Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management

Contents

Unit 1: Business Planning for Vehicle Operations

Unit code: F/503/1140

QCF level: 4

Credit value: 15

Aim

This unit will develop learners' understanding of business planning in a vehicle operation and the related processes involved in decision making, planning resources and the implementation of business plans.

Unit abstract

This unit examines the key aspects of strategic and corporate planning in vehicle operations and includes the planning of physical and human resources. Learners will gain an understanding of the decision making process at strategic and operational levels and the role of decision makers in providing direction for a business. Learners will also develop an understanding of the techniques used for the delivery of a business plan in a vehicle operation. The unit aims to develop a broad view of planning and should be delivered in a context appropriate to a middle manager in a vehicle operations business.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the key elements of strategic planning in a vehicle operation

2 Understand the decision making process

3 Understand the planning of resources in a vehicle operation

4 Understand the techniques used to deliver a business plan in a vehicle operation.

Unit content

1 Understand the key elements of strategic planning in a vehicle operation

Purpose and scope: provides direction and focus; progress towards achieving the vision and mission; coherence of a business' activities; scope includes the company vision and value statements, mission statements, strategic aims and objectives, 3/5 year corporate and strategic plans, identifying critical success factors

Key elements: the planning process eg consultation at all levels, analysis of past performance, progress towards vision, annual planning cycle, SWOT analysis (strengths, weaknesses, opportunities, threats), self-assessment; internal factors eg quality improvements, training and development, service improvements, factors related to premises; external factors eg market analysis, customers requirements, competition, economic aspects, new technology; setting business and performance objectives; use of the SMART principle (specific, measurable, attainable, relevant, timely); criteria for setting objectives

2 Understand the decision making process

Decision making process: the process at strategic, functional and operational levels; routine and one-off decisions; the Managing Tasks and Solving Problems sequence; conflict of policy, values and political/personal issues; roles of decision makers; comparison of autocratic and democratic styles; top-down and bottom-up processes; involving employees; management and supervision; effect on team building and morale; provide direction for the business; cultural and/or change issues

3 Understand the planning of resources in a vehicle operation

Physical resources: premises eg workshops, equipment and machinery, vehicles; economic factors; efficiency; utilisation; ways of increasing utilisation eg types of shift working, cost effectiveness, methods used to control loading

Human resources: manpower planning eg requirement to meet future needs, expansion and growth, allowances for training, sickness, holidays, planning for succession, retirement, resignations; calculation of hours available/hours required; use of overtime

Finance and budgets: capital requirements; capital expenditure budget; methods of increasing capital eg share issue, loans; cash flow budget; revenue budget; operational budgets

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

4 Understand the techniques used to deliver a business plan in a vehicle operation

Dissemination and delegation: setting departmental objectives; personal objectives of managers and employees; management by objectives (MBO); milestones; need to communicate the plan to the organisation eg selling the vision, gaining commitment and support of managers and employees, showing leadership and direction, demonstrating the importance of the plan, explaining key objectives

Techniques: the use of charts, spreadsheets and databases in control procedures related to the motor industry*Probability*: interpretation of probability; probabilistic models; empirical variability; events and sets; mutually exclusive events; independent events; conditional probability; sample space and probability; addition law; product law; Bayes' theorem

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 key elements of strategic planning in a vehicle operation	1.1 explain the purpose and scope of strategic planning 1.2 discuss the key elements involved in developing strategic plans 1.3 explain the annual planning cycle and the process of deciding business and performance objectives 1.4 prepare sample objectives for business goals applicable to a typical vehicle operations business
LO2 Understand the decision making process	2.1 compare the effectiveness of the different processes used for decision making 2.2 assess factors that can affect decision making within a motor industry organisation
LO3 Understand the planning of resources in a vehicle operation	3.1 explain how the use of physical resources is planned in vehicle operations 3.2 analyse the processes used to plan human resources 3.3 assess the relationship between planning resources and finance and budgets
LO4 Understand the techniques used to deliver a business plan in a vehicle operation	4.1 explain the processes used for dissemination and delegation of a business plan 4.2 explain techniques used to control the delivery of business plans.

Guidance

Links

This unit can be linked to *Unit 2: Managing Resources in Vehicle Operations*.

Essential requirements

There are no essential resources for this unit.

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 2: Managing Resources in Vehicle Operations

Unit code: J/503/1141

QCF level: 4

Credit value: 15

Aim

The aim of this unit is to provide learners with an understanding of the various aspects involved in the efficient management of resources in vehicle operations.

Unit abstract

This unit covers the processes involved in the identification and use of resources through careful selection, specification of requirements and planning. The unit also considers how to assess the effective use of resources through the measures of key performance indicators, utilisation factors and cost effectiveness. This is balanced against the need to evaluate the impact of health and safety legislation on the use of these resources.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the resources required to support a vehicle operation

2 Be able to evaluate the efficiency of use of resources in a vehicle operation

3 Understand the methods of acquiring physical resources in a vehicle operation

4 Be able to carry out a risk assessment in a vehicle operation.

Unit content

1 Understand the resources required to support a vehicle operation

Resources: premises eg workshops, parts departments, sales, administration, storage; equipment eg plant and machinery, tools, vehicles; human resource eg employers, employees, contractors

Factors: financial constraints eg demand, competition, performance and efficiency, economic life, obsolescence, projected revenue and costs; company policy eg image, company and departmental objectives; developing technology; legal and health and safety requirements

Selection of resources: selection processes eg consultation and communication with managers and staff, discussion and justification of decisions and recommendations; use of cost benefit analysis and capital investment appraisal techniques eg payback, net present value and discounted cash flow (DCF), previous record of use; presentation of findings

2 Be able to evaluate the efficiency of use of resources in a vehicle operation

Key performance indicators (KPIs): common KPIs for vehicle operations eg vehicle sales department (demo conversion rate, sales/staff ratio, average profit per sale), service department (percentage labour efficiency, hours sold per technician, direct/indirect staff ratio), parts department (percentage competitive parts sales, stock turn, sales/staff ratio, first time pick)

Utilisation factors: premises, equipment and human resources eg workshop loading, hours available, allowance for sickness, training and holidays, overtime, time required to complete work, hours in use and hours available for equipment; factors specific to vehicles eg type of load, type of vehicle, distance, routes, speed, drivers' hours

Cost effectiveness: eg revenue per hour or per employee, total revenue, costs and direct profit, return on capital employed (ROCE), breakeven point, factors specific to vehicles (downtime, running and standing costs, costs per kilometre, revenue per mile)

3 Understand the methods of acquiring physical resources in a vehicle operation

Legislation and regulations: the requirements of the Health and Safety at Work Act 1974, Control of Substances Hazardous to Health (COSHH) and Workplace (Health, Safety an Welfare) Regulations 1992

Reporting accidents: the requirements of RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995)

Risk assessment: definition of hazards and risks; risk assessment procedures; recording and controlling risks

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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 resources required to support a vehicle operation	1.1 discuss the resources needed for a vehicle operation 1.2 assess the factors that affect the selection of resources 1.3 make appropriate recommendations for the selection of resources to support a vehicle operation
LO2 Be able to evaluate the efficiency of use of resources in a vehicle operation	2.1 apply key performance indicators to measure the efficient use of resources in a vehicle operation 2.2 assess the utilisation and cost effectiveness of resources in a vehicle operation 2.3 recommend valid changes to improve the use of resources in a vehicle operation
LO3 Understand the methods of acquiring physical resources in a vehicle operation	3.1 explain methods of financing the acquisition of physical resources in a vehicle operation 3.2 explain alternative methods of acquiring the use of physical resources in a vehicle operation 3.3 evaluate methods of acquiring physical resources for a specified purpose in a vehicle operation
LO4 Be able to carry out a risk assessment in a vehicle operation	4.1 assess the impact of health and safety legislation and regulations upon the management of a vehicle operation 4.2 explain the requirements and mechanisms for recording and reporting accidents at work 4.3 carry out a risk assessment in a vehicle operation 4.4 make valid recommendations to control risks in a vehicle operation.

Guidance

Links

This unit has links with *Unit 1: Business Planning for Vehicle Operations*, *Unit 5: Finance for Vehicle Operations* and *Unit 24: Small Business Enterprise* and ideally should be studied in parallel with some or all of these units.

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.

Unit 3: Project Design, Implementation and Evaluation

Unit code: L/601/0995

QCF level: 5

Credit value: 20

Aim

To develop learners' skills of independent enquiry by undertaking a sustained investigation of direct relevance to their vocational, academic and professional development.

Unit abstract

This unit provides opportunities for learners to develop skills in decision making, problem solving and communication, integrated with the skills and knowledge developed in many of the other units within the programme to complete a realistic project.

It requires learners to select, plan, implement and evaluate a project and finally present the outcomes, in terms of the process and the product of the project. It also allows learners to develop the ability to work individually and/or with others, within a defined timescale and given constraints, to produce an acceptable and viable solution to an agreed brief.

If this is a group project, each member of the team must be clear about their responsibilities at the start of the project and supervisors must ensure that everyone is accountable for each aspect of the work and makes a contribution to the end result.

Learners must work under the supervision of programme tutors or work-based managers.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to formulate a project

2 Be able to implement the project within agreed procedures and to specification

3 Be able to evaluate the project outcomes

4 Be able to present the project outcomes.

Unit content

1 Be able to formulate a project

Project selection: researching and reviewing areas of interest; literature review; methods of evaluating feasibility of projects, initial critical analysis of the outline specification, selection of project option, initiating a project logbook/diary, estimating costs and resource implications, identifying goals and limitations, value of project, rationale for selection, agree roles and allocate responsibilities (individually with tutor/supervisor and within project group if appropriate)

Project specifications: developing and structuring a list of requirements relevant to project specifications eg costs, timescales, scale of operation, standards, legislation, ethics, sustainability, quality, fitness-for-purpose, business data, resource implications

Procedures: planning and monitoring methods, operating methods, lines of communication, risk analysis, structure of groups and collaborative working eg learner groups or roles and responsibilities within a work-based project, targets and aims

Project plan: production of a plan for the project including timescales, deliverables, milestones, quality assurance systems and quality plans, and monitoring progress

2 Be able to implement the project within agreed procedures and to specification

Implement: proper use of resources, working within agreed timescale, use of appropriate techniques for generating solutions, monitoring development against the agreed project plan, maintaining and adapting project plan where appropriate

Record: systematic recording of relevant outcomes of all aspects and stages of the project to agreed standards

3 Be able to evaluate the project outcomes

Evaluation techniques: detailed analysis of results, conclusions and recommendations, critical analysis against the project specification and planned procedures, use of appropriate evaluation techniques, application of project evaluation and review techniques (PERT), opportunities for further studies and developments

Interpretation: use of appropriate techniques to justify project progress and outcomes in relation to the original agreed project specification

Further consideration: significance of project; application of project results; implications; limitations of the project; improvements; recommendations for further consideration

4 Be able to present the project outcomes

Record of procedures and results: relevant documentation of all aspects and stages of the project

Format: professional delivery format appropriate to the audience; use of appropriate media

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 formulate a project	1.1 formulate and record possible outline project specifications 1.2 identify the factors that contribute to the process of project selection 1.3 produce a specification for the agreed project 1.4 produce an appropriate project plan for the agreed project
LO2 Be able to implement the project within agreed procedures and to specification	2.1 match resources efficiently to the project 2.2 undertake the proposed project in accordance with the agreed specification. 2.3 organise, analyse and interpret relevant outcomes
LO3 Be able to evaluate the project outcomes	3.1 use appropriate project evaluation techniques 3.2 interpret and analyse the results in terms of the original project specification 3.3 make recommendations and justify areas for further consideration
LO4 Be able to present the project outcomes	4.1 produce a record of all project procedures used 4.2 use an agreed format and appropriate media to present the outcomes of the project to an audience.

Guidance

Links

This unit is suitable for use by all sectors and should utilise the full range of skills developed through study of other units in the programme. These include planning, practical work, data handling and processing, analysis and presentation.

The knowledge applied may link to one particular unit or to a number of other units.

Essential requirements

The required resources will vary significantly with the nature of the project. The identification of the equipment and materials required, and the establishment of their availability, is a vital part of the planning phase. Learners should therefore have access to a wide variety of physical resources and data sources relevant to the project. Tutors should ensure that learners do not embark on work that cannot succeed because of lack of access to the required resources.

Employer engagement and vocational contexts

Centres should try to establish relationships with appropriate organisations in order to bring realism and relevance to the project.

Unit 4: Managing People in Vehicle Operations

Unit code: L/503/1142

QCF level: 5

Credit value: 15

Aim

This unit aims to develop learners' understanding of employment practices and the methods used to manage and evaluate the performance of teams and individuals in the motor industry.

Unit abstract

This unit provides a thorough foundation in the essential aspects of managing people working in a vehicle operation. It is intended to develop the learner's understanding and ability to deal effectively with the processes that relate to human resource management. The unit embraces all aspects of people management; personnel issues such as recruitment and selection, grievance and disciplinary processes, employment documentation, measuring performance and team management. This includes the motivation of teams and individuals to maximise their contribution to the quality of service and the performance of the business.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand employment practices in a vehicle operation

2 Understand the methods used for evaluating the performance of individuals in a vehicle operation

3 Be able to establish team targets in a vehicle operation

4 Be able to evaluate the performance of a team in a vehicle operation.

Unit content

1 Understand employment practices in a vehicle operation

Employment documentation: formal written contracts; policy and procedures eg employee handbook, grievance procedures, disciplinary procedures

Job descriptions: job analysis and roles eg duties, responsibilities, limits of authority, line management; layout and format of job specification; conditions of employment eg pay, bonus and incentives

Legal requirements: employment contracts; equal opportunities; discrimination

Recruitment and selection: work force planning; internal and external appointments eg advertising vacancies, use of recruitment and temporary placement agencies; documentation eg application forms, curriculum vitae, short and long listing, selection criteria, person specifications; selection processes eg psychometric testing, skills testing, interviewing processes and techniques; evaluating applicants; appointment procedures and induction procedures

2 Understand the methods used for evaluating the performance of individuals in a vehicle operation

Factors affecting performance: motivational aspects eg personal satisfaction, Maslow's hierarchy of needs, job satisfaction, status, recognition; personal skills; working conditions; pay; career development; personal relationships

Staff appraisals: appraisal systems eg one to one, 360º, appraisal training, appraisal documentation and preparation; managing the appraisal process eg appraisal techniques, questioning, dealing with contentious issues, working relationships, staff training, recording information

Performance review: methods of review eg by supervisor or manager, peers, team, subordinates and self appraisal; feedback of results; resolution of conflicts; use as a motivator for the achievement of performance targets

Performance targets: determining and agreeing individual targets eg quantitative and qualitative aspects, use of SMART for setting performance targets; reviewing achievement and feedback

3 Be able to establish team targets in a vehicle operation

Types of team: eg management teams, working groups, consultative teams, problem solving teams, focus groups, task groups, project groups

Team responsibilities: to superiors, subordinates, the business and team members; external factors eg external steering groups, performance targets, communicating results to interested parties; confidentiality and meeting deadlines

Team operation: purpose of team working eg team values, team dynamics, team ethics, behaviour in teams, Belbin's team roles; managing team meetings eg formalities and documentation of meetings, setting and agreeing targets and deadlines; methods of communication

Determining targets: establishing team role; purpose; authority and targets eg management set targets, creating team objectives, identifying limits of authority, clarifying desired outcomes

4 Be able to evaluate the performance of a team in a vehicle operation

Team management: deciding tasks; identifying resources; organising roles and tasks eg planning work, co-ordinating team activities; deciding milestones; controlling progress

Evaluating performance: measurement of outcomes eg team's self-appraisal, management evaluation, staff evaluation, customer evaluation; identification of performance data; quantitative and qualitative aspects

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 employment practices in a vehicle operation	1.1 evaluate employment documentation in terms of its benefits to the employer and the employee 1.2 examine the components of effective job descriptions 1.3 assess the legal requirements that relate to recruitment and selection 1.4 analyse the effectiveness of recruitment and selection processes in a vehicle operation
LO2 Understand the methods used for evaluating the performance of individuals in a vehicle operation	2.1 analyse the factors affecting the performance of people at work 2.2 analyse the procedures, processes and documentation of a staff appraisal system 2.3 evaluate the methods used for conducting a performance review 2.4 explain how individual performance targets are set
LO3 Be able to establish team targets in a vehicle operation	3.1 explain the type and responsibilities of teams found in a given vehicle operation 3.2 critically assess team operating procedures 3.3 determine realistic targets for a team in a vehicle operation
LO4 Be able to evaluate the performance of team in a vehicle operation	4.1 explain the factors affecting team management 4.2 evaluate the performance of a team in a vehicle operation.

