



education

Department of Education
REPUBLIC OF SOUTH AFRICA

**National Curriculum Statement
Grades 10 – 12
(General)**

ELECTRICAL TECHNOLOGY

Department of Education

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HOW TO USE THIS BOOK

This document is a policy document divided into four chapters. It is important for the reader to read and integrate information from the different sections in the document. The content of each chapter is described below.

■ Chapter 1 - Introducing the National Curriculum Statement

This chapter describes the principles and the design features of the National Curriculum Statement Grades 10 – 12 (General). It provides an introduction to the curriculum for the reader.

■ Chapter 2 - Introducing the Subject

This chapter describes the definition, purpose, scope, career links and Learning Outcomes of the subject. It provides an orientation to the Subject Statement.

■ Chapter 3 - Learning Outcomes, Assessment Standards, Content and Contexts


This chapter contains the Assessment Standards for each Learning Outcome, as well as content and contexts for the subject. The Assessment Standards are arranged to assist the reader to see the intended progression from Grade 10 to Grade 12. The Assessment Standards are consequently laid out in double-page spreads. At the end of the chapter is the proposed content and contexts to teach, learn and attain Assessment Standards.


■ Chapter 4 – Assessment

This chapter deals with the generic approach to assessment being suggested by the National Curriculum Statement. At the end of the chapter is a table of subject-specific competence descriptions. Codes, scales and competence descriptions are provided for each grade. The competence descriptions are arranged to demonstrate progression from Grade 10 to Grade 12.

■ Symbols


The following symbols are used to identify Learning Outcomes, Assessment Standards, grades, codes, scales, competence description, and content and contexts.


 = Learning Outcome


 = Assessment Standard

 = Grade

 = Code

 = Scale

 = Competence Description

 = Content and Contexts



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ACRONYMS

AC	Alternating Current
AIDS	Acquired Immune Deficiency Syndrome
AM	Amplitude Modulation
CASS	Continuous Assessment
CPU	Central Processing Unit
dB	Decibel
DO	Developmental Outcome
FET	Further Education and Training
FM	Frequency Modulation
GET	General Education and Training
HIV	Human Immunodeficiency Virus
IKS	Indigenous Knowledge Systems
ISO	International Organization for Standardization
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
LDR	Light-Dependent Resistor
NCS	National Curriculum Statement
NQF	National Qualifications Framework
OBE	Outcomes-Based Education
OHS	Occupational Health and Safety
PLC	Programmable Logic Controller
RLC	Resistance, Inductance and Capacitance
SABS	South African Bureau of Standards
SABS 0142	SABS Standard for the Wiring of Premises
SAQA	South African Qualifications Authority
SI	Système International

CHAPTER 1

INTRODUCING THE NATIONAL CURRICULUM STATEMENT

The adoption of the Constitution of the Republic of South Africa (Act 108 of 1996) provided a basis for curriculum transformation and development in South Africa. The Preamble states that the aims of the Constitution are to:

- heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improve the quality of life of all citizens and free the potential of each person;
- lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
- build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

The Constitution further states that ‘everyone has the right ... to further education which the State, through reasonable measures, must make progressively available and accessible’.

The National Curriculum Statement Grades 10 – 12 (General) lays a foundation for the achievement of these goals by stipulating Learning Outcomes and Assessment Standards, and by spelling out the key principles and values that underpin the curriculum.

PRINCIPLES

The National Curriculum Statement Grades 10 – 12 (General) is based on the following principles:

- social transformation;
- outcomes-based education;
- high knowledge and high skills;
- integration and applied competence;
- progression;
- articulation and portability;
- human rights, inclusivity, environmental and social justice;
- valuing indigenous knowledge systems; and
- credibility, quality and efficiency.

Social transformation

The Constitution of the Republic of South Africa forms the basis for social transformation in our post-apartheid society. The imperative to transform South African society by making use of various transformative tools stems from a need to address the legacy of apartheid in all areas of human activity and in education in particular. Social transformation in education is aimed at ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of our population. If social transformation is to be achieved, all South Africans have to be educationally affirmed through the recognition of their potential and the removal of artificial barriers to the attainment of qualifications.

Outcomes-based education

Outcomes-based education (OBE) forms the foundation for the curriculum in South Africa. It strives to enable all learners to reach their maximum learning potential by setting the Learning Outcomes to be achieved by the end of the education process. OBE encourages a learner-centred and activity-based approach to education. The National Curriculum Statement builds its Learning Outcomes for Grades 10 – 12 on the Critical and Developmental Outcomes that were inspired by the Constitution and developed through a democratic process.

The Critical Outcomes require learners to be able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively with others as members of a team, group, organisation and community;
- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.

The Developmental Outcomes require learners to be able to:

- reflect on and explore a variety of strategies to learn more effectively;
- participate as responsible citizens in the life of local, national and global communities;
- be culturally and aesthetically sensitive across a range of social contexts;
- explore education and career opportunities; and
- develop entrepreneurial opportunities.

High knowledge and high skills

The National Curriculum Statement Grades 10 – 12 (General) aims to develop a high level of knowledge and skills in learners. It sets up high expectations of what all South African learners can achieve. Social justice requires the empowerment of those sections of the population previously disempowered by the lack of knowledge and skills. The National Curriculum Statement specifies the minimum standards of knowledge and skills to be achieved at each grade and sets high, achievable standards in all subjects.

Integration and applied competence

Integration is achieved within and across subjects and fields of learning. The integration of knowledge and skills across subjects and terrains of practice is crucial for achieving applied competence as defined in the National Qualifications Framework. Applied competence aims at integrating three discrete competences – namely, practical, foundational and reflective competences. In adopting integration and applied competence, the National Curriculum Statement Grades 10 – 12 (General) seeks to promote an integrated learning of theory, practice and reflection.

Progression

Progression refers to the process of developing more advanced and complex knowledge and skills. The Subject Statements show progression from one grade to another. Each Learning Outcome is followed by an explicit statement of what level of performance is expected for the outcome. Assessment Standards are arranged in a format that shows an increased level of expected performance per grade. The content and context of each grade will also show progression from simple to complex.

Articulation and portability

Articulation refers to the relationship between qualifications in different National Qualifications Framework levels or bands in ways that promote access from one qualification to another. This is especially important for qualifications falling within the same learning pathway. Given that the Further Education and Training band is nested between the General Education and Training and the Higher Education bands, it is vital that the Further Education and Training Certificate (General) articulates with the General Education and Training Certificate and with qualifications in similar learning pathways of Higher Education. In order to achieve this articulation, the development of each Subject Statement included a close scrutiny of the exit level expectations in the General Education and Training Learning Areas, and of the learning assumed to be in place at the entrance levels of cognate disciplines in Higher Education.

Portability refers to the extent to which parts of a qualification (subjects or unit standards) are transferable to another qualification in a different learning pathway of the same National Qualifications Framework band. For purposes of enhancing the portability of subjects obtained in Grades 10 – 12, various mechanisms have been explored, for example, regarding a subject as a 20-credit unit standard. Subjects contained in the National Curriculum Statement Grades 10 – 12 (General) compare with appropriate unit standards registered on the National Qualifications Framework.

Human rights, inclusivity, environmental and social justice

The National Curriculum Statement Grades 10 – 12 (General) seeks to promote human rights, inclusivity, environmental and social justice. All newly-developed Subject Statements are infused with the principles and practices of social and environmental justice and human rights as defined in the Constitution of the Republic of South Africa. In particular, the National Curriculum Statement Grades 10 – 12 (General) is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors.

