SEC (2017)

ENGINEERING TECHNOLOGY SEC 37

SYLLABUS / LEARNING AND ASSESSMENT PROGRAMME

Contents

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 into two parts, namely

Part A: General Policies
Part B: Unit Specifications

In Part A, the overall aim and objectives of the programme are explained. Important terms that will be used in the LAP (Learning and Assessment Programme) will be defined. Additionally, policies, guidelines and strategies related to assessment practices are documented in this section. Quality Assurance processes and procedures are also documented in Part A of this document.

In Part B, the detailed specification of the three units that are to be implemented are provided for each unit. The learning outcomes, together with a brief description of the unit are also stipulated. The associated knowledge, skills and competences together with the unit content are specified for each learning outcome. The assessment criteria for each unit, together with assessment methods that are to be applied, are presented in this part of the document.

In order to ensure effective implementation of the programme, important standards and quality assurance processes and procedures have to be adopted. Standard templates will be provided in a separate document and will be structured as presented in the table provided overleaf.

Reference	Template
A	Assessment Template
A	Feedback Template
A	Unit Tracking Sheet Template
A	Programme Tracking Sheet Template
A	Assessment Schedule Template
QA	Internal Verification Report Templates
QA	External Verification Report Templates
QA	Learner Questionnaire
PM	Programme Team
PM	Programme – Cohort Plan
PM	Agenda /Minutes Meeting Template

Legend:
A: Assessment
QA: Quality Assurance
PM: Programme Management

Part A: General Policies

A.1. Programme Aim and Objectives

The aim of the vocational programme in Engineering Technology is to provide learners with the underpinning knowledge related to Engineering Technology, in line with the Malta Qualification Framework specified at MQF Level 3. By the end of the programme, candidates are expected to have gained sufficient skills and should be able to apply knowledge and skills under supervision.
Upon completing this programme, learners should be able to:

1. Carry out basic engineering tasks safely and effectively
2. Construct circuits of moderate complexity
3. Interpret and apply engineering information
4. Use tools safely when performing basic engineering tasks

A.2. Definitions/ Terminology

Term	Definition
Assessor	The person responsible to grade the candidates' work, issue a mark and determine the candidates' final grade.
Assessment (Continuous)	A number of tasks given to the candidate during the course; these could be an individual task or as group work.
Controlled Assessment	As assessment which can take several forms such as examination, written report and many others. However, it has to be conducted within a school environment. The minimum time for this assessment is 1 hour.
Learning Outcome	Learning Outcomes are statements which describe what a qualification represents in terms of knowledge, skills and competences. The Malta Qualification Frameworks (MQF) defines a learning outcome as what a learner understands and is capable of doing at the end of the learning process.
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.
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.
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.

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 and this content must be delivered to give the candidates the tools to achieve that outcome.
Assessment Grading Criteria	Descriptions of what a candidate is expected to do in order to demonstrate that a learning outcome has been achieved.
Sample of Work	A sample of work is a percentage of candidates' work gathered as a representative sample for the internal or external verifier.
Quality Assurance	To assure the standards and quality of the learning assessment programme.
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 learner the end of a learning process.
Synoptic Assessment	A Synoptic Assessment can be defined as an assessment which is designed to cover all the assessment grading criteria for a given unit.

A.3. Assessment

A.3.1 Scope

Assessment is an important element in any learning process. In order to ensure that assessment forms candidates and at the same time meet important conditions of reliability, validity and fairness, 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 learners
- 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 marks distribution are explained in Part B of the programme as part of the unit specifications.

A.3.2 Programme Grade

A cumulative percentage mark, calculated on the basis of a sum total of all the 3 units, determines the final grade of candidates/ learners. Candidates/ Learners may qualify for Grades 1, 2, 3, 4, 5, 6 and 7. The results of candidates/learners who do not obtain at least a Grade 7 shall remain unclassified.

