



**INSTITUTE OF THE  
MOTOR INDUSTRY**

## **QUALIFICATION SPECIFICATION**

### **TECHNICAL AWARDS**

**IMI Level 1 Certificate in Service and Maintenance  
Engineering (VRQ)  
OFQUAL NO: 601/0531/8**

**IMI Level 1 Diploma in Service and Maintenance Engineering  
(VRQ)  
OFQUAL NO: 601/0541/0**

**September 2017 (v1)**

This guidance should be read in conjunction with the:

- Candidate Assessment Summary (for the relevant qualification)
- Support Materials (for the relevant qualification)
- and the IMI Operating Manual for Approved Centres



## CENTRE INFORMATION

Please be aware that any **legislation** referred to in these qualifications may be subject to amendment/s during the life of the qualifications. Therefore IMI Approved Centres must ensure they are aware of and comply with any amendments, e.g. to health and safety legislation and employment practices.

Please be aware that **technologies** referred to in these qualifications reflect current practice, but may be subject to amendment/s, updates and replacements during the life of the qualifications. Therefore IMI Approved Centres must ensure they are aware of the latest developments and emerging technologies to ensure the currency of the qualifications.

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**Qualification Structures****IMI Level 1 Certificate in Service and Maintenance Engineering (VRQ)**

Ofqual I.D No: 601/0531/8

In order to pass the qualification, learners must achieve the following:

**Group A:** All 4 Mandatory Units must be completed.**Group B:** Both Core Units must be completed.**Group C:** A minimum of 1 Self Development Unit must be completed.**Group D:** A minimum of 2 Specialist Units must be completed.**IMI Level 1 Diploma in Service and Maintenance Engineering (VRQ)**

Ofqual I.D No: 601/0541/0

In order to pass the qualification, learners must achieve the following:

**Group A:** All 4 Mandatory Units must be completed.**Group B:** Both Core Units must be completed.**Group C:** A minimum of 3 Self Development Units must be completed.**Group D:** A minimum of 3 Specialist Units must be completed.**Key:**

C = Combination Assessment (Practical Task and/or Written Assessment)

P = Project (Portfolio of Evidence)

T = On Line Test

**Group A: Mandatory Units**

Unit Ref:	Unit Title and ID Number	GLH	Unit Level	Assessments		
				C	P	T
ET111	Health and Safety Practices in an Engineering Environment (D/505/4084)	30	1	M		M
ET112	Introduction to Engineering Tools, Equipment and Materials (H/505/4085)	30	1	M		M
ET114	Basic Mathematics and Science for Engineering Technicians (M/505/4087)	40	1	M		M
ET116	Introduction to Working with Customers and Colleagues in the Engineering Environment (A/505/4089)	25	1	M		M (20)



**Group B: Core Units (Mandatory)**

Unit Ref:	Unit Title and ID Number	GLH	Unit Level	Assessments		
				C	P	T
ET113	Introduction to Projects in an Engineering Environment (K/505/4086)	25	1		M	
ET115	Introduction to Working in The Engineering Industry (T/505/4088)	20	1	M		

**Group C: Self Development Units (Optional Units)**

Unit Ref:	Unit Title and ID Number	GLH	Unit Level	Assessments		
				C	P	T
PSD01	Self-Development (M/505/4090)	20	1	M		
PSD02	Solving Problems in Daily Life (T/505/4091)	20	1	M		
PSD03	Knowledge of Environmental Issues (A/505/4092)	20	1	M		
PSD06	Preparing for Work (F/505/4093)	20	1	M		

**Group D: Specialist Units (Optional Units)**

Unit Ref:	Unit Title and ID Number	GLH	Unit Level	Assessments		
				C	P	T
ET117	Introduction to Machining Engineering Materials (J/505/4094)	40	1	M		
ET118	Forming and Joining for Engineering Applications (R/505/4096)	40	1	M		
ET119	Electrical Foundation Skills in an Engineering Environment (L/505/4212)	40	1	M		
ET120	Introduction to Maintenance on Mechanical Systems in Engineering (R/505/4213)	50	1	M		
ET121	Introduction to Internal Combustion Engine Systems, Components and Operation (J/505/4242)	50	1	M		
ET122	Inspection, Repair and Replacement of Tyres (L/505/4243)	25	1	M		
ET123	Introduction to Computer Aided Design (R/505/4244)	40	1	M		
ET124	Cycle Construction and Routine Maintenance (Y/505/4245)	26	1	M		
ET129	Motorcycle Construction and Routine Maintenance (Y/505/4214)	26	1	M		
ET130	Routine Vehicle Maintenance Processes and Procedures on Vehicles (4 Wheels or more) (D/505/4215)	30	1	M		
ET131	Vehicle Paint Application and Minor Defect Rectification (D/505/4246)	38	1	M		
ET133	Introduction to Low Carbon Technologies in the Automotive Industry (K/505/4248)	20	1	M		
ET134	Principles of Component Fitting (J/505/4211)	20	1	M		
ET136	Electric Vehicle Awareness (M/505/4249)	4	1	M		



Level 1 Service and Maintenance Engineering Qualifications Assessment Criteria

<b>UNIT REF:</b> ET111	<b>UNIT TITLE: HEALTH AND SAFETY PRACTICES IN AN ENGINEERING ENVIRONMENT</b>
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<b>Level: 1</b>	<b>GLH: 30</b>
<p><b>Rationale:</b> This unit introduces learners to health and safety requirements when carrying out simple tasks in engineering environments. The unit covers the general requirements of health and safety in engineering environments, including personal responsibilities, common risks and hazards and health and safety information. Also covered is the use of health and safety practices and equipment, safe manual handling, Control Of Substances Hazardous to Health and fire prevention and emergency procedures.</p>	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know health and safety requirements and information in engineering environments	<p>1.1. Personal responsibilities for health and safety in engineering environments to include:</p> <ul style="list-style-type: none"> <li>a following health and safety notices and instructions</li> <li>b complying with employer’s instructions and procedures</li> <li>c using correct Personal Protective Equipment (PPE)</li> <li>d behaving responsibly and safely</li> <li>e being aware of others</li> </ul> <p>1.2. Common risks and hazards when working in engineering environments to include:</p> <ul style="list-style-type: none"> <li>a. electrical equipment and trailing leads</li> <li>b. air-lines and air powered tools</li> <li>c. hazardous substances used in engineering maintenance</li> <li>d. movement of equipment</li> <li>e. waste materials</li> <li>f. loose tools and equipment</li> <li>g. lifting heavy equipment</li> <li>h. inappropriate behaviour</li> <li>i. failing to use appropriate PPE</li> </ul> <p>1.3. The need to be aware of the actions of others in the working environment to include:</p> <ul style="list-style-type: none"> <li>a the risk posed by the action and conduct of colleagues in immediate vicinity</li> <li>b the possible risks to others posed by your own actions and conduct</li> <li>c the risks posed by the type of work being carried out by colleagues</li> </ul> <p>1.4. The main health and safety information and notices provided in engineering environments to include:</p> <ul style="list-style-type: none"> <li>a. fire and emergency exits</li> <li>b. actions in the event of a fire or emergency</li> <li>c. health and safety instructions</li> <li>d. use of health and safety equipment</li> </ul>



	<p>1.5. Key points relating to health and safety from the information provided</p>
<p>2. Be able to use appropriate health and safety practices and equipment in an engineering environment</p>	<p>2.1. Appropriate health and safety working practices when carrying out engineering operations to include:</p> <ul style="list-style-type: none"><li>a use of PPE</li><li>b location of fire extinguishers</li><li>c following safety instructions</li><li>d correct use of tools and equipment</li><li>e safe working practices when using engineering machinery</li></ul> <p>2.2. Appropriate personal protective equipment when working in engineering environments to include:</p> <ul style="list-style-type: none"><li>a. PPE - overalls, gloves, aprons, goggles, helmets, safety footwear appropriate to task</li></ul> <p>2.3. Good housekeeping practices when working in engineering environments to include:</p> <ul style="list-style-type: none"><li>a. prompt disposal of waste materials</li><li>b. prompt cleaning of spillages</li><li>c. regular cleaning of work area</li><li>d. storage of tools and equipment</li></ul>
<p>3. Be able to use safe manual handling procedures in an engineering environment</p>	<p>3.1. Safe manual handling practices and procedures used in engineering environments to include:</p> <ul style="list-style-type: none"><li>a. use of PPE</li><li>b. correct lifting technique</li><li>c. carrying technique</li></ul> <p>3.2. Manual handling equipment used in engineering environments to include:</p> <ul style="list-style-type: none"><li>a. jacks</li><li>b. cranes</li><li>c. hoists</li><li>d. chains, slings and wire ropes</li></ul> <p>3.3. Manual handling equipment and procedures when carrying or lifting during engineering operations to include:</p> <ul style="list-style-type: none"><li>a. use of PPE</li><li>b. need to ensure lifting aid capacity – Safe Working Load</li><li>c. care when moving of load over uneven surfaces</li><li>d. avoiding obstructions and floor based obstacles – cables, leads</li><li>e. need to keep load stable when moving</li></ul>



<p>4. Be able to use procedures relating to Control of Substances Hazardous to Health in an engineering environment</p>	<p>4.1. The main substances hazardous to health in engineering maintenance operations to include:</p> <ul style="list-style-type: none"><li>a. liquids – petrol, diesel, oils, cleaner substances</li><li>b. gases – welding and heating equipment</li><li>c. solids – old components</li></ul> <p>4.2. Appropriate methods to dispose of waste materials generated when working in the engineering environment to include:</p> <ul style="list-style-type: none"><li>a. waste oil and filters</li><li>b. old units and components</li><li>c. cleaning materials</li></ul>
<p>5. Know about fire prevention and emergency procedures in an engineering environment</p>	<p>5.1. The THREE elements that produce a fire:</p> <ul style="list-style-type: none"><li>a. oxygen</li><li>b. fuel</li><li>c. a source of ignition</li></ul> <p>5.2. Common causes of accidental combustion in an engineering environment to include:</p> <ul style="list-style-type: none"><li>a. bad housekeeping - waste materials / flammable liquids left in inappropriate areas</li><li>b. grinding</li><li>c. naked flame - gas cutting / welding etc</li><li>d. electrical short circuits</li><li>e. static electrical charge</li><li>f. gas leakage – combustible fumes</li></ul> <p>5.3. Different types of fire extinguisher and their uses in an engineering environment to include:</p> <ul style="list-style-type: none"><li>a. water</li><li>b. powder</li><li>c. CO2</li><li>d. foam</li></ul> <p>5.4. Procedures to follow in an emergency and the evacuation of the premises to include:</p> <ul style="list-style-type: none"><li>a. in the event of a colleague suffering an electric shock</li><li>b. in the event of a serious accident</li><li>c. sounding alarm</li><li>d. use of appropriate fire extinguisher evacuation of premises.</li></ul>



<b>UNIT REF:</b> ET112	<b>UNIT TITLE: INTRODUCTION TO ENGINEERING TOOLS, EQUIPMENT AND MATERIALS</b>
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<b>Level: 1</b>	<b>GLH: 30</b>
<b>Rationale:</b> This unit introduces learners to tools, equipment and materials that are used in an engineering environment and the ability to work safely with them. The unit covers common hand and power tools used for engineering maintenance, the equipment used during engineering maintenance and materials used in engineering operations.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to work safely with tools, equipment and materials in an engineering environment	<p>1.1. Use appropriate Personal Protective Equipment (PPE) when using tools, equipment and materials for engineering maintenance to include:</p> <ul style="list-style-type: none"> <li>a. overalls</li> <li>b. gloves</li> <li>c. aprons</li> <li>d. goggles</li> <li>e. helmets</li> <li>f. safety footwear appropriate to task</li> </ul> <p>1.2. Potential defects in common tools and equipment used in an engineering environment to include:</p> <ul style="list-style-type: none"> <li>a. examining tools for defects and damage</li> <li>b. correctly preparing tools for use</li> <li>c. using tools safely and correctly</li> <li>d. carrying out cleaning</li> <li>e. basic maintenance of tools</li> </ul> <p>1.3. Safe methods of working when using tools, equipment, and materials in an engineering environment. to include:</p> <ul style="list-style-type: none"> <li>a. electrical equipment – blown fuses, damaged cables</li> <li>b. identifying unsafe hand tools - damaged hand tools</li> <li>c. identifying unsafe equipment</li> </ul> <p>1.4. Hazards related to defects in tools, equipment and materials used in an engineering environment to include:</p> <ul style="list-style-type: none"> <li>a. bent or distorted tools</li> <li>b. cracks</li> <li>c. rough edges</li> <li>d. mushroomed chisels</li> <li>e. loose hammer heads</li> <li>f. damaged screwdrivers</li> <li>g. slipping ratchet wrenches</li> <li>h. damaged sockets</li> </ul>