The National Curriculum Statement Grades 10 – 12 (General) adopts an inclusive approach by specifying minimum requirements for all learners. It acknowledges that all learners should be able to develop to their full potential provided they receive the necessary support. The intellectual, social, emotional, spiritual and physical needs of learners will be addressed through the design and development of appropriate Learning Programmes and through the use of appropriate assessment instruments.

Valuing indigenous knowledge systems

In the 1960s, the theory of multiple-intelligences forced educationists to recognise that there were many ways of processing information to make sense of the world, and that, if one were to define intelligence anew, one would have to take these different approaches into account. Up until then the Western world had only valued logical, mathematical and specific linguistic abilities, and rated people as ‘intelligent’ only if they were adept in these ways. Now people recognise the wide diversity of knowledge systems through which people make sense of and attach meaning to the world in which they live. Indigenous knowledge systems in the South African context refer to a body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years. The National Curriculum Statement Grades 10 – 12 (General) has infused indigenous knowledge systems into the Subject Statements. It acknowledges the rich history and heritage of this country as important contributors to nurturing the values contained in the Constitution. As many different perspectives as possible have been included to assist problem solving in all fields.

Credibility, quality and efficiency

The National Curriculum Statement Grades 10 – 12 (General) aims to achieve credibility through pursuing a transformational agenda and through providing an education that is comparable in quality, breadth and depth to those of other countries. Quality assurance is to be regulated by the requirements of the South African Qualifications Authority Act (Act 58 of 1995), the Education and Training Quality Assurance Regulations, and the General and Further Education and Training Quality Assurance Act (Act 58 of 2001).

THE KIND OF LEARNER THAT IS ENVISAGED

Of vital importance to our development as people are the values that give meaning to our personal spiritual and intellectual journeys. *The Manifesto on Values, Education and Democracy* (Department of Education, 2001:9-10) states the following about education and values:

Values and morality give meaning to our individual and social relationships. They are the common currencies that help make life more meaningful than might otherwise have been. An education system does not exist to simply serve a market, important as that may be for economic growth and material prosperity. Its primary purpose must be to enrich the individual and, by extension, the broader society.

The kind of learner that is envisaged is one who will be imbued with the values and act in the interests of a society based on respect for democracy, equality, human dignity and social justice as promoted in the Constitution.

The learner emerging from the Further Education and Training band must also demonstrate achievement of the Critical and Developmental Outcomes listed earlier in this document. Subjects in the Fundamental Learning Component collectively promote the achievement of the Critical and Developmental Outcomes, while specific subjects in the Core and Elective Components individually promote the achievement of particular Critical and Developmental Outcomes.

In addition to the above, learners emerging from the Further Education and Training band must:

- have access to, and succeed in, lifelong education and training of good quality;
- demonstrate an ability to think logically and analytically, as well as holistically and laterally; and
- be able to transfer skills from familiar to unfamiliar situations.

THE KIND OF TEACHER THAT IS ENVISAGED

All teachers and other educators are key contributors to the transformation of education in South Africa. The National Curriculum Statement Grades 10 – 12 (General) visualises teachers who are qualified, competent, dedicated and caring. They will be able to fulfil the various roles outlined in the Norms and Standards for Educators. These include being mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists.

STRUCTURE AND DESIGN FEATURES

Structure of the National Curriculum Statement

The National Curriculum Statement Grades 10 – 12 (General) consists of an Overview Document, the Qualifications and Assessment Policy Framework, and the Subject Statements.

The subjects in the National Curriculum Statement Grades 10 – 12 (General) are categorised into Learning Fields.

What is a Learning Field?

A Learning Field is a category that serves as a home for cognate subjects, and that facilitates the formulation of rules of combination for the Further Education and Training Certificate (General). The demarcations of the Learning Fields for Grades 10 – 12 took cognisance of articulation with the General Education and Training and Higher Education bands, as well as with classification schemes in other countries.

Although the development of the National Curriculum Statement Grades 10 – 12 (General) has taken the twelve National Qualifications Framework organising fields as its point of departure, it should be emphasised that those organising fields are not necessarily Learning Fields or ‘knowledge’ fields, but rather are linked to occupational categories.

The following subject groupings were demarcated into Learning Fields to help with learner subject combinations:

- Languages (Fundamentals);
- Arts and Culture;
- Business, Commerce, Management and Service Studies;
- Manufacturing, Engineering and Technology;
- Human and Social Sciences and Languages; and
- Physical, Mathematical, Computer, Life and Agricultural Sciences.

What is a subject?

Historically, a subject has been defined as a specific body of academic knowledge. This understanding of a subject laid emphasis on knowledge at the expense of skills, values and attitudes. Subjects were viewed by some as static and unchanging, with rigid boundaries. Very often, subjects mainly emphasised Western contributions to knowledge.

In an outcomes-based curriculum like the National Curriculum Statement Grades 10 – 12 (General), subject boundaries are blurred. Knowledge integrates theory, skills and values. Subjects are viewed as dynamic, always responding to new and diverse knowledge, including knowledge that traditionally has been excluded from the formal curriculum.

A subject in an outcomes-based curriculum is broadly defined by Learning Outcomes, and not only by its body of content. In the South African context, the Learning Outcomes should, by design, lead to the achievement of the Critical and Developmental Outcomes. Learning Outcomes are defined in broad terms and are flexible, making allowances for the inclusion of local inputs.

What is a Learning Outcome?

A Learning Outcome is a statement of an intended result of learning and teaching. It describes knowledge, skills and values that learners should acquire by the end of the Further Education and Training band.

What is an Assessment Standard?

Assessment Standards are criteria that collectively describe what a learner should know and be able to demonstrate at a specific grade. They embody the knowledge, skills and values required to achieve the Learning Outcomes. Assessment Standards within each Learning Outcome collectively show how conceptual progression occurs from grade to grade.

Contents of Subject Statements

Each Subject Statement consists of four chapters and a glossary:

- *Chapter 1, Introducing the National Curriculum Statement:* This generic chapter introduces the National Curriculum Statement Grades 10 – 12 (General).
- *Chapter 2, Introducing the Subject:* This chapter introduces the key features of the subject. It consists of a definition of the subject, its purpose, scope, educational and career links, and Learning Outcomes.
- *Chapter 3, Learning Outcomes, Assessment Standards, Content and Contexts:* This chapter contains Learning Outcomes with their associated Assessment Standards, as well as content and contexts for attaining the Assessment Standards.
- *Chapter 4, Assessment:* This chapter outlines principles for assessment and makes suggestions for recording and reporting on assessment. It also lists subject-specific competence descriptions.
- *Glossary:* Where appropriate, a list of selected general and subject-specific terms are briefly defined.

LEARNING PROGRAMME GUIDELINES

A Learning Programme specifies the scope of learning and assessment for the three grades in the Further Education and Training band. It is the plan that ensures that learners achieve the Learning Outcomes as prescribed by the Assessment Standards for a particular grade. The Learning Programme Guidelines assist teachers and other Learning Programme developers to plan and design quality learning, teaching and assessment programmes.

CHAPTER 2

ELECTRICAL TECHNOLOGY

DEFINITION

Electrical Technology focuses on the understanding and application of electrical and electronic principles and the technological processes inherent in the production of products, services and systems in order to improve the quality of life.