A.3.3 Important Conditions

Candidates must obtain a minimum of 50 marks in each unit in order to obtain a grade classification. If a candidate obtains a minimum of 50 in two units, but fails to satisfy the examiner in the remaining unit, s/he may be eligible to obtain Grade 6 or Grade 7.
If a candidate obtains less than 120 marks, his grade will be Unclassified. The same applies if a candidate does not obtain at least 50 marks in two units by the end of the programme.

A.3.4 Re-Sits

If for a given unit, the total mark gained by a candidate is less than 50 marks, s/he will be eligible to re-sit. The re-sit assessment must consist of a synoptic assessment conducted within a school controlled environment during the same academic year. The highest possible mark that may be obtained in this case is 60 marks.
Candidates who obtained an average of 50 marks or more on completion of the three tasks for a given unit will not be eligible for a re-sit to better their original mark.
Candidates who miss the controlled assessment for a justifiable reason will be eligible to sit for the synoptic assessment and may obtain full marks. The mark obtained in this assessment will replace the controlled assessment mark. The controlled assessment should not be more than 2 hours long.

A.4 Quality Assurance

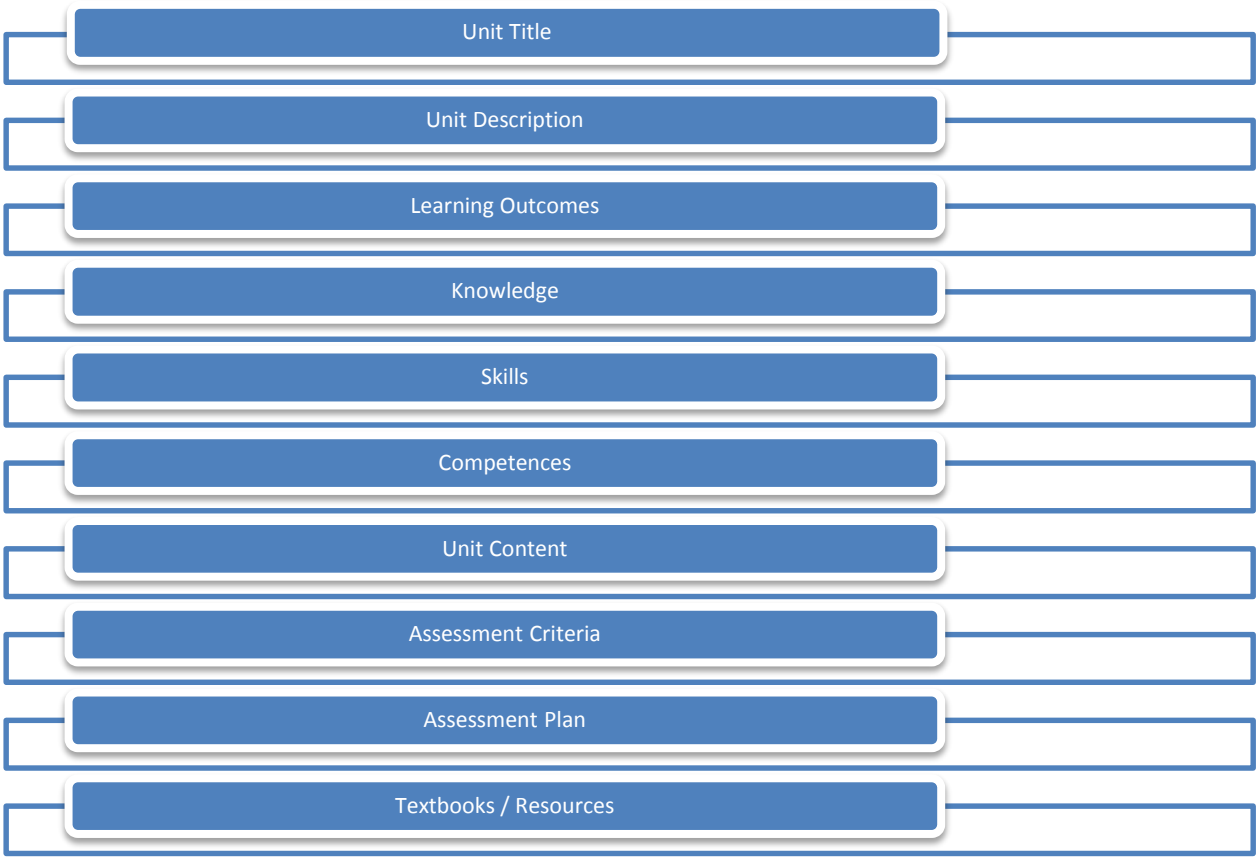
An important aspect of this programme is the quality assurance processes that must be conducted throughout the implementation of the programme. Three main processes are to be conducted as stipulated in the table below.