<p>2. Be able to use and maintain hand tools for engineering maintenance operations</p>	<p>2.1. Appropriate hand tools for engineering maintenance operations. to include:</p> <ul style="list-style-type: none"><li>a spanners – open end, ring, combination, speed and ratchet types)</li><li>b screwdrivers – flat blade, Phillips, Pozi-drive</li><li>c hammers – ball pein, lump, copper/hide, rubber, neoprene</li><li>d chisels</li><li>e saws – hacksaw, junior hacksaw</li><li>f steel rule and tape measure</li><li>g Allen keys</li><li>h vice grips</li><li>i socket sets – different drive sizes, specialist socket and screw bits, stud remover adaptor</li><li>j pliers and grips – long nose, engineers, side snips/cutters, pipe grips, mole grips</li><li>k torque wrench</li><li>l feeler blades</li><li>m tyre tread depth gauges</li></ul> <p>2.2. Prepare and use hand tools correctly to include:</p> <ul style="list-style-type: none"><li>a. holding tools correctly</li><li>b. selecting correct tool for task</li><li>c. stance when using tool</li><li>d. adjusting tools correctly, i.e. torque wrench setting, hacksaw blade tension</li><li>e. preparing tool correctly, i.e. fitting hacksaw blade correctly</li><li>f. using appropriate PPE, i.e. goggles and gloves when necessary</li></ul> <p>2.3. Maintain hand tools in a safe condition to include:</p> <ul style="list-style-type: none"><li>a. cleaning tools</li><li>b. removing mushroom end from chisels</li><li>c. resetting torque wrench after use</li><li>d. inspecting tools for damage</li><li>e. storing tools after use</li></ul>
<p>3. Be able to use and maintain power tools for engineering maintenance operations</p>	<p>3.1. Power tools for engineering maintenance operations to include:</p> <ul style="list-style-type: none"><li>a. hand held electric drills</li><li>b. hand held electric grinders</li><li>c. extension leads</li><li>d. hand held battery powered drills</li></ul> <p>3.2. Prepare and use power tools correctly to include:</p> <ul style="list-style-type: none"><li>a. holding tools correctly</li><li>b. selecting correct tool for task</li><li>c. stance when using tool</li><li>d. adjusting tools correctly</li><li>e. using appropriate PPE, i.e. goggles and gloves when necessary</li></ul> <p>3.3. Maintain power tools in a safe condition to include:</p> <ul style="list-style-type: none"><li>a. cleaning tools</li><li>b. inspecting tools for damage</li><li>c. storing tools after use</li></ul>



<p>4. Be able to use equipment for engineering maintenance operations</p>	<p>4.1. Appropriate equipment for engineering maintenance operations to include:</p> <ul style="list-style-type: none"><li>a. lifting equipment – hoists, ramps, chains, straps</li><li>b. air tools – air lines, wrenches, hammers, blow guns</li><li>c. bench tools – grindstone, pillar drill</li><li>d. select appropriate and necessary equipment for task</li></ul> <p>4.2. Prepare and use common equipment correctly to include:</p> <ul style="list-style-type: none"><li>a. adjust settings</li><li>b. set pressure</li><li>c. zero readings</li><li>d. examine for defects</li><li>e. locate correctly – axle stands and jacks</li><li>f. use when appropriate – exhaust extraction when engine is running</li></ul> <p>4.3. Carry out basic service and maintenance of common equipment to include:</p> <ul style="list-style-type: none"><li>a. check equipment for defects or damage – blown fuse, exposed electrical leads, leaking fluid</li><li>b. clean and store equipment after use</li><li>c. report defects or damage</li></ul>
<p>5. Be able to use materials when carrying out engineering operations</p>	<p>5.1. Identify common materials used in engineering operations to include:</p> <ul style="list-style-type: none"><li>a. metals – ferrous and non-ferrous</li><li>b. glass</li><li>c. plastic</li><li>d. glass fibre</li><li>e. rubber</li><li>f. fluids – lubricants, hydraulic oils, anti-freeze, brake fluid</li></ul> <p>5.2. Identify consumables used in engineering operations to include:</p> <ul style="list-style-type: none"><li>a. lubricants</li><li>b. coolants</li><li>c. fluids</li><li>d. adhesives and cements</li><li>e. sealers</li><li>f. filters</li><li>g. aerosol sprays</li><li>h. gaskets</li><li>i. cleaners</li></ul> <p>5.3. Select and use appropriate materials and consumables in engineering operations to include:</p> <ul style="list-style-type: none"><li>a. correct specifications – lubricants and fluids</li><li>b. correct quantity - lubricants</li><li>c. work safely when using materials.</li></ul>



<b>UNIT REF:</b> ET114	<b>UNIT TITLE: BASIC MATHEMATICS AND SCIENCE FOR ENGINEERING TECHNICIANS</b>
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<b>Level: 1</b>	<b>GLH: 40</b>
<b>Rationale:</b> This unit develops mathematical and science principles and contextualises both within the engineering perspective. Its aim is to build learner confidence; and extend and enhance knowledge for GCSEs and/or support Functional Skills and further study.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Understand basic mathematics used in the engineering environment	<p>1.1. Positive and negative numbers, prime numbers, odd and even numbers to include:</p> <ul style="list-style-type: none"> <li>a. positive and negative number</li> <li>b. calculate ranges from negative to positive and positive to negative</li> <li>c. list prime numbers up to 100</li> <li>d. odd and even numbers</li> <li>e. square numbers</li> <li>f. cube numbers</li> <li>g. rounding up and down</li> <li>h. long multiplication</li> <li>i. long division</li> </ul> <p>1.2. Lowest common multiples and highest common factors to include:</p> <ul style="list-style-type: none"> <li>a. factors</li> <li>b. prime factors</li> <li>c. multiples</li> </ul> <p>1.3. Different number patterns to include:</p> <ul style="list-style-type: none"> <li>a. common difference</li> <li>b. increasing difference</li> <li>c. decreasing difference</li> <li>d. multiplying factor</li> <li>e. dividing factor</li> <li>f. adding previous terms</li> </ul> <p>1.4. Mathematical shapes used in engineering and their areas to include:</p> <ul style="list-style-type: none"> <li>a. triangle</li> <li>b. square</li> <li>c. circle</li> <li>d. pentagon</li> <li>e. hexagon</li> <li>f. heptagon</li> <li>g. cube</li> <li>h. prism</li> <li>i. cylinder</li> </ul> <p>1.5. Metric and imperial units and their conversion factors to include</p> <ul style="list-style-type: none"> <li>a. metric length – mm, cm, m, km</li> <li>b. imperial length – inches, feet, yards, miles</li> </ul>



	<ul style="list-style-type: none"> <li>c. conversion factors for length</li> <li>d. metric area – mm<sup>2</sup>, cm<sup>2</sup>, m<sup>2</sup>, km<sup>2</sup></li> <li>e. imperial area – square inches, square feet, square miles</li> <li>f. metric weight – g, kg, tonnes</li> <li>g. imperial weight – ounces, pounds, stones, tons</li> <li>h. conversion factors for weight</li> <li>i. metric speed – km/h</li> <li>j. imperial speed – mph</li> </ul> <p>1.6. Identify fractions, decimals and percentages to include:</p> <ul style="list-style-type: none"> <li>a. proper fractions</li> <li>b. improper fractions</li> <li>c. adding fractions</li> <li>d. subtracting fractions</li> <li>e. multiplying fractions</li> <li>f. dividing fractions</li> <li>g. converting fractions to decimals adding decimals</li> <li>h. subtracting decimals</li> <li>i. multiplying decimals</li> <li>j. dividing decimals</li> <li>k. finding percentages of numbers</li> <li>l. percentage gain/profit</li> <li>m. percentage loss</li> </ul>
<p>2. Be able to solve basic mathematical problems in an engineering environment</p>	<p>2.1. Calculate areas to solve engineering problems to include:</p> <ul style="list-style-type: none"> <li>a. square</li> <li>b. triangle</li> <li>c. circle</li> <li>d. rectangle</li> <li>e. dividing shapes up to calculate the overall area</li> <li>f. perimeter</li> </ul> <p>2.2. Calculate metric and imperial conversions to solve engineering problems</p> <p>2.3. Mathematical shapes used to solve engineering problems</p>
<p>3. Understand basic science used in the engineering environment</p>	<p>3.1. The fossil fuels used in an engineering environment to include:</p> <ul style="list-style-type: none"> <li>a. carbon</li> <li>b. hydrogen</li> <li>c. hydrocarbons</li> <li>d. crude oil</li> <li>e. petrol</li> <li>f. diesel</li> <li>g. coal</li> </ul> <p>3.2. How fuel emissions effect the atmosphere to include:</p> <ul style="list-style-type: none"> <li>a. carbon monoxide</li> <li>b. carbon dioxide</li> <li>c. nitrogen oxides</li> <li>d. particulates of soot</li> <li>e. hydrocarbons</li> </ul>



	<ul style="list-style-type: none"><li>f. acid rain</li><li>g. greenhouse effect</li><li>h. ozone layer</li></ul> <p>3.3. The relationship between speed, distance and time to include:</p> <ul style="list-style-type: none"><li>a. SI units of speed, distance and time</li><li>b. equations for calculating speed, distance and time i.e. distance = speed x time</li><li>c. transposing this equation</li><li>d. using this equation to plan journeys</li></ul> <p>3.4. The formula to calculate basic gear ratios to include:</p> <ul style="list-style-type: none"><li>a. formula for calculating basic gear ratios driven/driver</li><li>b. effects of gear ratios on speed and torque</li><li>c. effects of idlers gears</li><li>d. using gear ratios to create the correct speed for machining/ drilling engineering materials</li></ul> <p>3.5. How levers are used to gain mechanical advantage to include:</p> <ul style="list-style-type: none"><li>a. effects of levers</li><li>b. pivot points/fulcrum</li><li>c. mechanical advantage</li><li>d. using levers to move heavy objects</li></ul>
4. Be able to solve basic scientific problems in an engineering environment	<p>4.1. The relationship between speed, distance and time to solve engineering problems</p> <p>4.2. Calculate gear ratios to solve engineering problems</p> <p>4.3. The principle of levers to overcome engineering problems.</p>



<b>UNIT REF:</b> ET116	<b>UNIT TITLE: INTRODUCTION TO WORKING WITH CUSTOMERS AND COLLEAGUES IN THE ENGINEERING ENVIRONMENT</b>
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<b>Level: 1</b>	<b>GLH: 25</b>
<b>Rationale:</b> This unit enables the learner to develop knowledge and understanding of how to keep good working relationships with customers and colleagues in an engineering work environment, by using effective communication and support skills.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know key organisational structures, functions and roles within an engineering work environment	1.1. Main sections which may be found within a typical engineering work environment to include: <ol style="list-style-type: none"> <li>a. reception</li> <li>b. manufacture / service / repair workshop</li> <li>c. parts</li> <li>d. sales</li> <li>e. administration</li> </ol> 1.2. Typical organisational structures and lines of communication within an engineering work environment to include: <ol style="list-style-type: none"> <li>a. large, medium and small companies</li> </ol> 1.3. Typical levels of responsibility within specific job roles in an engineering environment to include: <ol style="list-style-type: none"> <li>a. trainee</li> <li>b. skilled technician</li> <li>c. supervisor</li> </ol>
2. Know communication requirements within an engineering work environment	2.1. Examples of when it is important to communicate with customers and colleagues whilst working in an engineering environment 2.2. The importance to customers and colleagues of keeping accurate records of work carried out 2.3. Agreed timescales to include: <ol style="list-style-type: none"> <li>a. relationship between time and cost</li> <li>b. customer expectation</li> </ol> 2.4. Limits of authority and responsibility whilst maintaining professional working relationships with customers and colleague



<p>3. Know how to develop good working relationships with colleagues and customers in an engineering work environment</p>	<p>3.1. Develop positive working relationships with colleagues and customers to include:</p> <ul style="list-style-type: none"><li>a. importance of interest</li><li>b. enthusiasm</li><li>c. attendance</li><li>d. abiding by safe working practice and company rules and regulations</li><li>e. personal appearance and hygiene</li></ul> <p>3.2. Examples of why it is important to accept other peoples' views and opinions within the workplace to include:</p> <ul style="list-style-type: none"><li>a. problems with poor communication (i.e. lack of or incorrect)</li><li>b. use of correct methods for specific tasks</li></ul> <p>3.3. Why it is important to make and honour realistic commitments to colleagues and customers to include:</p> <ul style="list-style-type: none"><li>a. referral of problems</li><li>b. reporting delays</li><li>c. additional work identified during repair or maintenance</li><li>d. keep others informed of progress</li></ul>
<p>4. Be able to communicate with and support colleagues within an engineering work environment</p>	<p>4.1. Methods of communication with colleagues which meet their needs to include:</p> <ul style="list-style-type: none"><li>a. verbal</li><li>b. signs and notices</li><li>c. memos</li><li>d. electronic mail</li><li>e. job card</li><li>f. notice boards</li><li>g. SMS text messaging</li></ul> <p>4.2. Give colleagues accurate information</p> <p>4.3. Communicate with colleagues clearly and courteously</p>
<p>5. Be able to demonstrate good working relationships in an engineering work environment</p>	<p>5.1. Positive team work within an engineering environment</p> <p>5.2. Treat colleagues in a way which shows respect for their views and opinions</p> <p>5.3. Achievable commitments to colleagues</p> <p>5.4. Inform colleagues promptly of anything likely to affect their own work.</p>



<b>UNIT REF: ET113</b>	<b>UNIT TITLE: INTRODUCTION TO PROJECTS IN AN ENGINEERING ENVIRONMENT</b>
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<b>Level: 1</b>	<b>GLH: 25</b>
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**Rationale:** This unit is intended to give learners the understanding and skills to complete non-complex projects in an engineering environment. Learners are required to know how to plan and run a project which creates something new or implements a change. This may involve the manufacture, enhancement or replacement of a component, system or assembly; and could be linked to another unit.