Guidance

Links

This unit has links with *Unit 2: Managing Resources in Vehicle Operations* and *Unit 23: Working With and Leading People*.

Essential requirements

There are no essential resources required for this unit.

Employer engagement and vocational contexts

Suitable guest speakers might be invited to provide an overview and an industrial perspective on relevant aspects of the unit. For example, personnel management and team building in a range of vehicle operations.

Unit 5: Finance and Accounting for Vehicle Operations

Unit code: R/503/1143

QCF level: 5

Credit value: 15

Aim

This unit aims to develop learners' understanding of the financial and accounting tools and techniques used by supervisors and managers in the motor industry.

Unit abstract

This unit covers the main requirements of financial and management accounting that relate to the vehicle operations sector. The approach taken should be 'accounting for non-accountants' and should develop learners' understanding of finance and accounting as it applies to the role of the supervisor or manager in a vehicle operation.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand motor vehicle service company accounts

2 Be able to analyse the financial and business performance of a vehicle operation

3 Understand budgets and budgeting for a vehicle operation

4 Understand cost accounting for a vehicle operation.

Unit content

1 Understand motor vehicle service company accounts

Company accounts: ledger accounts eg sales and purchase ledger, recording transactions, general ledger, double entry principle; trial balance; trading account; profit and loss account; balance sheet

Financial terms: revenue; sales; turnover; overheads; expenses; gross profit; net profit; retained profit; fixed assets; current assets; net assets; tangible assets; intangible assets; long term liabilities; current liabilities; prepayments; accruals; working capital; total capital employed; capital eg ordinary and preference shares, retained profits, reserves, debenture loans; depreciation; reserves; corporation tax

Depreciation: straight line; reducing balance

2 Be able to analyse the financial and business performance of a vehicle operation

Financial and business performance: liquidity; profitability; use of assets; historic information; trends; impact of management decisions on performance eg expansion, purchase of assets, sources of additional capital, salary increases, expenses, overheads, overdraft; effect of current economic situation eg interest rates

Performance measures: profitability ratios eg return on capital employed (ROCE), % gross profit, % net profit, retained profit; taxation; liquidity ratios eg current ratio, acid test ratio, working capital; debtors ratio; accruals; cash availability to meet demands; use of assets eg creditors ratio, stock turn ratio; benchmarks and norms; comparison with other companies

3 Understand budgets and budgeting for a vehicle operation

Budgetary process: effect of business plans on budgets eg strategic and corporate plans; operational plans, departmental objectives; forecast final accounts eg trading and profit and loss accounts, balance sheets; departmental budgets

Budgets: sales; revenue; staffing; resources; costs; cash; budgetary control

4 Understand cost accounting for a vehicle operation

Cost accounting concepts: profit centres; cost centres; prime cost eg direct labour, direct materials, direct expenses; indirect expenses; overheads

Costing processes: apportionment of overheads; absorption costing; marginal costing; job costing; break-even analysis eg breakeven charts, break-even point; calculation of charges; labour rates; charge-out rate; vehicle costing eg standing and running costs, daily charges

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 motor vehicle service company accounts	1.1 explain the operation of ledger accounts and the creation of a trial balance 1.2 explain the meaning of financial terms used in company accounts 1.3 interpret the company accounts of a motor vehicle service company 1.4 determine the depreciation of fixed assets
LO2 Be able to analyse the financial and business performance of a vehicle operation	2.1 evaluate the financial performance of a motor vehicle service company 2.2 analyse areas of poor performance compared with other companies and suggest future corrective action
LO3 Understand budgets and budgeting for a vehicle operation s	3.1 explain the budgetary process 3.2 explain the process of budgetary control 3.3 devise an example budget for a typical situation in vehicle operations
LO4 Understand cost accounting for a vehicle operation	4.1 explain cost accounting concepts 4.2 apply appropriate costing processes to a typical situation in vehicle operations.

Guidance

Links

This unit has links with *Unit 1: Business Planning for Vehicle Operations*, *Unit 2: Managing Resources in Vehicle Operations*, *Unit 17: Vehicle Parts Management* and *Unit 24: Small Business Enterprise*.

Essential requirements

Learner will need access to a range of sector-specific financial information relating to the various specialist areas within the service sector of the motor industry.

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.

Unit 6: Business Law for Vehicle Operations

Unit code: Y/503/1144

QCF level: 4

Credit value: 15

Aim

This unit aims to develop learners' understanding of the legal system and the legislation that relates to business transactions in a vehicle operations setting.

Unit abstract

This unit will develop learners' understanding of the legal system, including sources of law and the courts structure. Learners will investigate the law of contracts and will develop an understanding of the nature and terms of contracts as applied in a vehicle operation. Consumer protection law, consumer credit and the role of the Office of Fair Trading are also analysed, as is the law of torts as applied in vehicle operations.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the court system and the sources of law

2 Understand the law of contracts as applied in vehicle operations

3 Understand the law relating to the consumer as applied in vehicle operations

4 Understand the law of torts as applied in vehicle operations.

Unit content

1 Understand the court system and the sources of law

Criminal courts: classification of crimes and methods of trial; magistrates court (jurisdiction, personnel, procedure); Crown court (juries, their role and structure, jurisdiction, procedure); grounds for appeal; Court of Appeal; House of Lords; European Court of Justice

Civil courts: small claims court and jurisdiction; county court and High Court (jurisdiction of both, allocation of cases to tracks); grounds for appeal; Court of Appeal; House of Lords; European Court of Justice

Sources of law: judicial precedent, statute, delegated legislation (meaning, how they operate, advantages and disadvantages); Rules of Statutory Interpretation; European law (types of law)

2 Understand the law of contracts as applied in vehicle operations

Essential elements: offer; acceptance; intention to be legally bound; consideration; capacity; privity of contract

Types of contract: oral; written; implied

Terms of a contract: express and implied; representations; warranties and conditions; exemptions; remedies for breach of contract

Invalidating factors: void; voidable; illegal (to include sale of business, restraint of trade, solus agreements); restrictive trade practices and vitiating factors

3 Understand the law relating to the consumer as applied in vehicle operations

Consumer protection: Consumer Protection Act; product liability; consumer safety; misleading price indications; HPI checks

Consumer credit: Consumer Credit Act; credit agreements; hire purchase contracts; credit sale agreements

Sale of goods: statutory implied terms, transfer of property and possession, seller's remedies against the buyer, consumer's remedies against the seller; relevant legislation

Supply of services: statutory implied terms, seller's remedies, consumer's remedies

4 Understand the law of torts as applied in vehicle operations

Background: origins and definition of the law of torts

Types: eg trespass, nuisance, assault and battery, premises, rights of way/custom and practice, liability, negligence, duty of care, defamation, libel and slander, deceit and fraud

Capacity, defences and remedies: age at which action can be taken; general defences eg inevitable accident, assumption of risk, self-defence and statutory authority, damages, injunctions, other remedies

Tortious situation: law of tort using case studies or hypothetical examples

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 court system and the sources of law	1.1 compare the differences between civil and criminal law 1.2 analyse the role of individual courts 1.3 assess the effectiveness of individual courts within the court structure 1.3 evaluate the current importance of sources of law
LO2 Understand the law of contracts as applied to vehicle operations	2.1 explain the importance of the essential elements required for the formation of a valid contract 2.2 discuss the impact of different types of contract 2.3 analyse terms in contracts with reference to their meaning and effect 2.4 explain the factors that make a contract invalid
LO3 Understand the law relating to the consumer as applied in vehicle operations	3.1 assess the affects of consumer protection legislation and consumer credit legislation in relation to a business transaction in a vehicle operation 3.2 explain the legal rules on implied terms relating to the sale of goods and supply of services 3.3 evaluate the statutory provisions on buyer's and seller's remedies
LO4 Understand the law of torts as applied in vehicle operations	4.1 explain the background to the law of torts 4.2 explain four different types of torts 4.3 analyse capacity, defences and remedies in a tortious situation 4.4 interpret the law of tort in a tortious situation for vehicle operations.

Guidance

Links

This unit has links with *Unit 7: Customer Service in Vehicle Operations*.

Essential requirements

There are no essential resources 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.

Unit 7: 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

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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 be linked to other units such as *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 8: Managing Quality in Vehicle Operations

Unit code: H/503/1146

QCF level: 5

Credit value: 15

Aim

This unit will develop learners' understanding of the principles of quality management and enable them to apply them in the vehicle operations sector.

Unit abstract

The motor industry has become increasingly competitive, with each company or organisation seeking ways of maintaining or increasing its competitive advantage. Vehicle manufacturers in the service repair sector and insurance companies in the body repair sector have demanded higher standards from franchised dealers and approved repairers. One of the accepted strategies for improving standards is to pursue a policy of quality management and assurance. This unit raises learners' awareness of various quality systems and their function and value when applied as a management tool. It introduces learners to the role of the manager in quality management systems.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the application of quality in vehicle operations

2 Be able to evaluate quality systems in vehicle operations

3 Be able to apply quality improvement techniques in a vehicle operation

4 Understand the effects of embedding a quality system into a vehicle operation.

Unit content

1 Understand the application of quality in vehicle operations

Quality control, assurance and management: definitions; attributes of quality; meeting the needs of customers; development of quality theory and the influence of quality management 'gurus'; quality control (QC); quality assurance (QA); Total Quality Management (TQM); the evolution of quality from quality control and quality assurance to TQM and onwards

Application of quality: applications in the motor industry eg quality of after sales service, quality of repairs, customer care and follow-up

2 Be able to evaluate quality systems in vehicle operations

Quality systems: TQM; ISO 9000 standards; Investors in People; promoting business excellence model (PROBE); long and short term financial considerations of quality systems; auditing systems eg policy, performance, procedures, suppliers, documentation

Implementation: role of the manager; preparation and training of staff

Benefits: competitive and trading advantages of external accreditation; improved levels of service and performance; increased customer satisfaction leading to increased sales; customer retention; improved market share

Barriers: lack of commitment; lack of knowledge; fear of change or failure; fear of bureaucracy; increased costs; lack of time; audit results

3 Be able to apply quality improvement techniques in a vehicle operation

Techniques: key performance parameters eg customer complaints, vehicle rectification returns; benchmarking, affinity diagrams; brainstorming; satisfaction surveys and satisfaction statistics; quality health checks; comparison against competitors and other franchise dealers; assessing the need for specific quality applications within the motor industry

Monitoring and recording: use of charts and diagrams eg flow charts, Gantt charts, scatter graphs, strengths/weaknesses/opportunities and threat (SWOT) analysis

3 Understand the effects of embedding a quality system into a vehicle operation

Effect on an organisation: working with Specific Performance Objectives (SPOs); approach and problems of implementation; evaluating quality systems

Applications and benefits: customer supply chains and relationships; use and purpose of quality circles eg composition, purpose, training needs; benefits eg employee involvement, bottom-up approach, improved morale; delegation of responsibilities and individual empowerment

Empowerment: delegated authority eg lines and limits of responsibility, financial control and budgets, lines of communication and management approaches such as coaching, mentoring; development opportunities eg team building, brainstorming, quality circles

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 application of quality in vehicle operations	1.1 explain methods of quality control and quality assurance used in vehicle operations 1.2 discuss the evolution of quality assurance and management 1.3 analyse the application of quality in a vehicle operation
LO2 Be able to evaluate quality systems in vehicle operations	2.1 compare the use of different quality systems 2.2 devise sample quality assurance standards for typical motor industry situations 2.3 evaluate an accredited quality system in terms of the implementation strategy, potential benefits and possible barriers to success
LO3 Be able to apply quality improvement techniques in a vehicle operation	3.1 apply quality improvement techniques in a vehicle operation 3.2 devise benchmarks for a motor industry application 3.3 monitor and record quality improvements in a motor industry application
LO4 Understand the effects of embedding a quality system into a vehicle operation	4.1 assess the effects on an organisation of embedding quality management in its business operation 4.2 explain the use of Specific Performance Objectives to achieve quality 4.3 analyse potential problems that may occur from using Specific Performance Objectives 4.4 explain the applications and benefits of empowerment 4.5 evaluate the composition and operation of a quality circle in a typical vehicle operation.

Guidance

Links

This unit links to many other units within the programme, particularly *Unit 1: Business Planning for Vehicle Operations*, *Unit 2: Managing Resources in Vehicle Operations*, *Unit 4: Managing People in Vehicle Operations*, *Unit 15: Business Strategy Planning for Vehicle Operations* and *Unit 24: Small Business Enterprise*.

Essential requirements

There are no special resource requirements for this unit.

Employer engagement and vocational contexts

Industrial visits, work placements or employment could provide access to additional resource facilities and reinforce relevance. Wherever possible, learners should be given the opportunity to observe quality operations through industry visits. Equally, the work-based experiences of the learners should be used to illustrate applications of theory in practice.

Unit 9: Marketing Vehicle Operations

Unit code: K/503/1147

QCF level: 5

Credit value: 15

Aim

This unit aims to develop learners' understanding of marketing principles and will enable them to apply those principles in a vehicle operation.

