L-Università ta' Malta

MATSEC
Examinations Board

SEC 37 Syllabus

Engineering Technology

2025

Updated July 2023

SEC37 Engineering Technology

Syllabus Addendum

Updates for the 2025 MATSEC Examinations Session

Changes in Subject Content	Content of Unit 3 **K3**, **K4**, **K8** and **C5** may not be covered.
Changes in Coursework	Unit 3: No changes.
Changes in Exam Paper(s)	The Unit 3 Controlled assessment will not include **K3**, **K4**, **K8** and **C5**. Marks for these criteria, which shall not be assessed, will be prorated at the end of the unit based on the combined performance in Knowledge and Comprehension criteria within the same unit.

MATSEC Examinations Board

September 2022

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Introduction

The aim of this learning and assessment programme is to assist secondary schools to manage vocational programmes, specifically in the planning and implementation of the programme delivery.

This learning and assessment programme is structured in two parts, namely:

Part A: General Policies

Part B: Unit Specifications

In Part A, the Learning Outcomes of the programme are explained. Important terms used in the Learning and Assessment Programme (LAP) are defined.

In Part B, the content to be covered in each unit is provided. The learning outcomes together with a brief description are also specified. The assessment criteria together with the scheme of assessment are presented in this part of the document.

In order to ensure effective implementation of the programme, adequate standards, quality assurance processes and procedures have to be adopted. Additionally, policies, guidelines and strategies related to assessment practices are documented in the SEC Vocational Subjects Policy Document. Standard templates will also be provided and will be structured as follows:

List of Templates
Teacher's Timeframe
Assignment Brief Front Sheet
Record of Internal Verification – Assignment Brief
Record of Internal Verification – Assessment Decision
External Verification Report Template
Unit Tracking Sheet Template

Part A: General Policies

Introduction

The aim of the vocational programme in Engineering Technology is to provide candidates with the underpinning knowledge related to the world of Engineering Technology. By the end of the programme, candidates are expected to have gained sufficient skills and knowledge and be able to apply them.

Programme Learning Outcomes

At the end of the programme, I can:

- Work safely in an engineering environment.
- Carry out basic risk assessments.
- Respond effectively to help persons when an incident occurs.
- Interpret different types of documentation.
- Use tools and machinery in the appropriate manner.
- Carry out simple tests on different materials.
- Manufacture a PCB.
- Construct an electro-mechanical project using tools and machinery.
- Conduct basic tests to identify faults.

Unit Learning Outcomes

Unit 1: Using Tools and Materials

At the end of the unit, I can:

LO 1. Prepare the necessary PPE according to statutory regulations.

LO 2. Demonstrate an understanding of the properties of different types of materials and manufacturing processes.

LO 3. Make use of measuring and marking out tools.

LO 4. Make use of different tools safely and appropriately to produce an engineering component.

LO 5. Finish a given product to given specifications.

Unit 2: Electronic Circuits Designs

At the end of the unit, I can:

LO 1. Demonstrate an understanding of voltage, current and resistance.

LO 2. Recognize basic circuit structures.

LO 3. Demonstrate knowledge of capacitors and resistors in timing circuits.

LO 4. Use semi-conductors and integrated circuits.

LO 5. Construct and test digital and analogue circuits safely and effectively.

Unit 3: Electro-mechanical systems

At the end of the unit, I can:

LO 1. Demonstrate knowledge of alternating current and coils.

LO 2. Demonstrate an understanding of power tools and their individual mechanical components.

LO 3. Demonstrate knowledge of emergency procedures.

LO 4. Construct an electro-mechanical product using power tools from given documentation.

Programme Descriptors

Programme descriptors are understood as outcome statements of what a candidate is expected to have achieved by the end of the programme. These are an adaptation of MQF level descriptors for the specific programme.

Overview

MQF Level 1	MQF Level 2	MQF Level 3
Basic general **knowledge.** 1. Acquires basic general knowledge related to the engineering world and expressed through a variety of simple tools and context as an entry point to lifelong learning; 2. Knows and understands the steps needed to complete simple tasks and activities in an engineering workshop environment; 3. Is aware and understands basic tasks and instructions; 4. Understands basic textbooks.	Basic factual **knowledge** of a field of work or study. 1. Possess good knowledge of engineering technology; 2. Is aware and interprets type of information and ideas; 3. Understands facts and procedures in the application of basic engineering tasks and instructions; 4. Selects and uses relevant knowledge to accomplish specific actions for self and others.	**Knowledge** of facts, principles, processes and general concepts in engineering technology. 1. Understands the relevancy of theoretical knowledge and information related to engineering related topics; 2. Assesses, evaluates and interprets facts, establishing basic principles and concepts in engineering technology; 3. Understands facts and procedures in the application of more complex tasks and instructions; 4. Selects and uses relevant knowledge acquired on one's own initiative to accomplish specific actions for self and others.

MQF Level 1	MQF Level 2	MQF Level 3
Basic **skills** required to carry out simple tasks. 1. Has the ability to apply basic knowledge and carry out a limited range of simple tasks related to engineering; 2. Has basic repetitive communication skills to complete well defined routine engineering tasks and identifies whether actions have been accomplished; 3. Follows instructions and be aware of consequences of basic actions for self and others.	Basic cognitive and practical **skills** required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools. 1. Has the ability to demonstrate a range of skills by carrying out a range of complex tasks within engineering environment; 2. Communicates basic information; 3. Ensures engineering tasks are carried out effectively.	A range of cognitive and practical **skills** required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information. 1. Demonstrates a range of developed skills to carry out more than one complex task effectively and in unfamiliar and unpredictable engineering contexts; 2. Communicates more complex information; 3. Solves basic problems by applying basic methods, tools, materials and information given in a restricted learning engineering environment.
Work out or study under direct supervision in a structured context. 1. Applies basic knowledge and skills to do simple, repetitive and familiar tasks in an engineering context; 2. Participates in and takes basic responsibility for the action of simple tasks related to engineering; 3. Activities are carried out under guidance and within simple defined timeframes; 4. Acquires and applies basic key engineering competences at this level.	Work or study under supervision with some autonomy. 1. Applies factual knowledge and practical skills to do some structured tasks related to engineering; 2. Ensures one acts pro-actively; 3. Carries out engineering activities under limited supervision and with limited responsibility in a quality controlled context; 4. Acquires and applies basic key competences in engineering technology at this level.	Take responsibility for completion of tasks in work or study and adapt own behaviour to circumstances in solving problems. 1. Applies knowledge and skills to carry out engineering tasks systematically; 2. Adapts own behaviour to circumstances in solving problems by participating pro-actively in structured learning environments related to engineering technology; 3. Uses own initiative with established responsibility and autonomy, but is supervised in quality controlled learning environments related to engineering technology; 4. Acquires key competences at this level as a basis for lifelong learning.