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, validated and reliability are to be performed.
Internal Verification of Assessment Decisions	Once learners complete their work, and assessments have been corrected, a representative sample of learners work is to be internally verified.
External Verification	The process of external verification will ensure that programme quality and standards criteria are met.

Part B: Unit Specifications

B.1 Introduction

This part of the programme guide provides detailed specification for each of the 3 units that are to be implemented for 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 learner should be able to do/know/apply by the end of the learning process."
The structure of the unit specifications is presented below:



B.2 Unit 1: Working Effectively and Safely in Engineering

Unit 1	Working Effectively and Safely in Engineering
Unit Description	The unit introduces effective and safe work to learners, focusing on their wellbeing, on prolonged life of tools and equipment and on economic aspects of work. The primary goal of the unit is to introduce basic work practices in engineering and potential hazards involved. The learner will be introduced to EU regulations adopted for engineering activities and for vocational training. This unit provides learners with knowledge of material and equipment handling, as well as the use of appropriate personal protective equipment (PPE), and their classification: protection of respiratory organs, skin, eye and hearing, protective clothing and ensembles. Learners will become aware of the hazards and risks associated with different engineering tasks, working environments (for example working with high voltages, and static-sensitive devices), use of tools and equipment (both common and special), and working with dangerous materials and substances. The unit covers ways of avoiding hazards and ways to respond correctly and swiftly in case of an incident both in theory and in practice. The knowledge required during the health a safety section can also be applied in everyday life. The learner will be equipped with suitable communication skills for working in a team.

Learning Outcomes

Upon completing the unit, learners should be able to:

LO 1. Apply statutory regulations and organizational safety requirements;
LO 2. Prepare PPE and working environment according to the task checklist;
LO 3. Carry out engineering task according to safety standards.

Competences, Knowledge and Skills

Competences	At the end of the unit the learner will have acquired the responsibility and the autonomy to:
	Comply with safety procedures in accordance to legislation of typical vocational technician tasks. {1,3} Ensure proper preparation of tools, working environment and themselves for safe work in regards to hazards in electrical engineering {1,2,3} Carry out tasks such as installation, assembly and testing under electricity hazards {2,3}
Knowledge	**At the end of the unit the learner will:**
	Understand how electrical current, fire and smoke affects the human body {1} Be familiar with the necessary steps to help yourself or other person under electrical shock {2} Know basic categories of PPE in relation to electronics technician practice {2,3}
Skills	**At the end of the unit learner will have mastered the following skills:**
Applying knowledge and understanding	Use protective hand gloves when handling hand tools in a reliable manner {1,2,3} Practise correct procedure in case of an incident under time constraint .{2,3} Demonstrate procedure of avoiding hazards in basic engineering tasks {1,2,3}
Communication skills	Interact with colleagues and others when preparing for and reporting after an engineering task {2} Explain the immediate consequences of electrical shock on human health {1} Explain in detail the cause of a problem and the effects on safety to a technical person who is not present on site {1,3} Present an effective plan of action when identifying hazards and risks associated with an engineering task {2,3}
Judgmental skills:	Evaluate the hazards and risks associated with a typical engineering task for a technician in electronics {1} Identify main causes of a risk that might lead to the observed electrical hazards in basic tasks {1,3} Evaluate proper sequence of PPE usage in complex electrical engineering tasks .{2,3} Choose the specific safety measures, tools, and PPE in the case of incident {3}
Learning skills:	Evaluate own learning to identify areas of self-improvement in avoiding hazards and risks associated with an engineering task {1,3}

Unit Content

LO 1. Apply statutory regulations and organizational safety requirements.