PURPOSE

Electrical Technology will expose learners to the relevant knowledge and skills, taking cognisance of the following outcomes:

- understand the social contribution of Electrical Technology with regard to economic growth, entrepreneurship, sustainability, and as a tool for change, improving the quality of life and providing solutions that are responsive to individual and community needs;
- identify and solve problems in the Electrical Technological environment using critical and creative thinking, in order, among others, to develop the creative potential of learners;
- communicate effectively using verbal, written, visual and graphical communication as well as mathematical skills as applied to Electrical Technology;
- organise and manage activities responsibly and effectively;
- collect, analyse, organise and critically evaluate relevant information;
- use science and technology effectively and critically, showing responsibility towards the environment and the rights and health of others, with particular reference to managing the impact of Electrical Technology on natural resources, cultural values and socio-economic development; and
- demonstrate an understanding of the ethical considerations, values and attitudes which relate to Electrical Technology.

Learners will be prepared for career pathways and additional education and training opportunities by:

- applying knowledge and skills in Electrical Technology;
- developing entrepreneurial skills;
- exploring education and career opportunities; and
- learning to be sensitive to the rights of others, including those with disabilities and those living with and affected by HIV/AIDS.

SCOPE

Electrical Technology affords learners the opportunity to carry out practical projects, experiments and real-life tasks using a variety of processes and skills. The subject Electrical Technology is organised to include:

- technology processes and communication methods;
- safety;
- tooling;
- measuring instruments;
- principles, generation and application of electricity;
- protective and switching devices;
- electronic and digital systems;
- society, technology and the environment;
- occupational safety for industry;
- SABS code of practice 0142; and
- ISO standards.

In order to ensure mobility between National Qualifications Framework (NQF) levels, progression to Higher Education and access to careers in Electrical Technology, the subject includes but is not limited to:

- the application of mathematical, physical, electrical and electronic principles;
- engineering and technology problem solving, basic design and graphics;
- the concepts of electrical, electronic and digital systems;
- effective technical, supervisory and general management principles;
- language presentation skills including terminology, style, structure and graphical support; and
- knowledge of codes, practice and legislation.

EDUCATIONAL AND CAREER LINKS

At the General Education and Training level, the Technology Learning Field is an integrated study covering a wide range of technological areas. Technology is organised around the following themes:

- Society and environment;
- Technological capability, knowledge and understanding; and
- Processes and skills.

The General Education and Training Technology Learning Area encourages learners to engage in investigating, designing, making, evaluating and communicating solutions. At the Further Education and Training level, learners will be equipped with the basic knowledge and skills needed to ensure competence and confidence within the Electrical Technology environment.

In the Further Education and Training band, training and practice is integrated to allow learners the opportunity to exercise and reinforce technical skills and apply acquired knowledge in order to provide orientation for career pathways such as:

- electrician;
- auto-electrician;
- electrical fitter;
- electrical engineer;
- electronic engineer;
- electrical draughtsperson;
- electrical or electronic technician;
- electrical or electronic technologist;
- academic in the field of Electrical Technology; and
- electronic mechanician.

These career pathways also offer new scope and opportunities for people with disabilities (e.g. deaf learners) to be economically independent.

LEARNING OUTCOMES



Learning Outcome 1: Technological Processes and Communication

The learner is able to understand and apply technological processes related to Electrical Technology ethically and responsibly, and to communicate the findings through the use of the appropriate terminology and communication methods.

In this Learning Outcome learners develop the ability to identify, design, develop and evaluate processes and products related to Electrical Technology (known as the technological process), and to communicate the findings through the use of appropriate electrical and electronic terminology.



Learning Outcome 2: Principles and Practices

The learner is able to demonstrate an understanding of the concepts, principles and practices related to Electrical Technology by organising and managing own activities responsibly and effectively considering the interrelatedness of systems as a context for problem solving.

This Learning Outcome is comprised of electrical and electronic principles and practices.



Learning Outcome 3: Society, Technology and the Environment

The learner is able to adapt and deal with changing job markets, consumer attitudes and international benchmarking related to Electrical Technology, through critical engagement with social, economic and environmental influences, in order to progress to 'world citizenship'.

This Learning Outcome seeks not only to create awareness in learners about non-discriminatory access to employment and services, but also to prepare them for the employment and entrepreneurial opportunities available through the economic integration of national and international economies.

CHAPTER 3

LEARNING OUTCOMES, ASSESSMENT STANDARDS, CONTENT AND CONTEXTS

Notes:

- These Learning Outcomes and Assessment Standards are to be used with the support of the content and context examples provide in the Electrical Technology Learning Programme Guidelines.
- Practical and theoretical competence must be integrated.

Grade 10



Learning Outcome 1

Technological Processes and Communication

The learner is able to understand and apply technological processes related to Electrical Technology ethically and responsibly, and to communicate the findings through the use of appropriate terminology and communication methods.



Assessment Standards

We know this when the learner is able to:

- Identify a problem in a given real-life context.
- Select information from various sources with reference to graphical symbols, SI units and definitions.
- Discuss design features.
- Make products using elementary design.
- Evaluate the final product against the initial design.
- Report on assignments by means of verbal and written communication.

Grade 11



Assessment Standards

We know this when the learner is able to:

- Identify and define a problem in a given real-life context.
- Identify and contextualise concepts with reference to electrical and electronic quantities and circuit diagrams.
- Recognise, discuss and describe design features.
- Make products according to a given standard design.
- Evaluate the final product against the standard design specifications.
- Report on assignments using a variety of communication media.

Grade 12



Assessment Standards

We know this when the learner is able to:

- Identify, analyse and explain a problem in a real-life context.
- Use technical and professional vocabulary to analyse information in a logical manner in order to communicate effectively and efficiently.
- Contextualise the problem/design and analyse various design solutions.
- Make products according to a particular design.
- Evaluate the final product against particular design specifications.
- Make a presentation using a variety of communication media.



Learning Outcome 2

Principles and Practices

The learner is able to demonstrate an understanding of the concepts, principles and practices related to Electrical Technology by organising and managing own activities responsibly and effectively considering the interrelatedness of systems as a context for problem solving.



Assessment Standards

We know this when the learner is able to:

- Describe basic safety methods, taking cognisance of health issues such as HIV/AIDS.
- Identify, select, use and care for tools appropriately.
- Select, use and care for measuring instruments appropriately.
- Describe the principles of magnetism and electricity.
- Describe the principles of operation, use and maintenance of power sources and power supplies, including rectifier circuits.
- Describe the installation of wire ways, taking into account cable selection requirements.
- Identify the components used in the construction of a variety of domestic appliances.
- Select and maintain lighting systems and luminaries.

Grade 11



Assessment Standards

We know this when the learner is able to:

- Explain basic safety methods, taking cognisance of health issues such as HIV/AIDS.
- Explain the basic care and use of measuring instruments.
- Explain the principles of single-phase alternating current theory and the effect of AC on a series RLC circuit.
- Explain the principles of AC generation and power supplies.
- Explain the basic operating principles of single-phase motors.
- Explain the principles of installation, testing and repair of domestic appliances.
- Select, use and maintain lighting systems and luminaries.

Grade 12



Assessment Standards

We know this when the learner is able to:

- Apply basic safety methods, taking cognisance of health issues such as HIV/AIDS.
- Explain the basic operating principles of measuring instruments (block diagrams).
- Demonstrate an understanding of three-phase alternating current systems, and the effect of AC on RLC series and parallel circuits.
- Demonstrate an understanding of the construction and application of power supplies and voltage regulation methods.
- Demonstrate an understanding of the operation of AC motors and control.