Definitions/Terminology

Term	Definition
Assessment Criteria	A description of what a candidate is expected to do in order to demonstrate that a learning outcome has been achieved.
Assessor	The person responsible to grade the candidate's work, issue a mark and determine the candidate's final grade.
Competences	Each competence is defined as a combination of knowledge and skills and is associated with the level of autonomy and responsibility that the person is expected to have at that level.
Controlled Assessment	An assessment set by MATSEC which may include written and/or practical tasks as specified in the syllabus. This may be a take-home assessment or carried out under controlled conditions.
Coursework	A number of assignments set by teachers and given to the candidate during the course as specified in the syllabus.
Knowledge	Knowledge refers to the understanding of basic, factual and theoretical information, which is traditionally associated with formal learning but can also be acquired from informal and non-formal learning.
Learning Outcome	Learning Outcomes are statements which describe what a qualification represents in terms of knowledge, skills and competences. The Malta Qualifications Framework (MQF) defines a learning outcome as what the candidate understands and is capable of doing at the end of the learning process.
Malta Qualification Framework	The Malta Qualifications Framework (MQF) provides an indication of the level of difficulty as a benchmark for a qualification, which needs to be assigned a level and mapped to the framework. The MQF has level descriptors from Level 1 to 8. The level descriptors are useful for education and training providers as they describe the Knowledge, Skills and Competences and a set of Learning Outcomes, which indicate to the candidate the end of a learning process.
Quality Assurance	A continuous process to assure the standards and quality of the learning assessment programme.
Sample of Work	A sample of work is a percentage of the candidate's work gathered as a representative sample for the internal or external verifier.
Skills	Skills imply the application of acquired knowledge and understanding in different contexts. A skill may be the result of formal learning or of repetitive work in an informal setting.
Synoptic Assessment	An assessment in the form of a written examination and conducted under controlled conditions covering all learning outcomes and the majority of Knowledge and Comprehension assessment criteria in a given unit.
Unit Content	The unit content is the content required to be communicated and given to the candidate per learning outcome. Each learning outcome must have content related to it, which content must be delivered to provide the candidate with the tools necessary to achieve that outcome.

Assessment Scope

Assessment is an important element in any learning process. This should inform candidates about their achievements and at the same time it should meet important conditions of reliability, validity and fairness. Thus, important rules and procedures must be adhered-to. In particular, the assessment regulations and procedures that are explained in this section will ensure that assessments are:

- Of the required standard, quality and level;
- Fair for all candidates;
- Valid and reliable.

Each unit will be assessed by means of three assignments, one of which must be an assessment conducted within a controlled school environment. The assessment mode/type, criteria to be assessed and the distribution of marks are explained in Part B of the programme as part of the unit specifications.

Quality Assurance

An important aspect of this programme is the quality assurance process that must be conducted throughout the implementation of the programme. Three main processes are to be conducted as stipulated in the table below.

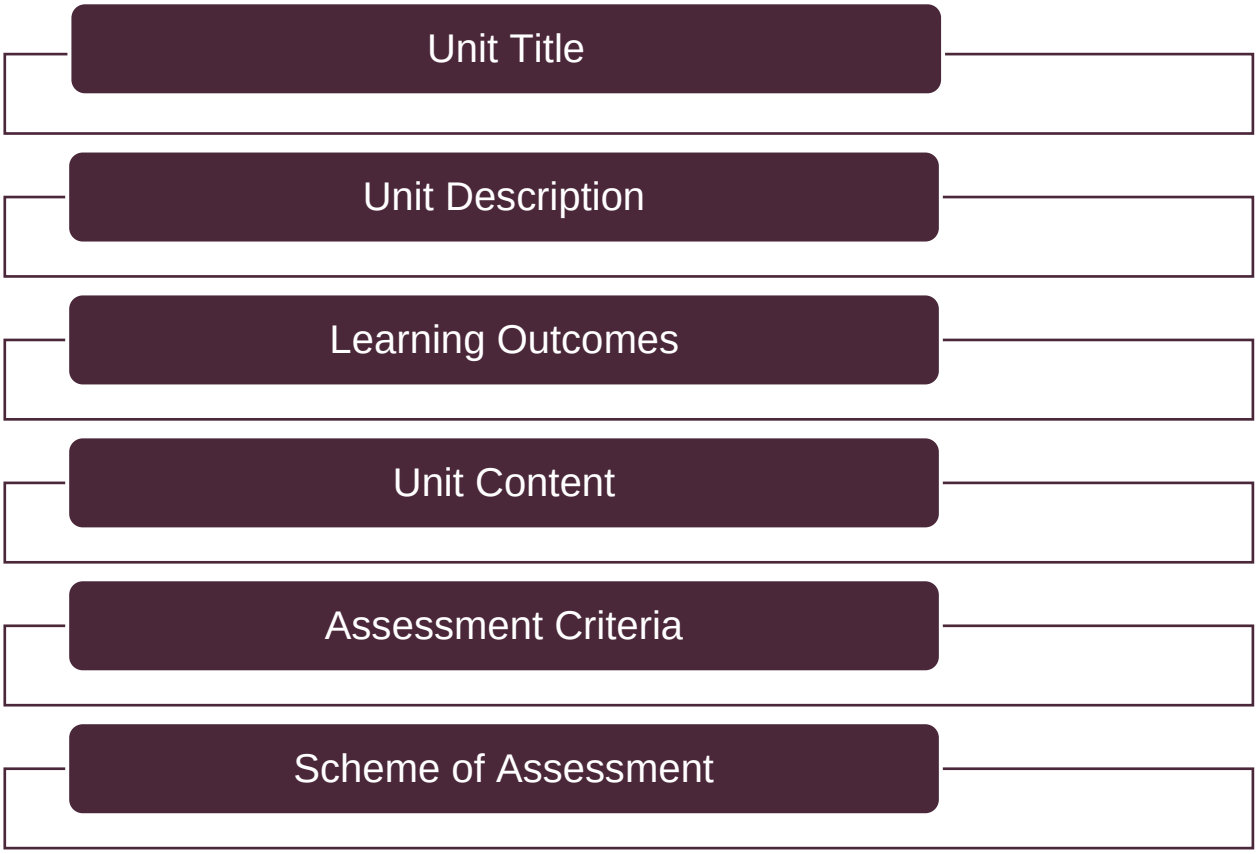
Internal Verification of Assessment Briefs	All assessment briefs are to be internally verified before being issued to the candidates. Within this process, important checks relating to learning outcomes, criteria to be assessed, validity and reliability are to be performed.
Internal Verification of Assessment Decisions	Once candidates complete their work, and their assessments have been corrected, a representative sample of candidates' work is to be internally verified.
External Verification	The process of external verification will ensure that programme quality and standards are met.

