formation eg Tuckman, structures and interactions eg Belbin's Team Role Theory, Adair's Action Centred Leadership model; benefits of team working; politics of working relationships; diversity issues; working cultures and practices; promotion of anti-discriminatory practices and behaviours; team building processes; conflict resolution; delegation and empowerment; coaching, support, mentoring; training, supervision, monitoring and evaluation

4 Be able to assess the work and development needs of individuals

Identifying development needs: learning styles and processes; supporting individual learning and encouraging lifelong learning; planning, recording, monitoring and evaluating; group development processes and behaviour

Planning, work orientation and job design: application of motivation theories and empowerment techniques; communication styles and techniques; delegation techniques and processes; supervision styles, working culture and practices, regulations and codes of practice, diversity issues

Performance monitoring and assessment: measuring effective performance; providing feedback; appraisal processes; benchmarking performance processes; mentoring and counselling; methods of correcting under-performance; legislation, codes of practice and procedures relating to disciplinary situations; diversity issues; management principles; promotions of anti-discriminatory practices and behaviours

Learning outcomes and assessment criteria

Learning outcomes On successful completion of this unit a learner will:	Assessment criteria for pass The learner can:
LO1 Be able to use recruitment, selection and retention procedures	1.1 prepare documentation to select and recruit a new member of staff 1.2 assess the impact of legal, regulatory and ethical considerations to the recruitment and selection process 1.3 take part in the selection process 1.4 evaluate own contribution to the selection process
LO2 Understand the styles and impact of leadership	2.1 explain the skills and attributes needed for leadership 2.2 explain the difference between leadership and management 2.3 compare leadership styles for different situations 2.4 explain ways to motivate staff to achieve objectives
LO3 Be able to work effectively in a team	3.1 assess the benefits of team working for an organisation 3.2 demonstrate working in a team as a leader and member towards specific goals, dealing with any conflict or difficult situations 3.3 review the effectiveness of the team in achieving the goals
LO4 Be able to assess the work and development needs of individuals	4.1 explain the factors involved in planning the monitoring and assessment of work performance 4.2 plan and deliver the assessment of the development needs of individuals 4.3 evaluate the success of the assessment process.

Guidance

Links

This unit also has links with the Higher National units within the BTEC Higher Nationals in Business (QCF) qualification, in particular the units that make up the management and human resources pathways.

Essential requirements

There are no essential or unique resources required for the delivery of this unit.

Employer engagement and vocational contexts

Centres should develop links with local businesses. Many businesses and chambers of commerce want to promote local business and are often willing to provide work placements, visit opportunities, information about businesses and the local business context and visiting speakers. For this unit it would be useful for learners to investigate the recruitment and selection processes in different organisations, as well as the functions and performance of different types of team.