Unit abstract

This is a broad-based unit which gives learners the opportunity apply the key principles of marketing. Firstly, the unit looks at the definitions of marketing, and what is meant by a marketing orientation and the marketing process. Next, learners will develop a marketing plan for a vehicle operation and consider its implementation. They will investigate the importance of market segmentation and how this leads to the identification and full specification of target groups. Learners then consider buyer behaviour and positioning. The unit looks at the main elements of both the original and the extended marketing mix. This includes an introduction to the concept of the product life cycle, new product development, pricing strategies, distribution options and the promotion mix. Finally, learners will develop their own marketing mixes to meet the needs of different target groups. This includes considering the differences when marketing services as opposed to goods. A range of other contexts are examined including marketing to businesses instead of consumers and the development of international markets.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the application of marketing in a vehicle operations environment

2 Be able to prepare a marketing plan for a vehicle operation

3 Understand applications of the marketing mix in vehicle operations

4 Be able to apply the marketing mix to different markets in vehicle operations.

Unit content

1 Understand the application of marketing in a vehicle operations environment

Marketing definitions: including those of the Chartered Institute of Marketing (CIM) and the American Marketing Association (AMA); satisfying customer needs and wants; exchange relationships; marginal utility; changing emphasis of marketing

Marketing concept: evolution of marketing; marketing orientations; societal issues and emergent philosophies; customer and competitor orientation; efficiency and effectiveness; limitations of the marketing concept

Benefits and costs: benefits eg providing customer satisfaction, desired quality and customer care, relationships marketing; costs eg penalties of too narrow a marketing focus

Marketing objectives: market position; financial eg sales targets, profit margins, cash flow; image; relevant factors eg products and services, competitor activity, national economic activity and performance, available resources, fashion, changes in technology

Marketing process: marketing audit; environmental analysis; SWOT analysis; setting objectives; constraints; options; plans eg target markets and marketing mix

2 Be able to prepare a marketing plan for a vehicle operation

Marketing information: eg business contacts, market research, trade journals, trade organisations, professional bodies, marketing specialists, local and national government, local business advice services, customers, suppliers, vehicle manufacturers, own staff, competitors, internal records

Marketing plan: assessment of market; customer requirements; marketing objectives and forecasts; costs; marketing mix; product; price; promotion; personnel; distribution channels; information systems; action plan with timescales

Implementation: distribution of plan; use of plan; resources required eg finance, internal and external human and physical resources such as full or temporary staff, training and development, equipment usage or hire; correct marketing mix; timescales; monitoring arrangements

3 Understand applications of the marketing mix in vehicle operations

Product choice: eg benefits, the total product, product mix, product lifecycle and its effect on other elements of the marketing mix, product strategy, new product development, adoption theory

Distribution: customer convenience and availability; role of intermediaries; channel selection; integration and distribution systems; franchising; physical distribution management

Price setting: perceived value; pricing process eg strategy and objectives, demand elasticity, competition, costs, psychological, discriminatory

Promotion: awareness and image; effective communication; communication process eg market, mission, money, message, method, monitoring; promotional mix eg advertising above and below the line including packaging, public relations and sponsorship, sales promotion, direct marketing and personal selling, branding

4 Be able to apply the marketing mix to different markets in vehicle operations

Consumer markets: eg fast moving consumer goods, consumer durables, co-ordinated marketing mix to achieve objectives

Organisational markets: differences from consumer markets; adding value through service; industrial; non-profit making; government; re-seller

Services: differences of services from physical products eg intangibility, ownership, inseparability, perishability, variability; service elements of physical product marketing eg tangible and intangible benefits

International markets: range of markets eg globalisation, the EC; benefits and risks; market attractiveness; strategies

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 application of marketing in a vehicle operations environment	1.1 compare alternative definitions of marketing 1.2 explain the various elements of the marketing concept 1.3 assess the benefits and costs of a marketing approach in a vehicle operation 1.4 assess the appropriateness of marketing objectives 1.5 explain the benefits of the marketing process for an organisation in vehicle operations
LO2 Be able to prepare a marketing plan for a vehicle operation	2.1 use appropriate sources of marketing information 2.2 prepare a marketing plan for a vehicle operation 2.3 determine how a marketing plan will be implemented
LO3 Understand applications of the marketing mix in vehicle operations	3.1 analyse how products are chosen to meet customers' and the organisation's needs 3.2 analyse how distribution is arranged to provide customer convenience 3.3 explain how prices are set, taking account of aims, demand, competition and costs 3.4 explain how a promotional activity is chosen to achieve its aims for the target market in a vehicle operation
LO4 Be able to apply the marketing mix to different markets in vehicle operations	4.1 apply the marketing mix to different types of consumer markets in vehicle operations 4.2 examine the differences between marketing to organisations rather than to consumers 4.3 illustrate how services are marketed in a vehicle operation 4.4 explain how and why marketing internationally is different from domestic marketing.

Guidance

Links

This unit can be linked with other units such as *Unit 8: Managing Quality in Vehicle Operations*, *Unit 17: Vehicle Parts Management* and *Unit 24: Small Business Enterprise*.

Essential requirements

Learners will need access to a range of marketing texts, trade journals and other motor industry material.

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.

Unit 10: 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

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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	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 11: Vehicle Systems and Technology*, *Unit 14: Vehicle Electronics* and *Unit 16: 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 11: 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

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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 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 10: Vehicle Fault Diagnosis* and *Unit 14: 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 12: 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

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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 10: Vehicle Fault Diagnosis* and *Unit 11: 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 13: Automotive Accident Investigation

Unit code: L/601/1368

QCF level: 5

Credit value: 15

Aim

This unit gives learners an in-depth appreciation of the principles and techniques used for accident investigation and reconstruction.

Unit abstract

This unit will develop learners' understanding of the forces acting on a vehicle in motion and during a collision. Learners will then investigate brake and tyre characteristics and the influence that they have on a vehicle. The final learning outcome will develop the skills used when analysing and reconstructing an accident.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the forces acting on a vehicle when in motion and during a collision

2 Understand the influence of vehicle brake characteristics on the behaviour of a vehicle

3 Understand the influence of vehicle tyre characteristics on the behaviour of a vehicle

4 Be able to apply accident reconstruction techniques.

Unit content

1 Understand the forces acting on a vehicle when in motion and during a collision

Forces and motion: applications of mass, weight, force, Newton's Laws of motion and equations of motion on a moving vehicle; determination and effect of tractive effort and tractive resistance

Effect of friction: definition of friction and the co-efficient of friction; factors affected eg skidding, sliding, rolling; calculations eg to determine stopping distances, cornering speeds, effects of gradient, rolling and air friction; deceleration and braking theory; brake efficiency; brake ratio

Vehicle collision: collision with moving and stationary bodies; principle of conservation of momentum; principle of conservation of energy; calculation of impact speeds; interpretation of projective behaviour eg objects projected from a vehicle on impact; load transfer

2 Understand the influence of vehicle brake characteristics on the behaviour of a vehicle

Types of brake circuits: single line braking circuit; front and rear split circuit; diagonally split circuit; H-split; L-split; full dual circuit; air/hydraulic circuits; air brake circuits; anti-lock braking circuit

Types of pressure valves: pressure limiting valves; load sensing valve; inertia sensing valve

Characteristics of brake fluid: types of fluid; constituents; contamination boiling point; vapour lock point

Brake defects: braking faults eg effect of air in brake fluid, temporary loss of breaking, air contamination, heat soak, uneven braking, brake fade, drum expansion

Legal requirements: legal requirements with respect to hydraulic and air braking systems eg the design and use of braking systems are governed by two sets of regulations, the Construction and Use regulations, and the Economic Commission for Europe (ECE) Directives

3 Understand the influence of vehicle tyre characteristics on the behaviour of a vehicle

Tyre markings: car and truck markings; nominal rim diameter; nominal section width; overall diameter; section height; load index; speed index; nominal aspect ratio; load capacity

Vehicle handling and tyre behaviour: slip angle; self-aligning torque; cornering force; centrifugal force; cornering power; instantaneous centre; neutral steer; understeer; oversteer; effects of fault suspension dampers on vehicle handling

Factors affecting a*dhesion*: co-efficient of friction; effect on adhesion as retardation is increased on various types of surface and weather conditions; skidding; aquaplaning

Tyre construction: cross-ply; radial-ply; bias-belted; bead; carcass; sidewall; bracing belt; tyre tread materials

Tyre defects: under inflation; over inflation; lumps; bulges; casing break-up; cuts; exposed cords; inspection of tyre valve; reasons for tyre blow-out; effects of impact or concussion damage

Legal requirements: legal requirements of tyres eg be free from any cuts bigger than 25mm or 10% of their section width, especially the side walls, be free from any cuts deep enough to reach the cords or plies, have no evidence of lumps, bulges or tears caused by any separation or structural failure, have no exposed plies or cords, have the original groove bases visible in the tread area, have a minimum of 1mm depth of tread pattern across ¾ of the breadth of the tread (goods/passenger vehicles only), have the remaining ¼ of the breadth of the tyre with a visible tread pattern, have a tread depth not less than 1.6mm across the centre of the tyre tread (cars)

4 Be able to apply accident reconstruction techniques

Tyre marks and vehicle damage: skid marks; scuff marks; deceleration scuff and tyre prints; debris; secondary impact; vehicle position before and after impact

Accident scene construction plans: the immediate scene, intermediate scene, extended scene; sketch plans and scale plans; triangulation, base line and offsets; use of computer software eg CAD

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 forces acting on a vehicle when in motion and during a collision	1.1	carry out calculations to determine the forces acting upon a vehicle in motion
		1.2	explain the effect of friction on the motion of a vehicle
		1.3	evaluate the effects of a vehicle collision
LO2	Understand the influence of vehicle brake characteristics on the behaviour of a vehicle	2.1	analyse different types of brake circuits and explain the effect of circuit failure on brake performance when one circuit fails
		2.2	explain the operation of different types of pressure valves
		2.3	assess the different characteristics of brake fluid
		2.4	explain the different types of brake defects
		2.5	explain the legal requirements with regard to vehicle braking systems
LO3	Understand the influence of vehicle tyre characteristics on the behaviour of a vehicle	3.1	select appropriate tooling for the production of specific features on specific materials
		3.2	determine the forces acting on the tool face and work piece during ideal orthogonal cutting
		3.3	calculate speeds and feeds for turning and milling operations for a variety of tool and work piece materials
		3.4	describe the mechanisms and effects of different types of tool wear and catastrophic failure
		3.5	estimate the life of given tools for specific applications
LO4	Be able to apply accident reconstruction techniques	4.1	evaluate the relevance of vehicle debris and tyre markings at the scene of an accident
		4.2	produce accident scene construction plans.

Guidance

Links

This is a stand alone unit.

Essential requirements

Centres must provide access to suitable and relevant automotive accident data.

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.

Unit 14: 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 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 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

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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 10: Vehicle Fault Diagnosis* and *Unit 11: 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 15: Business Strategy Planning for Vehicle Operations

Unit code: A/601/5142

QCF level: 5

Credit value: 15

Aim

This unit aims to develop learners' understanding of the business strategy planning process and its implementation in vehicle operations.

Unit abstract

In this unit learners will investigate the impact of the external operating environment and the need to adopt organisational strategies that will ensure effective business performance. Learners will develop an understanding of the role of strategic planning in vehicle operations and the different approaches to planning and formulating strategy. They will then go on to cover the means and methods used to implement a strategy, including identifying and allocating resources. Finally learners will monitor, review and evaluate the strategic plan against benchmarked outcomes.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand strategic planning in vehicle operations

2 Understand approaches to strategy formulation in vehicle operations

3 Understand approaches to strategy implementation in vehicle operations.

Unit content

1 Understand strategic planning in vehicle operations

Strategic contexts and terminology: role of strategy eg setting of missions/visions/strategic intent, objectives, goals; identification of core competencies; strategic architecture; strategic control

Evaluation of the strategy framework: reasons why and ways in which corporate planning and strategies are devised eg the creation of strategic visions, organisational mission statements, corporate planning and corporate objectives and the relationship with operational planning, objectives and target setting

Planning process: approaches to planning and formulation of strategy and objectives eg in small, medium and large organisations; the formal approach to planning compared to the ad hoc approach

Differing approaches to strategy: eg classical/rational, incremental and emergent approaches to strategy and the benefits and limitations of each

2 Understand approaches to strategy formulation in vehicle operations

Environment audit: eg political, economic, socio-cultural, technological, legal and economic analysis (PESTLE), Porter's 5 force analysis, the threat of new entrants, the power of the buyer, the threat of substitutes, competitive rivalry, competition and collaboration

Internal audit: eg benchmarking, the use of McKinsey's 7S framework, SWOT, purpose, scope of activities and markets, product positions, organisational efficiency, distribution methods, operations, finance, policy and procedures

Current market position: eg competitor analysis, Boston Matrix

Strategic direction: eg the Ansoff matrix, growth, stability, profitability, efficiency, market leadership, survival, mergers and acquisitions, expansion into the global market place

3 Understand approaches to strategy implementation in vehicle operations

Strategic implementation: realisation of strategic plans to operational reality eg selling the concepts, project teams, identification of team and individual responsibilities

Resource allocation: finance; human and physical resources; materials; time

Review and evaluation: evaluation of the benchmarked outcomes in a given time period of corporate, operational and individual targets

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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 strategic planning in vehicle operations	1.1 explain the strategic contexts and terminology of planning in a vehicle operation setting 1.2 evaluate the strategy framework in a vehicle operation 1.3 explain the role and setting of objectives in the planning process 1.4 compare the differing approaches to strategy in vehicle operation settings
LO2 Understand approaches to strategy formulation in vehicle operations	2.1 conduct an environmental and internal audit of a vehicle operation 2.2 discuss the current market for the vehicle operation 2.3 develop an organisational strategy based on the audit
LO3 Understand approaches to strategy implementation in vehicle operations	3.1 compare the roles and responsibilities for strategy implementation in two different organisations 3.2 explain the resource requirements needed to implement a new strategy for a vehicle operation 3.3 propose targets and time scales for the review and evaluation of achievement in a given organisation to monitor a given strategy.

Guidance

Links

This unit can be linked with *Unit 1: Business Planning for Vehicle Operations*.

Essential requirements

There are no essential requirements for this unit.

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 16: 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

This unit 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 appreciate possible future developments in vehicle engineering and in particular the use of new technologies, materials and design method.

Learners are 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 are 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 V2A; air resistance variation with engine speed and its effects on fuel economy; Cd, CdA, 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 10: Vehicle Fault Diagnosis*, *Unit 11: Vehicle Systems and Technology* and *Unit 14: Vehicle Electronics*.

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 17: Vehicle Parts Management

Unit code: L/601/5145

QCF level: 5

Credit value: 15

Aim

This unit provides learners with an understanding of the management of vehicle parts distribution and supply in the retail sector of the motor industry.