Part B: Unit Specifications

Introduction

This part of the programme guide provides detailed specification for each of the 3 units that are to be implemented for the successful completion of the programme. The curriculum design adopted for the development of the units of study is based on the learning outcomes approach. The latter can be defined as "written statements of what a candidate should be able to do/know/apply by the end of the learning process."[1]

The structure of the unit specifications is presented below:



Interpreting the Unit Specifications

The syllabus is written in a way whereby the knowledge criteria at MQF level 3 build upon the knowledge criteria at MQF level 2 and in the same manner the knowledge criteria at MQF level 2 build upon the knowledge criteria at MQF level 1. The same applies for the comprehension and application criteria. The comprehension criteria also build upon the knowledge criteria and the application criteria build upon the knowledge and the comprehension criteria.

[1] http://www.cedefop.europa.eu/files/4156_en.pdf

The document is an assessment syllabus; therefore any other examples or information apart from those written in the unit content should be taught so that candidates will enjoy the learning process and get a general overview of the subject. Under each grading criterion, only the **minimum** content that has to be covered is listed. The material covered in class must at least reflect **both** the unit content and grading criteria.

Examples (e.g.), commas, semi-colons, bullets, or, and N.B. are used in the Learning and Assessment Programme. When semi-colons are used the students should be assessed on all the content prescribed. However, when the list is headed with example (e.g.), all the content is to be covered but candidates are to be assessed on more than 50% of the content prescribed for that grading criterion. Where bullets are present, marks allocated for the criterion should be equally distributed. Where 'or' is present, only one of the listed items should be assessed. Where an 'N.B.' is present, important information regarding the assessment is given.

Where the plural is used in grading criteria (e.g. types, aspects, etc.), at least two answers are expected. Unless indicated otherwise in the unit content, when assignments are written, the criteria assessed should build on each other.

In each grading criterion there is a command verb which determines the type of answers expected by the student, such as list, identify, outline, describe, explain, etc… These verbs are defined in the glossary of verbs available on the MATSEC website. It is of vital importance that the command verbs specified in the grading criteria remain unchanged in the assignment brief.

Unit 1: Using Tools and Materials

Unit 1	Using Tools and Materials
Unit Description	This unit exposes the candidate to knowledge about common materials used in industry such as wood, metals and plastics. After completing this unit the candidate will be able to differentiate between materials and comprehend some of their properties. The candidate will also gain knowledge about the most common processes used to work and form such materials for the industrial market. Consequently, they will learn how to make use of a variety of hand and power tools to work the mentioned materials, whilst also becoming aware of ways in which such tools could be maintained.

Learning Outcomes

At the end of the unit, I can:

LO 1. Prepare the necessary PPE according to statutory regulations.

LO 2. Demonstrate an understanding of the properties of different types of materials and manufacturing processes.

LO 3. Make use of measuring and marking out tools.

LO 4. Make use of different tools safely and appropriately to produce an engineering component.

LO 5. Finish a given product to given specifications.

Unit Content

Subject Focus	Health and Safety
LO 1.	Prepare the necessary PPE according to statutory regulations.
K-1.	Personal Protective Equipment: e.g. overalls, protective footwear, eye protection, masks/respirators, harnesses, hard hats, hand protection.
K-2.	Purpose of safety sign colours: • Red signs: prohibition **or** danger **or** firefighting equipment; • Yellow signs: warning; • Blue signs: mandatory; • Green signs: no danger **or** emergency escape **or** first aid.
	Safety signs: e.g. no smoking, not drinkable, no access for pedestrians, no access for unauthorised persons, fire extinguisher, do not extinguish with water, flammable material, toxic material, overhead load, industrial vehicles, danger of electrocution, general danger, safety overalls must be worn, safety helmet must be worn, eye protection must be worn, face protection must be worn, emergency exit, first aid, eyewash. ***N.B.*** *It is highly recommended that during delivery reference should be made to Subsidiary Legislation 424.16.*
	N.B. *For assessment purposes, students should identify* ***FOUR*** *suitable safety signs.*
K-3.	Responsibilities of employers and employees according to Act 27 0f 2000 Occupational Health and Safety Authority Act: • Employers should provide: a safe system of work; a safe and healthy workplace; safe work equipment; safe methods of storing, transporting, handling, using and disposing of substances and materials; competent properly-trained supervisor; • Employees: cooperate with employers in all matters regarding health and safety; not put oneself and other people at risk; not to misuse or interfere with anything relating to health and safety; to report defects or dangerous situations that you find in the workplace; to work safely following instruction and training.
	Health and Safety legislation: e.g. • Legal notice 44 of 2002 Work Place (Minimum Health and Safety Requirements) Regulations, • Legal notice 45 of 2002 Work Places (Provision of Health and/or Safety Signs) Regulations, • Legal notice 36 of 2003 General Provisions for Health and Safety at Work Places Regulations, • Legal notice 227 of 2003 Protection of the Health and Safety of Workers from the Risks related to Chemical Agents at Work Regulations, • Legal notice 121 of 2003 Minimum Requirements for the use of Personal Protective Equipment at Work Regulations, • Legal notice 35 of 2003 Protection against Risks of Back Injury at Work Placement Regulations.
	Responsibilities and adherence to Health and Safety legislation: injury leading to temporary/permanent disability **or** damages to tools/equipment/machinery.

C-1.	Consequences of not using PPE: e.g. minor injury, suffer a serious life changing injury or illness as the result of an accident at work, worker could be killed.
	Design and material of PPE: functional design; material.
	Choice of PPE for a given scenario: working at heights **or** working in confined spaces **or** handling hazardous chemicals **or** hot working **or** working on electrical equipment **or** working with machine tools **or** construction work **or** electrical installation.