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Understand how to prepare and plan a project	1.1. Stakeholders involved in a project to include: <ul style="list-style-type: none"> <li>a. essential for input to initial project brief</li> </ul> 1.2. Requirements of a project brief to include: <ul style="list-style-type: none"> <li>a. written and graphical techniques (where appropriate)</li> <li>b. to provide an overview of the project and existing problem</li> <li>c. what the project is expected to achieve</li> <li>d. how it will improve the existing problem or situation</li> <li>e. project aims and objectives</li> </ul> 1.3. Benefits and value of defining a project's purpose, scope, timescale, costs, aims and objectives; <ul style="list-style-type: none"> <li>a. all parties working to a common purpose with clear defined goals</li> </ul> 1.4. Project risks and the importance of developing contingency plans to include: <ul style="list-style-type: none"> <li>a. typical risks involved with engineering projects</li> <li>b. contingency arrangements for issues such as increase in cost, time</li> </ul> 1.5. Tools that can be used to assist project planning and control to include: <ul style="list-style-type: none"> <li>a. typical planning software</li> <li>b. Gantt charts</li> <li>c. Mind Maps</li> <li>d. 5 W's" Who, When, Where, Why, What</li> <li>e. "what ifs" and "so what's"</li> </ul>
2. Be able to prepare and plan a project	2.1. The purpose of the project with all relevant stakeholders 2.2. Agree the project scope, timescale, aims and objectives 2.3. Prepare a project brief 2.4. All types of resources needed for the project





	<p>2.5. Plan the project and timed use of all types of resources</p> <p>2.6. Risks and develop contingency plans for the project</p>
<p>3. Understand how to run a project</p>	<p>3.1. Methods used to monitor projects to include:</p> <ul style="list-style-type: none"><li>a. interim review meetings</li><li>b. physical observation</li><li>c. progress reports</li><li>d. target dates</li><li>e. comparisons</li></ul> <p>3.2. Methods of communication and how they could be used to make sure the project runs smoothly to include</p> <ul style="list-style-type: none"><li>a. written</li><li>b. graphical</li><li>c. face to face</li><li>d. electronic mail</li><li>e. hard / electronic copies</li></ul> <p>3.3. Purpose and value of being flexible and adapting project plans when necessary</p> <p>3.4. Purpose and value of achieving projects within agreed timescales to include:</p> <ul style="list-style-type: none"><li>a. personal satisfaction</li><li>b. customer satisfaction</li><li>c. client satisfaction</li><li>d. new work</li><li>e. profit margins</li></ul> <p>3.5. How to learn lessons from completed projects for the future to include:</p> <ul style="list-style-type: none"><li>a. compare final outcome against aims and objectives</li><li>b. review interim reports</li><li>c. good and bad points for reference</li><li>d. discuss with stakeholders to gain their perspective</li></ul>
<p>4. Be able to run a project</p>	<p>4.1. Use and monitor a project plan</p> <p>4.2. Communicate with all those involved in or affected by the project</p> <p>4.3. Required outcomes on time and to budget</p> <p>4.4. The degree to which the project met its aims and objectives</p> <p>4.5. Project strengths and areas for improvement.</p>



<b>UNIT REF: ET115</b>	<b>UNIT TITLE: INTRODUCTION TO WORKING IN THE ENGINEERING INDUSTRY</b>
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<b>Level: 1</b>	<b>GLH: 20</b>
<b>Rationale:</b> This unit provides learners with an understanding of the various organisations that make up the engineering industry. The unit also introduces learners to the types of job roles available within the engineering industry.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know the type of organisations that make up the engineering industry	1.1. Types of organisations that make up the engineering industry to include: <ul style="list-style-type: none"> <li>a. retail operations</li> <li>b. sales operations</li> <li>c. automotive / transport (road / rail / marine)</li> <li>d. heavy engineering i.e. steel works, fabrication</li> <li>e. aircraft</li> <li>f. mechanical (manufacture / maintenance)</li> <li>g. design</li> </ul>
2. Know the types of machinery used within the engineering industry	2.1. Different types of machinery used within the engineering industry to include: <ul style="list-style-type: none"> <li>a. lathes</li> <li>b. milling machines</li> <li>c. folding machines</li> <li>d. welding equipment</li> <li>e. grinding machines</li> <li>f. spot welding machines</li> <li>g. hoists</li> <li>h. hydraulic jacks</li> <li>i. fault diagnostic equipment</li> </ul>
3. Know the technical and non-technical job roles available within the engineering industry.	3.1. SEVEN technical and non-technical job roles available across the engineering industry to include: <ul style="list-style-type: none"> <li>a service / repair technician</li> <li>b maintenance engineer</li> <li>c examiner</li> <li>d workshop controller/ supervisor</li> <li>e parts advisor</li> <li>f sales person</li> <li>g customer service advisor</li> <li>h welder/ fabricator</li> <li>i design engineer</li> <li>j diagnostic engineer</li> <li>k apprentice</li> </ul> 3.2. ONE example of the type of work carried out for each of the job roles to include: <ul style="list-style-type: none"> <li>a. service technician- service and repair of engineering equipment</li> <li>b. maintenance engineer – maintaining and servicing engineering equipment</li> <li>c. examiner- safety inspections</li> </ul>



	<ul style="list-style-type: none"><li>d. workshop controller/ supervisor – controlling workflow and supervising technicians</li><li>e. parts advisor- supply of parts to public and trade</li><li>f. sales person - new and used equipment sales</li><li>g. customer service advisor - liaises with customers and workshop staff</li><li>h. welder/ fabricator – repair and manufacture engineering components</li><li>i. design engineer – designing engineering components</li><li>j. diagnostic engineer – diagnose faults</li><li>k. apprentice – working under supervision whilst training to become an engineer</li></ul> <p>3.3. Opportunities for career progression and development within the engineering industry to include.</p> <ul style="list-style-type: none"><li>a. supervisor and manager</li><li>b. technical engineer</li><li>c. vehicle damage assessor</li><li>d. technical trainer and assessor</li><li>e. warranty personnel</li></ul>
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UNIT REF: PSD01

UNIT TITLE: SELF DEVELOPMENT

Level: 1

GLH: 20

**Rationale:** To introduce the learner to ways in which they can reflect on their own personal development and how their personal skills, abilities and behaviours can be improved.

LEARNING OUTCOMES	CONTENT
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to take an active role in their self-development	1.1. Personal strengths or abilities to include: <ul style="list-style-type: none"> <li>a thinking skills</li> <li>b physical strength</li> <li>c discipline</li> <li>d independence</li> <li>e decisiveness</li> <li>f supportive</li> <li>g patience</li> <li>h communication</li> <li>i enthusiastic</li> <li>j imaginative</li> <li>k determination</li> <li>l subject knowledge</li> <li>m creative</li> </ul> 1.2. An area for self-development to include: <ul style="list-style-type: none"> <li>a. physical strength</li> <li>b. independence</li> <li>c. communication</li> <li>d. determination</li> <li>e. subject knowledge</li> </ul> 1.3. Why is this area important for their self-development to include: <ul style="list-style-type: none"> <li>a physical wellbeing</li> <li>b mental wellbeing</li> <li>c improve career prospects</li> <li>d improve knowledge</li> <li>e personal enjoyment</li> </ul>



<p>2. Be able to plan for their self-development</p>	<p>2.1. Prepare a plan for their identified area of self-development to include:</p> <ul style="list-style-type: none"><li>a. specific</li><li>b. measurable</li><li>c. achievable</li><li>d. realistic</li><li>e. time-bound</li></ul> <p>2.2. Activities, targets and timelines for their self-development to include:</p> <ul style="list-style-type: none"><li>a. those agreed with tutor prior to beginning</li><li>b. support required to meet objectives</li></ul> <p>2.3. Review progress towards achieving their targets to include:</p> <ul style="list-style-type: none"><li>a. review dates set prior to beginning development</li><li>b. review meetings with tutor</li></ul> <p>2.4. Work through the agreed plan to include:</p> <ul style="list-style-type: none"><li>a. working through set objectives</li><li>b. keeping within timescales</li><li>c. adjusting plan as required</li><li>d. continuous review of progress towards target</li></ul>
<p>3. Know how to review their self-development and plan for the future</p>	<p>3.1. Self-development plan to include:</p> <ul style="list-style-type: none"><li>a. what was learned</li><li>b. how it was learned</li><li>c. what went well</li><li>d. what did not go well</li></ul> <p>3.2. Suggest improvements and amendments to the plan to include:</p> <ul style="list-style-type: none"><li>a. amendments to objectives</li><li>b. amendments to timelines</li><li>c. identification of further areas for development</li></ul> <p>3.3. Continue with their self-development in the future to include:</p> <ul style="list-style-type: none"><li>a. continuation of existing development</li><li>b. identification of new area for development</li><li>c. preferred styles of learning.</li></ul>



<b>UNIT REF: PSD02</b>	<b>UNIT TITLE: SOLVING PROBLEMS IN DAILY LIFE</b>
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<b>Level: 1</b>	<b>GLH: 20</b>
<b>Rationale:</b> To introduce learners to the concept of problem solving and help them to develop skills to enable them to tackle problems in their daily lives.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught</b>
1. Know how to identify a straightforward problem and ways to deal with it	1.1. Identify a straightforward problem and describe its effects to include: <ol style="list-style-type: none"> <li>a. personal</li> <li>b. financial</li> <li>c. technical</li> </ol> 1.2. Suggest ways in which they might tackle the problem to include: <ol style="list-style-type: none"> <li>a. logical processes</li> <li>b. alternative methods including consideration of similar problems</li> <li>c. consider effects on themselves and other people</li> </ol> 1.3. Carry out a way to tackle the problem and agree it with an appropriate person to include: <ol style="list-style-type: none"> <li>a. consultation with their tutor</li> <li>b. identify the limits to what can be done</li> <li>c. consideration of health and safety rules.</li> </ol>
2. Be able to tackle a problem and plan a method to deal with it	2.1. Plan the method needed to tackle the problem to include: <ol style="list-style-type: none"> <li>a. methods and steps for working through the problem</li> <li>b. time-scales</li> <li>c. knowing whom to ask when unsure about how to proceed</li> <li>d. what to do if things go wrong</li> </ol> 2.2. Identify resources to help tackle the problem to include: <ol style="list-style-type: none"> <li>a. materials</li> <li>b. tools</li> <li>c. equipment</li> </ol> 2.3. Carry out planned activities: <ol style="list-style-type: none"> <li>a. following agreed plans</li> <li>b. amending plans if problems arise</li> <li>c. using appropriate support if required</li> </ol>