Unit abstract

In this unit learners will explore the roles and responsibilities of parts suppliers, parts managers and franchise suppliers. They will also look at the different ways of dealing with customers. Stock management systems are investigated and learners will evaluate the different types of stock control systems. Learners will examine the function and layout of a parts department and will identify potential risks that can be found within the department. Finally, the role of advertising in a vehicle parts operation and the means of promoting a parts supplier are explored, along with the internal factors that can affect parts sales.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the roles and responsibilities in vehicle parts supply and management

2 Understand stock management systems

3 Understand the functions and processes in a vehicle parts supplier operation

4 Understand the role of advertising and promotion in a vehicle parts operation.

Unit content

1 Understand the roles and responsibilities in vehicle parts supply and management

Parts supplier: manufacturers eg vehicle, component manufacturer; distributor eg dealerships, wholesaler, factor, national retail chains, DIY outlets, high street retailers, cash and carry; specialist supplier

Customer: eg retail, trade, own workshop, vehicle sales, car fleet, van fleet, commercial fleet, body repairer, fast fit, garage, service station, breakdown and recovery specialist, repair specialist, vehicle restoration specialist

Responsibilities: financial eg turnover, profitability, control of stock investment, control of costs; development of customer base and new markets eg customer care, sales promotion, after sales services; management of staff and department eg personnel issues, staffing levels, layout and maintenance of department and facilities

Franchise supplier: relationship with manufacturer; franchise agreements; obligations and responsibilities; benefits and/or disadvantages

2 Understand stock management systems

Efficiency: maintenance of stock eg maximum, minimum, working stock, order level, safety stock, lead time, virtual stock, stock turn, obsolete, redundant, fast moving, slow moving, captive parts, competitive parts, warranty; financial control eg stock turn ratio, cost of holding stock, cost of ordering stock, economic order quantity (EOQ), gross profit, net profit; physical stock control eg stock check and audit, categorising stock, Pareto's Law, coding stock, statistical sampling

Stock control: card systems; in-house computerised systems; on-line systems (electronic ordering), computer parts catalogue; just-in-time (JIT)

Computerised systems: maintenance of stock levels; automatic order generation; bar coding stock; stock and sales analysis; changes in demand

Lost sales: parts satisfaction level; increase in demand; mathematical techniques

3 Understand the functions and processes in a vehicle parts supplier operation

Main sections: goods inwards; goods outwards; parts storage; gangways; trade and retail sales counter and/or workshop counter; stock control; parts manager's office; sales displays; delivery and distribution methods eg road, rail, post

Factors: security of stock; capacity; health and safety; accessibility; speed of picking; limitation of stock damage; presentation; image

Documentation: delivery note; advice note; damage/discrepancy report; estimate; quotation; order; trade note; invoice; statement; credit note; stock order; emergency order; vehicle off road (VOR) order; stock audit report; warranty report

Risk assessment: liquids and chemicals eg solvents, glues, paints, oil, grease, thinners, cleaners, anti-freeze, de-icers, battery acid; machinery eg fork lift, stackers, trolley, crane; storage eg weight, bulk, access, height

4 Understand the role of advertising and promotion in a vehicle parts operation

Advertising media: newspapers; magazines; radio; television; other eg leaflets, mail shots, recommendations; benefits (cost, coverage, targeting, geographical, timing, impact)

Promoting: sponsorship; presentations; trade events; shows

In-house factors: staff eg presentation, knowledge, attitude, customer care; layout eg presentation, comfort, services (drinks and papers), size; service eg speed, price, efficiency and effectiveness

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 roles and responsibilities in vehicle parts supply and management	1.1 compare the role of different types of parts suppliers 1.2 explain the different approaches and methods of dealing with customers 1.3 explain the responsibilities of the parts manager 1.4 explain the obligations and responsibilities of the franchise supplier
LO2 Understand stock management systems	2.1 determine the efficiency of stock management 2.2 evaluate stock control systems 2.3 explain the benefits of a computerised stock management system 2.4 identify lost sales and new demand
LO3 Understand the benefits of total productive maintenance (TPM) techniques	3.1 explain the function of the main sections of the parts department 3.2 explain factors affecting the layout of the parts department 3.3 describe the documentation used by parts suppliers 3.4 conduct a risk assessment for the parts department
LO4 Understand optimised production technology (OPT)	4.1 evaluate the benefits of different advertising media 4.2 evaluate methods of promoting the parts supplier 4.3 discuss the in-house factors affecting parts sales.

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

Guidance

Links

This unit can be linked with other units such as *Unit 8: Managing Quality in Vehicle Operations*.

Essential requirements

There are no essential requirements for this unit..

Employer engagement and vocational contexts

It would be helpful for delivery if learners visited one or two different types of vehicle parts supplier. Alternatively, suitable guest speakers might be invited to provide an overview of the roles and responsibilities within their organisation.

Unit 18: 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; IRQ 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)

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

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

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.

Essential requirements

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

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 19: Fleet Transport Operations

Unit code: K/503/1150

QCF level: 5

Credit value: 15

Aim

This unit will develop learners' understanding of the legal and operational requirements for running a fleet of vehicles and will enable them to use costing techniques within a fleet operation.

Unit abstract

This unit is designed to develop learners' understanding of the effective and efficient costing and management of a fleet of vehicles. The vehicles may be of any type, such as cars or goods vehicles.

The knowledge and skills developed are those appropriate to a middle manager in a fleet operating business. The fleet may be operated for the purposes of a company to sell and/or deliver its own products or services, or to provide a service to other companies either directly or indirectly. The aim is to provide a broad-based understanding of transport operations and vehicle fleet management.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the legal aspects of vehicles

2 Understand operational procedures for fleet vehicles

3 Understand the requirements for specialist vehicle operations

4 Be able to apply costing techniques to a vehicle operation.

Unit content

1 Understand the legal aspects of vehicles

Road vehicle type approval and construction and use regulations: how the law ensures that motor vehicles are constructed to safe standards; operation of type approval for passenger cars and goods vehicles; vehicles that need type approval and exclusions; relation of type approval to construction and use regulations

surfaces generated for visualisation and subsequent machining

2 Understand operational procedures for fleet vehicles

Maintenance procedures: vehicle inspectorate maintenance advise; maintenance contracts; in house repairs; contract out repairs; retention of records; cleaning of vehicles; wall planning charts; vehicle history files; enforcement of maintenance standards

Inspection procedures: driver defect reports; inspection records; defect repair sheets; service records; daily running checks; weekly inspections; planned inspection procedure eg 6 weekly inspections or 6000 mile inspections; negligence by repairer; items for inspection and vehicle servicing

Road traffic accidents: reporting of accidents; information required in the event of an accident; action required by the vehicle driver; action required by the vehicle operator; the need to stop following an accident; third party property damage and time allowance for reporting such accidents

Operational documentation: consignment notes; delivery notes; vehicle control documents; road haulage permits and transit advice notes

Responsibilities to customers: fleet maintenance; fleet inspections; tachograph procedures; calibrations and analysis; public perceptions of the fleet and its operations and contractual obligations

3 Understand the requirements for specialist vehicle operations

Specialist bus operations: location eg rural and urban, dial-a-ride; types and purpose of vehicles eg capacity, range of operations, flexibility and specialist functions

Abnormal loads: cranes and long loads; regulations; procedures eg markings, lengths, height, overhang, restrictions, lighting, abnormal indivisible loads, Special Types General Orders (STGO)

Vehicle markings: eg rear reflective markings, forward, side and rearward projections

Hazardous and perishable loads: eg definitions, restrictions, exemptions, driver training, Hazchem markings, emergency action codes, conveyance of dangerous goods by road, explosives, chemicals, hazardous waste, European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

4 Be able to apply costing techniques to a vehicle operation

Range of costs: identification of applicable fleet vehicle operating costs

Standing charges: eg insurance, fleet hire, bank charges, advertising

Running costs: eg vehicle costs, maintenance, testing, fuel, tyres, wages, insurance, down time and vehicle waiting time

Overheads: eg land and buildings, premises, workshop rents, council charges, rates, vehicle purchases/hire, plant and machinery

Daily charges: eg stock, debtors, bad debt provision, overdrafts and penalisation clauses

Delivery costs: eg efficient route planning, return loads, vehicle utilisation and maximum load usage

Vehicle costing techniques: financial reports; budgets; vehicle efficiency; type and size of vehicles; maintenance and servicing periods; warranty specifications and load costing/estimating

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 aspects of vehicles	1.1 explain how the law ensures that motor vehicles are constructed to safe standards 1.2 explain the operation of type approval for passenger cars and goods vehicles 1.3 explain which vehicles need type approval 1.4 analyse how type approval relates to the construction and use regulations
LO2 Understand operational procedures for fleet vehicles	2.1 evaluate a maintenance and inspection procedure suitable for a fleet of vehicles 2.2 explain the procedures to be adopted following a road traffic accident involving a fleet vehicle 2.3 evaluate the procedures relating to the issue and use of operational documentation 2.4 examine the responsibilities of a fleet operator to its customers
LO3 Understand the requirements for specialist vehicle operations	3.1 determine the operating requirements for a specialist bus operation 3.2 analyse the operating procedures and regulations which must be followed when dealing with abnormal loads 3.3 explain the requirements for vehicle markings and projecting loads 3.4 analyse the procedures for handling hazardous and perishable loads 3.5 explain the legal requirements for the marking of hazardous and perishable loads
LO4 Be able to apply costing techniques to a vehicle operation	4.1 establish the range of costs that apply to a vehicle operation 4.2 apply costing techniques to a vehicle operation 4.3 compare costs between vehicle fleet operators who carry out in-company repairs and operation to those who contract hire 4.4 determine how maximum utilisation of vehicles can be achieved.

Guidance

Links

Although this may be treated as a stand alone unit it may also effectively linked with *Unit 6: Business Law for Vehicle Operations* and *Unit 21: Transport Legislation* to provide an understanding of the legal system.

Essential requirements

Learners will need access to Vehicle Inspectorate paperwork.

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.

Unit 20: Vehicle Damage Assessment

Unit code: M/503/1151

QCF level: 5

Credit value: 15

Aim

This unit aims to develop the skills and understanding required to carry out accident damage assessments.

Unit abstract

This unit enable learners to assess and report on vehicle damage, evaluate the suitability of repair methods and produce accurate costings. Learners will develop the skills used to carry out vehicle valuations and evaluate the quality of vehicle repairs. They will investigate insurers' claim liability, and the duties and responsibilities of a vehicle damage assessor.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to carry out vehicle damage assessment and cost evaluation

2 Be able to use recognised methods to calculate vehicle valuations and consequential losses

3 Be able to appraise the quality of vehicle repairs

4 Understand insurers' claim liability

5 Understand the duties and responsibilities of the assessor.

Unit content

1 Be able to carry out vehicle damage assessment and cost evaluation

Damage assessment: vehicle details; vehicle condition; body repair; mechanical components; geometry; production of damage assessment report; post-repair inspection

Repair costing: Thatcham repair times; manufacturers' repair times; computer estimating; paint and materials; cash in lieu of repairs

Repair methods and materials: suitability of repair methods; vehicle construction; materials used in vehicle construction; method and types of joining; plastic repairs

Total losses and salvage disposal: documentation; value; categories; Motor Insurance Anti-Fraud and Theft Register (MIAFTR); disposal; constructive total loss; salvage retention; cash in lieu

2 Be able to use recognised methods to calculate vehicle valuations and consequential losses

Depreciation: straight line; reducing balance; current cost; sum of digits

Vehicle valuations: market value-definition; types and use of accepted guides; agreed values; previous 'total loss' vehicles; manual research

Hourly and retail labour rates: labour rates; retail rates; overhead costs; definition of terms

Profit and running costs: calculations for loss of profits and running costs; applications

VAT: application to inspection charges; VAT on invoicing

3 Be able to appraise the quality of vehicle repairs

Preparation defects: filler mixing; sanding; adhesion problems; silicone contamination; substrates; pin-holing

Paint and rectification: solvent pop; runs; sags; orange peel; clouding; transparency; colour match; striping (metallics); mapping out; poor adhesion; plastics; substrates; fish eyes; micro-blisters; water-based failures-causes; poor gloss and dirt ingress

Non- Original Equipment (OE) parts: cost effectiveness; policy conditions; warranty; OE supplier and vehicle manufacturer; used parts

Environmental protection and British Standards: definition; Volatile Organic Compounds (VOCs); body shop requirements; High Volume Low Pressure (HVLP) and Low Volume Low Pressure (LVLP) equipment; Control of Substances Hazardous to Health (COSHH); BS/ISO 9000; advantages

Post-repair inspections: repaired total loss; repair evaluations; Ministry of Transport test (MOT); value; re-insurance; estimate/repair comparisons; geometry checks

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

4 Understand insurers' claim liability

Types of insurance cover: comprehensive; third party fire and theft; third party only; excess; duty of care

Types of insurance claim: fire; theft/attempted theft; flood; accidental damage; mechanical

Specialist investigation: latent and patent defects; mechanical failures; electrical failures; use of specialists

Betterment contribution: definition; application; contribution; calculation of; betterment and the ombudsman

5 Understand the duties and responsibilities of the assessor

Effective negotiations: objectives; approach; tactics; gambits; communications; stance; types of negotiation; probable outcomes

Assessor's responsibilities: to principals; other professional engineers; to insured; to brokers; nature of repairs effected; repairer's capabilities

Expert witness: prior process; notes required; court procedure-examination; cross examination; professionalism

Qualities: experience, qualifications; attributions; personality; telephone manner; patience; manners

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 carry out vehicle damage assessment and cost evaluation	1.1 conduct a vehicle damage assessment 1.2 calculate repair costs for a damaged vehicle 1.3 evaluate the suitability of repair methods and materials used 1.4 explain an application of total losses and salvage disposal
LO2 Be able to use recognised methods to calculate vehicle valuations and consequential losses	2.1 summarise different methods of depreciation 2.2 compare the recognised methods of calculating vehicle valuation 2.3 calculate hourly and retail labour rates 2.4 calculate profit and running costs 2.5 calculate the VAT on an invoice for an inspection charge
LO3 Be able to appraise the quality of vehicle repairs	3.1 evaluate different preparation defects 3.2 evaluate different paint defects and suitable rectification methods 3.3 discuss the use of non-OE parts in a vehicle repair 3.4 examine the application of environmental protection and British Standards to a vehicle repair 3.5 explain the requirements of post-repair inspection
LO4 Understand insurers' claim liability	4.1 compare different types of insurance cover 4.2 examine different types of insurance claim 4.3 explain the requirements of a specialist investigation 4.4 explain the application of betterment contribution
LO5 Understand the duties and responsibilities of the assessor	5.1 discuss the importance of effective negotiation skills for an assessor 5.2 explain the responsibilities of an assessor 5.3 explain the importance of an appropriate expert witness 5.4 evaluate the qualities of an engineer assessor.

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

Guidance

Links

This unit is intended to be linked with *Unit 13: Automotive Accident Reconstruction* and *Unit 22: Motor Insurance Principles*.

Essential requirements

Centres should provide access to a range of vehicles, at least one computer-based estimating system and Thatcham repair time books and repair manuals.

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.

Unit 21: Transport Legislation

Unit code: T/503/1152

QCF level: 5

Credit value: 15

Aim

This unit is designed to develop the learners' appreciation and understanding of the legal aspects relating to goods vehicle operations within the United Kingdom and European Union.