Subject Focus	Materials
LO 2.	Demonstrate an understanding of the properties of different types of materials and manufacturing processes.
K-4.	Forms of supply of metal: e.g. bar, sheet, pipe, rod, wire, castings, forgings, mouldings, extrusions.
	Properties of different metals: e.g. hardness, ductility, malleability, resistance to environment degradation, strength, elasticity.
	Type of metal: mild steel **or** carbon steel **or** wrought iron **or** aluminium **or** lead **or** copper **or** carbon steel **or** cast iron **or** stainless steel **or** brass **or** duralumin **or** solder. ***N.B.*** *It is highly recommended that reference is made to ferrous metals, non-ferrous metals, ferrous alloys and non-ferrous alloys.*
K-5.	Forms of supply of wood: planks; sheets; dowels; mouldings; beams.
	Properties of different woods: strength; toughness; hardness; wear resistance; resistance to environment degradation.
	Type of wood: mahogany **or** oak **or** balsa wood **or** beech **or** walnut **or** cherry **or** pine **or** red deal. ***N.B.*** *It is highly recommended that reference is made to hardwood, softwood and manufactured wood.*
K-6.	Forms of supply of polymers: e.g. film/sheet, pallets/powder, extrusions, castings, pipe/rod, liquid.
	Properties of different polymers: e.g. hardness, ductility, malleability, resistance to environment degradation, strength, elasticity.
	Type of polymer: polyurethane **or** polyester **or** vulcanised rubber **or** Bakelite **or** epoxy resin **or** melamine **or** silicones **or** polyethylene **or** polypropylene **or** polystyrene **or** acrylic **or** ABS **or** PET **or** PVC. ***N.B.*** *It is highly recommended that reference is made to thermosetting and thermoplastic polymers.*
C-2.	Different tests: e.g. hardness, tensile, compression, shear, temperature, torque, impact, environment degradation.
C-3.	Manufacturing processes: e.g. • Metal processes: annealing; hardening; galvanising; electroplating, • Wood processes: seasoning; wood joints; bending; finishing, • Polymers: vacuum forming; line bending; moulding; rotational forming; casting.

Subject Focus	Measuring and marking out tools
LO 3.	Make use of measuring and marking out tools.
K-7.	Measuring and marking out tools: • Measuring tools: e.g. steel ruler, measuring tape, protractor, height gauge, Vernier calliper, micrometre, engineering/try square, sliding bevel, combination square; • Marking out tools: e.g. scriber/marking knife, centre punch, chalk line, dividers/ callipers, surface plate, blueing or paint, scribing block, mortise gauge, centre square.
A-1.	Preparation: PPE; marking out tools; materials.
	Using measuring and marking out tools: handling of marking out tools; good housekeeping; team work.
	Carrying out the necessary measurements: accuracy and precision (tolerance of 0.5mm); clear markings.

Subject Focus	Cutting, drilling, bending, forming and joining processes
LO 4.	Make use of different tools safely and appropriately to produce an engineering component.
K-8.	Drilling and cutting tools: e.g. saws/hack saw, milling machine, lathe, angle grinder, band saw/engineers band saw, circular saw, jigsaw/scroll saw, taps and dies, drill.
	Preventive measures: e.g. wear appropriate PPE, use suitable tool for the proper job, visual inspection of the tool, work to laid down procedures, do not remove or disable guards, do not remove or disable safety devices on machinery, remove loose clothing, remove long hair and jewellery.
K-9.	Bending and forming tools: e.g. sheet bender/former, pipe bender, vacuum former, hot air blower, strip wire heater, hammers/mallets.
	Preventive measures: e.g. wear appropriate PPE, use suitable tools for the proper job, adopt good working posture, taking frequent breaks, remove sharp edges, avoid repetitive work movements.
C-4.	Different methods of joining materials: e.g. • Wood: wood adhesives; wood joints; nails; screws, • Metal: welding; bolts and nuts; rivets; self-tapping screws, • Plastic: welding; adhesive; bolts and nuts; self-tapping screws.
A-2.	Preparation: PPE; tools; materials.
	Using fabrication tools: handling of tools; good housekeeping; team work.
	Product finishing to specifications: accuracy and precision (tolerance of 0.5mm); quality of workmanship.

Subject Focus	Assembly and finishing tools and equipment
LO 5.	Finish a given product to given specifications.
K-10.	Assembly and finishing tools: • Assembly tools: spanners; sockets; screw drivers; universal bits; riveter; • Finishing tools: spray gun; sander; buffer; file; paint brush.
	Preventive measures: e.g. wear appropriate PPE, use suitable tool for the proper job, visual inspection of the tool, work to laid down procedures, remove loose clothing, remove long hair and jewellery.
C-5.	Importance of quality assurance: reduce waste; reduce time; reduce customer's complaints; increase quality of product; good marketing strategy and increase profit.
	Checks: dimensions; quality of finish (edges, surface); functionality; final finishing. ***N.B.*** *C-5 should be assessed after A-3.*
A-3.	Preparation: PPE; tools; consumables.
	Assembly of the required product: use necessary PPE appropriately; use necessary tools appropriately; assemble correctly to produce the required product.
	Finishing of the required product: dimensions; quality of finish (edges, surface); functionality; final finishing.

N.B. *No marks should be awarded in any application criteria unless candidates are wearing appropriate PPE throughout practical work.*

Learning Outcomes and Assessment Criteria

Subject Focus:	**Health and Safety**
Learning Outcome 1:	Prepare the necessary PPE according to statutory regulations.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-1. Identify personal protective equipment.	K-1. List personal protective equipment related to a given task/s.	K-1. Describe the functions of PPEs related to a given task/s.	C-1. Explain the consequences of not using the appropriate design and material of PPE for a specific activity.	C-1. Explain the purpose of the different functional design and materials of a particular PPE.	C-1. Explain the choice of PPE with specific design and material for a given scenario.			
K-2. Match safety sign colours with their purpose.	***K-2. Name the given safety signs.***	***K-2. Identify suitable safety signs for a given scenario.***						
K-3. List the responsibilities of the employer and the employee from a given Health and Safety legislation.	K-3. Assign Health and Safety legislation to given scenarios.	K-3. Describe responsibilities and adherence to Health and Safety legislation related to a given incident.						

Subject Focus:	**Materials**
Learning Outcome 2:	Demonstrate an understanding of the properties of different types of materials and manufacturing processes.

Knowledge Criteria			***Comprehension Criteria***			***Application Criteria***		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-4. Identify the different forms of supply of metal.	***K-4. Outline the properties of different metals.***	***K-4. Describe the form of supply and type of metal used for a given scenario.***	***C-2. Outline the different tests that can be carried out on materials.***	***C-2. Explain the test needed to examine a particular property of a given material.***	***C-2. Justify a test to be carried out to select a particular material for a given scenario.***			
K-5. List the different forms of supply of wood.	***K-5. Outline the properties of different wood.***	***K-5. Describe the form of supply and type of wood used for a given scenario.***	***C-3. Identify the different manufacturing processes of different materials.***	***C-3. Describe the steps involved in a manufacturing process of a particular material.***	***C-3. Explain the reason behind the different manufacturing processes of a particular material.***			
K-6. List the different forms of supply of polymers.	K-6. Outline the properties of different polymers.	K-6. Describe the form of supply and type of polymers used for a given scenario.						

Subject Focus:	**Measuring and marking out tools**
Learning Outcome 3:	Make use of measuring and marking out tools.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-7. Identify different measuring and marking out tools.	***K-7. Outline the functions of different measuring and marking out tools.***	***K-7. Choose the appropriate measuring and marking out tools for a specific task/s.***				A-1. Prepare the necessary PPE, measuring and marking out tools and materials from a given engineering drawing.	A-1. Use measuring and marking out tools in the appropriate manner.	A-1. Carry out the necessary measurements and markings to a given tolerance.