<p>3. Be able to carry out a review of their activities and the skills they used in dealing the problem</p>	<p>3.1. Review the approach used to deal with the problem to include:</p> <ul style="list-style-type: none"><li>a. review completed work with tutor</li></ul> <p>3.2. What went well and what did not go so well, to include:</p> <ul style="list-style-type: none"><li>a. working to the plan</li><li>b. deviations from the plan</li><li>c. how the problem may have been solved differently</li></ul> <p>3.3. Identify whether the problem has been solved to include:</p> <ul style="list-style-type: none"><li>a visual inspections</li><li>b functional testing</li><li>c aural testing.</li></ul>
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<b>UNIT REF: PSD03</b>	<b>UNIT TITLE: KNOWLEDGE OF ENVIRONMENTAL ISSUES</b>
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<b>Level: 1</b>	<b>GLH: 20</b>
<b>Rationale:</b> This unit aims to encourage learners to take responsibility for their environment by identifying environmental issues and how they can go about helping the environment.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to show an awareness of how the actions of humans affect the environment	1.1. Examples of human behaviours which harm the environment to include: <ol style="list-style-type: none"> <li>a. burning fossil fuels</li> <li>b. over population</li> <li>c. pollution, e.g. noise, water, air</li> <li>d. excessive energy consumption</li> <li>e. destruction of habitats</li> <li>f. destroying animal life, e.g. over fishing</li> </ol> 1.2. Examples of human behaviours which help the environment to include: <ol style="list-style-type: none"> <li>a reduced energy consumption</li> <li>b alternative fuels</li> <li>c recycling</li> <li>d reduced harmful emissions</li> <li>e consideration of others e.g. human, animal</li> </ol> 1.3. Ways to raise awareness about environmental issues to include: <ol style="list-style-type: none"> <li>a. education</li> <li>b. promotion</li> <li>c. protests</li> <li>d. legislation</li> </ol>
2. Know how to understand environmental issues which affect the local area	2.1. An environmental issue which has an impact on their local area to include: <ol style="list-style-type: none"> <li>a littering</li> <li>b loss of habitat</li> <li>c increased pollution (including noise)</li> <li>d decreased wildlife</li> <li>e health issues</li> <li>f lost recreational areas</li> </ol> 2.2. Ways in which this issue can be tackled to bring about improvements to include: <ol style="list-style-type: none"> <li>a. lifestyle changes</li> <li>b. conscientious purchasing</li> <li>c. focus groups</li> <li>d. legislative changes</li> </ol>





<p>3. Be able to carry out activities to help improve the environment in the local area</p>	<p>3.1. Activities that they can carry out to improve the local environment to include:</p> <ul style="list-style-type: none"><li>a cleaning up local areas</li><li>b recycling points</li><li>c reducing energy use</li><li>d planting trees</li></ul> <p>3.2. Carry out at least two activities to improve the local environment to include:</p> <ul style="list-style-type: none"><li>a. cleaning up local areas</li><li>b. reusing materials</li><li>c. recycling points</li><li>d. reducing energy use</li><li>e. planting trees</li></ul> <p>3.3. The benefits of these activities for the local area to include:</p> <ul style="list-style-type: none"><li>a improved health</li><li>b reduced costs</li><li>c increased wildlife</li><li>d Improved visually</li></ul> <p>3.4. What actions are needed to maintain improvements in the future to include:</p> <ul style="list-style-type: none"><li>a. continuation of improvement activities</li><li>b. monitoring through regular inspection</li><li>c. maintenance of areas.</li></ul>
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UNIT REF: PSD06

UNIT TITLE: PREPARING FOR WORK

Level: 1

GLH: 20

**Rationale:** To encourage learners to look at their own skills and qualities in relation to those needed at work and to use this understanding to identify key personal information needed for an application.

LEARNING OUTCOMES	CONTENT
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
<p>1. Know how own skills and qualities relate to those needed for working life</p>	<p>1.1. Personal and employability skills and qualities which employees need to include:</p> <ul style="list-style-type: none"> <li>a. displaying positive body language</li> <li>b. showing interest, initiative and applying effort</li> <li>c. being confident about own efforts and contributions made by others</li> <li>d. being on-time and keeping to time schedules</li> <li>e. promptly informing appropriate personnel of planned and unforeseen lateness</li> </ul> <p>1.2. Be able to identify their own skills, qualities and achievements to include:</p> <ul style="list-style-type: none"> <li>a. displaying positive body language</li> <li>b. showing interest, initiative and applying effort</li> <li>c. being confident about own efforts and contributions made by others</li> <li>d. being on-time and keeping to time schedules</li> <li>e. promptly informing appropriate personnel of planned and unforeseen lateness</li> </ul> <p>1.3. How their own skills, qualities and achievements relate to those needed in the workplace to include:</p> <ul style="list-style-type: none"> <li>a. hard working</li> <li>b. reliable</li> <li>c. willing to learn</li> <li>d. presentable</li> <li>e. positive attitude</li> </ul> <p>1.4. Areas for improvement to include:</p> <ul style="list-style-type: none"> <li>a. skills to enhance employability</li> <li>b. developing skills</li> </ul>



<p>2. Be able to research personal career opportunities</p>	<p>2.1. Know how to find out about a range of potential job roles which interest them to include:</p> <ul style="list-style-type: none"><li>a. light vehicle technician</li><li>b. heavy vehicle technician</li><li>c. motorcycle technician</li><li>d. parts advisor</li><li>e. sales person</li><li>f. valeter</li><li>g. body technician</li><li>h. painter</li></ul> <p>2.2. Skills, qualities and achievements to a potential job role to include:</p> <ul style="list-style-type: none"><li>a. match skills to employment options</li></ul> <p>2.3. Prepare key information needed for an application or interview to include:</p> <ul style="list-style-type: none"><li>a. listen and understand people's views,</li><li>b. ask questions to confirm understanding.</li><li>c. identifying interests, experiences</li><li>d. skills and qualities</li><li>e. displaying positive body language</li><li>f. being on time and keeping to time schedules.</li></ul>
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<b>UNIT REF: ET117</b>	<b>UNIT TITLE: INTRODUCTION TO MACHINING ENGINEERING MATERIALS</b>
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<b>Level: 1</b>	<b>GLH: 40</b>
<p><b>Rationale:</b> This unit gives learners an introduction to the diverse methods used when machining materials in an engineering environment. It includes drilling, turning, milling; and grinding. The knowledge requirement is intended to introduce a variety of methods to the learners and the practical activities allow the learner to focus on centre lathe turning.</p> <p>As this unit involves the use of tools, equipment or machinery it must be delivered in a secure and safe environment with learners being supervised at all times by competent and qualified staff. It is expected that all tools, equipment or machinery will be maintained and presented in a safe and fit state.</p>	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know different machines, methods and their applications	1.1. Common machining methods used in an engineering environment to include: <ul style="list-style-type: none"> <li>a. milling</li> <li>b. turning</li> <li>c. grinding</li> <li>d. shaping</li> <li>e. drilling</li> </ul> 1.2. Industrial applications of machining methods 1.3. Why different machining processes are chosen for different tasks / applications 1.4. Types and basic parts of common machines used to include: <ul style="list-style-type: none"> <li>a. milling</li> <li>b. turning</li> <li>c. grinding</li> <li>d. shaping</li> <li>e. drilling</li> </ul>
2. Know how to prepare for machining activities	2.1. The safety requirements when using machining processes to include: <ul style="list-style-type: none"> <li>a. PPE</li> <li>b. risk assessment</li> <li>c. importance of cleanliness</li> </ul> 2.2. The requirements of preparing the workplace to include: <ul style="list-style-type: none"> <li>a. types</li> <li>b. function</li> <li>c. availability and condition of tools and equipment</li> </ul> 2.3. The requirements of planning how to carry out the operations 2.4. The procedures for setting up machining equipment



<p>3. Be able to prepare for machining activities</p>	<p>3.1. Appropriate resources and information to assist in preparing for machining activities</p> <p>3.2. The tools and work holding equipment used for non-complex specific machining processes</p>
<p>4. Be able to carry out machining activities</p>	<p>4.1. Set up drilling equipment to include:</p> <ul style="list-style-type: none"> <li>a. bench</li> <li>b. pedestal</li> <li>c. basic nomenclature</li> <li>d. sharpening drills</li> <li>e. speeds relative to diameter</li> <li>f. chuck use</li> <li>g. work holding methods</li> <li>h. coolant use</li> </ul> <p>4.2. Set up turning equipment to include:</p> <ul style="list-style-type: none"> <li>a. parts of a centre lathe</li> <li>b. tool post</li> <li>c. tailstock</li> <li>d. bed</li> <li>e. headstock</li> <li>f. 3 Jaw Chuck operation</li> <li>g. types of tool (wedge shape)</li> <li>h. simple turning speed calculation</li> <li>i. coolant use</li> </ul> <p>4.3 Set up milling equipment to include:</p> <ul style="list-style-type: none"> <li>a. parts of a milling machine (horizontal/vertical)</li> <li>b. basic cutter types (horizontal/vertical)</li> <li>c. work holding methods</li> <li>d. familiarisation with controls on machines</li> </ul> <p>4.4. Use machining equipment safely</p>
<p>5. Know that machining activities are carried out correctly</p>	<p>5.1. Methods used to check machining has been carried out correctly</p> <p>5.2. Identify the methods used to check machining has been carried out correctly</p>
<p>6. Be able to carry out basic checks on completed work</p>	<p>6.1. Check for condition to include:</p> <ul style="list-style-type: none"> <li>a. how and when the quality will be checked</li> <li>b. condition (machining marks and finish)</li> <li>c. accuracy (dimensional accuracy)</li> <li>d. tolerance</li> </ul> <p>6.2. Check for accuracy and tolerance to include</p> <ul style="list-style-type: none"> <li>a. micrometers</li> <li>b. Vernier (calipers and height gauge)</li> <li>c. calipers (inside and outside).</li> </ul>



UNIT REF: ET118

UNIT TITLE: FORMING AND JOINING FOR ENGINEERING APPLICATIONS

Level: 1

GLH: 40

**Rationale:**

This unit will enable the learner to develop the knowledge and skills needed when working with tools and equipment used for a range of forming; and mechanical and thermal joining applications within the engineering environment.

LEARNING OUTCOMES	CONTENT
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to work safely whilst forming and joining materials in an engineering environment	1.1. Personal protective equipment to include: a. overalls b. gloves c. aprons d. goggles e. helmets f. safety footwear appropriate to task  1.2. Follow safe working practices at all times to include: a use of PPE b location of fire extinguishers c following safety instructions d correct use of tools and equipment e safe working practices when using engineering machinery
2. Understand tools, equipment and processes used when forming and joining engineering materials	2.1. A range of forming equipment and hand tools. to include: a. hammers b. mallets c. dollies d. hand shears e. G clamps f. mole grips g. files h. drills  2.2. Use a range of forming equipment and hand tools to include: a. rules b. squares c. scribes d. odd leg calipers e. dividers



<p>3. Be able to form and join engineering materials applicable to the task.</p>	<p>3.1 A range of joining processes and the factors which effect their selection to include:</p> <ul style="list-style-type: none"><li>a. cost</li><li>b. fixing restrictions</li><li>c. type of material</li><li>d. permanence of joint</li><li>e. position of joint</li><li>f. joint operating conditions</li><li>g. equipment availability</li></ul> <p>3.2 The equipment and consumables used in the gas welding process to include:</p> <ul style="list-style-type: none"><li>a. cylinders</li><li>b. regulators</li><li>c. flash back arresters</li><li>d. hoses</li><li>e. hose check valves</li><li>f. welding torch</li><li>g. welding nozzles</li></ul> <p>3.3 the features of MIG/MAG welding sets to include:</p> <ul style="list-style-type: none"><li>a. gas cylinder:</li><li>b. regulator / flow meter</li><li>c. welding torch</li><li>d. wire reel</li><li>e. pinch rollers</li><li>f. tensioner</li><li>g. drive motor</li><li>h. torch liner</li><li>i. contact tip</li><li>j. earth clamp</li><li>k. operating switch</li><li>l. voltage switch</li><li>m. wire speed potentiometer</li></ul> <p>3.4 The features of resistance spot welding equipment to include:</p> <ul style="list-style-type: none"><li>a. pincer type welding unit</li><li>b. electrode arms</li><li>c. electrode tips</li><li>d. timer unit / transformer</li></ul> <p>3.5 The features of soft soldering</p> <p>3.6. Fusion and non-fusion welding to include:</p> <ul style="list-style-type: none"><li>a. brazing</li><li>b. soldering</li><li>c. MIG/MAG</li><li>d. TIG/ TAG</li><li>e. gas fusion</li><li>f. resistance welding</li></ul>
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	<p>3.7. The methods and features of joining using mechanical fastening and adhesives to include:</p> <ul style="list-style-type: none"><li>a. nuts and bolts</li><li>b. washers</li><li>c. studs</li><li>d. hollow rivets</li><li>e. adhesives</li><li>f. manufacturers special fasteners</li><li>g. speed clips</li><li>h. self-tapping screws</li></ul>
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<b>UNIT REF: ET119</b>	<b>UNIT TITLE: ELECTRICAL FOUNDATION SKILLS IN AN ENGINEERING ENVIRONMENT</b>
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<b>Level: 1</b>	<b>GLH: 40</b>
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**Rationale:** This unit introduces learners to the basic principles of operation of 12 and 24 volt electrical systems and their components. It covers the identification of main components and the main electrical principles and terminology used in non-complex engineering electrical systems. The unit also introduces learners to the fundamental operating principles of engineering electrical systems and components. On satisfactory completion of the unit, the learner will be able to interpret and create simple electrical circuits.