Learning Outcome 2 Continued

Principles and Practices

The learner is able to demonstrate an understanding of the concepts, principles and practices related to Electrical Technology by organising and managing own activities responsibly and effectively considering the interrelatedness of systems as a context for problem solving.



Assessment Standards

We know this when the learner is able to:

- Identify and compare different types of protective devices.
- Demonstrate an understanding of basic electronics and logic circuits.
- Describe the basic operating principles of two-way transmission and reception systems (block diagram applications).

Grade 11



Assessment Standards

We know this when the learner is able to:

- Explain the basic working principles of different protective devices.
- Identify and explain the working principles and applications of semiconductor devices, and demonstrate an understanding of logic circuits.
- Explain the operating principles of AM/FM radio systems (only block diagram applications).
- Identify and explain the operation of amplifier circuits.

Grade 12



Assessment Standards

We know this when the learner is able to:

- Explain the basic working principles of different protective devices in relation to earthing methods.
- Demonstrate an understanding of logic system applications, and analyse these applications.
- Demonstrate an understanding of communication systems (only block diagram applications).
- Identify and explain the operating principles of operational amplifiers and audio amplifiers, taking feedback into account.
- Illustrate the working principles of switching and control circuits by means of circuit diagram applications.
- Identify and explain the operating principles of oscillator circuits.
- Describe the principles of operation of adder circuits (block diagrams).
- Identify, explain and demonstrate the basic working principles of a programmable logic controller (PLC).
- Demonstrate an understanding of anti-intrusion system applications (only block diagram applications).



Learning Outcome 3

Society, Technology and the Environment

The learner is able to adapt and deal with changing job markets, consumer attitudes and international benchmarking related to Electrical Technology, through critical engagement with social, economic and environmental influences, in order to progress to 'world citizenship'.



Assessment Standards

We know this when the learner is able to:

- Display an awareness of human rights.

- Demonstrate entrepreneurship by sharing ideas about the marketing of products.

Grade 11



Assessment Standards

We know this when the learner is able to:

- Display an awareness of human rights and access regarding non-discriminatory access to employment.
- Explain entrepreneurial opportunities in the field of Electrical Technology.
- Discuss how different cultures locally and around the world respond to technological change and its influence on the environment.

Grade 12



Assessment Standards

We know this when the learner is able to:

- Display an awareness of human rights and access regarding non-discriminatory access to employment.
- Apply the competencies required by entrepreneurs.
- Discuss the impact of globalisation on national economies and the environment.



CONTENT AND CONTEXTS FOR THE ATTAINMENT OF ASSESSMENT STANDARDS

In this section content and contexts are provided to support the attainment of the Assessment Standards. The content indicated needs to be dealt with in such a way as to assist the learner to progress towards the achievement of the Learning Outcomes. Content must serve the Learning Outcomes and not be an end in itself. The contexts suggested will enable the content to be embedded in situations which are meaningful to the learner and so assist learning and teaching. The teacher should be aware of and use local contexts, not necessarily indicated here, which could be more suited to the experiences of the learner. Content and context, when aligned to the attainment of the Assessment Standards, provide a framework for the development of Learning Programmes. The Electrical Technology Learning Programme Guidelines give more detail in this respect.

Note: Practical and theoretical competence must be integrated.

Grade 10



Learning Outcome 1

Technological Processes and Communication

The learner is able to understand and apply technological processes related to Electrical Technology ethically and responsibly, and to communicate the findings through the use of appropriate terminology and communication methods.

Proposed content

- Description of the technological processes (identifying problems, designing, making and evaluating).
- Description of terminology applicable to electrical technology.
- Effective communication using a variety of media.

Grade 11



Proposed content

- Identification of the technological processes (defining problems, designing, making and evaluating).
- Correct use of relevant terminology in electrical technology.
- Preparation of written reports.

Grade 12



Proposed content

- Application of the technological processes (analysing and explaining problems, designing, making and evaluating).
- Application of relevant terminology in electrical technology.
- Presentation of reports.



Learning Outcome 2

Principles and Practices

The learner is able to demonstrate an understanding of the concepts, principles and practices related to Electrical Technology by organising and managing own activities responsibly and effectively considering the interrelatedness of systems as a context for problem solving.

Proposed content

- Understanding the Occupational Health and Safety Act.
- Identification of health hazards and HIV/AIDS.
- Explanation of the functions of basic workshop tools and equipment.
- Identification of different types of measuring instruments.
- Understanding the principles of magnetism and electricity.

- Explanation of the sources and principles of operation, use and maintenance of power supply, including rectification.
- Explanation of installation techniques for wire ways, including cable selection.

- Understanding the components used in domestic appliances, including their function.
- Understanding lighting systems and luminaries.
- Understanding a variety of protection devices.

Grade 11



Proposed content

- Analysis of the Occupational Health and Safety Act and regulations.
- Description of health hazards and HIV/AIDS.
- Measuring instruments and their correct application and use to ensure accurate readings.
- Explanation of the theory and principles of single-phase alternating current on a series RLC circuits.
- Explanation of the principles of alternating current generation and power supply.
- Explanation of the operating principles of single-phase motors.
- Application of the principles used in the installation, testing, and repair of domestic appliances.
- Maintenance of lighting systems and luminaries.
- Explanation of the principles of operation of a variety of protection devices.

Grade 12



Proposed content

- Application of the Occupational Health and Safety Act and regulations.
- Application of safety measures to prevent health hazards and HIV/AIDS.
- Typical calculations with measuring instruments and precision equipment.
- Understanding of the theory and principles of three-phase alternating current systems, including the effects of AC on RLC series and parallel circuits.
- Understanding the theory and principles used in the construction and application of power supplies, including voltage regulation methods.
- Understanding of the operating principle of AC motors, including control.
- Application of the principles of operation of a variety of protection devices, including their relationship to earthing methods.



Learning Outcome 2 Continued

Principles and Practices

The learner is able to demonstrate an understanding of the concepts, principles and practices related to Electrical Technology by organising and managing own activities responsibly and effectively considering the interrelatedness of systems as a context for problem solving.

Proposed content

- Understanding basic electronics and logic systems.
- Understanding the principles of electronic communication systems.

Grade 11



Proposed content

- Understanding the principles and operation of semiconductor devices and logic systems.
- Understanding the principles of AM/FM radio systems.
- Understanding and application of the operating principles of amplifier circuits.

Grade 12



Proposed content

- Analysis and application of the principles and operation of semiconductor devices and logic systems.
- Application of the operating principles of electronic communication systems, including block diagrams.
- Understanding the operating principles of amplifiers, including both operational and audio amplifiers, with consideration of feedback effects.
- Application of the working principles of switching and control circuits, including circuit diagrams.
- Understanding the operating principles of oscillator circuits.
- Understanding the operating principles of adder circuits, including block diagrams.
- Application of the working principles of a programmable logic controller (PLC).
- Application of the working principles of anti-intrusion systems, including block diagrams.



Learning Outcome 3

Society, Technology and the Environment

The learner is able to adapt and deal with changing job markets, consumer attitudes and international benchmarking related to Electrical Technology, through critical engagement with social, economic and environmental influences, in order to progress to 'world citizenship'.

Proposed content

- Understanding human rights, inclusivity issues and issues relating to indigenous knowledge systems.
- Understanding the principles of entrepreneurial activity.