Subject Focus:	**Cutting, drilling, bending, forming and joining processes**
Learning Outcome 4:	Make use of different tools safely and appropriately to produce an engineering component.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-8. Name different cutting and drilling tools.	K-8. Relate the appropriate cutting and drilling tools to a specific task.	K-8. Describe preventive measures to be taken when using cutting and drilling tools.	***C-4. Describe different methods of joining materials together.***	***C-4. Select the ideal joining method for different scenarios.***	***C-4. Justify the ideal joining methods for different scenarios.***	A-2. Prepare the necessary PPE, tools and materials to manufacture the required product.	A-2. Use the appropriate tools and materials to manufacture the required product.	A-2. Finish the required manufactured product to the given specifications.
K-9. Identify different bending and forming tools.	K-9. Associate the appropriate bending and forming tools to a specific task.	K-9. Describe preventive measures to be taken when using bending and forming tools.						

Subject Focus:	**Assembly and finishing tools and equipment**
Learning Outcome 5:	Finish a given product to given specifications.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-10. Identify assembly and finishing tools.	***K-10. Relate assembly and finishing tools to specific tasks.***	***K-10. Describe preventive measures when using assembly and finishing tools and equipment.***	C-5. Outline the importance of quality assurance when manufacturing a product.	C-5. Describe the necessary checks whilst constructing the given product to meet the required specifications.	C-5. Evaluate the finished product with respect to the given specification.	A-3. Prepare the necessary PPE, tools and consumables to assemble and finish the required product.	A-3. Use the appropriate tools and material to assemble the required product.	A-3. Finish the required assembled and finished product to the given specifications.

Assessment Criteria

Assessment criteria provide guidance on how the candidates will be assessed in order to ensure that the learning outcomes have been achieved.

To achieve each outcome a candidate must satisfy the assessment criteria listed in the previous table. The assessment criteria which will be assessed in the controlled assessment have been highlighted.

Scheme of Assessment

Assignment Number	Assignment Type	Percentage distribution
1	Coursework	26 - 34%
2	Coursework	26 - 34%
3	Controlled	38 - 42%

Distribution of Marks

Criteria	MQF Level 1 Marks	MQF Level 2 Marks	MQF Level 3 Marks	Totals
Knowledge	1	1	2	4
Comprehension	2	2	2	6
Application	3	3	4	10

Unit 2: Electronic Circuits Designs

Unit 2	Electronic Circuits Designs
Unit Description	This unit equips the candidate with a skill set of theoretical and practical knowledge relating to the domains of electrical and electronic circuits. Through the successful completion of this unit, the candidate will be able to read and interpret circuit diagrams while being aware of how different electrical and electronic components interact so that a circuit achieves a desired function. The candidate will also be in a position to assemble and test simple circuits on prototype boards such as a breadboard and a strip board, and also manufacture a printed circuit board.

Learning Outcomes

At the end of the unit, I can:

LO 1. Demonstrate an understanding of voltage, current and resistance.

LO 2. Recognize basic circuit structures.

LO 3. Demonstrate knowledge of capacitors and resistors in timing circuits.

LO 4. Use semi-conductors and integrated circuits.

LO 5. Construct and test digital and analogue circuits safely and effectively.

Unit Content

Subject Focus	Voltage, current and resistance
LO 1.	Demonstrate an understanding of voltage, current and resistance.
K-1.	Materials: • Conductors: e.g. gold, silver, copper, aluminium, iron, steel, brass, bronze, mercury; • Insulators: e.g. glass, rubber, oil, paper, fiberglass, porcelain, ceramic, plastic, wood.
	Parameters affecting resistance of material: resistivity of material; length and cross-sectional area of material. (R= ρl/A)
K-2.	Resistors: fixed resistor; potentiometer; pre-set resistor; LDR; thermistor.
	DC voltage sources: e.g. batteries, power supplies, solar cells.
	Multi-meter: use of multi-meter to measure continuity; voltage; current; resistance.
C-1.	Ohm's Law (V=IR) and SI units.
	Resistance from a given VI graph: • Correct gradient; • Correct answer: correct value; SI unit.
	Missing values: • Correct subject of the formula; • Correct answer: correct value; SI unit.

Subject Focus	Basic circuit structures
LO 2.	Recognize basic circuit structures.
K-3.	Series and parallel circuits: switches; batteries; bulbs; resistors.
K-4.	Different designs of switches e.g. toggle, slide, rocker, reed, tilt, push, rotary, key.
	Different types of switches in terms of poles and throws: SPST; SPDT; DPDT; push to make; push to break. ***N.B.*** *For assessment purposes, each scenario should require a different type of switch.*
C-2.	Calculating total resistance: working; correct answer.

Subject Focus	Capacitors and resistors
LO 3.	Demonstrate knowledge of capacitors and resistors in timing circuits.
K-5	Different types of capacitors: electrolytic; ceramic; film; power film.
	Ranking values of capacitors: prefixes; numbers.
	Sketching of voltage-time graph: charging; discharging.
C-3.	Determining total capacitance for capacitors: working; correct answer.
	Determining missing values in RC circuits (T=RC): working; correct answer.
A-1.	Construction of RC circuits: correct configuration of circuit; correct selection of components; correct use of strip-board.
	Use of oscilloscope to display output of RC circuit: correct connection of probes; correct use of oscilloscope; correct readings of oscilloscope.
	Calibration of circuit to satisfy a given time constant: correct calibration; recording of resistance; recording of capacitance; confirming results with T=RC.

Subject Focus	Semi-conductor devices and integrated circuits
LO 4.	Use semi-conductors and integrated circuits.
K-6.	Different types of signals: sine; square; triangle; DC; saw tooth.
	Parameters of signal: amplitude; frequency; periodic time; corresponding SI units.
	Features of an oscilloscope: display; probes; vertical controls; horizontal controls.
K-7.	Analogue devices: diodes; transistors.
	Physical characteristics of diodes and transistors devices: • Diode: semiconductor material; cathode; anode; forward biased; reverse biased; • Transistor: semiconductor material; emitter; collector; base; NPN/PNP.
K-8.	Pin-outs of ICs: numbering of pinouts; identification of Gnd and Vcc.
	Physical characteristics of ICs: surface mount; through hole; single in-line; dual in-line.
	Advantages of ICs: size; weight; efficiency; cost; reliability.
C-4.	Logic Gates: e.g. AND, OR, NOT, NAND, NOR, XOR, XNOR.
	Truth Tables of Logic Gates: e.g. AND, OR, NOT, NAND, NOR, XOR, XNOR.
	Determine the output of a multi staged logic gate circuit: configuration of 4 logic gates connected together. ***N.B.*** *Inputs should be given.*

A-2.	Preparation of circuit construction: acquiring the correct components from the schematic diagram; preparing required equipment; preparing correct PPE.
	Construction of circuit on breadboard: correct assembly of components on breadboard; minimal use of jumpers; teamwork; good housekeeping. ***N.B.*** *It is highly suggested that the typical circuits be considered: timers Ne555 IC, counter circuits, sensing circuits, sound to light circuits.*
	Testing of circuit: using multi-meter to test circuits; using oscilloscope to test circuits.