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<p><b>The Learner will:</b></p> <p>1. Be able to work safely on basic engineering electrical systems</p>	<p><b>The Learner should be taught:</b></p> <p>1.1. Personal protective equipment (PPE) when working on 12/ 24 volt electrical systems in an engineering environment to include:</p> <ul style="list-style-type: none"> <li>a. overalls</li> <li>b. protective and safety gloves</li> <li>c. protective footwear</li> <li>d. goggles</li> <li>e. aprons</li> </ul> <p>1.2. Appropriate and safe working practices when working on electrical systems in an engineering environment to include:</p> <ul style="list-style-type: none"> <li>a. ensuring the circuit is safe prior to working on it</li> <li>b. follow logical sequence of working</li> <li>c. minimising risk of electrical shorts</li> <li>d. avoiding damage to electrical and electronic components</li> <li>e. use safe working practices</li> <li>f. select and use correct tools and equipment</li> </ul> <p>1.3. Dangers associated with high voltage electrical systems and their components found in an engineering environment to include capacitor discharge</p>



<p>2. Know about non-complex engineering electrical systems and electrical principles</p>	<p>2.1. Main electrical systems and components in non-complex electrical circuits used in an engineering environment to include:</p> <ul style="list-style-type: none"><li>a. electrical storage systems</li><li>b. starting system</li><li>c. lighting systems</li><li>d. warning systems</li></ul> <p>2.2. Simple electrical principles and laws to include:</p> <ul style="list-style-type: none"><li>a. magnet effect of electrical current</li><li>b. heating effect of electrical current</li><li>c. chemical effect – storage and discharge of electrical energy by the battery</li><li>d. types of circuit – series and parallel</li><li>e. ratings of bulbs, lamps and fuses</li></ul> <p>2.3. Common electrical units of measurement used in an engineering environment to include</p> <ul style="list-style-type: none"><li>a. volt</li><li>b. ampere</li><li>c. ohm</li><li>d. watt</li></ul> <p>2.4. Common electrical symbols used in an engineering environment to include:</p> <ul style="list-style-type: none"><li>a. battery</li><li>b. switches</li><li>c. motors</li><li>d. fuses</li><li>e. lamps</li><li>f. earth</li><li>g. diode</li><li>h. transistor</li><li>i. relay</li></ul> <p>2.5. Series and parallel circuits used in an engineering environment</p>
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<p>3. Be able to make non-complex electrical circuits</p>	<p>3.1. The correct size cable and fuses for a given circuit to include:</p> <ul style="list-style-type: none"><li>a. amperage</li><li>b. voltage</li><li>c. no. of strands</li><li>d. thickness</li><li>e. blade type</li><li>f. cartridge fuse</li></ul> <p>3.2. The ability to accurately read and interpret a simple wiring diagram as used in an engineering environment to include:</p> <ul style="list-style-type: none"><li>a. series circuits</li><li>b. parallel circuits</li><li>c. lighting circuits</li><li>d. warning systems</li></ul> <p>3.3. The correct procedures to make a simple 12/ 24 volt lighting circuit using cable, switches, fuses, a relay and bulbs to include:</p> <ul style="list-style-type: none"><li>a. safe use of tools and equipment</li><li>b. correct making of connections</li><li>c. identification of correct polarity</li><li>d. correct selection of components</li></ul> <p>3.4. The correct use of a voltmeter and ammeter when checking electrical circuit operation to include:</p> <ul style="list-style-type: none"><li>a. correct connection of lead to meter</li><li>b. correct scale selected on meter</li><li>c. correct connection to circuit</li><li>d. correct measurement of current and voltage</li></ul> <p>3.5. The correct methods to crimp terminals to each end of a length of wire to include:</p> <ul style="list-style-type: none"><li>a. identification of terminals for wire</li><li>b. selection of crimping plier position</li><li>c. correct use of crimping pliers</li><li>d. secure connection.</li></ul>
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<b>UNIT REF: ET120</b>	<b>UNIT TITLE: INTRODUCTION TO MAINTENANCE ON MECHANICAL SYSTEMS IN ENGINEERING</b>
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<b>Level: 1</b>	<b>GLH: 50</b>
<b>Rationale:</b> This unit introduces the learner to mechanical systems used in engineering and covers the basic identification of the main components of those mechanical systems and their functions. It also allows the learner to use technical manuals to locate data specific to the systems.	

LEARNING OUTCOMES	CONTENT
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to work safely on mechanical systems in an engineering environment	1.1. Personal Protective Equipment when working on mechanical systems to include <ul style="list-style-type: none"> <li>a overalls</li> <li>b gloves</li> <li>c protective footwear</li> <li>d goggles</li> <li>e precautions when using electrical equipment</li> <li>f disposal of waste materials</li> </ul> 1.2. Safe working practices when working on mechanical systems to include: <ul style="list-style-type: none"> <li>a. follow logical sequence of working</li> <li>b. use safe working procedures and practices</li> <li>c. select and use correct tools and equipment</li> <li>d. correct use of mechanical system repair tools</li> </ul>
2. Know about bearings and seals used in an engineering environment	2.1. The different types of bearings and their uses to include: <ul style="list-style-type: none"> <li>a. ball bearing</li> <li>b. roller bearing</li> <li>c. taper roller bearing</li> <li>d. needle roller bearing</li> <li>e. thrust bearing</li> <li>f. lip seals</li> <li>g. dust and moisture seals</li> </ul> 2.2. The different types of seals and their uses to include <ul style="list-style-type: none"> <li>a. 'O' rings</li> <li>b. gaskets</li> <li>c. end caps</li> <li>d. endfloat</li> <li>e. freeplay</li> <li>f. pre-load</li> </ul> 2.3. Different methods used to remove and replace bearings and seals: <ul style="list-style-type: none"> <li>a clean working area</li> <li>b selecting and using the correct removal tools</li> <li>c removing a seal</li> <li>d removing a bearing</li> <li>e reinstating a bearing correctly</li> <li>f reinstating a seal correctly</li> <li>g confirming the bearing and seal is operating correctly</li> </ul>



<p>3. Know about gears and gearboxes used in and engineering environment</p>	<p>3.1. The different types of gears and their uses to include:</p> <ul style="list-style-type: none"><li>a. spur gears</li><li>b. helical gears</li><li>c. double helical gears</li><li>d. bevel gears</li><li>e. worm gear</li><li>f. hypoid</li></ul> <p>3.2. The purpose of the gearbox to include:</p> <ul style="list-style-type: none"><li>a. types of mechanical gearboxes</li><li>b. provide permanent neutral</li><li>c. provide reverse</li><li>d. torque multiplier</li></ul> <p>3.3. Basic gear ratios to include:</p> <ul style="list-style-type: none"><li>a. input and output torque</li><li>b. input and output speeds</li><li>c. simple gear ratios</li></ul> <p>3.4. Different methods used to select gears to include:</p> <ul style="list-style-type: none"><li>a. selector mechanisms</li><li>b. interlocks</li></ul>
<p>4. Know about braking systems used in and engineering environment</p>	<p>4.1. The different types of braking systems to include:</p> <ul style="list-style-type: none"><li>a. friction</li><li>b. brake bands</li><li>c. disc brakes</li><li>d. drum brakes</li></ul> <p>4.2. The purpose of the braking system to include:</p> <ul style="list-style-type: none"><li>a. energy conversions</li></ul> <p>4.3. Different methods used to operate braking systems to include:</p> <ul style="list-style-type: none"><li>a. hydraulic and mechanical brakes</li><li>b. levers</li><li>c. pedals</li><li>d. adjustments</li></ul>



<p>5. Know about mechanical linkages and connections used in and engineering environment</p>	<p>5.1. The different types of mechanical linkages and their uses to include:</p> <ul style="list-style-type: none"><li>a. cables</li><li>b. levers and rods</li><li>c. control arms/ wheels</li></ul> <p>5.2. The different types of connections used to join mechanical linkages to include:</p> <ul style="list-style-type: none"><li>a. clevis pins</li><li>b. ball joints</li><li>c. roll pins</li><li>d. universal joints</li><li>e. constant velocity joints</li></ul> <p>5.3. The effect of mechanical advantage using linkages</p> <p>5.4. Different methods used to adjust mechanical linkages:</p> <ul style="list-style-type: none"><li>a. locknut</li><li>b. adjusting to correct specifications</li><li>c. excessive adjustment</li><li>d. insufficient adjustment</li><li>e. tolerances</li><li>f. alignment</li></ul>
<p>6. Be able to carry out routine maintenance on mechanical systems used in and engineering environment</p>	<p>6.1. Appropriate information and technical data necessary to complete routine maintenance on mechanical systems</p> <p>6.2. The correct procedures to check and top up the lubricant levels in a mechanical gearbox</p> <p>6.3. The correct procedures to replace a bearing and seal</p> <p>6.4. The correct procedures to adjust a mechanical linkage</p> <p>6.5. The correct procedure for replacing components on braking systems.</p>



<b>UNIT REF: ET121</b>	<b>UNIT TITLE: INTRODUCTION TO INTERNAL COMBUSTION ENGINE SYSTEMS, COMPONENTS AND OPERATION</b>
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<b>Level: 1</b>	<b>GLH: 50</b>
<b>Rationale:</b> This unit introduces learners to the principles of internal combustion engine systems, components and operation; and includes the requirements for carrying out routine engine maintenance.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to work safely on internal combustion engines	1.1. Personal Protective Equipment (PPE) and Vehicle Protection Equipment (VPE) when working on internal combustion engines to include: <ul style="list-style-type: none"> <li>a. overalls</li> <li>b. protective and safety gloves</li> <li>c. protective footwear</li> <li>d. goggles</li> </ul> VPE protection to include: <ul style="list-style-type: none"> <li>a. wing covers</li> <li>b. seat covers</li> <li>c. carpet protection</li> </ul> 1.2. Appropriate and safe working practices when working on internal combustion engine mechanical systems to include: <ul style="list-style-type: none"> <li>a removal and/or storage of owners property from vehicle</li> <li>b immobilising engine</li> <li>c ensuring handbrake is applied</li> <li>d follow logical sequence of working</li> <li>e use safe working practices</li> <li>f select and use correct tools and equipment</li> </ul>
2. Know internal combustion engine systems and components	2.1. The main components used in internal combustion engines to include: <ul style="list-style-type: none"> <li>a. cylinder block</li> <li>b. cylinder head</li> <li>c. engine sump</li> <li>d. crankshaft</li> <li>e. connecting rods</li> <li>f. pistons and rings</li> <li>g. camshaft</li> <li>h. valves</li> <li>i. inlet and exhaust manifolds</li> <li>j. flywheel</li> <li>k. front drive pulley</li> <li>l. gaskets and seals</li> <li>m. turbocharger</li> </ul> 2.2. The purpose of the main components used in internal combustion engines to include: <ul style="list-style-type: none"> <li>a. cylinder block</li> <li>b. cylinder head</li> </ul>



	<ul style="list-style-type: none"> <li>c. engine sump</li> <li>d. crankshaft</li> <li>e. piston and rings</li> <li>f. connecting rod</li> <li>g. flywheel</li> <li>h. camshaft</li> <li>i. inlet and exhaust valves</li> <li>j. inlet and exhaust manifolds</li> <li>k. gaskets and seals</li> <li>l. turbocharger</li> </ul> <p>2.3. The purpose of the main systems used in internal combustion engines to include:</p> <ul style="list-style-type: none"> <li>a. induction and fuel system</li> <li>b. exhaust system</li> <li>c. lubrication system</li> <li>d. cooling system</li> <li>e. ignition system</li> <li>f. starting system</li> <li>g. charging system</li> </ul>
<p>3. Understand how internal combustion engines operate</p>	<p>3.1. The basic operating cycles of 2 and 4 stroke internal combustion engines to include:</p> <ul style="list-style-type: none"> <li>a. stages of operation - induction, compression, power and exhaust</li> <li>b. piston position and movement</li> <li>c. firing orders for 4 cylinder engine</li> <li>d. engine terminology – bore, stroke, capacity, TDC, BDC, compression ratio, direct injection, indirect injection</li> <li>e. mixing of fuel and air</li> </ul> <p>3.2. Examples of the valve configurations for 4 stroke internal combustion engines to include:</p> <ul style="list-style-type: none"> <li>a piston position when opening and closing valves</li> <li>b piston position for timing of spark</li> <li>c need to vary ignition timing with increase in engine speed</li> <li>d piston position at point of injection</li> </ul> <p>3.3. The main constituents of internal combustion engine exhaust gas emissions to include:</p> <ul style="list-style-type: none"> <li>a. stoichiometric air/fuel ratio</li> <li>b. compression of air only</li> <li>c. weak mixture</li> <li>d. rich mixture</li> <li>e. wider range of air/fuels ratios in CI engines</li> <li>f. point of injection</li> <li>g. lambda</li> </ul>