Statutory regulations and organizational safety requirements clearly define the role team members at work, working environment, workplace, safety and welfare regulations. Regulations cover personal and protective equipment (PPE), manual handling of operations, identification of warning signs for the seven main groups of hazardous substances (defined by EU classification), packaging and labelling of dangerous substances regulations, sources of information and guidance within an organization; safe and efficient use of equipment (mechanical and electrical), lifting and carrying techniques, and protecting others from harm. Learners will be able to distinguish between hazardous working environments, required level of safety and application of safety tools along with required measures in relation to vocational engineering tasks.

LO 2. Prepare PPE and working environment according to the task checklist.

Learners will be introduced to personal protective equipment (PPE) such as respiratory masks, skin protection, eye and ear protection, protective footwear, and other protective ensembles such as hazmat suits and back and spine braces; and their uses while performing different tasks. Learners will be able to detect all the PPE needed to complete the task safety checklist, by identifying PPE and checking its function, using it effectively and storing PPE for further use. Learners will be able to verify proper functioning of PPE in basic engineering tasks and report any causes of protection failure.

LO 3. Carry out engineering task according to safety standards.

Learners will learn about typical engineering activities such as installing equipment, assembling and testing parts of devices, machining of parts, servicing machines or equipment, regular and emergency testing, establishing and following safety procedures, etc. This classification of activities guides the division of the major groups of protective equipment and statutory regulations. Learners will learn about general and specific safety measures, tool preparation, preparatory procedures application and about carrying out work without being exposed to hazards, harming others or destroying tools and machines. This unit will enable learners to achieve skills needed to complete basic engineering procedures successfully without being hurt, hurting others or destroying tools and equipment.

Assessment Criteria

Assessment criteria provide guidance on how the learners will be assessed in order to ensure that the learning outcome has been achieved. To achieve each outcome a learner must satisfy the following assessment criteria grid.

Learning Outcomes	Knowledge	Comprehension	Application
LO 1	K-1. List personal and protective equipment imposed by statutory regulations relating to organizational safety requirements. K-2. Identify warning signs for the seven main groups of hazardous substances.	C-1. Select operations and measures required for maintaining a safe work environment. C-2. Describe packaging and labelling of dangerous substances.	A-1. Demonstrate the prompt and correct procedure in case of an incident.
LO 2	K-3. Relate PPE to major groups of tasks. K-4. List all the PPE needed to complete the task safety checklist. K-5. Explain the effects of electricity on the human body and consequences of electrical shock to human health.	C-3. Describe the functions of PPE for a specific task. C-4. Describe the necessary steps to help person under electrical shock.	A-2. Apply properly the PPE in relation to basic vocational technician tasks.
LO 3	K-6. List typical engineering activities. K-7. Relate major groups of protective equipment to specified activities. K-8. Relate the statutory regulations to a given activity. K-9. List general and specific safety measures for specified engineering activities. K-10. Prepare tools for specified engineering activities.	C-5. Explain a cause resulting in hazard to technical person.	A-3. Apply current safety legislation in order to complete an activity safely and effectively.

Assessment criteria – Marking scheme

4 marks are to be allocated for each knowledge assessment criteria (K1 to K10), for a total of 40 marks.
6 marks are to be allocated for each comprehension assessment criteria (C1 to C5), for a total of 30 marks.
10 marks are to be allocated for each application assessment criteria (A1 to A3), for a total of 30 marks.

Ass. No.	Assessment Mode	Percentage distribution
1	Take-home	30%
2	Practical	30%
3	Controlled	40%

References

Textbooks

- Health and Safety Executive – Essentials of Health and Safety at Work (HSE Books, 2006), ISBN 9780717661794
- Health and Safety Executive – Health and Safety in Engineering Workshops (HSE Books, 2004), ISBN 9780717617173

Websites

- http://electrical-engineering-portal.com/21-safety-rules-for-working-with-electrical-equipment, as of 3.9.2013.
- http://www.ohsa.org.mt/ Maltese Occupational Health and Safety Authority
- http://www.workcover.nsw.gov.au/formspublications/publications/Documents/your_guide_workplace_health_saftey_maltese_0909.pdf as of 3.9.2013.
- http://en.wikipedia.org/wiki/European_Agency_for_Safety_and_Health_at_Work, as of 3.9.2013.