Subject Focus	**Construction and testing of circuits**
LO 5.	Construct and test digital and analogue circuits safely and effectively.
K-9.	Identifying electronic symbols: e.g. resistor, LDR, capacitor, diode, operational amplifier, transistor, motor, battery, SPST switch.
	SI units: Amps; Ohms; Volts; Watts; Farads.
	Packaging of the same electronic components: radial vs. axial; through hole vs. surface mount; dual in-line vs. single in-line; different pin-out spacing.
K-10.	Tools required to construct electronic circuits: e.g. soldering iron, wire stripper, side cutter, long nose pliers, third hand, de-soldering pump, solder wick, track cutter, PCB driller.
	Soldering iron process: clean soldering iron tip; free board from oxidization; apply the required heat to component pin and copper track; apply the correct amount of solder; allow the solder joint to solidify appropriately.
C-5.	Warning signs for hazardous substances: e.g. gas under pressure, explosives, oxidizing, flammable, corrosive, health hazard, acute toxicity, serious health hazards; hazardous to the environment.
	Hazards while constructing circuits (breadboard, strip board, PCB): • Etching PCB: chemical spill; inhaling dangerous fumes; • Drilling and soldering: airborne fragments; burns; cuts; dangerous fumes from solder.
A-3.	Design: efficient use of PCB space; efficient use of jumpers; thickness of tracks.
	Manufacture: use of PPE; correct use of equipment; good housekeeping; teamwork.
	Test: correct use of testing equipment; functionality of circuit.

N.B. *No marks should be awarded in any application criteria unless candidates are wearing appropriate PPE throughout practical work.*

Learning Outcomes and Assessment Criteria

Subject Focus:	**Voltage, current and resistance**
Learning Outcome 1:	Demonstrate an understanding of voltage, current and resistance.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-1. Categorise different materials as insulators, conductors.	***K-1. Define the term semi-conductor.***	***K-1. State the parameters affecting resistance of a material.***	C-1. Describe the relationship between resistance, voltage and current giving the SI unit for each parameter.	C-1. Determine the resistance from a given VI graph of an ohmic component.	C-1. Calculate a missing value using Ohm's law.			
K-2. Identify different types of resistors.	K-2. Outline different types of DC voltage sources.	K-2. Use the multi-meter to measure current voltage and resistance.						

Subject Focus:	**Basic circuit structures**
Learning Outcome 2:	Recognize basic circuit structures.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-3. Differentiate between open and closed circuit.	***K-3. Draw series and parallel circuits.***	***K-3. Identify parallel and series sub-circuits in a given circuit.***	***C-2. Find the total resistance in a series circuit.***	***C-2. Find the total resistance in a parallel circuit.***	***C-2. Find the total resistance of a circuit containing series and parallel sub-circuits.***			
K-4. Identify different designs of switches.	K-4. Identify different types of switches in terms of poles and throws.	K-4. Select the appropriate switch for two given scenarios.						

Subject Focus:	**Capacitors and Resistors**
Learning Outcome 3:	Demonstrate knowledge of capacitors and resistors in timing circuits.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-5. Identify different types of capacitors.	K-5. Rank different capacitor values in order.	K-5. Sketch the voltage-time graph of charging and discharging.	***C-3. Find the total capacitance in a parallel circuit.***	***C-3. Find the total capacitance in a series circuit.***	***C-3. Find the value of a missing parameter in a RC circuit.***	A-1. Construct a given RC circuit on a strip board using a variable resistor and a fixed capacitor.	A-1. Connect the oscilloscope to the circuit to display the charging of the capacitor.	A-1. Calibrate the circuit to satisfy a given time constant.

Subject Focus:	**Semi-conductor devices and integrated circuits**
Learning Outcome 4:	Use semi-conductors and integrated circuits.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-6. Identify different types of signals.	***K-6. Define parameters of a given signal and their SI units.***	***K-6. Label important features of an oscilloscope.***	C-4. List different types of logic gates and their respective symbols.	C-4. Write the truth table of different logic gates.	C-4. Determine the output of a multi staged circuit using logic gates.	A-2. Prepare the required components and equipment to assemble a given circuit.	A-2. Use a breadboard to assemble a given circuit.	A-2. Use testing equipment to confirm the expected output of the circuit.
K-7. List different types of analogue devices.	K-7. List the characteristics of diodes and transistors.	K-7. Describe the function of diodes and transistors.						
K-8. Identify the pin-outs of an integrated circuit (IC) from a data sheet.	K-8. List physical characteristics of an IC.	K-8. Describe the advantages of using ICs in circuits.						

Subject Focus:	**Construction and testing of circuits**

Learning Outcome 5:	Construct and test digital and analogue circuits safely and effectively.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-9. Identify electronic symbols.	***K-9. Match SI units to their respective parameters.***	***K-9. Identify different packaging of the same electronic components.***	***C-5. Identify suitable warning signs for given hazardous scenarios.***	***C-5. Identify hazards that might be present when manufacturing a PCB.***	***C-5. Identify ways to eliminate or minimize the risks involved when manufacturing a PCB.***	A-3. Design the art work of the PCB using electronics software.	A-3. Manufacture a printed circuit board using the chemical process.	A-3. Test the functionality of the PCB.
K-10. Label different tools used in electronic circuit construction.	***K-10. Identify correct steps to use a soldering iron effectively***	***K-10. Outline the functions of different tools for circuit construction.***						

Assessment Criteria

Assessment criteria provide guidance on how the candidates will be assessed in order to ensure that the learning outcomes have been achieved.

To achieve each outcome a candidate must satisfy the assessment criteria listed in the previous table. The assessment criteria which will be assessed in the controlled assessment have been highlighted.

Scheme of Assessment

Assignment Number	Assignment Type	Percentage distribution
1	Coursework	26 - 34%
2	Coursework	26 - 34%
3	Controlled	38 - 42%

Distribution of Marks

Criteria	MQF Level 1 Marks	MQF Level 2 Marks	MQF Level 3 Marks	Totals
Knowledge	1	1	2	4
Comprehension	2	2	2	6
Application	3	3	4	10

Unit 3: Electro-mechanical systems

Unit 3	Electro-mechanical systems
Unit Description	This unit equips the candidate with a skill set of theoretical and practical knowledge related to the domains of AC current, coils, and different mechanical systems. This basic knowledge is imperative in understanding the inner workings of different power tools. Candidates can then go into the use, maintenance and care of different power tools. Through this unit, learners will be able to read and interpret technical information to construct an electro-mechanical product using multiple power tools, safely and efficiently.