Grade 11



Proposed content

- Identification of human rights, inclusivity issues and issues related to indigenous knowledge systems.
- Investigating the entrepreneurial opportunities related to Electrical Technology.
- Explanation of the impact of technological changes on different cultures both locally and internationally.

Grade 12



Proposed content

- Application of human rights, inclusivity issues and indigenous knowledge systems in the context of Electrical Technology.
- Application of entrepreneurial principles to enhance the economy.
- Understanding the impact of globalisation patterns on national economics.

CHAPTER 4

ASSESSMENT

INTRODUCTION

Assessment is a critical element of the National Curriculum Statement Grades 10 – 12 (General). It is a process of collecting and interpreting evidence in order to determine the learner's progress in learning and to make a judgement about a learner's performance. Evidence can be collected at different times and places, and with the use of various methods, instruments, modes and media.

To ensure that assessment results can be accessed and used for various purposes at a future date, the results have to be recorded. There are various approaches to recording learners' performances. Some of these are explored in this chapter. Others are dealt with in a more subject-specific manner in the Learning Programme Guidelines.

Many stakeholders have an interest in how learners perform in Grades 10 – 12. These include the learners themselves, parents, guardians, sponsors, provincial departments of education, the Department of Education, the Ministry of Education, employers, and higher education and training institutions. In order to facilitate access to learners' overall performances and to inferences on learners' competences, assessment results have to be reported. There are many ways of reporting. The Learning Programme Guidelines and the Assessment Guidelines discuss ways of recording and reporting on school-based and external assessment as well as giving guidance on assessment issues specific to the subject.

WHY ASSESS

Before a teacher assesses learners, it is crucial that the purposes of the assessment be clear and unambiguous. Understanding the purposes of assessment ensures that an appropriate match exists between the purposes and the methods of assessment. This, in turn, will help to ensure that decisions and conclusions based on the assessment are fair and appropriate for the particular purpose or purposes.

There are many reasons why learners' performance is assessed. These include monitoring progress and providing feedback, diagnosing or remediating barriers to learning, selection, guidance, supporting learning, certification and promotion.

In this curriculum, learning and assessment are very closely linked. Assessment helps learners to gauge the value of their learning. It gives them information about their own progress and enables them to take control of and to make decisions about their learning. In this sense, assessment provides information about whether teaching and learning is succeeding in getting closer to the specified Learning Outcomes. When assessment indicates lack of progress, teaching and learning plans should be changed accordingly.

TYPES OF ASSESSMENT

This section discusses the following types of assessment:

- baseline assessment;
- diagnostic assessment;
- formative assessment; and
- summative assessment.

Baseline assessment

Baseline assessment is important at the start of a grade, but can occur at the beginning of any learning cycle. It is used to establish what learners already know and can do. It helps in the planning of activities and in Learning Programme development. The recording of baseline assessment is usually informal.

Diagnostic assessment

Any assessment can be used for diagnostic purposes – that is, to discover the cause or causes of a learning barrier. Diagnostic assessment assists in deciding on support strategies or identifying the need for professional help or remediation. It acts as a checkpoint to help redefine the Learning Programme goals, or to discover what learning has not taken place so as to put intervention strategies in place.

Formative assessment

Any form of assessment that is used to give feedback to the learner is fulfilling a formative purpose. Formative assessment is a crucial element of teaching and learning. It monitors and supports the learning process. All stakeholders use this type of assessment to acquire information on the progress of learners. Constructive feedback is a vital component of assessment for formative purposes.

Summative assessment

When assessment is used to record a judgement of the competence or performance of the learner, it serves a summative purpose. Summative assessment gives a picture of a learner's competence or progress at any specific moment. It can occur at the end of a single learning activity, a unit, cycle, term, semester or year of learning. Summative assessment should be planned and a variety of assessment instruments and strategies should be used to enable learners to demonstrate competence.

WHAT SHOULD ASSESSMENT BE AND DO?

Assessment should:

- be understood by the learner and by the broader public;
- be clearly focused;
- be integrated with teaching and learning;
- be based on the pre-set criteria of the Assessment Standards;
- allow for expanded opportunities for learners;
- be learner-paced and fair; and
- be flexible;
- use a variety of instruments;
- use a variety of methods.

HOW TO ASSESS

Teachers' assessment of learners' performances must have a great degree of reliability. This means that teachers' judgements of learners' competences should be generalisable across different times, assessment items and markers. The judgements made through assessment should also show a great degree of validity; that is, they should be made on the aspects of learning that were assessed.

Because each assessment cannot be totally valid or reliable by itself, decisions on learner progress must be based on more than one assessment. This is the principle behind continuous assessment (CASS). Continuous assessment is a strategy that bases decisions about learning on a range of different assessment activities and events that happen at different times throughout the learning process. It involves assessment activities that are spread throughout the year, using various kinds of assessment instruments and methods such as tests, examinations, projects and assignments. Oral, written and performance assessments are included. The different pieces of evidence that learners produce as part of the continuous assessment process can be included in a portfolio. Different subjects have different requirements for what should be included in the portfolio. The Learning Programme Guidelines discuss these requirements further.

Continuous assessment is both classroom-based and school-based, and focuses on the ongoing manner in which assessment is integrated into the process of teaching and learning. Teachers get to know their learners through their day-to-day teaching, questioning, observation, and through interacting with the learners and watching them interact with one another.

Continuous assessment should be applied both to sections of the curriculum that are best assessed through written tests and assignments and those that are best assessed through other methods, such as by performance, using practical or spoken evidence of learning.

METHODS OF ASSESSMENT

Self-assessment

All Learning Outcomes and Assessment Standards are transparent. Learners know what is expected of them. Learners can, therefore, play an important part, through self-assessment, in ‘pre-assessing’ work before the teacher does the final assessment. Reflection on one’s own learning is a vital component of learning.

Peer assessment

Peer assessment, using a checklist or rubric, helps both the learners whose work is being assessed and the learners who are doing the assessment. The sharing of the criteria for assessment empowers learners to evaluate their own and others’ performances.

Group assessment

The ability to work effectively in groups is one of the Critical Outcomes. Assessing group work involves looking for evidence that the group of learners co-operate, assist one another, divide work, and combine individual contributions into a single composite assessable product. Group assessment looks at process as well as product. It involves assessing social skills, time management, resource management and group dynamics, as well as the output of the group.

METHODS OF COLLECTING ASSESSMENT EVIDENCE

There are various methods of collecting evidence. Some of these are discussed below.

Observation-based assessment

Observation-based assessment methods tend to be less structured and allow the development of a record of different kinds of evidence for different learners at different times. This kind of assessment is often based on tasks that require learners to interact with one another in pursuit of a common solution or product. Observation has to be intentional and should be conducted with the help of an appropriate observation instrument.

Test-based assessment

Test-based assessment is more structured, and enables teachers to gather the same evidence for all learners in

the same way and at the same time. This kind of assessment creates evidence of learning that is verified by a specific score. If used correctly, tests and examinations are an important part of the curriculum because they give good evidence of what has been learned.

Task-based assessment

Task-based or performance assessment methods aim to show whether learners can apply the skills and knowledge they have learned in unfamiliar contexts or in contexts outside of the classroom. Performance assessment also covers the practical components of subjects by determining how learners put theory into practice. The criteria, standards or rules by which the task will be assessed are described in rubrics or task checklists, and help the teacher to use professional judgement to assess each learner's performance.

RECORDING AND REPORTING

Recording and reporting involves the capturing of data collected during assessment so that it can be logically analysed and published in an accurate and understandable way.