Unit abstract

This unit will provide a broad understanding of the main regulations and directives affecting heavy goods vehicle operations as they apply to fleet operators and repairers. As a high proportion of current UK transport operators move goods through many countries, this unit will cover UK and international operations. All of the operational requirements covered are formed from EU directives.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the construction and use regulations

2 Understand the law regarding to goods vehicle plating, testing and inspection

3 Understand operator licensing regulations

4 Understand driver licensing and traffic offence regulations.

Unit content

1 Understand the construction and use regulations

Vehicle legal requirements: braking eg braking standards, maintenance, efficiencies, braking on trailers; tyre approval marks; tyres eg tread depth, tyre damage, recut tyres and legal requirements; speed limiters eg EU requirements, speed limiter plates; smoke opacity limits eg offences, control of fumes, excess fuel devices, exhaust emissions European directives; vehicle equipment eg mirrors, horn, safety glass, fuel tanks; type approval exemptions eg alteration to vehicle, arrangements for first licensing, issue of plate

Vehicle lighting systems: obligatory lamps; optional lamps; side marker lamps; reflectors; indicators and lighting of projecting load

Non-compliance: loss of licence; criminal prosecution; unsafe vehicle

2 Understand the law regarding goods vehicle plating, testing and inspection

Vehicle plating: manufacturer's plate; Department of Transport plate; standard lists and exemptions from plating; notifiable alterations

Vehicle testing: types of test; test application; refusal to test; test procedures

Vehicle inspections: roadside vehicle inspection checks; inspections on premises; inspection notices and prohibitions

Non-compliance: loss of licence; criminal prosecution; unsafe vehicle

3 Understand operator licensing regulations

Operator's license: restricted, standard and international operator licences; exemptions

Application considerations: traffic commissioner's considerations eg traffic commissioner's rulings; past legal history; applicant's if character eg reputation, financial standing, professional competence; nominated operating centre(s); licence variation eg local regulations

4 Understand driver licensing and traffic offence regulations

Vehicle excise licensing: payment of duty for different vehicle combinations eg plateable rigid and articulated vehicles not exceeding 12000 kg mass weight, plateable rigid and articulated vehicles exceeding 12000 kg mass weight, trailers (single, tandem and tri-axle combinations)

Driver licensing: the issuing authority; types of LGV driving licence; driving licence classes; exemptions; vehicle categories and age limits; licence fees; provisional LGV driving licence; medical requirements; licence renewal; revocation and disqualification; international driving permits

Traffic offences: speed limits; loading and unloading restrictions; overloading; seat belts; vehicle roadworthiness

Non-compliance: loss of licence; criminal prosecution; punishment of offences eg penalty points and fines; procedure for pleading guilty by letter; mitigating circumstance

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 construction and use regulations	1.1 analyse the legal requirements of the construction and use regulations 1.2 explain the law relating to vehicle lighting systems 1.3 assess the consequences of non-compliance
LO2 Understand the law regarding goods vehicle plating, testing and inspection	2.1 analyse the requirements for goods vehicle plating 2.2 analyse the requirements for annual vehicle testing 2.3 analyse the requirements for vehicle inspections 2.4 assess the consequences of non-compliance
LO3 Understand operator licensing regulations	3.1 compare restricted, standard and international operator licences 3.2 examine the application considerations for operator licensing
LO4 Understand driver licensing and traffic offence regulations	4.1 compare the excise duty requirements for different vehicle combinations 4.2 explain the different LGV driver licensing requirements 4.3 discuss the law relating to traffic offences 4.4 assess the consequences of non-compliance with licence and traffic regulations.

Guidance

Links

This unit may effectively be linked with *Unit 6: Business Law for Vehicle Operations* as this will provide an understanding of the legal system that underpins the transport legislation.

Essential requirements

Learners will need access to current legislation, eg Road Vehicles (Construction and Use) Regulations.

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 and detailed case study materials.

Unit 22: Motor Insurance Principles

Unit code: F/503/1154

QCF level: 4

Credit value: 15

Aim

This unit will give learners an understanding of motor insurance principles, the types of policy available and the relevant associated legislation.

Unit abstract

This unit will develop an understanding of the basic principles of insurance, including risk analysis and the factors affecting premiums. Learners will analyse the effect of the Road Traffic Act on motor insurance. They will also gain an understanding of the different forms of insurance policy and the role of the motor insurance bureau. Finally learners will investigate relevant EC legislation and directives.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand motor insurance principles

2 Understand the Road Traffic Act in relation to motor insurance

3 Understand the different types of motor insurance policy

4 Understand the effects of EC legislation on motor insurance.

Unit content

1 Understand motor insurance principles

Basic principles: indemnity; utmost good faith; insurable interest; subrogation; contribution; betterment contribution; proximate clause

Risk analysis: power to weight ratio; age of vehicle; vehicle value; cost of repair and labour; district in which vehicle is garaged; type of use; age of the policyholder; main user of the vehicle

Factors affecting premium: factors reducing premiums eg voluntary excess, no claims discount, introductory discount, restricted driving, restricted mileage, vehicle garaged loyalty discounts; factors increasing premiums eg occupation, health, previous convictions, driver's history of accidents, losses or claims, driver's insurance history; type of vehicle eg private, commercial, kit cars, veteran or vintage cars, modified vehicles

2 Understand the Road Traffic Act in relation to motor insurance

Summary of the Road Traffic Act: principal road safety provisions; construction and use of vehicles and equipment; licensing of drivers; driving instruction; third party liabilities; miscellaneous and general

Interpretation of third party liabilities: requirement to be insured; exceptions from the requirement; requirements of an insurance policy; provisions of security in respect of third party risks; avoidance of certain exceptions to policies or securities; liabilities towards passengers; car sharing agreements; limitations of the policy on the entitlement to drive an insured vehicle; effects of bankruptcy on third party claims; duty to supply information to a third party; deposits; power to require evidence of insurance on application for vehicle excise licence; payment for hospital treatment of traffic casualties; supplementary provisions as to payment for treatments; regulations; definition of regulations and prescribed; interpretation of the key words used in the relevant sections

3 Understand the different types of motor insurance policy

Interpretation and conditions of insurance policies: private motorist insurance; proposal form; types of cover; recital clause; operative clause; general exclusions; conditions; schedule and endorsements; motor trade insurance; main types of policy; internal risks policy; road risks policy; motor trader combined policy; commercial vehicle insurance; definition of a commercial vehicle; type of use; type of vehicle; district; cover required; details of the insured and/or drivers

Motor insurance bureau: historical background; function; untraced driver's agreement; uninsured driver's agreement; domestic agreement

4 Understand the effects of EC legislation on motor insurance

Legislation: relevant EC directives on motor insurance; green card system; use of policy extension; commercial vehicle; Passenger Carrying Vehicles (PCVs); caravan and trailer insurance for EC use

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 motor insurance principles	1.1 explain the basic principles of motor vehicle insurance 1.2 analyse the risks involved when setting premiums 1.3 assess the factors likely to affect an insurance premium
LO2 Understand the Road Traffic Act in relation to motor insurance	2.1 discuss the sections of the Road Traffic Act relevant to motor insurance 2.2 explain the requirements of third party liabilities in respect to the Road Traffic Act
LO3 Understand the different types of motor insurance policy	3.1 compare the conditions of different types of insurance policy and the factors that affect risk 3.2 evaluate the purpose and operation of the motor insurance bureau
LO4 Understand the effects of EC legislation on motor insurance	4.1 assess the effects of EC law on UK motor insurance 4.2 explain the different policies required when using commercial vehicles, PCVs, caravans and trailers in the EU.

Guidance

Links

This unit is intended to be linked with *Unit 6: Business Law for Vehicle Operations*, *Unit 13: Automotive Accident Reconstruction* and *Unit 20: Vehicle Damage Assessment*.

Essential requirements

Learners should have access to materials and case studies that reflect current legislation and industrial practice.

Employer engagement and vocational contexts

NB: This can be an optional section. It could be used to include suggested employer contact that would enhance the delivery of the unit.

Unit 23: Working with and Leading People

Unit code: M/601/0908

QCF level: 5

Credit value: 15 credits

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 for both the individual and the organisation, 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 teamworking 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

The unit links with *Unit 4: Managing People in Vehicle Operations*.

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.

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

Unit 24: Small Business Enterprise

Unit code: H/601/1098

QCF level: 5

Credit value: 15 credits

Aim

The aim of this unit is to give learners the opportunity to focus on the processes involved, through change management, of reviewing and improving the performance of a small business enterprise.

Unit abstract

This unit is designed primarily for learners who are interested in small business enterprises and looks at the development and expansion of these businesses. The unit will be particularly appropriate for learners currently working in a small business enterprise. The unit is also appropriate for learners who have had work placements or work experience in small businesses and for learners who wish to pursue careers in the small business sector of the economy.

The government's vision is for more people in the UK to have the opportunity, aspiration and motivation to use their talent and initiative to be enterprising, and to have an increased proportion of people starting a business. The Department for Business, Innovation and Skills is responsible for small business and enterprise policy. Statistics from the Federation of Small Businesses website show that there are almost 5 million small businesses in the UK, almost 14 million people are employed in small- and medium-sized enterprises and over half a million people start up their own businesses every year. The small business sector provides employment and career opportunities which may appeal to many learners not attracted to a career in large organisations.

The unit draws together many of the topics covered in other units and allows learners to practise the business skills needed in reviewing and managing the performance of a small enterprise.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to investigate the performance of a selected small business enterprise

2 Be able to propose changes to improve management and business performance

3 Be able to revise business objectives and plans to incorporate proposed changes

4 Be able to examine the impact of change management on the operations of the business.

Unit content

1 Be able to investigate the performance of a selected small business enterprise

Business profile: components of the business, objectives of the business, internal and external factors affecting business performance, performance measures, constraints and restrictions on business, responsibilities and liabilities of owner-manager

Comparative measures of performance: comparisons with other similar-sized businesses in same geographical area, comparisons with businesses in same or similar industry, comparisons with industry averages; comparisons should cover all areas (financial, production, marketing, sales, human resources, use of technology)

Analysis of business information: analysis of past and current business information (financial, marketing information, sales, production, human resource efficiency, management effectiveness) using ratios, budget information, market research results, SWOT analysis, business reports eg production efficiency

2 Be able to propose changes to improve management and business performance

Overcoming weaknesses: problem-solving strategies, sources and availability of professional advice in appropriate areas, finding solutions and alternatives, availability and use of outsourcing for specific functions eg payroll, debt collection

Maintaining and strengthening existing business: maintaining appropriate performance records, building on business strengths, maintaining market share/position, importance of good customer/supplier/adviser relationships

New opportunities: identifying areas for expansion eg niche markets and export opportunities where appropriate, research techniques, evaluating projects, assessing project requirements, costing and finding finance for new projects, risk assessment

Evaluation of management and personnel: skills audit, self-evaluation, development of self and associated personnel, assessing costs and benefits of self and staff development

3 Be able to revise business objectives and plans to incorporate proposed changes

Business objectives: structure of business objectives, assessment of business objectives in the light of current performance, making changes to business objectives, impact of changes on business plans

Business plans: structure of integrated business plans (financial, sales and marketing, production/output, personnel), use of business plans, evaluation of plans against business objectives, incorporating changes to plans, budgeting for changes, preparation of business forecasts

Action plans: plans to implement changes, systems to manage, monitor and evaluate changes, performance measures, milestones, setting deadlines

BH023344 – Edexcel BTEC Levels 4 and 5 Higher Nationals specification in Vehicle Operations Management – Issue 1 – July 2012 © Pearson Education Limited 2012

4 Be able to examine the impact of change management on the operations of the business

Impact of change: effects of change on all areas of business (finance, workloads, morale, job roles, physical aspects eg office space, production methods); use of technology, anticipating possible obstacles/problems

Management of change: monitoring effects of change, maintaining systems and records to evaluate impact of change, appropriate revision of plans in response to actual results

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 investigate the performance of a selected small business enterprise	1.1 produce a profile of a selected small business identifying its strengths and weaknesses 1.2 carry out an analysis of the business using comparative measures of performance
LO2 Be able to propose changes to improve management and business performance	2.1 recommend with justification, appropriate actions to overcome the identified weaknesses in the business 2.2 analyse ways in which existing performance could be maintained and strengthened 2.3 recommend with justification, new areas in which the business could be expanded
LO3 Be able to revise business objectives and plans to incorporate proposed changes	3.1 produce an assessment of existing business objectives and plans 3.2 revise business plans to incorporate appropriate changes 3.4 prepare an action plan to implement the changes
LO4 Be able to examine the impact of change management on the operations of the business	4.1 report on the impact of the proposed changes on the business and its personnel 4.2 plan how the changes will be managed in the business 4.3 monitor improvements in the performance of the business over a given timescale.

Guidance

Links

This unit links with other management units within this specification.

The unit also links with the Management and Leadership NOS.

Essential requirements

Some learners will be able to use their own experience of small business as a basis for their work in this unit. Other learners will need to be given realistic case studies.

Local government reports and statistics relating to small businesses are available in most public libraries and will be needed.

Employer engagement and vocational contexts

Learners will be encouraged to use their own organisation for research. Learners will require access to research facilities and the internet. Guest speakers with experience of small business management can provide valuable input to support the underpinning knowledge and understanding of the unit.

Unit 25: Organisations and Behaviour

Unit code: H/601/0551

QCF level: 4

Credit value: 15 credits

Aim

The aim of this unit is to give learners an understanding of individual and group behaviour in organisations and to examine current theories and their application in managing behaviour in the workplace.

Unit abstract

This unit focuses on the behaviour of individuals and groups within organisations. It explores the links between the structure and culture of organisations and how these interact and influence the behaviour of the workforce. The structure of a large multi-national company with thousands of employees worldwide will be very different from a small local business with 20 employees. The way in which an organisation structures and organises its workforce will impact on the culture that develops within the organisation. This system of shared values and beliefs will determine and shape the accepted patterns of behaviour of an organisations workforce. The culture in organisations that differ in size, for example, or are from different sectors of the economy can be very different.

The structure and culture of an organisation are key factors which contribute to motivating the workforce at all levels of the organisation. The Japanese were instrumental in developing a culture of 'continuous improvement through teamwork' in their manufacturing industry. This culture has now been exported around the world and encapsulates the way in which structure and culture contribute to patterns of behaviour in the workplace. This unit will develop learner understanding of the behaviour of people within organisations and of the significance that organisational design has on shaping that behaviour.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the relationship between organisational structure and culture

2 Understand different approaches to management and leadership

3 Understand ways of using motivational theories in organisations

4 Understand mechanisms for developing effective teamwork in organisations.

Unit content

1 Understand the relationship between organisational structure and culture

Types of organisation and associated structures: functional, product-based, geographically based, multi-functional and multi-divisional structures, matrix, centralisation and de-centralisation; organisational charts; spans of control; internal and external network structures; flexible working

Organisational culture: classification of organisational culture – power culture, role culture, task culture, person culture; cultural norms and symbols; values and beliefs; development of organisational culture

Diagnosing behavioural problems: concepts; principles; perspectives; methodology

Perception: definition; perceptual selection; perception and work behaviour; attitude; ability and aptitude; intelligence

Significance and nature of individual differences: self and self-image; personality and work behaviour; conflict

Individual behaviour at work: personality, traits and types; its relevance in understanding self and others

2 Understand different approaches to management and leadership

Development of management thought: scientific management; classical administration; bureaucracy; human relations approach; systems approach; contingency approach

Functions of management: planning; organising; commanding; coordinating; controlling

Managerial roles: interpersonal; informational; decisional

Nature of managerial authority: power; authority; responsibility; delegation; conflict

Frames of reference for leadership activities: opportunist; diplomat; technician; achiever; strategist; magician; pluralistic; transformational; change

3 Understand ways of using motivational theories in organisations

Motivation theories: Maslow's Hierarchy of Needs; Herzberg's Motivation – Hygiene theory; McGregor's Theory X and Y; Vroom and Expectancy theories; Maccoby, McCrae and Costa – personality dimensions

Motivation and performance: rewards and incentives; motivation and managers; monetary and non-monetary rewards

Leadership: leadership in organisations; managers and leaders; leadership traits; management style; contingency approach; leadership and organisational culture

Leadership and successful change in organisations: pluralistic; transformational; communications; conflict

4 Understand mechanisms for developing effective teamwork in organisations

Teams and team building: groups and teams; informal and formal groups; purpose of teams; selecting team members; team roles; Belbin's theory; stages in team development; team building; team identity; team loyalty; commitment to shared beliefs; multi-disciplinary teams

Team dynamics: group norms; decision-making behaviour; dysfunctional teams; cohesiveness

Impact of technology on team functioning: technology; communication; change; networks and virtual teams; global and cross-cultural teams

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 relationship between organisational structure and culture	1.1 compare and contrast different organisational structures and culture 1.2 explain how the relationship between an organisation's structure and culture can impact on the performance of the business 1.3 discuss the factors which influence individual behaviour at work
LO2 Understand different approaches to management and leadership	2.1 compare the effectiveness of different leadership styles in different organisations 2.2 explain how organisational theory underpins the practice of management 2.3 evaluate the different approaches to management used by different organisations
LO3 Understand ways of using motivational theories in organisations	3.1 discuss the impact that different leadership styles may have on motivation in organisations in periods of change 3.2 compare the application of different motivational theories within the workplace 3.3 evaluate the usefulness of a motivation theory for managers
LO4 Understand mechanisms for developing effective teamwork in organisations	4.1 explain the nature of groups and group behaviour within organisations 4.2 discuss factors that may promote or inhibit the development of effective teamwork in organisations 4.3 evaluate the impact of technology on team functioning within a given organisation.