Learning Outcomes

At the end of the unit, I can:

LO 1. Demonstrate knowledge of alternating current and coils.

LO 2. Demonstrate an understanding of power tools and their individual mechanical components.

LO 3. Demonstrate knowledge of emergency procedures.

LO 4. Construct an electro-mechanical product using power tools from given documentation.

Unit Content

Subject Focus	Alternating current and coils
LO 1.	Demonstrate knowledge of alternating current and coils.
K-1.	Different types of electrical power generation plants: e.g. fossil-fuel, nuclear, geothermal, hydroelectric, wind, solar.
	Electricity generation, transmission and distribution: power plant; step-up transformer; transmission lines; step-down transformer; consumer unit.
K-2.	Different applications of electromagnetic devices: e.g. relays, loudspeakers, microphones, transformers, motors and generators, solenoid.
	Working principle of an electromagnet: relationship between electricity and magnetism.
	Parts of a relay: electromagnet; movable armature; spring; normally open and normally closed pins.
K-3.	Main components of a transformer: primary coil; secondary coil; laminated core; insulating casing.
	Applications of transformers: battery chargers; power supplies; welding sets; substations.
	Function of transformers: to step-up voltage; to step-down voltage.
K-4.	Main parts of a DC motor: armature; stator; commutator; brushes.
	Working principle of a DC motor: magnetism and current; Fleming's left hand rule.
K-5.	Different types of motors: DC motors; brushless motors; stepper motors; servo motors.
	Working principles: stepper motors; servo motors.
C-1.	Selecting the correct rating of a fuse: function; hazards that might arise when selecting inappropriate fuse.
	Calculate the appropriate rating of a BS1361 fuse (or equivalent): Power = Voltage × Current.
	Difference between an MCB and a fuse: cost; sensitivity to current overload; sacrificial vs. reset; ease to resume supply.
C-2.	***N.B.*** *For assessment purposes, the circuit given should contain a latching sub-circuit.*

A-1.	Design: neatness; selection of the proper components; correct wiring.
	Construction of a circuit on strip board to control the direction of a DC motor: • Proper connection of components: wiring; soldering; • Functionality.
	Construction of a circuit on strip board to control the speed of a DC motor: • Proper connection of components: wiring; soldering; • Functionality.
A-2.	Preparation: tools; components.
	Wiring a three-pin plug: correct stripping technique; correct identification of wires, correct length of insulation and outer jacket; correct assembling of cable grip.
	Wiring to trailing socket: Correct stripping technique; correct identification of wires; correct length of insulation and outer jacket; correct assembling of trailing socket.

Subject Focus	**Power tools**
LO 2.	Demonstrate an understanding of power tools and their individual mechanical components.
K-6.	Different types of bearings: e.g. ball bearing, roller bearing, tapered roller bearing, thrust bearing, magnetic bearing, fluid bearing.
	Accelerated bearing failure factors: heavier load than designed for; inadequate lubrication; ineffective bearing sealing; shaft misalignment; incorrect fit.
	Replacing bearings: using a bearing puller; using a press; heating inside diameter of bearing; using wax or grease to force out a thrust bearing.
K-7.	Different mechanical systems: e.g. gears, pulleys, chain and sprocket, levers and linkages, crank and slider, cam and follower.
	Functions of mechanical systems: e.g. change in rotational direction, change in rotational speeds, conversion of rotational to linear motion, conversion of linear motion to rotational motion, mechanical advantages, linking two or more shafts.

	Advantages and disadvantages of gear and pulley systems: • Advantages of a gear drive system: e.g. it is more efficient than a pulley drive because it does not slip, multiple output rotational speeds can be obtained by using a suitable gear drive, compared to other drives it has a longer life; • Disadvantages of a gear drive system: e.g. it needs lubrication, more expensive to produce than a pulley drive system, it produces more noise than a pulley system; • Advantages of a pulley drive system: e.g. no lubricant is required, noise is relatively less, if the belt breaks during overload it will protect the machine from damage; • Disadvantages of a pulley drive system: e.g. power loss due to the belt slipping over the pulley, the belt needs to be adjusted to the correct tension from time to time, life of the belt is relatively low.
K-8.	Different types of power tools and machinery: e.g. power drill/pillar drill, jigsaw, circular saw, grinder, lathe, belt sander, milling machine.
	Main components of a power tool: e.g. motor, gearbox, bearings, trigger switch, brushes, PCB.
C-3.	Preventative measures before using power tools: e.g. ensure that you have been properly trained to use the tool, inspect tools for any damage, inspect plug and cord for defects, ensure that the tool is properly grounded using a three-pin plug, ensure that the power tool has the correct guard, check for damaged switches or faulty trigger locks.
	Safety measures while using a power tool: e.g. wear or use personal protective equipment (PPE), keep power cords clear of tools and the path that the cutting tool will take, make use of clamps or vices to hold and support the workpiece, disconnect the power supply before making adjustments or changing accessories, follow good housekeeping procedures, ensure that cutting tools and drills are kept sharp.
	Maintenance and care of power tools and machinery: e.g. store power tools in a dry and secure location when not in use, cool down heated power tools, lubricate moving parts with oil or grease, use a power tool only for its designated load and material, pull the plug not the cord when unplugging a power tool, replace worn parts.

Subject Focus	**Health and Safety**
LO 3.	Demonstrate knowledge of emergency procedures.
K-9.	Main classes of fire: • Class A - Fires with trash, wood, paper or other combustible materials as the fuel source; • Class B - Fires with flammable or combustible liquids as the fuel source; • Class C - Fires involving gases; • Class D* - Fires involving combustible metals; • Class E - Fires involving electrical equipment; • Class F - Fires involving cooking oils; **N.B.** *It is highly recommended that Class D fire be included in delivery although it is not assessed within this syllabus.*

	Fire extinguishers for the different classes of fire: e.g. water, foam, powder, CO2, dry and wet chemical extinguisher, fire blanket.
	Important practices to adopt when a fire emergency occurs: sound the fire alarm; if you are trained and the fire is still contained try to put it out using the correct fire extinguisher; do not take out with you heavy personal belongings; evacuate the building via the escape route to the assembly area avoiding lifts.
C-4.	Required information needed when reporting an emergency: location; number of casualties; type of injuries; age of casualty; contact number.
	Incidents that may occur in a workshop: e.g. electric shock, cuts, burns, falling from height, penetration of foreign body, fractures.