<p>4. Be able to safely and correctly carryout routine engine maintenance</p>	<p>4.1. The correct technical data for internal combustion engine maintenance to include:</p> <ul style="list-style-type: none"><li>a vehicle manufacturer’s repair instructions</li><li>b vehicle manufacturer’s engine specifications</li><li>c torque settings</li><li>d fluid types and quantities</li></ul> <p>4.2. The correct procedures when removing and refitting an internal combustion engine cylinder head from a fully equipped non running stand engine to include:</p> <ul style="list-style-type: none"><li>a using appropriate PPE and VPE</li><li>b storage and protection of components</li><li>c disabling engine when appropriate</li><li>d logical working sequence</li><li>e correct selection and use of tools and equipment</li><li>f locating and using correct information and data</li><li>g correct setting and adjustment of components</li><li>h awareness of others</li><li>i care of vehicle</li></ul> <p>4.3. The correct procedures for reinstating the engine and vehicle after internal combustion engine maintenance to include:</p> <ul style="list-style-type: none"><li>a. reinstate vehicle owners property</li><li>b. removal of VPE</li><li>c. adjustments following refitting</li><li>d. cleaning vehicle of grease and oil marks</li><li>e. check function of engine operation(rotation of engine by hand)</li><li>f. check for engine for leaks.</li></ul>
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<b>UNIT REF: ET122</b>	<b>UNIT TITLE: INSPECTION, REPAIR AND REPLACEMENT OF TYRES</b>
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<b>Level: 1</b>	<b>GLH: 25</b>
<b>Rationale:</b> This unit will help the learner to develop the knowledge and skills required to inspect, fit, repair and maintain standard light vehicle tyres and wheels.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know about tyre legislation and construction	1.1. The main purpose of tyres to include: <ul style="list-style-type: none"> <li>a. interaction between tyres, other components and vehicle handling</li> <li>b. steering, drive and suspension</li> <li>c. passenger comfort</li> </ul> 1.2. The different types of wheel and rim construction to include: <ul style="list-style-type: none"> <li>a. light alloy</li> <li>b. pressed steel</li> <li>c. spoked wheel</li> <li>d. wire wheels</li> <li>e. standard and safety rims</li> </ul> 1.3. The types and application of tyre construction to include: <ul style="list-style-type: none"> <li>a. radial</li> <li>b. cross ply</li> <li>c. bias belted</li> <li>d. directional</li> <li>e. asymmetric</li> </ul> 1.4. The legal requirements for tyres to include: <ul style="list-style-type: none"> <li>a. tread depth</li> <li>b. tyre wall and casing damage</li> <li>c. tyre pressure</li> <li>d. mixing of tyre types</li> <li>e. re-grooving legislation</li> </ul>
2. Know about the tools and equipment used when working with light vehicle tyres	2.1. The tools and equipment used when working with tyres to include: <ul style="list-style-type: none"> <li>a. lifting and supporting equipment</li> <li>b. tyre fitting and removal tools and machinery</li> <li>c. hand tools</li> <li>d. tyre repair tools</li> <li>e. measuring equipment</li> <li>f. wheel balancing equipment</li> <li>g. tyre inflation equipment</li> </ul> 2.2. Specialist maintenance requirements of wheel balancing and tyre removal and refitting machinery



<p>3. Know about the inspection, removal and replacement of tyres</p>	<p>3.1. The meaning of markings on tyres to include:</p> <ul style="list-style-type: none"> <li>a. speed rating</li> <li>b. size markings</li> <li>c. aspect ratio</li> <li>d. load handling</li> <li>e. ply rating</li> <li>f. tread wear indicators</li> </ul> <p>3.2. The procedures and methods used when inspecting tyres. to include:</p> <ul style="list-style-type: none"> <li>a. inspection:</li> <li>b. on the rim visual (external)</li> <li>c. removed from wheel (internal)</li> <li>d. use of tread depth indicators, tyre probes and pressure gauges</li> <li>e. information sources including tyre and manufacturers' technical data</li> </ul> <p>3.3. Tyre, wheel and valve removal and refitting methods and procedures.</p> <p>3.4. The principles of wheel balancing to include:</p> <ul style="list-style-type: none"> <li>a. static balancing</li> <li>b. dynamic balancing</li> </ul>
<p>4. Be able to work safely when carrying out removal and replacement activities</p>	<p>4.1 Suitable personal protective equipment and vehicle coverings when working on vehicles to include:</p> <ul style="list-style-type: none"> <li>a. overalls</li> <li>b. protective and safety gloves</li> <li>c. protective footwear</li> <li>d. goggles</li> </ul> <p>VPE protection to include:</p> <ul style="list-style-type: none"> <li>a. wing covers</li> <li>b. seat covers</li> <li>c. carpet protection</li> </ul> <p>4.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment</p>
<p>5.. Be able to use the correct techniques when inspecting tyres</p>	<p>5.1. Carry out inspection of wheels and tyres using appropriate techniques, suitable tools, equipment and manufacturer's instructions where relevant to include:</p> <ul style="list-style-type: none"> <li>a visual inspection</li> <li>b measurement of tread depth</li> <li>c tyre pressures</li> <li>d balance</li> </ul>
<p>6. Be able to carry out the repair and replacement of tyres</p>	<p>6.1. Carry out tyre repair activities within appropriate timescales, using:</p> <ul style="list-style-type: none"> <li>a suitable tools and equipment</li> <li>b correct repair and replacement techniques</li> <li>c correct type and size of replacement components</li> <li>d correct materials</li> </ul> <p>6.2. Carry out tyre replacement activities within appropriate timescales</p>



7. Be able to balance wheels and carry out final checks on the equipment	7.1. Carry out wheel balancing to within acceptable limits 7.2. Carry out final equipment safety checks in the workshop, prior to releasing the equipment to the customer.
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<b>UNIT REF: ET123</b>	<b>UNIT TITLE: INTRODUCTION TO COMPUTER AIDED DESIGN</b>
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<b>Level: 1</b>	<b>GLH: 40</b>
<b>Rationale:</b> In this unit the learner will gain the knowledge and skills necessary to produce a two and three dimensional drawing using engineering drawing software; and also an appreciation of how this is then used, to complete the manufacturing process through Computer Numerical Control.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know the uses of Computer Aided Design (CAD) programmes in an engineering environment	<p>1.1. The advantages and disadvantages of Computer Aided Design (CAD) programmes to include:</p> <p>Advantages:</p> <ul style="list-style-type: none"> <li>a. more accurate than hand drawn designs</li> <li>b. no human error</li> <li>c. 'Save and Edit' makes it easier and cheaper to modify designs</li> <li>d. 3D detail</li> <li>e. can be resized easily</li> <li>f. modelling and simulation can take place by using software</li> <li>g. speeds up production process</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>a. software can be expensive so initial costs can be high</li> <li>b. staff need training which adds to the cost</li> <li>c. PC required</li> <li>d. unless very sophisticated software is used it has no in depth knowledge of manufacturing materials</li> <li>e. it does not always accurately simulate 'real world'</li> </ul> <p>1.2. Computer Aided Design is used in engineering environments to include:</p> <ul style="list-style-type: none"> <li>a. simulation</li> <li>b. modelling components and printed circuit boards (PCBs)</li> <li>c. linking to manufacturing processes</li> </ul>
2. Be able to use drawing programmes in an engineering context	<p>2.1 A suitable drawing programme to produce a two dimensional engineering drawing of a chosen engineering component</p> <p>2.2 A suitable drawing programme to produce a three dimensional model of the chosen engineering component</p> <p>2.3 A suitable CAD file that can be used in conjunction with a machine to manufacture a chosen engineering component</p> <p>2.4 How to save CAD files correctly</p> <p>2.5 How to retrieve a CAD file and make amendments to the drawings</p>



<p>3. Know the uses of Computer Aided Manufacture (CAM) in an engineering environment</p>	<p>3.1. The advantages and disadvantages of Computer Aided Manufacture (CAM) to include: Advantages: a. Mass production repeat operations b. consistent results in large scale production c. very high accuracy levels d. very complex shapes can be machined e. less human labour involved f. overall saving in money once investment is realised Disadvantages: a. software and machinery interface can be expensive b. can be slower than traditional methods for one off or low-volume production c. staff need to be trained to use the software and machinery adding to cost</p> <p>3.2. Computer Aided Manufacture (CAM) used in engineering environments</p>
<p>4. Know the fundamental process of Computer Numerical Control (CNC)</p>	<p>4.1. The meaning of the term CNC</p> <p>4.2. Typical machine tools that can be operated by CNC to include: a. lathes b. mills c. routers d. grinders</p> <p>4.3. The importance of relevant software and the control console in the process</p> <p>4.4. Typical steps when setting up machine.</p>



<b>UNIT REF: ET124</b>	<b>UNIT TITLE: CYCLE CONSTRUCTION AND ROUTINE MAINTENANCE</b>
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<b>Level: 1</b>	<b>GLH: 26</b>
<b>Rationale:</b> This unit will enable the learner to develop an understanding of: <ul style="list-style-type: none"> <li>• fundamental principles of cycle construction</li> <li>• features associated with cycle design</li> <li>• and routine cycle maintenance activities</li> </ul>	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know the different types of cycles and design features	1.1. Different types of cycles and their purpose to include: <ol style="list-style-type: none"> <li>a. BMX</li> <li>b. racing</li> <li>c. mountain</li> <li>d. touring</li> </ol> 1.2. The location of the main components to include: <ol style="list-style-type: none"> <li>a. frame</li> <li>b. handlebars</li> <li>c. seat post</li> <li>d. gears</li> <li>e. brake components</li> <li>f. front and rear brake levers</li> <li>g. forks</li> <li>h. headset /yoke</li> <li>i. suspension</li> <li>j. chain and sprockets</li> </ol> 1.3. The operation of gears and the need for gear ratios to include: <ol style="list-style-type: none"> <li>a. chains</li> <li>b. front sprockets</li> <li>c. rear sprockets</li> <li>d. derailleur types</li> <li>e. ratios</li> </ol>
2. Know about routine maintenance activities on cycles	2.1. The need for routine maintenance on cycles to include: <ol style="list-style-type: none"> <li>a. chain lubrication</li> <li>b. brake cable (level end) adjustment</li> <li>c. seat adjustment</li> <li>d. handlebar adjustment</li> <li>e. tyre condition and pressures</li> <li>f. cable condition and lubrication</li> </ol> 2.2. The regular checks that are required to maintain a cycle in good condition to include: <ol style="list-style-type: none"> <li>a. chain lubrication</li> <li>b. brake cable (level end) adjustment</li> <li>c. seat adjustment</li> <li>d. handlebar adjustment</li> <li>e. tyre condition and pressures</li> <li>f. cable condition and lubrication</li> </ol>



<p>3. Carry out routine maintenance activities on cycles</p>	<p>3.1. Suitable personal protective equipment when working on cycles to include:</p> <ul style="list-style-type: none"><li>a. gloves</li><li>b. protective clothing</li><li>c. eyewear</li><li>d. footwear</li></ul> <p>3.2. Suitable sources of technical information to include:</p> <ul style="list-style-type: none"><li>a. manufacturer's instructions from distributors and websites</li><li>b. specific brand maintenance requirements</li><li>c. servicing criteria</li></ul> <p>3.3. Carry out the removal and replacement of cycle components required for routine maintenance to include:</p> <ul style="list-style-type: none"><li>a. frame</li><li>b. handlebars</li><li>c. seat post</li><li>d. gears</li><li>e. brake components</li><li>f. front and rear brake levers</li><li>g. forks</li><li>h. headset /yoke</li><li>i. suspension</li><li>j. chain and sprockets</li></ul> <p>3.4. Locate and repair a puncture to a cycle wheel and inner tube to include:</p> <ul style="list-style-type: none"><li>a. tyre removal, fitting and checking for damage</li><li>b. inner tube removal, fitting and checking for damage</li><li>c. finding holes in tubes and tyres</li><li>d. types and causes of punctures</li><li>e. repairing tubes</li><li>f. tyre inflation</li></ul> <p>3.5. Carry out basic adjustments to cycle components and systems to include:</p> <ul style="list-style-type: none"><li>a. frame</li><li>b. handlebars</li><li>c. seat post</li><li>d. gears</li><li>e. brake components</li><li>f. front and rear brake levers</li><li>g. forks</li><li>h. headset /yoke</li><li>i. suspension</li><li>j. chain and sprockets</li></ul>
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<b>UNIT REF: ET129</b>	<b>UNIT TITLE: MOTORCYCLE CONSTRUCTION AND ROUTINE MAINTENANCE</b>
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<b>Level: 1</b>	<b>GLH: 26</b>
<b>Rationale:</b> This unit will enable the learner to develop an understanding of: <ul style="list-style-type: none"> <li>• fundamental principles of motor cycle construction</li> <li>• safety features associated with motor cycle design</li> <li>• and technical information required to carry out motor cycle inspections and maintenance.</li> </ul>	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know different types of motorcycle and layouts	1.1. Different types of motorcycles and the location of the main components to include: <ol style="list-style-type: none"> <li>moped</li> <li>scooter</li> <li>trail</li> <li>commuter</li> <li>custom</li> <li>sports</li> <li>2 stroke (single, twin, triple)</li> <li>4 stroke (single, twin, triple, 4 cyl., 6 cyl.)</li> <li>inline</li> <li>flat</li> <li>vee</li> </ol> 1.2. The different types of motorcycle frames and their construction methods to include: <ol style="list-style-type: none"> <li>pressed steel</li> <li>step through</li> <li>backbone</li> <li>single down tube cradle</li> <li>twin down tube cradle</li> <li>diamond</li> <li>twin spar beam</li> <li>cross members</li> <li>load-bearing points</li> <li>tubular</li> <li>box sections</li> <li>sub-frames</li> </ol> 1.3. The components used in motorcycle fairings and side panel construction to include: <ol style="list-style-type: none"> <li>fairings</li> <li>seat unit</li> <li>tail piece</li> <li>side panels</li> <li>shoulder bolt screws</li> <li>fast screws</li> <li>rubber 'O' rings &amp; panel lugs</li> <li>rubber mountings</li> <li>metal fasteners and other securing devices</li> </ol>