Guidance

Links

This unit links to *Unit 4: Managing People in Vehicle Operations*.

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 guest speakers, visit opportunities and information about the operation of their businesses.

Unit 26: Employability Skills

Unit code: A/601/0992

QCF level: 5

Credit value: 15

Aim

This unit provides learners with the opportunity to acquire honed employability skills required for effective employment.

Unit abstract

All learners at all levels of education and experience require honed employability skills as a prerequisite to entering the job market. This unit gives learners an opportunity to assess and develop an understanding of their own responsibilities and performance in, or when entering, the workplace.

It considers the skills required for general employment, such as interpersonal and transferable skills, and the dynamics of working with others in teams or groups including leadership and communication skills.

It also deals with the everyday working requirement of problem solving which includes the identification or specification of the 'problem', strategies for its solution and then evaluation of the results through reflective practices.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to determine own responsibilities and performance

2 Be able to develop interpersonal and transferable skills

3 Understand the dynamics of working with others

4 Be able to develop strategies for problem solving.

Unit content

1 Be able to determine own responsibilities and performance

Own responsibilities: personal responsibility; direct and indirect relationships and adaptability, decision-making processes and skills; ability to learn and develop within the work role; employment legislation, ethics, employment rights and responsibilities

Performance objectives: setting and monitoring performance objectives

Individual appraisal systems: uses of performance appraisals eg salary levels and bonus payments, promotion strengths and weaknesses, training needs; communication; appraisal criteria eg production data, personnel data, judgemental data; rating methods eg ranking, paired comparison, checklist, management by objectives

Motivation and performance: application and appraisal of motivational theories and techniques, rewards and incentives, manager's role, self-motivational factors

2 Be able to develop interpersonal and transferable skills

Effective communication: verbal and non-verbal – awareness and use of body language, openness and responsiveness, formal and informal feedback to and from colleagues; ICT as an effective communication medium; team meetings

Interpersonal skills: personal effectiveness; working with others; use of initiative; negotiating skills; assertiveness skills; social skills

Time management: prioritising workload; setting work objectives; making and keeping appointments; working steadily rather than erratically; time for learning; reliable estimate of task time

Problem solving: problem analysis; researching changes in the workplace; generating solutions; choosing a solution

3 Understand the dynamics of working with others

Working with others: nature and dynamics of team and group work; informal and formal settings, purpose of teams and groups eg long-term corporate objectives/strategy; problem solving and short-term development projects; flexibility/adaptability; team player

Teams and team building: selecting team members eg specialist roles, skill and style/approach mixes; identification of team/work group roles; stages in team development eg team building, identity, loyalty, commitment to shared beliefs, team health evaluation; action planning; monitoring and feedback; coaching skills; ethics; effective leadership skills, eg, setting direction, setting standards, motivating, innovative, responsive, effective communicator, reliability, consistency

4 Be able to develop strategies for problem solving

Specification of the problem: definition of the problem; analysis and clarification

Identification of possible outcomes: identification and assessment of various alternative outcomes

Tools and methods: problem-solving methods and tools

Plan and implement: sources of information; solution methodologies; selection and implementation of the best corrective action eg timescale, stages, resources, critical path analysis

Evaluation: evaluation of whether the problem was solved or not; measurement of solution against specification and desired outcomes; sustainability

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 determine own responsibilities and performance	1.1 develop a set of own responsibilities and performance objectives 1.2 evaluate own effectiveness against defined objectives 1.3 make recommendations for improvement 1.4 review how motivational techniques can be used to improve quality of performance
LO2 Be able to develop interpersonal and transferable skills	2.1 develop solutions to work based problems 2.2 communicate in a variety of styles and appropriate manner at various levels 2.3 identify effective time management strategies
LO3 Understand the dynamics of working with others	3.1 explain the roles people play in a team and how they can work together to achieve shared goals 3.2 analyse team dynamics 3.3 suggest alternative ways to complete tasks and achieve team goals
LO4 Be able to develop strategies for problem solving	4.1 evaluate tools and methods for developing solutions to problems 4.2 develop an appropriate strategy for resolving a particular problem 4.3 evaluate the potential impact on the business of implementing the strategy.

Guidance

Links

This unit links with the *Personal and Professional Development*, the W*ork-Based Experience* and *Research Project* units. It also links with the following Asset Skills cross-sectoral Employability Matrix:

- B2.4: Plan and manage time, money and other resources to achieve goals
- B3.3: Find and suggest new ways to achieve goals and get the job done and achieve goals
- B4.5: Plan for and achieve your learning goals
- C1.1: Understand the roles people play in a group and how you can best work with them
- C1.7: Lead or support and motivate a team to achieve high standards
- C2.6: Find new and creative ways to solve a problem.

Essential requirements

Learners will need access to a range of work-related exemplars (for example, appraisal and development systems, team health checks, job descriptions, action plans, communication strategies).

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.

Unit 27: Personal and Professional Development

Unit code: T/601/0943

QCF level: 5

Credit value: 15

Aim

This unit aims to help the learner become an effective and confident self-directed employee. This helps the learner become confident in managing own personal and professional skills to achieve personal and career goals.

Unit abstract

This unit is designed to enable learners to assess and develop a range of professional and personal skills in order to promote future personal and career development. It also aims to develop learners' ability to organise, manage and practise a range of approaches to improve their performance as self-directed learners in preparation for work or further career development.

The unit emphasises the needs of the individual but within the context of how the development of self-management corresponds with effective team management in meeting objectives.

Learners will be able to improve their own learning, be involved in teamwork and be more capable of problem solving through the use of case studies, role play and real-life activities.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand how self-managed learning can enhance lifelong development

2 Be able to take responsibility for own personal and professional development

3 Be able to implement and continually review own personal and professional development plan

4 Be able to demonstrate acquired interpersonal and transferable skills.

Unit content

1 Understand how self-managed learning can enhance lifelong development

Self-managed learning: self-initiation of learning processes; clear goal setting, eg aims and requirements, personal orientation achievement goals, dates for achievement, self-reflection

Learning styles: personal preferences; activist; pragmatist; theorist; reflector, eg reflexive modernisation theory; Kolb's learning cycle

Approaches: learning through research; learning from others, eg mentoring/coaching, seminars, conferences, secondments, interviews, use of the internet, social networks, use of bulletin boards, news groups

Effective learning: skills of personal assessment; planning, organisation and evaluation

Lifelong learning: self-directed learning; continuing professional development; linking higher education with industry, further education, Recognition of Prior Learning, Apprenticeships, Credit Accumulation and Transfer Schemes

Assessment of learning: improved ability range with personal learning; evidence of improved levels of skill; feedback from others; learning achievements and disappointments

2 Be able to take responsibility for own personal and professional development

Self appraisal: skills audit (personal profile using appropriate self-assessment tools); evaluating self-management; personal and interpersonal skills; leadership skills

Development plan: current performance; future needs; opportunities and threats to career progression; aims and objectives; achievement dates; review dates; learning programme/activities; action plans; personal development plan

Portfolio building: developing and maintaining a personal portfolio

Transcripts: maintaining and presenting transcripts including curriculum vitae

3 Be able to implement and continually review own personal and professional development plan

Learning styles and strategies: types of styles; awareness of own personal style; impact of personal style and interactions with others

Learning from others: formal learning and training; observation; mentoring; supervision; tutorials; informal networks; team members; line managers; other professionals

Evaluation of progress: setting and recording of aims and objectives; setting targets; responding to feedback; re-setting aims and targets; establishing and recognising strengths and weaknesses; directions for change; cycles of activity (monitoring, reflecting and planning)

4 Be able to demonstrate acquired interpersonal and transferable skills

Transferable skills: personal effectiveness (ability to communicate effectively at all levels, initiative, self-discipline, reliability, creativity, problem solving)

Verbal and non-verbal communication: effective listening, respect for others' opinions; negotiation; persuasion; presentation skills; assertiveness; use of ICT

Delivery formats: ability to deliver transferable skills using a variety of formats

Working with others: team player; flexibility/adaptability; social skills

Time management: prioritising workloads; setting work objectives; using time effectively; making and keeping appointments; reliable estimates of task time

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 self-managed learning can enhance lifelong development	1.1 evaluate approaches to self managed learning 1.2 propose ways in which lifelong learning in personal and professional contexts could be encouraged 1.3 evaluate the benefits of self-managed learning to the individual and organisation
LO2 Be able to take responsibility for own personal and professional development	2.1 evaluate own current skills and competencies against professional standards and organisational objectives 2.2 identify own development needs and the activities required to meet them 2.3 identify development opportunities to meet current and future defined needs 2.4 devise a personal and professional development plan based on identified needs
LO3 Be able to implement and continually review own personal and professional development plan	3.1 discuss the processes and activities required to implement the development plan 3.2 undertake and document development activities as planned 3.3 reflect critically on own learning against original aims and objectives set in the development plan 3.4 update the development plan based on feedback and evaluation
LO4 Be able to demonstrate acquired interpersonal and transferable skills	4.1 select solutions to work-based problems 4.2 communicate in a variety of styles and appropriate manner at various levels 4.3 evaluate and use effective time management strategies.

Guidance

Links

The unit links with U*nit 26: Employability Skills*.

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.

Unit 28: Research Project

Unit code: K/601/0941

QCF level: 5

Credit value: 20

Aim

To develop learners' skills of independent enquiry and critical analysis by undertaking a sustained research investigation of direct relevance to their Higher Education programme and professional development.

Unit abstract

This unit is designed to enable learners to become confident using research techniques and methods. It addresses the elements that make up formal research including the proposal, a variety of research methodologies, action planning, carrying out the research itself and presenting the findings. To complete the unit satisfactorily, learners must also understand the theory that underpins formal research.

The actual research depends on the learner, the context of their area of learning, their focus of interest and the anticipated outcomes. The unit draws together a range of other areas from within the programme to form a holistic piece of work that will makes a positive contribution to the learner's area of interest. Learners should seek approval from their tutors before starting their research project

Learning outcomes

On successful completion of this unit a learner will:

1 Understand how to formulate a research specification

2 Be able to implement the research project within agreed procedures and to specification

3 Be able to evaluate the research outcomes

4 Be able to present the research outcomes.

Unit content

1 Understand how to formulate a research specification

Research formulation: aims and objectives; rationale for selection; methodology for data collection and analysis; literature review; critique of references from primary sources, eg questionnaires, interviews; secondary sources, eg books, journals, internet; scope and limitations; implications, eg resources

Hypothesis: definition; suitability; skills and knowledge to be gained; aims and objectives; terms of reference; duration; ethical issues

Action plan: rationale for research question or hypothesis; milestones; task dates; review dates; monitoring/reviewing process; strategy

Research design: type of research, eg qualitative, quantitative, systematic, original; methodology; resources; statistical analyses; validity; reliability; control of variables

2 Be able to implement the research project within agreed procedures and to specification

Implement: according to research design and method; test research hypotheses; considering test validity; reliability

Data collection: selection of appropriate tools for data collection; types, eg qualitative, quantitative; systematic recording; methodological problems, eg bias, variables and control of variables, validity and reliability

Data analysis and interpretation: qualitative and quantitative data analysis – interpreting transcripts; coding techniques; specialist software; statistical tables; comparison of variable; trends; forecasting

3 Be able to evaluate the research outcomes

Evaluation of outcomes: an overview of the success or failure of the research project planning, aims and objectives, evidence and findings, validity, reliability, benefits, difficulties, conclusion(s)

Future consideration: significance of research investigation; application of research results; implications; limitations of the investigation; improvements; recommendations for the future, areas for future research

4 Be able to present the research outcomes

Format: professional delivery format appropriate to the audience; use of appropriate media

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 formulate a research specification	1.1 formulate and record possible research project outline specifications 1.2 identify the factors that contribute to the process of research project selection 1.3 undertake a critical review of key references 1.4 produce a research project specification 1.5 provide an appropriate plan and procedures for the agreed research specification
LO2 Be able to implement the research project within agreed procedures and to specification	2.1 match resources efficiently to the research question or hypothesis 2.2 undertake the proposed research investigation in accordance with the agreed specification and procedures 2.3 record and collate relevant data where appropriate
LO3 Be able to evaluate the research outcomes	3.1 use appropriate research evaluation techniques 3.2 interpret and analyse the results in terms of the original research specification 3.3 make recommendations and justify areas for further consideration
LO4 Be able to present the research outcomes	4.1 use an agreed format and appropriate media to present the outcomes of the research to an audience.

Guidance

Links

This unit may be linked to single or several units in the programme, depending on the research topic and the context of their area of learning.

The unit can also be linked to the SEMTA Level 4 National Occupational Standards in Engineering Management, particularly:

- Unit 4.5: Identify and Define Areas of Engineering Research
- Unit 4.6: Develop a Research Methodology for Engineering
- Unit 4.8: Undertake Engineering Research
- Unit 4.9: Evaluate the Results of Engineering Research.

Essential requirements

Tutor will need to establish the availability of resources to support the independent study before allowing the learner to proceed with the proposal.

Employer engagement and vocational contexts

Centres should try to establish relationships with appropriate organisations in order to bring realism and relevance to the research project.

Unit 29: Work-based Experience

Unit code: D/601/0998

QCF level: 5

Credit value: 15

Aim

This unit aims to enable learners to experience the scope and depth of learning which may take place in a work-based context by planning, monitoring and evaluating the work experience.

Unit abstract

A significant amount of learning can be achieved by carrying out practical activities in a workplace. Learning may be enhanced by taking a more formal approach to work-based activities – by planning, carrying out the activities and reflecting on the benefits of the activities to the business and to the learner.

This unit is designed to allow flexibility of study for part-time and full-time learners. It is expected that learners will be supervised in the workplace in addition to the supervision provided by their academic supervisor.