Subject Focus	**Electro-mechanical product**
LO 4.	Construct an electro-mechanical product using power tools from given documentation.
K-10.	Different types of documentation: e.g. job card, fabrication drawing, data sheet, assembly drawing, repair and maintenance diagram, risk assessment.
C-5.	Different measures to properly handle and store documentation: e.g. store in a dry and safe place when not in use, handle with clean hands, fold using the appropriate method, refrain scribbling or drawing graffiti, report loss or damage, report discrepancies in data.
	Need for reading and interpreting technical documentation: working to laid down procedures; producing accurately the required task; working safely and effectively; safeguarding the equipment being used.
A-3.	Risk assessment: identification of hazards; likelihood of the risk involved (High, Medium, Low); measures to eliminate or lower the risks involved.
	Preparation: documentation; tools and materials; PPE.
	Construct an electro-mechanical product: use power tools correctly; accuracy and precision; function; quality.

N.B. *No marks should be awarded in any application criteria unless candidates are wearing appropriate PPE throughout practical work.*

Learning Outcomes and Assessment Criteria

Subject Focus:	**Alternating current and coils**
Learning Outcome 1:	Demonstrate knowledge of alternating current and coils.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-1. Name the different types of electrical power generation plants.	***K-1. Define generation and distribution of electrical power.***	***K-1. Describe how electrical power reaches the consumer from a generation plant.***	***C-1. Outline the importance of selecting a fuse with the appropriate current rating.***	***C-1. Calculate the appropriate rating of a fuse.***	***C-1. Discuss the main differences between an MCB and a fuse.***	A-1. Design a circuit to control the direction of a DC motor.	A-1. Construct a circuit to control the direction of a DC motor.	A-1. Construct a circuit to control the speed of a DC motor.
K-2. List applications of electromagnetic devices.	***K-2. Outline the working principle of an electromagnet.***	***K-2. Describe how a relay achieves its function through its individual parts.***						
K-3. Label main components of a transformer.	***K-3. Outline applications of transformers.***	***K-3. Describe the function of a given transformer.***						
K-4. Label the main parts of a DC motor.	***K-4. Outline the working principle of a DC motor.***	***K-4. State the main difference between a DC motor and a generator.***	C-2. Identify the latching part from a given circuit.	C-2. Explain the working principle of a latching circuit.	C-2. Justify an application of a latching circuit for a given scenario.	A-2. Prepare the necessary tools to wire a three-pin plug.	A-2. Carry out the task of wiring a three-pin plug to a cord using the correct procedure.	A-2. Carry out the installation of the wired plug to a trailing socket.
K-5. List different types of motors.	K-5. Match the different types of motors with their typical applications.	K-5. Describe the working principles of different types of motors.						

Subject Focus:	**Power tools**
Learning Outcome 2:	Demonstrate an understanding of power tools and their individual mechanical components.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-6. List different types of bearings.	***K-6. Identify different factors that causes premature bearing failure.***	***K-6. Outline how different bearings can be replaced.***						
K-7. Identify different mechanical systems.	K-7. Describe the function of mechanical systems.	K-7. List the advantages and disadvantages of gears and pulleys.	C-3. Describe preventative measures before using power tools.	C-3. Describe safety measures while using power tools.	C-3. Explain the maintenance and care of power tools and machinery.			
K-8. List different types of power tools and machinery.	***K-8. Identify the main components of a power tool.***	***K-8. Describe the function of different components in a power tool.***						

Subject Focus:	**Health and Safety**
Learning Outcome 3:	Demonstrate knowledge of emergency procedures.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-9. List the main classes of fire.	***K-9. Identify the proper fire extinguisher for different classes of fire.***	***K-9. Describe important practices to adopt when a fire emergency occurs.***	C-4. State the required information needed when reporting an emergency situation.	C-4. Describe the necessary procedure to perform when particular incidents occur in a workshop.	C-4. Justify the procedures adopted when an incident occurs in a workshop.			

Subject Focus:	**Electro-mechanical product**
Learning Outcome 4:	Construct an electro-mechanical product using power tools from given documentation.

Knowledge Criteria			**Comprehension Criteria**			**Application Criteria**		
Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)	Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
K-10. Define the terms copyright and plagiarism.	K-10. List different types of documentation.	K-10. Describe the function of different types of documentation.	***C-5. List different measures in order to properly handle and store documentation.***	***C-5. Explain measures needed in order to properly handle and store documentation.***	***C-5. Discuss the need for reading and interpreting technical documentation accurately.***	A-3. Carry out a risk assessment to construct a product which includes a mechanical and an electronic aspect.	A-3. Prepare documentation, materials, tools and PPE needed to construct an electro-mechanical product.	A-3. Construct an electro-mechanical product with the use of multiple power tools.

Assessment Criteria

Assessment criteria provide guidance on how the candidates will be assessed in order to ensure that the learning outcomes have been achieved.

To achieve each outcome a candidate must satisfy the assessment criteria listed in the previous table. The assessment criteria which will be assessed in the controlled assessment have been highlighted.

Scheme of Assessment

Assignment Number	Assignment Type	Percentage distribution
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2	Coursework	26 - 34%
3	Controlled	38 - 42%

Distribution of Marks

Criteria	MQF Level 1 Marks	MQF Level 2 Marks	MQF Level 3 Marks	Totals
Knowledge	1	1	2	4
Comprehension	2	2	2	6
Application	3	3	4	10

Minimum Required Resources

This list is not intended to be exhaustive. It is highly recommended that tools listed hereunder should be educational. These resources should be available for at least 16 candidates.

Per workshop

- **Marking out tools**: chalk line; surface plate; blueing or paint; scribing block; mortise gauge;
- **Measuring tools:** micrometre; gauges;
- **Power tools and machinery:**
    - Machinery: lathe, sanding machines; band saw; pillar drill; strip wire heater; vacuum former; angle grinder; circular saw; scroll saw;
    - Electronics: UV box; etching tank;
- **Test Bench Equipment:** oscilloscope; signal generator.

Per candidate

- **Measuring tools:** ruler;
- **Hand tools** (Electronics): soldering iron; wire stripper; side cutter; long nose pliers; third hand.

Per group of 2 candidates

- **Benches:** wood working benches; metal working benches.

Per group of 2-4 candidates

- **Marking out tools:** scriber; centre punch; dividers/callipers;
- **Measuring tools:** measuring tape; protractor; veneer calliper; engineer square; sliding bevel; combination sets;
- **Hand tools:**
    - Materials: hammers/mallets; pincers; pliers; saws; screwdrivers; files; spanners; sockets; chisels; planer; taps; dies;
    - Electronics: de-soldering pump track cutter;
- **Power tools and machinery:** drills; hot air blowers; jigsaw;
- **Test Bench Equipment:** multi-meter.