Resources

Workshop facility is essential for the delivery of guided training in basic vocational engineering tasks. Basic set of equipment, hand and power tools are needed. All PPE must be available to be used by every single learner during demonstration, practice and assessment.

B.3 Unit 2: Using Engineering Drawings, Tools and Materials

Unit 2	Using Engineering Drawings, Tools and Materials
Unit Description	This unit aims to provide learners with the knowledge and skills required to use engineering information, such as drawings and instructions, necessary to carry out vocational engineering operations, with particular focus on electronics. The ability to access and use information is probably one of the most critical basic vocational skills required in engineering. This unit will enable learners to understand how to make effective use of information when working with documentation that consist of engineering drawings, reference tables, specifications, charts or any other medium/ means which carries information, being either printed or digital. Learners will be trained to extract information from engineering drawings and related documents in a fast and reliable way. Learners will also learn how to use drawings and related documentation to determine the work that needs to be done, carry out the work according to specifications and validate their own performance. Learners will be using measuring and marking out tools, selecting materials, and other hand tools to carry out basic engineering tasks under supervision.

Learning Outcomes

Upon completion of this unit, the learner will be able to:

LO 1.Interpret engineering drawings and information
LO 2. Select engineering materials for a specified task
LO 3. Use measuring and marking out tools appropriately for a given task
LO4. Use tools safely when undertaking basic engineering tasks.

Competences, Knowledge and Skills

Competences	At the end of the unit the learner will have acquired the responsibility and autonomy to:
	Extract information from engineering drawings, written documentation and other sources needed to carry out an engineering task; .{1,2} Apply engineering drawings and related documentation to carry out a given task .{1,4} Compile personal safety responsibilities from technical specifications {4} Produce a control check-list to carry out, validate own work and generate report {1,3}
Knowledge	**At the end of the unit the learner will:**
	Be familiar with the range of engineering documentation related engineering processes {1} Understand information from engineering drawings, related documentation and other sources before carrying out an engineering task {1,3,4} Understand important properties of materials {2} Know how to use tools safely and effectively {3, 4}
Skills	**At the end of the unit the learner will have mastered the following skills:**
Applying knowledge and understanding	Prepare information from relevant drawings and related documentation to estimate its value {1} Use control procedures for the drawings and related documentation used when carrying out a task {1, 3, 4}
Communication skills	Collaborate with others during group work, to match information on site with technical specification of a given task {1,2} Generate fact finding report of a job done, combining instructions with check-list and other information available {1,3}
Judgmental skills:	Evaluate information compiled from engineering drawings, relevant documentation and other sources to assess its relevance to a given engineering task {2} Analyse relevance and usefulness of information from engineering documentations. {1,2} Select different materials in terms of purpose of use {2}
Learning skills:	Study tools and procedures to adapt and augment available documentation for further personal or public use {1,3} Carry out steps for creating own documentation archive {1,2,3}

Unit Content

LO 1. Interpret engineering drawings and information

Learners will interpret engineering drawings including, Orthographic projection (1st / 3rd angle), Pictorial views (iso / oblique), and exploded views. Important concepts relating to dimensioning, such as imperial / metric systems, scales and symbols / for part of the learning content. Learners will also learn on charts and documentation, including Tapping drill charts, flow charts, manuals, data sheets, job cards and Standards such as ISO and BS.

LO 2. Select engineering materials for a specified task

Learners will learn about basic material properties, like hardness, toughness, strength and plasticity. They will also learn about the properties, application and limits of different groups of materials, like ferrous metals (steel, cast iron), non-ferrous metals (aluminium, brass, copper, and lead), polymers, composites, and organic materials , like solid timber and manufactured boards.