Methods of recording

There are different methods of recording. It is often difficult to separate methods of recording from methods of evaluating learners' performances.

The following are examples of different types of recording instruments:

- rating scales;
- task lists or checklists; and
- rubrics.

Each is discussed below.

Rating scales

Rating scales are any marking system where a symbol (such as A or B) or a mark (such as 5/10 or 50%) is defined in detail to link the coded score to a description of the competences that are required to achieve that score. The detail is more important than the coded score in the process of teaching and learning, as it gives learners a much clearer idea of what has been achieved and where and why their learning has fallen short of the target. Traditional marking tended to use rating scales without the descriptive details, making it difficult to have a sense of the learners' strengths and weaknesses in terms of intended outcomes. A six-point scale of achievement is used in the National Curriculum Statement Grades 10 – 12 (General).

Task lists or checklists

Task lists or checklists consist of discrete statements describing the expected performance in a particular task. When a particular statement (criterion) on the checklist can be observed as having been satisfied by a learner during a performance, the statement is ticked off. All the statements that have been ticked off on the list (as criteria that have been met) describe the learner's performance. These checklists are very useful in peer or group assessment activities.

Rubrics

Rubrics are a combination of rating codes and descriptions of standards. They consist of a hierarchy of standards with benchmarks that describe the range of acceptable performance in each code band. Rubrics require teachers to know exactly what is required by the outcome. Rubrics can be holistic, giving a global picture of the standard required, or analytic, giving a clear picture of the distinct features that make up the criteria, or can combine both. The Learning Programme Guidelines give examples of subject-specific rubrics.

To design a rubric, a teacher has to decide the following:

- Which outcomes are being targeted?
- Which Assessment Standards are targeted by the task?
- What kind of evidence should be collected?
- What are the different parts of the performance that will be assessed?
- What different assessment instruments best suit each part of the task (such as the process and the product)?
- What knowledge should be evident?
- What skills should be applied or actions taken?
- What opportunities for expressing personal opinions, values or attitudes arise in the task and which of these should be assessed and how?
- Should one rubric target all the Learning Outcomes and Assessment Standards of the task or does the task need several rubrics?
- How many rubrics are, in fact, needed for the task?

It is crucial that a teacher shares the rubric or rubrics for the task with the learners before they do the required task. The rubric clarifies what both the learning and the performance should focus on. It becomes a powerful tool for self-assessment.

Reporting performance and achievement

Reporting performance and achievement informs all those involved with or interested in the learner's progress. Once the evidence has been collected and interpreted, teachers need to record a learner's achievements. Sufficient summative assessments need to be made so that a report can make a statement about the standard achieved by the learner.

The National Curriculum Statement Grades 10 – 12 (General) adopts a six-point scale of achievement. The scale is shown in Table 4.1.

Table 4.1 Scale of achievement for the National Curriculum Statement Grades 10 – 12 (General)

Rating Code	Description of Competence	Marks (%)
6	Outstanding	80-100
5	Meritorious	60-79
4	Satisfactory	50-59
3	Adequate	40-49
2	Partial	30-39
1	Inadequate	0-29

SUBJECT COMPETENCE DESCRIPTIONS

To assist with benchmarking the achievement of Learning Outcomes in Grades 10 – 12, subject competences have been described to distinguish the grade expectations of what learners must know and be able to achieve. Six levels of competence have been described for each subject for each grade. These descriptions will assist teachers to assess learners and place them in the correct rating. The descriptions summarise the Learning Outcomes and the Assessment Standards, and give the distinguishing features that fix the achievement for a particular rating. The various achievement levels and their corresponding percentage bands are as shown in Table 4.1.

In line with the principles and practice of outcomes-based assessment, all assessment – both school-based and external – should primarily be criterion-referenced. Marks could be used in evaluating specific assessment tasks, but the tasks should be assessed against rubrics instead of simply ticking correct answers and awarding marks in terms of the number of ticks. The statements of competence for a subject describe the minimum skills, knowledge, attitudes and values that a learner should demonstrate for achievement on each level of the rating scale.

When teachers/assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a particular outcome. The relevant Assessment Standard or Standards must be used when creating the rubric for assessing the task or question. The descriptions clearly indicate the minimum level of attainment for each category on the rating scale.

The competence descriptions for this subject appear at the end of this chapter.

PROMOTION

Promotion at Grade 10 and Grade 11 level will be based on internal assessment only, but must be based on the same conditions as those for the Further Education and Training Certificate. The requirements, conditions, and rules of combination and condonation are spelled out in the *Qualifications and Assessment Policy Framework for the Grades 10 – 12 (General)*.

WHAT REPORT CARDS SHOULD LOOK LIKE

There are many ways to structure a report card, but the simpler the report card the better, provided that all important information is included. Report cards should include information about a learner's overall progress, including the following:

- the learning achievement against outcomes;
- the learner's strengths;
- the support needed or provided where relevant;
- constructive feedback commenting on the performance in relation to the learner's previous performance and the requirements of the subject; and
- the learner's developmental progress in learning how to learn.

In addition, report cards should include the following:

- name of school;
- name of learner;
- learner's grade;
- year and term;
- space for signature of parent or guardian;
- signature of teacher and of principal;
- date;
- dates of closing and re-opening of school;
- school stamp; and
- school attendance profile of learner.

ASSESSMENT OF LEARNERS WHO EXPERIENCE BARRIERS TO LEARNING

The assessment of learners who experience any barriers to learning will be conducted in accordance with the recommended alternative and/or adaptive methods as stipulated in the *Qualifications and Assessment Policy Framework for Grades 10 – 12 (General)* as it relates to learners who experience barriers to learning. Refer to *White Paper 6 on Special Needs Education: Building an Inclusive Education and Training System*.



Code



Scale

6

80%-100%
Outstanding



Competence Descriptions

By the end of Grade 10 the learner with outstanding achievement can:

- independently analyse and apply the technological process to solve a problem in a real-life situation, taking cognisance of indigenous knowledge systems;
- independently illustrate basic safety methods including HIV/AIDS in the workplace;
- select, care for and use tools and measuring instruments critically;
- analyse the operation principle of electrical and electronic circuits and appliances;
- independently analyse human rights issues and entrepreneurship opportunities within the South African context.

Grade 11



Cd Competence Descriptions

By the end of Grade 11 the learner with outstanding achievement can:

- independently analyse and apply the technological process to solve a problem in a real-life situation, with recommendations using relevant technological terminology, taking cognisance of indigenous knowledge systems;
- independently apply and demonstrate safety methods including HIV/AIDS in the workplace;
- apply, care for and use measuring instruments critically;
- analyse the operation and installation principle of electrical and electronic circuits and appliances;
- independently analyse and interpret human rights issues and entrepreneurship opportunities within the South African context, taking into account environmental impact.

Grade 12



Cd Competence Descriptions

By the end of Grade 12 the learner with outstanding achievement can:

- identify, define, analyse and interpret the technological process to solve a problem in a real-life situation, with detailed explanations and recommendations using correct technological terminology, taking cognisance of indigenous knowledge systems;
- analyse safety methods including HIV/AIDS in the workplace, including precautionary measures;
- use a critical approach in the application, care of and use of measuring instruments;
- analyse the operation, installation and application principles of electrical and electronic circuits;
- analyse and interpret human rights and access to employment issues and entrepreneurship opportunities within the South African context, taking into account environmental impact.