Learners will have the opportunity, supported by their supervisors, to negotiate and perform activities which will allow them to fulfil the assessment criteria for this unit. They will recognise the scope of what they have achieved by recording evidence from carrying out the activities. They will also gain maximum benefit by reflection on and evaluation of the work they undertake.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to negotiate industry experience

2 Understand the specific requirements of the placement

3 Be able to undertake work experience as identified

4 Be able to monitor and evaluate own performance and learning.

Unit content

1 Be able to negotiate industry experience

Suitable organisation and location: types of establishments for placement eg industry-related work for a client brief at college, existing work environment, different departments within current employer's business

Negotiation: methods of contacting organisations; methods of undertaking negotiations

Nature of duties: type of undertaking eg routine duties and tasks, project work, development of new procedures/protocol

Supervisors: roles and responsibilities of academic and industrial mentors

Expectations of learning: aims eg proficiency in new tasks and procedures, time-management and problem solving skills, reflection, discuss progress with others, teamwork

Business constraints: consideration of possible limitations eg need to be fully trained, adherence to quality systems, health and safety considerations, supervision time, workload, customer satisfaction, limited staffing, cost of materials

2 Understand the specific requirements of the placement

Tasks: details of activities eg specific hourly, daily, weekly routine and non-routine tasks; breakdown of a project into stages; new procedures/protocol

Prioritise: reasons for rationalisation of the order of tasks; methods of prioritising work

Plan for the work experience: methods used to develop detailed plan with schedule of tasks, proposed dates for reviews, expected input from supervisors

Benefits to organisation and learner: advantages to business eg allowing more routine tasks to be carried out, allowing procedures/techniques to be developed, increasing responsiveness, identifying cost saving measures; advantages to learner eg understanding how a business operates, understanding importance of teamwork, learning new techniques, development of problem-solving and time-management skills

3 Be able to undertake work experience as identified

Carry out the planned activities: realisation eg carrying out tasks and project work according to relevant legislation, training and codes of practice; developing new procedures or protocol

Record activities in the appropriate manner: systematic and appropriate recording of relevant activities eg logbook, diary, portfolio, spreadsheets, data bases; list of resources

Revise the initial plan as required: methods used to review activities at the appropriate time to see if they meet requirements, make alterations as needed

4 Be able to monitor and evaluate own performance and learning

Evaluation of the quality of the work undertaken: meeting industry standards and evaluating own performance against original proposal; comments/testimony from supervisors

Account of learning during the work experience: details of experience gained eg new procedures, interpersonal skills, time-management, problem-solving, teamwork; details of evidence eg portfolio of evidence, scientific report, management report

Recommendations on how the learning experience could have been enhanced: alternative ideas eg different location, different brief, different time period, more/less support, better time-management, better preparation

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 negotiate industry experience	1.1 research and evaluate suitable organisations that could provide industry experience 1.2 negotiate with work and academic supervisors a proposal for the work experience 1.3 recognise the business constraints on the work experience offered
LO2 Understand the specific requirements of the placement	2.1 agree and prioritise the tasks and responsibilities involved in the work experience 2.2 produce a plan for the work experience 2.3 analyse the benefits of the proposed activities to the business and the learner
LO3 Be able to undertake work experience as identified	3.1 fulfil specified requirements of placement conforming to all related codes of practice 3.2 produce systematic records of work undertaken 3.3 revise the initial plan as required 3.4 make suggestions for improvement and review these with appropriate supervisor
LO4 Be able to monitor and evaluate own performance and learning	4.1 monitor progress against original proposal 4.2 evaluate the quality of own performance 4.3 analyse the learning which has taken place during the work experience using suitable reflections 4.4 make recommendations on how the experience could have been enhanced.

Guidance

Links

This unit has possible links with all units in the programme, especially the *Personal and Professional Development* and *Employability Skills* units.

Essential requirements

Given the work-based nature of this unit, the majority of resources will be those available to the learner in the workplace. The work will normally be planned to be achievable within the resource constraints of the employer. Therefore knowledge of company structures and daily routines and expectations are essential. Learners will also need access to a wide range of research facilities including careers library and/or careers services.

Tutor support and guidance are essential. Learners should remain in touch with tutors during the work-experience – email is often the best way but some colleges may have access to a virtual learning environment where learners can share information and experiences with each other and the tutor.

Employer engagement and vocational contexts

Delivery of this unit depends on centres establishing strong links with employers who can offer work-based placements.

Unit 30: Financial Accounting and Reporting

Unit code: F/601/0864

QCF level: 4

Credit value: 15 credits

Aim

In this unit learners will prepare financial statements for different types of business, complying with relevant legal and regulatory provisions and the basic principles of group accounts. Learners will also develop tools for the interpretation of financial statements.

Unit abstract

It is essential for the success of any business that it has good financial control and record keeping. Lack of effective control, planning and recording can ultimately lead to poor financial results. Owners and managers need to be able to recognise the indications of potential difficulties and take remedial action when required.

The unit considers the current regulations governing financial reporting, the formats of financial statements and the purpose of these statements for different users.

Learners will use records to complete financial statements. They will consider various categories of business income and expenditure and use cash flow forecasts, monitoring and adjusting for the effective management of cash flow. They will measure financial performance using a profit and loss account and balance sheet and analyse the profitability, liquidity and efficiency of a business through the application of ratio analysis.

Learning outcomes

On successful completion of this unit a learner will:

1 Understand the regulatory framework for financial reporting

2 Be able to prepare financial statements from complete or incomplete records

3 Be able to present financial information in accepted formats for publication

4 Be able to interpret financial statements.

Unit content

1 Understand the regulatory framework for financial reporting

User groups: owners; managers; employees; suppliers; customers; lenders; government; potential investors; different needs from financial statements

User needs: profitability; liquidity; gearing; cash flow; job security; Accounting Standards Board (ASBs) statement of principles; International Accounting Standards Board (IASBs) framework for the presentation of financial statements

Legislation: current legislation including Companies Acts 1985, 1989 and 2006; Partnership Act 1890; European directives

Other regulations: International Accounting Standards (IASs); International Financial Reporting Standards and the main differences from UK Statements of Standard Accounting Practice (SSAPs) and Financial Reporting Standards (FRSs); The Accounting Standards Board (ASB)

2 Be able to prepare financial statements from complete or incomplete records

Statements: trial balance; assets, liabilities, income, expenses, capital; profit and loss accounts; balance sheet; cash flow statement; notes to the accounts; statement of recognised gains and losses; international equivalents under the International Accounting Standards (IAS)

Types of business: sole trader; partnership; limited company (public and private); manufacturing/service/retail, group of companies

Preparation: from trial balance with adjustments eg stock, prepayments, accruals, bad debts, depreciation; from incomplete records; basic consolidation of accounts; changes to reporting requirements under the International Accounting Standards (IAS) eg statement of comprehensive income, statement of financial position

3 Be able to present financial information in accepted formats for publication

Types of business: different formats for the businesses described in learning outcome 2 above; annual report

Formats: requirements of law and generally accepted accounting practice; changes to reporting requirements under the International Accounting Standards (IAS)

4 Be able to interpret financial statements

Ratios: calculate ratios to reflect profitability, liquidity, efficiency, gearing, investment; comparison of these ratios both externally (other companies, industry standards) and internally (previous periods); interpretation of results

Reporting: present findings in a format appropriate to users; weaknesses and limitations of analysis

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 regulatory framework for financial reporting	1.1 describe the different users of financial statements and their needs 1.2 explain the legal and regulatory influences on financial statements 1.3 assess the implications for users 1.4 explain how different laws/regulations are dealt with by accounting and reporting standards
LO2 Be able to prepare financial statements from complete or incomplete records	2.1 prepare financial statements for a variety of businesses from a trial balance, making appropriate adjustments 2.1 prepare financial statements from incomplete records 2.3 prepare a consolidated balance sheet and profit and loss account for a simple group of companies
LO3 Be able to present financial information in accepted formats for publication	3.1 explain how the information needs of different user groups vary 3.2 prepare financial statements in a form suitable for publication by a sole trader, partnership and limited company
LO4 Be able to interpret financial statements	4.1 calculate accounting ratios to assess the performance and position of a business 4.2 prepare a report incorporating and interpreting accounting ratios, including suitable comparisons.

Guidance

Links

The unit links with *Unit 5: Finance and Accounting for Vehicle Operations*.

Essential requirements

Published financial reports of public limited companies are essential and are available from the companies themselves, or from the free online service provided by *The Financial Times*.

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.

www.businessbritainuk.co.uk	provides information about business in Britain and has extensive links to other business and business news sites.
www.fsb.org.uk	The Federation of Small Businesses provides information, support and guidance about small businesses in the UK.

Unit 31: Managing Business Activities to Achieve Results

Unit code: J/601/0946

QCF level: 4

Credit value: 15 credits

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
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 links with *Unit 8: Managing Quality in Vehicle Operations*.

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 32 Mechanical Principles

Unit code: F/601/1450

QCF level: 5

Credit value: 15

Aim

This unit aims to develop learners' understanding of an extended range of mechanical principles that underpin the design and operation of mechanical engineering systems.

Unit abstract

This unit will develop learners' understanding of complex loading systems and will provide an introduction to the concept of volumetric strain and the relationship between elastic constants. The expressions derived for linear and volumetric strain then form a basis for determining dimensional changes in loaded cylinders.

The unit will build upon learners' existing knowledge of the relationship between the distribution of shear force and bending moment in loaded beams, to include the relationship between bending moment, slope and deflection.

Learners will analyse the use of mechanical power transmission systems, both individually and in the combinations that are used in practical situations. Learners' knowledge of rotating system elements is further extended through an investigation of the dynamic characteristics of the slider-crank and four-bar linkage. The balancing of rotating systems is also investigated, together with the determination of flywheel mass and size to give sufficiently smooth operating conditions.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to determine the behavioural characteristics of materials subjected to complex loading systems

2 Be able to determine the behavioural characteristics of loaded beams and cylinders

3 Be able to determine the dynamic parameters of power transmission system elements

4 Be able to determine the dynamic parameters of rotating systems.

Unit content

1 Be able to determine the behavioural characteristics of materials subjected to complex loading systems

Relationship: definition of Poisson's Ratio; typical values of Poisson's Ratio for common engineering materials

Two- and three-dimensional loading: expressions for strain in the x, y and z-directions; calculation of changes in dimensions

Volumetric strain: expression for volumetric strain; calculation of volume change

Elastic constants: definition of Bulk Modulus; relationship between Modulus of Elasticity; Shear Modulus; Bulk Modulus and Poisson's Ratio for an elastic material

2 Be able to determine the behavioural characteristics of loaded beams and cylinders

Relationships: slope $i = \frac{1}{E1}\int Mdx$

deflection $y = \frac{1}{E\,1}\iint Mdxdx$

Loaded beams: slope and deflection for loaded beams eg cantilever beams carrying a concentrated load at the free end or a uniformly distributed load over the entire length, simply supported beams carrying a central concentrated load or a uniformly distributed load over the entire length

Stresses in thin-walled pressure vessels: circumferential hoop stress and longitudinal stress in cylindrical and spherical pressure vessels subjected to internal and external pressure eg compressed-air receivers, boiler steam drums, submarine hulls, condenser casings; factor of safety; joint efficiency

Stresses in thick-walled cylinders: circumferential hoop stress, longitudinal stress and radial stress in thick-walled cylinders subjected to pressure eg hydraulic cylinders, extrusion dies, gun barrels; Lame's theory; use of boundary conditions and distribution of stress in the cylinder walls

3 Be able to determine the dynamic parameters of power transmission system elements

Belt drives: flat and v-section belts; limiting coefficient friction; limiting slack and tight side tensions; initial tension requirements; maximum power transmitted

Friction clutches: flat single and multi-plate clutches; conical clutches; coefficient of friction; spring force requirements; maximum power transmitted by constant wear and constant pressure theories; validity of theories

Gear trains: simple, compound and epicycle gear trains; velocity ratios; torque, speed and power relationships; efficiency; fixing torques

4 Be able to determine the dynamic parameters of rotating systems

Plane mechanisms: slider crank and four bar linkage mechanisms; production of vector diagrams and determination of kinetic characteristics

Balancing: single plane and multi-plane rotating mass systems; Dalby's method for determination of out-of-balance forces and couples and the required balancing masses

Flywheels: angular momentum; kinetic energy; coefficient of fluctuation of speed; coefficient of fluctuation of energy; calculation of flywheel mass/dimensions to give required operating conditions

Effects of coupling: conservation of angular momentum; common final velocity and energy loss due to coupling of two freely rotating systems

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 determine the behavioural characteristics of materials subjected to complex loading systems	1.1 apply the relationship between longitudinal and transverse strain to determine the dimensional effects of uniaxial loading on a given material 1.2 determine the effects of two-dimensional and three-dimensional loading on the dimensions of a given material 1.3 determine volumetric strain and change in volume due to three-dimensional loading 1.4 apply the relationship between elastic constants
LO2 Be able to determine the behavioural characteristics of loaded beams and cylinders	2.1 apply the relationship between bending moment, slope and deflection to determine the variation of slope and deflection along a simply supported beam 2.2 determine the principal stresses that occur in a thin-walled cylindrical pressure vessel 2.3 determine the distribution of the stresses that occur in a pressurised thick-walled cylinder
LO3 Be able to determine the dynamic parameters of power transmission system elements	3.1 determine the dynamic parameters of a belt drive 3.2 determine the dynamic parameters of a friction clutch 3.3 determine the holding torque and power transmitted through compound and epicyclic gear trains
LO4 Be able to determine the dynamic parameters of rotating systems	4.1 determine the parameters of a slider-crank and a four-bar linkage mechanism 4.2 determine the balancing masses required to obtain dynamic equilibrium in a rotating system 4.3 determine the energy storage requirements of a flywheel 4.4 determine the dynamic effects of coupling two freely rotating systems.

Guidance

Links

This unit can be linked with *Unit 34: Analytical Methods for Engineers* and *Unit 35: Engineering Science*.

Essential requirements

Sufficient laboratory/test equipment will need to be available to support a range of practical investigations.

Employer engagement and vocational contexts

Liaison with employers would prove of benefit to centres, especially if they are able to offer help with the provision of suitable mechanical systems/equipment that can be used to demonstrate applications of the principles.

Unit 33: Electrical and Electronic Principles

Unit code: R/601/1453

QCF level: 5

Credit value: 15

Aim

This unit provides an understanding of electrical and electronic principles used in a range of engineering careers and provides the basis for further study of more specialist areas of electrical/electronic engineering.

Unit abstract

Circuits and their characteristics are fundamental to any study of electrical and electronic engineering and therefore a good understanding is important to any engineer.

The engineer must be able to take complex electrical circuit problems, break them down into acceptable elements and apply techniques to solve or analyse the characteristics. Additionally, fine tuning of the circuits can be performed to obtain required output dynamics.

This unit draws together a logical appreciation of the topic and offers a structured approach to the development of the broad learning required at this level. Learners will begin by investigating circuit theory and the related theorems to develop solutions to electrical networks.

In learning outcome 2 the concept of an attenuator is introduced by considering a symmetrical two-port network and its characteristics. The design and testing of both T and π networks is also covered.

Learning outcome 3 considers the properties of complex waveforms and Fourier analysis is used to evaluate the Fourier coefficients of a complex periodic waveform.