LO 3. Use measuring and marking out tools appropriately for a given task

Know about and use measuring and marking out tools such as Engineer's ruler / square; Scriber / centre punch / dividers; Veneer calliper / height gauge; Scribing block; Work holding devices / angle plates; Marking out mediums and Datum edges.

LO4. Use tools safely when undertaking basic engineering tasks.

Know about and use hand tools including saws, files, pliers. Know about and use power tools such as Jig saw and Power drill. Know about and use machinery such as Centre lathe, Pillar drill and Sanding machine.

Assessment Criteria

Assessment criteria provide guidance on how the students will be assessed in order to ensure that the learning outcome has been achieved. To achieve each outcome a learner must satisfy the following assessment criteria: .

Learning Outcomes	Knowledge	Comprehension	Application
LO 1	K-1. Identify different engineering drawings, charts and standards K-2. Explain the function of engineering drawings, charts and standards	C-1. Show assembly sequences or installation requirements from the documents.	A-1. Discover missing information sources that might lead to completion of a given task.
LO 2	K-3. Identify and explain the difference between ferrous and non-ferrous metals K-4. Identify and explain the difference between natural and manufactured woods K-5. Identify and explain the difference between thermosetting and thermoplastic polymers	C-2. Recognise mechanical properties of materials C-3. Describe different tests that can be conducted within an engineering environment	
LO 3	K-6. Identify measuring and marking out tools K-7. Explain the purpose of use of measuring and marking out tools K-8. List a set of actions that need to be taken when handling tools	C-4. Describe appropriate corrective action for defective equipment	A-2. Use measuring and marking out tools appropriately for a given engineering task
LO 4	K-9. Explain, by the use of sketches, different hand tools that can be used in engineering K-10. Identify the main parts of machine tools	C-5. Select appropriate tools for a given engineering application	A-3. Use manufacturing tools appropriately for a given basic task

Assessment criteria – Marking scheme

4 marks are to be allocated for each knowledge assessment criteria (K1 to K10), for a total of 40 marks.
6 marks are to be allocated for each comprehension assessment criteria (C1 to C5), for a total of 30 marks.
10 marks are to be allocated for each application assessment criteria (A1 to A3), for a total of 30 marks.

Ass. No.	Assessment Mode	Percentage distribution
1	Take-home	30%
2	Practical	30%
3	Controlled	40%

References

Textbooks:

- Electrical Documentation According to Standards, by Jørgen Sommer, 3rd edition 2011, ISBN 978-87-989072-4-4
- Simmons D, Maguire D and Phelps N – Manual of Engineering Drawing (Butterworth Heinemann, 2009), ISBN 9780750689854

Websites

- http://madiadly.webs.com/Using%20and%20interpreting%20information/Interpreting%20and%20Using%20Engineering%20Information.pdf, as of 3.9.2013.

Resources

Workshop facility is essential for the delivery of guided training in basic vocational engineering tasks. Basic set of equipment, hand and power tools are needed. All PPE must be available to be used by every single student during demonstrating, practice and assessment.

B.4 Unit 3: Electronics Circuits Designs

Unit 4	Electronic Circuits Designs
Unit Description	This unit will provide learners with the skills and theory required for selecting electronic devices and designing simple circuits. Such skills and knowledge are a requirement in the vocational domain of an electronics technician. The unit builds up the learner's competence in simple circuit schematics and design by providing sufficient understanding of the fundamental principles of selecting electronic devices to meet given specifications. Learners will also develop the ability to design and prototype a simple electronic circuit using a variety of techniques, including desktop prototyping on breadboards. In addition learners will gain an understanding of the safe working practices needed when working with electronic components and circuits as well as the hazards and risks that can occur when assembling electronic circuits in a workshop or laboratory. Learners will understand the characteristics of electronic components, passive and active, up to the level of operational amplifiers, their symbolic representation in circuit schematics as well as their usage and rules of selection The above is followed by various methods used for electronic circuits prototyping using hand designs of printed circuit boards (PCB) and simple software tools used for PCB layout design. The focus on PCB design is in relation to placing basic elements of electronic circuit such as voltage stabilizing circuitry and separating analogue from digital circuitry in order to avoid interference. Finally, rules of wiring and shielding within the electronic device housing are explained by carefully selected examples of simple electronic devices.