Code



Scale

5

60%-79%
Meritorious



Competence Descriptions

By the end of Grade 10 the learner with meritorious achievement can:

- demonstrate and comprehensively apply the technological process to solve a problem in a real-life situation, taking cognisance of indigenous knowledge systems;
- demonstrate and comprehensively compare basic safety methods including HIV/AIDS in the workplace;
- select, care for and use tools and measuring instruments;
- demonstrate and compare the operation principle of electrical and electronic circuits and appliances;
- demonstrate and comprehensively compare issues of human rights and entrepreneurship opportunities within the South African context.

Grade 11


Cd Competence Descriptions

By the end of Grade 11 the learner with meritorious achievement can:

- identify and comprehensively define the technological process to solve a problem in a real-life situation, with recommendations using correct technological terminology, taking cognisance of indigenous knowledge systems;
- demonstrate safety methods including HIV/AIDS in the workplace;
- demonstrate the use of measuring instruments critically;
- demonstrate the operation and installation principle of electrical and electronic circuits and appliances;
- demonstrate an awareness of human rights issues and entrepreneurship opportunities within the South African context, taking into account environmental impact.

Grade 12


Cd Competence Descriptions

By the end of Grade 12 the learner with meritorious achievement can:

- identify and explain the technological process to solve a problem in a real-life situation, with detailed explanations and recommendations using correct technological terminology, taking cognisance of indigenous knowledge systems;
- apply and compare safety methods including HIV/AIDS in the workplace;
- use a critical approach in the application and comparison of measuring instruments;
- demonstrate the operation, installation and application principles of electrical and electronic circuits;
- categorises issues of human rights and access to employment and entrepreneurship opportunities within the South African context, taking into account environmental impact.



Code



Scale

4

**50%-59%
Satisfactory**



Competence Descriptions

By the end of Grade 10 the learner with satisfactory achievement can:

- explain the technological process to solve a problem in a real-life situation, taking cognisance of indigenous knowledge systems;
- explain basic safety methods including HIV/AIDS in the workplace;
- select, care for and use tools and measuring instruments;
- explain the operation principle of electrical and electronic circuits and appliances;
- explain human rights issues and entrepreneurship opportunities within the South African context.

Grade 11



Cd Competence Descriptions

By the end of Grade 11 the learner with satisfactory achievement can:

- define the technological process to solve a problem in a real-life situation, with recommendations using correct technological terminology, taking cognisance of indigenous knowledge systems;
- explain safety methods including HIV/AIDS in the workplace;
- explain the use of measuring instruments critically;
- explain the operation and installation principle of electrical and electronic circuits and appliances;
- explain issues of human rights and entrepreneurship opportunities within the South African context, taking into account environmental impact.

Grade 12



Cd Competence Descriptions

By the end of Grade 12 the learner with satisfactory achievement can:

- explain the technological process to solve a problem in a real-life situation, with explanations using technological terminology, taking cognisance of indigenous knowledge systems;
- apply and illustrate safety methods including HIV/AIDS in the workplace;
- demonstrate the operating principle of measuring instruments;
- explain the operation, installation and application principles of electrical and electronic circuits;
- compare issues of human rights and their influence on employment and entrepreneurship opportunities within the South African context, taking into account environmental impact.



Code



Scale

3

40%-49%
Adequate



Competence Descriptions

By the end of Grade 10 the learner with adequate achievement can:

- describe with minimal guidance the technological process required to solve a problem, taking cognisance of indigenous knowledge systems;
- describe with minimal guidance basic safety methods including HIV/AIDS in the workplace;
- select, care for and use tools and measuring instruments;
- describe with minimal guidance the operation principle of electrical and electronic circuits and appliances;
- describe human rights issues and entrepreneurship opportunities within the South African context.

Grade 11



Cd Competence Descriptions

By the end of Grade 11 the learner with adequate achievement can:

- describe the technological process to solve a problem in a real-life situation, using a variety of technological terminology and taking cognisance of indigenous knowledge systems;
- explain basic safety methods including HIV/AIDS in the workplace;
- explain the use of measuring instruments;
- describe the operation and installation principle of electrical and electronic circuits and appliances;
- describe human rights issues and entrepreneurship opportunities within the South African context, taking into account environmental impact.

Grade 12



Cd Competence Descriptions

By the end of Grade 12 the learner with adequate achievement can:

- identify and analyse the technological process to solve a problem in a real-life situation, with explanations using technological terminology, taking cognisance of indigenous knowledge systems;
- apply safety methods including HIV/AIDS in the workplace;
- explain the operating principle of measuring instruments;
- describe the operation, installation and application principles of electrical and electronic circuits;
- explain issues of human rights and their influence on employment and entrepreneurship opportunities within the South African context, taking into account environmental impact.



Code



Scale

2

30%-39%
Partial



Competence Descriptions

By the end of Grade 10 the learner with partial achievement can:

- describe with assistance the technological process to solve a problem, taking cognisance of indigenous knowledge systems;
- describe with assistance safety methods including HIV/AIDS in the workplace;
- select, care for and use tools and measuring instruments in a limited approach;
- describe with limited knowledge the operation principle of electrical and electronic circuits and appliances;
- describe with assistance issues of human rights and entrepreneurship opportunities within the South African context.

Grade 11


Cd Competence Descriptions

By the end of Grade 11 the learner with partial achievement can:

- identify and define the technological process to solve a problem in a real-life situation, using limited technological terminology and taking cognisance of indigenous knowledge systems, with little competence;
- describe only some basic safety methods including HIV/AIDS in the workplace;
- describe with limited knowledge the use of measuring instruments;
- describe with limited knowledge the basic operation and installation principle of electrical and electronic circuits and appliances;
- describe with little understanding human rights issues and entrepreneurship opportunities within the South African context, taking into account environmental impact.

Grade 12


Cd Competence Descriptions

By the end of Grade 12 the learner with partial achievement can:

- identify and analyse the technological process to solve a problem in a real-life situation with little understanding, using limited technological terminology and taking cognisance of indigenous knowledge systems;
- describe basic safety methods including HIV/AIDS in the workplace;
- describe the operating principle of measuring instruments;
- describe the operation, installation and application principles of electrical and electronic circuits;
- recognise some issues of human rights and their influence on employment and entrepreneurship opportunities within the South African context, taking into account environmental impact.



Code



Scale

1

**0%-29%
Inadequate**




Competence Descriptions

By the end of Grade 10 the learner with inadequate achievement can:

- describe with only a little or no knowledge the technological process to solve a problem, taking cognisance of indigenous knowledge systems;
- describe with only a little or no knowledge safety methods including HIV/AIDS in the workplace;
- describe with only a little or no knowledge the selection, care and use of tools and measuring instruments;
- describe with only a little or no knowledge the operation principle of electrical and electronic circuits and appliances;
- describe with only a little or no knowledge human rights issues and entrepreneurship opportunities within the South African context.


Grade 11


 Competence Descriptions

By the end of Grade 11 the learner with inadequate achievement can:

- identify the technological process to solve a problem in a real-life situation, using limited or no technological terminology and taking little or no cognisance of indigenous knowledge systems;
- describe only a few or no basic safety methods including HIV/AIDS in the workplace;
- describe with little or no knowledge the use of measuring instruments;
- describe with little or no knowledge the basic operation and installation principle of electrical and electronic circuits and appliances;
- describe limited human rights issues and entrepreneurship opportunities within the South African context;
- describe with limited understanding how technological change influences the lifestyle of different cultures and the environment.