<p>2. Know safety features used in motorcycle construction</p>	<p>2.1. The safety features used in motorcycle construction to include:</p> <ul style="list-style-type: none"><li>a. engine protection bars</li><li>b. bar ends</li><li>c. frame &amp; engine mounted mushroom / bobbins</li></ul> <p>2.2 The purpose and basic action of each safety feature</p> <p>2.3 The methods used to protect the riders</p>
<p>3. Carry out routine motorcycle maintenance</p>	<p>3.1. Technical information sources to include:</p> <ul style="list-style-type: none"><li>a. manufacturer's technical manuals</li><li>b. technical bulletins</li><li>c. servicing schedules</li><li>d. job card instructions</li><li>e. inspection records</li><li>f. check list</li><li>g. Department of Transport inspection requirements and repair procedures</li></ul> <p>3.2. Routine motorcycle maintenance inspections and record findings to include:</p> <ul style="list-style-type: none"><li>a. aural</li><li>b. visual and functional assessments</li><li>c. malfunction</li><li>d. damage</li><li>e. distortion</li><li>f. corrosion</li><li>g. fluid leaks</li><li>h. leaks</li><li>i. wear</li><li>j. security</li><li>k. condition</li><li>l. serviceability</li><li>m. clearances</li><li>n. settings</li><li>o. alignment</li></ul> <p>3.3. Basic requirements of statutory regulations relating to the repair and use of motorcycles to include:</p> <ul style="list-style-type: none"><li>a. Road Traffic Act</li><li>b. Highway Code</li><li>c. MOT Regulations</li></ul>



<b>UNIT REF: ET130</b>	<b>UNIT TITLE: ROUTINE VEHICLE MAINTENANCE PROCESSES AND PROCEDURES ON VEHICLES (4 WHEELS OR MORE)</b>
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<b>Level: 1</b>	<b>GLH: 30</b>
<p><b>Rationale:</b> This unit introduces learners to the principles of routine vehicle maintenance on vehicles with 4 wheels or more. It requires learners to know the tools and equipment that would be used during routine vehicle maintenance. It also covers the procedures and methods that must be used to ensure this is carried out effectively. The final outcome of the unit is concerned with the learner being able to safely and correctly carry out routine vehicle maintenance.</p>	

LEARNING OUTCOMES	CONTENT
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to work safely when carrying out routine vehicle maintenance	1.1. Appropriate PPE when carrying out routine vehicle maintenance to include: <ol style="list-style-type: none"> <li>a. overalls</li> <li>b. protective and safety gloves</li> <li>c. protective footwear</li> <li>d. goggles</li> <li>e. protective safety helmets</li> </ol> 1.2. Appropriate and safe working practices when carrying out routine vehicle maintenance to include: <ol style="list-style-type: none"> <li>a. removal and/or storage of owners property from vehicle</li> <li>b. immobilising vehicle – removal of ignition key</li> <li>c. ensuring handbrake is applied</li> <li>d. safe use of trolley jacks, vehicle lifts and axle stands</li> <li>e. follow logical sequence of working</li> <li>f. use safe working practices</li> <li>g. safe and correct use of tools and equipment</li> </ol>
2. Know vehicle components and systems that require routine maintenance	2.1 The main components and systems found on a modern vehicle that require routine maintenance to include: <ol style="list-style-type: none"> <li>a. tyres – wear and condition</li> <li>b. wheels – damage, buckling</li> <li>c. brakes – wear, adjustment, fluid leaks, fluid level, corrosion of pipes, condition of hoses</li> <li>d. steering and suspension – security of components, wear of joints, suspension damper</li> <li>e. electrical – battery, alternator, warning lamps, front and rear wipers, horn</li> <li>f. lighting – function of side and rear lamps, number plate lamp, headlamps, dip and main beam control, boot lamp (on and off), interior lamps, indicators, hazard lamps, front and rear fog lamps</li> <li>g. engine compartment – washer fluid, brake fluid level, coolant leaks and level, oil leaks and level, bonnet release, battery, drive belts</li> <li>h. transmission – clutch operation and adjustment, drive shafts, joints, rubber boots, fluid leaks</li> <li>i. vehicle exterior – bodywork, paintwork, trim, doors and door locks, wing mirror condition</li> </ol>



	<ul style="list-style-type: none"> <li>j. vehicle interior – seats (condition &amp; adjustment), seat belts, driver controls, warning lamps, wing mirror operation</li> </ul>
<p>3. Know routine maintenance requirements for vehicle systems and components</p>	<p>3.1 Correct and appropriate sources of information, tools and equipment required to carry out basic routine vehicle maintenance e.g. interim service to include:</p> <ul style="list-style-type: none"> <li>a. vehicle specifications and data</li> <li>b. vehicle manufacturer’s inspection requirements</li> <li>c. vehicle manuals</li> <li>d. vehicle inspection check lists</li> <li>e. trolley jack and axle stands</li> <li>f. vehicle lifting equipment</li> <li>g. spanners and sockets</li> <li>h. torque wrench</li> <li>i. screwdrivers</li> <li>j. levers and bars</li> <li>k. inspection lamps</li> <li>l. tyre tread depth indicator</li> <li>m. measurement tools</li> </ul>
<p>4. Be able to carry out routine vehicle maintenance e.g. interim service</p>	<p>4.1. Correct technical data when carrying out basic routine maintenance of vehicles e.g. interim service to include:</p> <ul style="list-style-type: none"> <li>a. torque settings</li> <li>b. lubricant grades</li> <li>c. quantities</li> <li>d. tyre pressures</li> <li>e. legal requirements</li> </ul> <p>4.2. The correct procedures when inspecting systems and components during basic routine vehicle maintenance:</p> <ul style="list-style-type: none"> <li>a. following inspection schedule</li> <li>b. not assuming component and system is satisfactory</li> <li>c. systematic visual inspection of components</li> <li>d. systematic functional checks on components and system operation</li> <li>e. use of aural assessment during system operation</li> <li>f. visual signs and indicators of wear, maladjustment and corrosion</li> <li>g. using measurement tools</li> <li>h. comparison of measurements with specifications</li> <li>i. using levers and bars</li> <li>j. recording possible concerns</li> </ul> <p>4.3 The correct procedures when replacing and replenishing fluids and service items during basic routine vehicle maintenance to include:</p> <ul style="list-style-type: none"> <li>a. brake fluid</li> <li>b. power steering fluid</li> <li>c. battery electrolyte</li> <li>d. washer fluid</li> <li>e. coolant</li> <li>f. oil and filter change and level</li> <li>g. transmission fluids</li> </ul>



	<p>4.4 The correct procedures when adjusting and lubricating vehicle components and systems to include:</p> <ul style="list-style-type: none"><li>a. doors and door locks</li><li>b. bonnet catch and hinges</li><li>c. headlamps</li><li>d. tyre pressures</li><li>e. belts - alternator and water pump.</li></ul>
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<b>UNIT REF: ET131</b>	<b>UNIT TITLE: VEHICLE PAINT APPLICATION AND MINOR DEFECT RECTIFICATION</b>
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<b>Level: 1</b>	<b>GLH: 38</b>
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<p><b>Rationale:</b> This unit will enable the learner to develop the understanding and practical skills required to:</p> <ul style="list-style-type: none"> <li>• apply protective coatings using correct methods.</li> <li>• know the importance of using correct spraying techniques.</li> <li>• and avoid defects which may occur during spraying</li> </ul>
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<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
<p>1. Be able to work safely appropriate to the task</p>	<p>1.1. Personal protective equipment and vehicle protection to include:</p> <ul style="list-style-type: none"> <li>a. overalls</li> <li>b. protective and safety gloves</li> <li>c. protective footwear</li> <li>d. goggles</li> </ul> <p>VPE protection to include:</p> <ul style="list-style-type: none"> <li>a. wing covers</li> <li>b. seat covers</li> <li>c. carpet protection</li> </ul> <p>1.2. Safe working practices at all times to include:</p> <ul style="list-style-type: none"> <li>a removal and/or storage of owners property from vehicle</li> <li>b immobilising engine</li> <li>c ensuring handbrake is applied</li> <li>d follow logical sequence of working</li> <li>e use safe working practices</li> <li>f select and use correct tools and equipment</li> </ul>
<p>2. Be able to apply materials using different methods</p>	<p>2.1. Apply protective materials using different methods to include:</p> <ul style="list-style-type: none"> <li>a. spray gun/sealer gun</li> <li>b. brush</li> <li>c. aerosol</li> <li>d. roller</li> </ul> <p>2.2. Different methods of applying foundation materials to include:</p> <ul style="list-style-type: none"> <li>a. spray gun/sealer gun</li> <li>b. brush</li> <li>c. aerosol</li> <li>d. roller</li> </ul> <p>2.3. Typical situations where each method of application would be appropriate</p>



<p>3. Be able to carry out correct spraying techniques</p>	<p>3.1. Spray undercoats on to body panels using correct methods to include:</p> <ul style="list-style-type: none"><li>a. gun distance</li><li>b. gun angle</li><li>c. gun speed</li></ul> <p>3.2. How the spray gun motion affects the finish to include</p> <ul style="list-style-type: none"><li>a. an even film thickness</li><li>b. level surface finish</li><li>c. fault free surface finish</li></ul>
<p>4. Know the common paint faults and their causes</p>	<p>4.1. Common paint faults which may occur during the application of undercoats to include:</p> <ul style="list-style-type: none"><li>a. runs</li><li>b. sags</li><li>c. dirt</li><li>d. contamination (fish eyes)</li><li>e. orange peel</li><li>f. dry spray</li></ul> <p>4.2. Causes of common paint faults which may occur during the application of undercoats.</p>



<b>UNIT REF: ET133</b>	<b>UNIT TITLE: INTRODUCTION TO LOW CARBON TECHNOLOGIES IN THE AUTOMOTIVE INDUSTRY</b>
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<b>Level: 1</b>	<b>GLH: 20</b>
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**Rationale:** This unit aims to encourage learners to realise how their actions in driving vehicles can impact the environment and some of the measures vehicle manufacturers are taking to reduce carbon outputs.