Learning Outcomes

Upon completion of this unit the learner will be able to:

LO 1. Use safe working practices in the electronics laboratory and workshop

LO 2. Describe the function of basic electronic components

LO 3. Demonstrate prototyping skills of electronic circuits, typically used in vocational engineering

LO 4. Construct circuits of moderate complexity

Competences, Knowledge and Skills

Competences	At the end of the unit the learner will have acquired the responsibility and autonomy to:
	Test electronic circuits of medium complexity using active components {1,3,4} Produce an electronic circuit design with integrated circuits of medium complexity using the appropriate symbols and rules of selection {1,2,3,4} Carry out the appropriate safety measures and procedures to ensure the safety of personnel and to protect components and devices when working on electronic circuits. {1,3,4} Participate in a team to share own ideas and skills when working on a given task {,3,4}
Knowledge	**At the end of the unit the learner will:**
	Be familiar with the health and safety requirements when working in an electronics laboratory and workshop {1} Know the different safety procedures required to safeguard personnel as well as components and devices in electronic circuits {1} Be conversant with the tools, equipment and materials required to work on the construction of circuits {1,2,4} Be familiar with the fundamental principles of electronic devices to be able to select devices and meet given specifications {1,2,3,4} Be familiar with the electronic components and devices and their placement in circuit diagrams {2} Be familiar with the procedure used to apply a through hole component in circuits {2,3,4} Know the established safety measures and regulations related to the constructions of circuits {1,2,4} Be familiar with the characteristics and symbols of electronic components {2} Be familiar with the basic applications of semi-conductor devices {2,3,4}
Skills	**At the end of the unit the learners will have mastered the following skills:**
Applying knowledge and understanding	Use the correct tools and method to protect components and devices from electrostatic discharge {1} Use circuits and associated bench top equipment to solve a particular problem {3} Design and prototype a simple electronic circuit using a variety of techniques {3} Carry out basic voltage-current-resistance tests of a breadboard circuitry using table top measurement equipment {3}

Communication skills	Communicate results achieved from tests conducted on specific circuits {1,3,4} State the hazards and risks that can be encountered when assembling electronic circuits in a workshop or laboratory {1} Explain the differences between ideal and real semi-conductor devices {4}
Judgmental skills:	Choose the correct tools, materials, equipment and procedure to work on given e circuits in a laboratory or workshop {1,2,3} Select the most suitable components and devices to construct a circuit for given specifications {2,3,4} Assess a designed circuit in relation to board dimensions, placement, cost and functionality {2,3,4} Assess the effect of temperature on given components {4} Predict the peak-to-peak output of an inverting semi-conductor device using feedback resistors {3} Solve basic problems by using given basic methods, tools, materials and information {1,3,4}
Learning skills:	Evaluate own strengths and weaknesses in the design of electronic circuits. {3,4} Research online to improve own knowledge of electronic circuits {2,3,4}

Unit Content

LO1. Use safe working practices in the electronics laboratory and workshop.

Although working with electronic circuits results in no hazards to personnel, there are areas where safety procedures are required. Safety procedured are required when wiring power supply units, conducting protective grounding of awork piece and items and chassis This uniit will also take into consideration the safety procedures required with chemicals for etching and soldering fumes.

Other types of safe working practice include methods to prevent electrostatic discharge that may harm the electronic circuitry.

Learners will be able to extend their knowledge and awareness of supplementary techniques, concepts and materials using varied resources and media formats within the scope of circuitry design and related problems related.

Besides, learners will be able to work in teams so that each and every learner will bring his/her own diverse skills and knowledge when conducting lab experiments.