Grade 12


 Competence Descriptions

By the end of Grade 12 the learner with inadequate achievement can:

- identify the technological process to solve a problem in a real-life situation with little or no understanding, using little or no technological terminology and taking cognisance of indigenous knowledge systems;
- describe few or no basic safety methods including HIV/AIDS in the workplace;
- describe with limited knowledge the operating principle of measuring instruments;
- describe with limited knowledge the operation, installation and application principles of electrical and electronic circuits;
- demonstrate with limited knowledge issues of human rights and their influence on employment and entrepreneurship opportunities within the South African context, taking into account environmental impact.

GLOSSARY

amplifier – a system where an input signal is altered (usually in amplitude)

amplitude modulation (AM) – a process of modulating the carrier wave in which the amplitude of the carrier wave is changed in sympathy with the modulating signal (information)

analogue – a system in which changing values are represented by a continuously variable electrical signal

anti-intrusion system – a system or technique used to monitor and prevent unlawful entry to premises by means of, for example, closed-circuit television, electric fencing, gate control, intercom system

astable – a circuit which has no stable condition, and which changes at a rate determined by circuit values

audio – relating to a system concerned with frequencies within the range of human hearing

base – one terminal of a transistor through which 2% of the supply current will flow

binary logic – an assembly of digital logic elements which operate with two distinct states

binary number – a number system to the base 2

bandwidth – the range of frequencies to which a system will respond in the required manner

bipolar-transistor – a transistor in which current is carried through the semiconductor both by holes and electrons; it is a current operated device

bistable – a circuit which can have two stable states, and which can remain in either state indefinitely

Boolean algebra – a system of formal logic used for minimising complex digital systems

capacitor – a component used in electronic circuits that has the ability to store electrical charge for a period of time

class A amplifier – a system of which the output is identical to the input in terms of frequency and shape but not in amplitude

class B amplifier – a system of which the output signal is altered in amplitude and shape representing half of the output signal

class C amplifier – a system of the output signal is altered in amplitude and shape to represent less than half of the input signal

collector – one terminal of a bipolar transistor through which 98% of the supply current will flow

conductor – a material through which an electric current can flow relatively easily

construction – encompasses the study of residential, commercial, industrial and recreational applications of Technology, including systems required to maintain and service them

conventional current – electric current, regarded as flowing from positive to negative

central processing unit (CPU) – the main number-processing and control section of a computer. In a microcomputer the CPU will be a microprocessor.

crystal – usually refers to quartz crystal, used as a precision timing element in many circuits; may refer to the term piezoelectric

Darlington pair – transistors used in cascade, giving high gain and high input impedance

decibel (dB) – one-tenth of a bell; a measure of power gain, on a logarithmic scale (e.g. a power level equal to 10 times the common logarithm of the ratio of the output power to the input power). The decibel is a convenient unit for representing a very large range of power gain.

delta network – a combination of three components connected to form a triangular configuration like the Greek letter delta; also known as a mesh connection

demodulation – the process of recovery of a modulating signal from a modulated carrier

design – includes the study of a variety of basic design processes that are used in solving technological challenges

diac – a bi-directional breakover diode; often used for triggering a triac

digital electronics – the branch of electronics concerned with the processing of digital systems, usually in binary

diode – a component, either semiconductor or thermionic, that permits current to flow through it in one direction only

electronflow – regarded as the flow of electrons from negative to positive

emitter – one terminal of a bipolar transistor through which 100% of the supply current will flow

energy – focuses on domestic, industrial, generation and transmission services

farad – unit of capacitance; a very large unit, the largest practical unit being the microfarad

fibre-optic – a glass or plastic fibre used for the transmission of information through light

field-effect transistor – a type of transistor characterised by a very high input resistance that is a voltage-operated device

flip-flop – general term for a **bistable**, **astable** or **monostable** circuit

frequency – the number of complete repetitions of a wave form in one second, expressed in Hertz

gain – the factor by which the output of a system exceeds the input

gate – a component in a digital logic circuit or one terminal of a field-effect transistor, or other semiconductor device

henry – unit of inductance

integrated circuit – an electronic system, or part of a system, produced on a silicon chip using microelectronic techniques

impedance – the ratio of the voltage applied to a circuit to the current flowing in the circuit; similar to resistance, but applicable to alternating currents and voltages

insulator – a material through which electric current will not easily flow

Karnaugh mapping – a visual technique used in the planning of digital systems for the minimisation of logic circuits

liquid crystal display (LCD) – a reflective display used in digital systems for the presentation of output; characterised by a very low power consumption

light-emitting diode (LED) – an electronic component in which electric current is converted directly into visible or infrared light

logic – the basic principles and applications of truth tables, interconnections of on/off circuit elements, and other factors involved in mathematical computation in a computer; also used as a general term for various types of **gates**, **flip-flops**, and other on/off circuits used to perform problem-solving functions in a digital computer

manufacturing and materials – product design, process and production planning, raw materials, manufacturing processes and quality control

microcomputer – a computer in which the central processing unit is a microprocessor

microprocessor – a central processing unit constructed using large-scale integration in which all the CPU circuits are fitted into a single integrated circuit

modulation – variation of the frequency, phase or magnitude of a high frequency waveform in accordance with a waveform of lower frequency

monostable – a circuit with a single stable state

multimeter – a general-purpose measuring instrument, usually able to measure resistance, current and voltage

negative feedback – feedback applied to a system in such a way that it tends to reduce the output

NPN – one of the two alternative types of bipolar transistors

ohm – the unit of resistance (Ω)

operational amplifier – a highly stable, **gain**, DC amplifier, usually produced as a single integrated circuit

opto-electronics – electronic systems or devices that involve the use of light

oscillator – an electronic system that produces a regular periodic output

oscilloscope – an instrument for displaying electrical waveforms on a cathode ray tube

photo-resistor – also known as an LDR (light-dependent resistor); a resistor whose value depends upon the amount of light falling on it

piezoelectric effect – the direct conversion of electrical to mechanical energy or vice versa in some crystalline materials

programmable logic controller (PLC) – a control device, normally used in industrial control applications, that employs the hardware architecture of a computer and a programming language

PNP – one of the two alternative types of bipolar transistor

power supply – source of electrical energy

positive feedback – feedback applied to a system in such a way that it tends to increase the output

protective device – a particular type of equipment used in electric power systems to detect abnormal conditions and to initiate appropriate corrective action

rectification – the process of changing an alternating current to a unidirectional current

relay – an electromechanical device in which an electric current controls a switch

resistance – the property of a material that resists the flow of electrical current

speaker – an electromechanical device for converting electrical energy into sound (e.g. a loudspeaker)

star network – a set of three or more branches with one terminal of each connected at a common node to give the form of a star; also known as a Y connection

technological process – the identification, design, development and evaluation of processes and products related to Electrical Technology

thyristor – a component similar to a semiconductor diode but having in addition a gate connection by which the component, normally non-conducting, can be triggered into conduction

tolerance – generally the amount by which a specified component value can vary from the marked value

triac – a semiconductor component similar to the **thyristor** but which will conduct in either direction

uni-junction transistor – a semiconductor device used in some oscillators

voltage regulation – a process to maintain the terminal voltage within required limits despite variations in input voltage or load

wavelength – the physical distance between two similar and successive points on an alternating wave

zener diode – a semiconductor **diode**, used for voltage regulation. When the zener diode is reverse-biased, it exhibits a sudden increase in conductivity at a certain specific voltage