Finally, learning outcome 4 introduces the use of Laplace transforms as a means of solving first order differential equations used to model RL and RC networks, together with the evaluation of circuit responses to a step input in practical situations.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to apply electrical and electronic circuit theory

2 Be able to apply two-port network models

3 Understand the use of complex waves

4 Be able to apply transients in R-L-C circuits.

Unit content

1 Be able to apply electrical and electronic circuit theory

Transformation theorems: energy sources as constant-voltage and constant-current generators; Thévenin's and Norton's theorems; delta-star and star-delta transformation

Circuit theory: maximum power transfer conditions for resistive and complex circuits; mesh and nodal analysis; the principle of superposition

Magnetically coupled circuits: mutual inductance; the use of dot notation; equivalent circuits for transformers including the effects of resistive and reactive features

R-L-C tuned circuits: series and parallel resonant circuits; impedance; phase angle; dynamic resistance; Q-factor; bandwidth; selectivity and resonant frequency; the effects of loading on tuned circuit performance

2 Be able to apply two-port network models

Network models: symmetrical two-port network model; characteristic impedance, Z_o; propagation coefficient (expressed in terms of attenuation, α, and phase change ß); input impedance for various load conditions including $Z_L = Z_{o;}$ relationship between the neper and the dB; insertion loss

Symmetrical attenuators: T and π attenuators; the expressions for R_o and α in terms of component values

3 Understand the use of complex waves

Properties: power factor; rms value of complex periodic waveforms

Analyse: Fourier coefficients of a complex periodic voltage waveform eg Fourier series for rectangular, triangular or half-wave rectified waveform, use of a tabular method for determining the Fourier series for a complex periodic waveform; use of a waveform analyser; use of an appropriate software package

4 Be able to apply transients in R-L-C circuits

Laplace transforms: definition of the Laplace transform of a function; use of a table of Laplace transforms

Transient analysis: expressions for component and circuit impedance in the s-plane; first order systems must be solved by Laplace (ie RL and RC networks); second order systems could be solved by Laplace or computer-based packages

Circuit responses: over, under, zero and critically damped response following a step input; zero initial conditions being assumed

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 apply electrical and electronic circuit theory	1.1 calculate the parameters of AC equivalent circuits using transformation theorems 1.2 apply circuit theory techniques to the solution of AC circuit problems 1.3 analyse the operation of magnetically coupled circuits 1.4 use circuit theory to solve problems relating to series and parallel R-L-C tuned circuits
LO2 Be able to apply two-port network models	2.1 apply two-port network model to the solution of practical problems 2.2 design and test symmetrical attenuators against computer models
LO3 Understand the use of complex waves	3.1 calculate the properties of complex periodic waves 3.2 analyse complex periodic waves
LO4 Be able to apply transients in R-L-C circuits	4.1 use Laplace transforms for the transient analysis of networks 4.2 calculate circuit responses to a step input in practical situations.

Guidance

Links

This unit relies heavily on the use of mathematical analysis to support the underlying theory and practical work. Consequently it is assumed that *Unit 34: Analytical Methods for Engineers* has been taught previously or is being delivered in parallel. It may also be linked with *Unit 35: Engineering Science*.

Essential requirements

Learners will require access to a range of electronic test equipment, eg oscilloscopes, signal generators, etc.

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.

Unit 34: Analytical Methods for Engineers

Unit code: A/601/1401

QCF level: 4

Credit value: 15

Aim

This unit will provide the analytical knowledge and techniques needed to carry out a range of engineering tasks and will provide a base for further study of engineering mathematics.

Unit abstract

This unit enables learners to develop previous mathematical knowledge obtained at school or college and use fundamental algebra, trigonometry, calculus, statistics and probability for the analysis, modelling and solution of realistic engineering problems.

Learning outcome 1 looks at algebraic methods, including polynomial division, exponential, trigonometric and hyperbolic functions, arithmetic and geometric progressions in an engineering context and expressing variables as power series.

The second learning outcome will develop learners' understanding of sinusoidal functions in an engineering concept such as AC waveforms, together with the use of trigonometric identities.

The calculus is introduced in learning outcome 3, both differentiation and integration with rules and various applications.

Finally, learning outcome 4 should extend learners' knowledge of statistics and probability by looking at tabular and graphical representation of data; measures of mean, median, mode and standard deviation; the use of linear regression in engineering situations, probability and the Normal distribution.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to analyse and model engineering situations and solve problems using algebraic methods

2 Be able to analyse and model engineering situations and solve problems using trigonometric methods

3 Be able to analyse and model engineering situations and solve problems using calculus

4 Be able to analyse and model engineering situations and solve problems using statistics and probability.

Unit content

1 Be able to analyse and model engineering situations and solve problems using algebraic methods

Algebraic methods: polynomial division; quotients and remainders; use of factor and remainder theorem; rules of order for partial fractions (including linear, repeated and quadratic factors); reduction of algebraic fractions to partial fractions

Exponential, *trigonometric and hyperbolic functions*: the nature of algebraic functions; relationship between exponential and logarithmic functions; reduction of exponential laws to linear form; solution of equations involving exponential and logarithmic expressions; relationship between trigonometric and hyperbolic identities; solution of equations involving hyperbolic functions

Arithmetic and geometric: notation for sequences; arithmetic and geometric progressions; the limit of a sequence; sigma notation; the sum of a series; arithmetic and geometric series; Pascal's triangle and the binomial theorem

Power series: expressing variables as power series functions and use series to find approximate values eg exponential series, Maclaurin's series, binomial series

2 Be able to analyse and model engineering situations and solve problems using trigonometric methods

Sinusoidal functions: review of the trigonometric ratios; Cartesian and polar co-ordinate systems; properties of the circle; radian measure; sinusoidal functions

Applications: angular velocity, angular acceleration, centripetal force, frequency, amplitude, phase, the production of complex waveforms using sinusoidal graphical synthesis, AC waveforms and phase shift

Trigonometric identities: relationship between trigonometric and hyperbolic identities; double angle and compound angle formulae and the conversion of products to sums and differences; use of trigonometric identities to solve trigonometric equations and simplify trigonometric expressions

3 Be able to analyse and model engineering situations and solve problems using calculus

Calculus: the concept of the limit and continuity; definition of the derivative; derivatives of standard functions; notion of the derivative and rates of change; differentiation of functions using the product, quotient and function of a function rules; integral calculus as the calculation of area and the inverse of differentiation; the indefinite integral and the constant of integration; standard integrals and the application of algebraic and trigonometric functions for their solution; the definite integral and area under curves

Further differentiation: second order and higher derivatives; logarithmic differentiation; differentiation of inverse trigonometric functions; differential coefficients of inverse hyperbolic functions

Further integration: integration by parts; integration by substitution; integration using partial fractions

Applications of the calculus: eg maxima and minima, points of inflexion, rates of change of temperature, distance and time, electrical capacitance, rms values, electrical circuit analysis, AC theory, electromagnetic fields, velocity and acceleration problems, complex stress and strain, engineering structures, simple harmonic motion, centroids, volumes of solids of revolution, second moments of area, moments of inertia, rules of Pappus, radius of gyration, thermodynamic work and heat energy

Engineering problems: eg stress and strain, torsion, motion, dynamic systems, oscillating systems, force systems, heat energy and thermodynamic systems, fluid flow, AC theory, electrical signals, information systems, transmission systems, electrical machines, electronics

4 Be able to analyse and model engineering situations and solve problems using statistics and probability

Tabular and graphical form: data collection methods; histograms; bar charts; line diagrams; cumulative frequency diagrams; scatter plots

Central tendency and dispersion: the concept of central tendency and variance measurement; mean; median; mode; standard deviation; variance and interquartile range; application to engineering production

Regression, *linear correlation*: determine linear correlation coefficients and regression lines and apply linear regression and product moment correlation to a variety of engineering situations

Probability: interpretation of probability; probabilistic models; empirical variability; events and sets; mutually exclusive events; independent events; conditional probability; sample space and probability; addition law; product law; Bayes' theorem

Probability distributions: discrete and continuous distributions, introduction to the binomial, Poisson and normal distributions; use of the normal distribution to estimate confidence intervals and use of these confidence intervals to estimate the reliability and quality of appropriate engineering components and systems

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 model engineering situations and solve problems using algebraic methods	1.1 determine the quotient and remainder for algebraic fractions and reduce algebraic fractions to partial fractions 1.2 solve engineering problems that involve the use and solution of exponential, trigonometric and hyperbolic functions and equations 1.3 solve scientific problems that involve arithmetic and geometric series 1.4 use power series methods to determine estimates of engineering variables expressed in power series form
LO2 Be able to analyse and model engineering situations and solve problems using trigonometric methods	2.1 use trigonometric functions to solve engineering problems 2.2 use sinusoidal functions and radian measure to solve engineering problems 2.3 use trigonometric and hyperbolic identities to solve trigonometric equations and to simplify trigonometric expressions
LO3 Be able to analyse and model engineering situations and solve problems using calculus	3.1 differentiate algebraic and trigonometric functions using the product, quotient and function of function rules 3.2 determine higher order derivatives for algebraic, logarithmic, inverse trigonometric and inverse hyperbolic functions 3.3 integrate functions using the rules, by parts, by substitution and partial fractions 3.4 analyse engineering situations and solve engineering problems using calculus
LO4 Be able to analyse and model engineering situations and solve problems using statistics and probability	4.1 represent engineering data in tabular and graphical form 4.2 determine measures of central tendency and dispersion 4.3 apply linear regression and product moment correlation to a variety of engineering situations 4.4 use the normal distribution and confidence intervals for estimating reliability and quality of engineering components and systems.

Guidance

Links

Entry requirements for this unit are at the discretion of the centre. However, it is strongly advised that learners should have completed the BTEC National unit *Mathematics for Engineering Technicians* or equivalent. Learners who have not attained this standard will require appropriate bridging studies.

Essential requirements

There are no essential resources for this unit.

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 35: Engineering Science

Unit code: L/601/1404

QCF level: 4

Credit value: 15

Aim

This unit aims to provide learners with an understanding of the mechanical and electrical principles that underpin mechanical and electrically focused engineering systems.

Unit abstract

Engineers, no matter from what discipline, need to acquire a fundamental understanding of the mechanical and electrical principles that underpin the design and operation of a large range of engineering equipment and systems.

This unit will develop learners' understanding of the key mechanical and electrical concepts that relate to all aspects of engineering.

In particular, learners will study elements of engineering statics including the analysis of beams, columns and shafts. They will then be introduced to elements of engineering dynamics, including the behavioural analysis of mechanical systems subject to uniform acceleration, the effects of energy transfer in systems and to natural and forced oscillatory motion.

The electrical system principles in learning outcome 3 begin by refreshing learners' understanding of resistors connected in series/parallel and then developing the use of Ohm's law and Kirchhoff's law to solve problems involving at least two power sources. Circuit theorems are also considered for resistive networks only together with a study of the characteristics of growth and decay of current/voltage in series C-R and L-R circuits.

The final learning outcome develops learners' understanding of the characteristics of various AC circuits and finishes by considering an important application – the transformer.

Learning outcomes

On successful completion of this unit a learner will:

1 Be able to determine the behavioural characteristics of elements of static engineering systems

2 Be able to determine the behavioural characteristics of elements of dynamic engineering systems

3 Be able to apply DC theory to solve electrical and electronic engineering problems

4 Be able to apply single phase AC theory to solve electrical and electronic engineering problems.

Unit content

1 Be able to determine the behavioural characteristics of elements of static engineering systems

Simply supported beams: determination of shear force; bending moment and stress due to bending; radius of curvature in simply supported beams subjected to concentrated and uniformly distributed loads; eccentric loading of columns; stress distribution; middle third rule

Beams and columns: elastic section modulus for beams; standard section tables for rolled steel beams; selection of standard sections eg slenderness ratio for compression members, standard section and allowable stress tables for rolled steel columns, selection of standard sections

Torsion in circular shafts: theory of torsion and its assumptions eg determination of shear stress, shear strain, shear modulus; distribution of shear stress and angle of twist in solid and hollow circular section shafts

2 Be able to determine the behavioural characteristics of elements of dynamic engineering systems

Uniform acceleration: linear and angular acceleration; Newton's laws of motion; mass moment of inertia and radius of gyration of rotating components; combined linear and angular motion; effects of friction

Energy transfer: gravitational potential energy; linear and angular kinetic energy; strain energy; principle of conservation of energy; work-energy transfer in systems with combine linear and angular motion; effects of impact loading

Oscillating mechanical systems: simple harmonic motion; linear and transverse systems; qualitative description of the effects of forcing and damping

3 Be able to apply DC theory to solve electrical and electronic engineering problems

DC electrical principles: refresh idea of resistors in series and parallel; use of Ohm's and Kirchhoff's laws; voltage and current dividers; review of motor and generator principles eg series, shunt; circuit theorems eg superposition, Thevenin, Norton and maximum power transfer for resistive circuits only; fundamental relationships eg resistance, inductance, capacitance, series C-R circuit, time constant, charge and discharge curves of capacitors, L-R circuits

4 Be able to apply single phase AC theory to solve electrical and electronic engineering problems

AC electrical principles: features of AC sinusoidal wave form for voltages and currents; explanation of how other more complex wave forms are produced from sinusoidal wave forms; R, L, C circuits eg reactance of R, L and C components, equivalent impedance and admittance for R-L and R-C circuits; high or low pass filters; power factor; true and apparent power; resonance for circuits containing a coil and capacitor connected either in series or parallel; resonant frequency; Q-factor of resonant circuit; transformer fundamentals: construction eg double wound; transformation ratio; equivalent circuit; unloaded transformer; resistance (impedance) matching; transformer losses; applications eg current transformers, voltage transformers

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 determine the behavioural characteristics of elements of static engineering systems	1.1 determine distribution of shear force, bending moment and stress due to bending in simply supported beams 1.2 select standard rolled steel sections for beams and columns to satisfy given specifications 1.3 determine the distribution of shear stress and the angular deflection due to torsion in circular shafts
LO2 Be able to determine the behavioural characteristics of elements of dynamic engineering systems	2.1 determine the behaviour of dynamic mechanical systems in which uniform acceleration is present 2.2 determine the effects of energy transfer in mechanical systems 2.3 determine the behaviour of oscillating mechanical systems
LO3 Be able to apply DC theory to solve electrical and electronic engineering problems	3.1 solve problems using Kirchhoff's laws to calculate currents and voltages in circuits 3.2 solve problems using circuit theorems to calculate currents and voltages in circuits 3.3 solve problems involving current growth/decay in an L-R circuit and voltage growth/decay in a C-R circuit
LO4 Be able to apply single phase AC theory to solve electrical and electronic engineering problems	4.1 recognise a variety of complex waveforms and explain how they are produced from sinusoidal waveforms 4.2 apply AC theory to solve problems on R, L, C circuits and components 4.3 apply AC theory to solve problems involving transformers.

Guidance

Links

This unit may be linked with *Unit 34: Analytical Methods for Engineers*.

Successful completion of this unit would enable learners to meet, in part, the Incorporated Engineer (IEng) requirements laid down in the UK Engineering Council Standard for Professional Engineering Competence (UK-SPEC) Competence A2, 'Use appropriate scientific, technical or engineering principles'.

Essential requirements

Learners will need access to suitable mechanical and electrical laboratory equipment.

Employer engagement and vocational contexts

Liaison with employers would prove of benefit to centres, especially if they are able to offer help with the provision of suitable mechanical or electrical systems/equipment that demonstrate applications of the principles.

Db170712 S:\LT\PD\HIGH NATIONALS 2010\BH023344 HNCD L45 IN VEHICLE OPERATIONS MANAGEMENT UNITS.DOC.1-177/5