LO 2. Describe the function of basic electronic components

Components and devices are considered as an integral part of modern, mixed-signal systems enabling various functions in reaction to environment and to operator. A variety of electronic components such as: batteries, power supplies, connectors, resistors, capacitors, inductors/chokes, diodes, transistors (bipolar and unipolar), togetherwith a wide range of information regarding design principles, housing, annotation, availability on the market and application ideas will be introduced. Learners will learn how to categorise devices are into switches for breaking or diverting current flow , based on a command or environmental event. Other devices such as sensors and transducers, LED, relays, operational amplifiers, comparators, timers and integrated circuits, and logic gates will be explored.

LO3. Demonstrate prototyping skills of electronic circuits, typically used in vocational engineering.

Learners will be able to list, explain and perform basic circuitry from electronic schematics, using basic rules of positioning the components and skills of wirewraping and soldering. Based on the schematics or experimental setup, learners will be able design by hand and/or software the PCB layout of a simple circuitry, such as power amplifiers and output stages, in one layer, with wire jumpers.

In addition, learners will be able to conduct experimental laboratory work using circuits and associated bench top equipment such as voltage supplies and oscilloscopes to solve a particular problem.

LO4. Construct circuits of moderate complexity with semi-conductor devices and through hole components.

Learners will be able to use basic circuit building blocks to create more advanced circuits within the scope and to the extent of the information presented.

Based on the knowledge of operational amplifiers and their internal devices, including BJT and CMOS transistors, learners will be able to construct examples of Semi conductor devices at basic to moderate complexity level, using through hole components. Using such examples learners will

demonstrate the differences between “ideal” and “real” semi conductor devices, the frequency response of semi conductor devices and the basic effect of feedback.

Assessment Criteria

Assessment criteria provide guidance on how the learners will be assessed in order to ensure that the learning outcome has been achieved.
To achieve each outcome a learner must satisfy the following assessment criteria.

Learning Outcomes	Knowledge	Comprehension	Application
LO 1	K-1. Define possible hazards and potential treats to ensure safe and reliable operation of electronic circuitry. K-2. Define the procedures to prevent electrostatic discharge and protect the electronic circuitry.	C-1.Identify appropriate PPE for given engineering tasks.	A-1. Apply safe working practices whilst constructing an electronic circuit.
LO 2	K-3. Describe functionality and use of power supplies and battery chargers. K-4. Show the characteristics of diodes and transistors K-5. Describe functionality and use of amplifiers and comparators. K-6. State the main characteristics of the fundamental integrated circuits topologies.	C-2. Describe the function of a basic system through the use of a block diagram consisting of common electronic components and devices.	
LO 3	K-7. Describe the main features of multimeters and oscilloscopes. K-8. Describe the purpose of using testing equipment.	C-3.Describe a simple case study suitable for applying testing equipment C-4.Select suitable testing equipment for a given case study	A-2. Use multimeters appropriately to determine important electrical data
LO 4	K-9. Describe at least 3 methods of constructing a circuit. K-10. State the process of constructing a PCB	C-5.Describe the need of basic voltage-current-resistance tests.	A-3. Construct a circuit using 2 methods of construction

Assessment criteria – Marking scheme

4 marks are to be allocated for each knowledge assessment criteria (K1 to K10), for a total of 40 marks.
6 marks are to be allocated for each comprehension assessment criteria (C1 to C5), for a total of 30 marks.
10 marks are to be allocated for each application assessment criteria (A1 to A3), for a total of 30 marks.

Ass. No.	Assessment Mode	Percentage distribution
1	Take-home	30%
2	Practical	30%
3	Controlled	40%

References

Textbooks

- Tooley M – Electronic Circuits – Fundamentals and Applications: Fundamentals and Applications (Newnes, 2006) ISBN 9780-750669238
- Electronic Circuits and Secrets of an Old-Fashioned Spy, by Sheldon Charrett,1999-05-01 | ISBN: 1581600275
- Webtool for Sketch, simulate, and share schematics.

Resources

Workshop facility is essential for the delivery of guided training on basic vocational engineering tasks. Basic set of equipment, hand and power tools are needed. All PPE must be available to be used by every single learner during demonstrating, practice and assessment.