LEARNING OUTCOMES	CONTENT
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know how their own actions can affect the environment	1.1. Examples of driving styles that harm the environment to include: <ol style="list-style-type: none"> <li>a. excessive acceleration</li> <li>b. excessive deceleration</li> <li>c. driving at high speed</li> <li>d. idling engine whilst stopped</li> <li>e. incorrect gear selection</li> <li>f. use of auxiliary equipment e.g. air conditioning</li> </ol> 1.2. Examples how they can reduce carbon emissions when travelling to include: <ol style="list-style-type: none"> <li>a. carefully planned routes</li> <li>b. use motor transport less- walk, cycle</li> <li>c. car sharing</li> <li>d. use public transport</li> <li>e. more efficient vehicles- lower engine size, alternative fuel vehicles</li> <li>f. correctly inflated tyres</li> <li>g. properly serviced and maintained vehicles</li> <li>h. do not carry excessive loads e.g. empty boot</li> <li>i. keep windows closed to reduce drag</li> </ol>
2. Know the impact that a conventional vehicle has on the environment	2.1. The exhaust emissions that a conventional vehicle produces to include: <ol style="list-style-type: none"> <li>a. carbon monoxide</li> <li>b. carbon dioxide</li> <li>c. oxides of nitrogen</li> <li>d. sulphur dioxide</li> <li>e. soot particles</li> <li>f. hydrocarbons</li> </ol> 2.2. The impact of exhaust emissions on people and the environment to include: <ol style="list-style-type: none"> <li>a. carbon monoxide – colourless, odourless, poisonous to animal life</li> <li>b. carbon dioxide – greenhouse gas that contributes to global warming</li> <li>c. oxides of nitrogen – can cause respiratory conditions, smog and acid rain</li> <li>d. sulphur dioxide – pollution and acid rain</li> <li>e. soot particles – causes respiratory problems and cancers</li> <li>f. hydrocarbons - causes respiratory problems, liver damage and cancers</li> </ol>





	<p>2.3. The meaning of 'carbon footprint' to include:</p> <ul style="list-style-type: none"><li>a. the amount of greenhouse gases</li><li>b. most commonly carbon dioxide</li><li>c. produced over the life time of a vehicle</li><li>d. during the manufacture, running and disposal of the vehicle at the end of its working life.</li></ul>
<p>3. Know some of the actions vehicle manufacturers' are taking to reduce carbon emissions</p>	<p>3.1. The common vehicle parts that may be recycled to include:</p> <ul style="list-style-type: none"><li>a. metals</li><li>b. plastics</li><li>c. oils</li><li>d. other fluids e.g. brake fluid and antifreeze</li><li>e. batteries</li><li>f. refrigerant from air conditioning systems</li><li>g. glass</li><li>h. tyres</li></ul> <p>3.2. The new types of propulsion available in modern and future vehicles to include:</p> <ul style="list-style-type: none"><li>a. low emission conventional engine</li><li>b. alternative fuels including LPG and bio-fuel engines</li><li>c. hybrid</li><li>d. electric</li><li>e. hydrogen powered vehicles</li></ul> <p>3.3. The benefits of alternative fuel types and propulsion methods for the user and environment to include:</p> <ul style="list-style-type: none"><li>a. low emission conventional engine, e.g. lean burn-improvement on normal engines, but not vastly</li><li>b. alternative fuels including LPG and bio-fuel engines - normally uses a mixture of normal fuels and gas, or fuels produced from vegetable or plant extracts resulting in reduced engine emissions, renewable, and less processing required than crude oil</li><li>c. hybrid vehicles using a combination of power sources such as conventional engine and electric motors - resulting in reduced emissions, improved fuel consumption</li><li>d. electric vehicles using solely electric motors to propel the vehicle. Benefits are zero emissions and low running cost, but expensive at present and limited range - expected to increase in numbers considerably over the next few years</li><li>e. hydrogen powered vehicles- zero emissions but limited availability and hazardous</li></ul>



	<p>3.4. How bio-fuels can reduce carbon emissions to include:</p> <ul style="list-style-type: none"><li>a. potential to reduce greenhouse gases because the carbon in the plant matter from which the fuel is produced comes from the carbon dioxide absorbed by the plants over the course of its life, unlike fossil fuels where the carbon has been locked up under ground for millions of years and then released to the atmosphere as carbon dioxide when burnt during combustion.</li><li>b. impact on land being used for growing fuel crops instead of food crops.</li></ul>
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<b>UNIT REF: ET134</b>	<b>UNIT TITLE: PRINCIPLES OF COMPONENT FITTING</b>
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<b>Level: 1</b>	<b>GLH: 20</b>
<b>Rationale:</b> In this unit the learner will learn how to remove and replace mechanical, electrical and trim components which are often required as part of other work carried out on motor vehicles.	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Be able to work safely	1.1 Appropriate PPE and safe working practices when removing and refitting body, electrical and trim components to include: <ul style="list-style-type: none"> <li>a overalls</li> <li>b gloves</li> <li>c protective footwear</li> <li>d goggles</li> <li>e face mask</li> <li>f precautions when using equipment</li> <li>g disposal of waste materials</li> </ul>
2. Be able to correctly remove and refit basic body components	2.1 The removal and refitting of body components. to include: <ul style="list-style-type: none"> <li>a seat</li> <li>b front bumper</li> <li>c rear bumper</li> <li>d bonnet</li> <li>e boot</li> </ul>
3. Be able to correctly remove and refit basic trim components	3.1 The removal and refitting of trim components to include: <ul style="list-style-type: none"> <li>a interior door trim</li> <li>b glove box</li> <li>c boot/tailgate trim</li> <li>d door aperture seals</li> </ul>
4. Know how to correctly remove and replace simple electrical system components	4.1 The correct methods to isolate electrical components before removal and refitting to include: <ul style="list-style-type: none"> <li>a turn off switch for component</li> <li>b remove key from ignition</li> <li>c inform others of work being carried out</li> </ul> 4.2 How to select the correct fuse for replacement to include: <ul style="list-style-type: none"> <li>a identify inoperative circuit</li> <li>b identify fuse from panel cover</li> <li>c remove fuse and identify rating</li> <li>d replace fuse with same rating</li> <li>e check operation of circuit</li> </ul>



	<p>4.3 State the correct methods for disconnecting and reconnecting batteries to include:</p> <ul style="list-style-type: none"><li>a turn off all electrical consumers</li><li>b remove key from ignition</li><li>c ensure all radio codes etc recorded</li><li>d disconnect negative lead first, then positive</li><li>e reconnect positive first, then negative</li><li>f re-instate electrical codes</li></ul>
<p>5. Be able to correctly remove and refit basic electrical components</p>	<p>5.1 Demonstrate the removal and refitting of electrical components to include:</p> <ul style="list-style-type: none"><li>a. battery</li><li>b. headlight</li><li>c. rear light</li><li>d. alternator.</li></ul>



<b>UNIT REF: ET136</b>	<b>UNIT TITLE: ELECTRIC VEHICLE AWARENESS</b>
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<b>Level: 1</b>	<b>GLH: 4</b>
<b>Mapping: Based on IMI SSC Electric Vehicle NOS 2011</b>	
<p><b>Rationale:</b> This unit is designed for those people who may encounter electric/hybrid vehicles and require safety awareness. It is suitable for non-technical people such as managers, valeters, parts, sales staff; and electric vehicle drivers. It contains the <b>knowledge</b> of the dangers surrounding electric/hybrid vehicles and the precautions to avoid potential injury.</p> <p><b>Note:</b> <i>This is a knowledge unit only and does not deem someone competent to work on the high energy electrical system.</i></p>	

<b>LEARNING OUTCOMES</b>	<b>CONTENT</b>
<b>The Learner will:</b>	<b>The Learner should be taught:</b>
1. Know about the types of electric vehicles available	1.1 How to identify electric vehicles to include: <ul style="list-style-type: none"> <li>a. construction</li> <li>b. badging</li> </ul> 1.2 Examples of the electrically propelled vehicles that are currently available to include: <ul style="list-style-type: none"> <li>a. hybrid incl. plug in</li> <li>b. electric</li> <li>c. two wheel moped/scooters</li> <li>d. commercial vehicles</li> <li>e. passenger transport</li> <li>f. car</li> </ul> 1.3 The main differences between hybrid and electric vehicles to include: <ul style="list-style-type: none"> <li>a. layouts</li> <li>b. components</li> <li>c. batteries</li> <li>d. motors</li> </ul> 1.4 Examples of the typical voltages used for a range of electrical vehicles to include: <ul style="list-style-type: none"> <li>a. 100-650V</li> </ul>
2. Understand the hazards around high energy electrical systems	2.1 The basic hazards associated with high energy electricity to include: <ul style="list-style-type: none"> <li>a. electric shock</li> <li>b. burns</li> <li>c. arc flash</li> <li>d. arc blast</li> <li>e. fire</li> <li>f. explosion</li> <li>g. chemicals</li> <li>h. gases/fumes</li> </ul>



	<p>2.1 The hazards that may be present in the event of an accident or suspected overcharging to include:</p> <ul style="list-style-type: none"><li>a. electric shock</li><li>b. burns</li><li>c. arc flash</li><li>d. arc blast</li><li>e. fire</li><li>f. explosion</li><li>g. chemicals</li><li>h. gases/fumes</li></ul> <p>2.4 Potential hazards when making connections for charging electric vehicles</p>
<p>3. Know how to work safely around electric vehicles</p>	<p>3.1 Safety precautions to be taken before approaching and working on or around electric vehicles to include:</p> <ul style="list-style-type: none"><li>a. risk assessment</li><li>b. awareness of damaged components</li><li>c. dealing with leakage</li><li>d. isolation of high energy electrical system</li><li>e. safe connection when charging</li></ul> <p>3.2 How to identify high energy cabling and associated components to include:</p> <ul style="list-style-type: none"><li>a. colouring</li><li>b. warning symbols</li></ul> <p>3.3 How the vehicle may be safely charged using an external source.</p>

Appendix A: Level 1 Cross Mapping for Synoptic Assessment Evidence

MANDATORY AND CORE UNITS

	MANDATORY UNITS																				CORE UNIT		
	ET111					ET112					ET114				ET116					ET115			
	Learning Outcome					Learning Outcome					Learning Outcome				Learning Outcome					Learning Outcome			
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	1	2	3	4	5	1	2	3	
ET113 L01															X	X	X	X	X			X	
ET113 L02											X											X	
ET113 L03		X														X	X	X					
ET113 L04	X					X					X		X			X	X	X	X				

SELF DEVELOPMENT UNITS

	SELF DEVELOPING UNITS										
	PSD01			PSD02			PSD03			PSD06	
	Learning Outcome			Learning Outcome			Learning Outcome			Learning Outcome	
	1	2	3	1	2	3	1	2	3	1	2
ET113 L01	X			X			X			X	
ET113 L02		X		X	X						X
ET113 L03			X	X		X				X	
ET113 L04	X				X	X					X

SPECIALIST UNITS

	ET117					ET118			ET134					ET119			ET120						ET129			
	Learning Outcome					Learning Outcome			Learning Outcome					Learning Outcome			Learning Outcome						Learning Outcome			
	1	2	3	4	5	6	1	2	3	1	2	3	4	5	1	2	3	1	2	3	4	5	6	1	2	3
	ET113 L01	X	X					X			X	X				X			X	X	X	X			X	X
ET113 L02		X	X				X	X		X	X		X		X			X	X	X	X			X	X	
ET113 L03					X																					
ET113 L04						X																				

Appendix A to Service and Maintenance Engineering Qualification Specification Document

	ET130				ET121				ET122							ET123				ET124			ET131			
	Learning Outcome				Learning Outcome				Learning Outcome							Learning Outcome				Learning Outcome			Learning Outcome			
	1	2	3	4	1	2	3	4	1	2	3	4	5	6	7	1	2	3	4	1	2	3	1	2	3	4
ET113 L01		X	X			X	X		X		X						X		X		X			X	X	
ET113 L02		X	X			X	X		X		X					X	X	X	X		X			X	X	
ET113 L03																										
ET113 L04																										

	ET133			ET136		
	Learning Outcome			Learning Outcome		
	1	2	3	1	2	3
ET113 L01	X	X	X	X	X	X
ET113 L02	X	X	X	X	X	X
ET113 L03						
ET113 L04						



## Appendix B: Project Grading Criteria ET113 – Introduction to Projects in an Engineering Environment

<b>PASS</b>	<b>Tick (✓)</b>	<b>MERIT</b>	<b>Tick (✓)</b>	<b>DISTINCTION</b>	<b>Tick (✓)</b>
In order to achieve a Pass grade the learner must produce evidence that shows they have met the following Pass criteria.		In order to achieve a Merit grade the learner must complete all pass criteria and produce evidence that shows they have met the following Merit criteria.		In order to achieve a Distinction grade the learner must complete all pass and merit criteria and produce evidence that shows they have met the following Distinction criteria.	
<b>L01 &amp; L02 – Understand and be able to prepare and plan a project</b>					
Identifies and list the key stakeholders required for a project		Describe the scope of the project and the input of each stakeholder to the project success		Explain the importance of developing contingency plans to help complete the project and the consequences of a lack of resources.	
Identify and list the project requirements including scope, timescales, aims and objectives					
Produce an outline project plan		Describe the resources required to complete the project and identify any risks that may prevent project completion			
Identifies and list the resources required for completion of project					
<b>L03 &amp; L04 – Understand and be able to run a project</b>					
Identify and list the ways of monitoring project progress		Describe the importance of monitoring the project progress and effective communications		Explain how the project could have been improved and what lessons have been learned from completing this project	
Identify and List the methods of communication used during the project					
State the value of achieving the project within agreed timescales		Describe the projects strengths and weaknesses and the effect it had on project completion			
Identify and List the projects strengths and areas for improvement					