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NATIONAL CURRICULUM STATEMENT GRADES 10-12 (GENERAL)

LEARNING PROGRAMME GUIDELINES

CIVIL TECHNOLOGY

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SECTION 1

INTRODUCTION

1.1 INTRODUCING THE NATIONAL CURRICULUM STATEMENT

1.1.1 BACKGROUND

In 1995 the South African government began the process of developing a new curriculum for the school system. There were two imperatives for this. First, the scale of change in the world, the growth and development of knowledge and technology and the demands of the 21st Century required learners to be exposed to different and higher level skills and knowledge than those required by the existing South African curricula. Second, South Africa had changed. The curricula for schools therefore required revision to reflect new values and principles, especially those of the Constitution of South Africa.

The first version of the new curriculum for the General Education Band, known as Curriculum 2005, was introduced into the Foundation Phase in 1997. While there was much to commend the curriculum, the concerns of teachers led to a review of the Curriculum in 1999. The review of Curriculum 2005 provides the basis for the development of the National Curriculum Statement for General Education and Training (Grades R-9) and the National Curriculum Statement for Grades 10-12.

1.1.2 THE NATIONAL CURRICULUM STATEMENT

The National Curriculum Statement consists of 29 subjects. Subject specialists developed the Subject Statements which make up the National Curriculum Statement. The draft versions of the Subject Statements were published for comment in 2001 and then re-worked to take account of the comments received. In 2002 twenty-four subject statements and an overview document were declared policy through Government Gazette. In 2004 five subjects were added to the National Curriculum Statement. The National Curriculum Statement now consists of the Subject Statements for the following subjects:

- Languages – 11 official languages (each counted as three subjects to cater for the three levels Home Language, First Additional Language and Second Additional Language); 13 non-official languages

- Mathematics; Mathematical Literacy; Physical Sciences; Life Sciences; Computer Applications Technology; Information Technology

- Accounting; Business Studies; Economics

- Geography; History; Life Orientation; Religion Studies

- Consumer Studies; Hospitality Studies; Tourism

- Dramatic Arts; Dance Studies; Design; Music; Visual Arts

- Agricultural Sciences, Agricultural Management Practices, Agricultural Technology

- Civil Technology; Mechanical Technology; Electrical Technology; Engineering Graphics and Design

1.1.3 NATIONAL SENIOR CERTIFICATE

The *National Senior Certificate: A Qualification on Level 4 of the National Qualifications Framework (NQF)* provides the requirements for promotion at the end of Grades 10 and 11 and the awarding of the National Senior Certificate at the end of Grade 12. This document replaces two of the original National Curriculum Statement documents: the *Overview* and the *Qualifications and Assessment Policy Framework.*

1.1.4 SUBJECT ASSESSMENT GUIDELINES

The Subject Assessment Guidelines set out the internal or school-based assessment requirements for each subject and the external assessment requirements. In addition, the *National Protocol for Recording and Reporting (Grades R-12)* (an addendum to the policy, *The National Senior Certificate*) has been developed to standardise the recording and reporting procedures for Grades R to 12. This protocol came into effect on 1 January 2007.

1.2 INTRODUCING THE LEARNING PROGRAMME GUIDELINES

1.2.1 PURPOSE AND CONTENT OF THE LEARNING PROGRAMME GUIDELINES

The Learning Programme Guidelines aim to assist teachers and schools in their planning for the introduction of the National Curriculum Statement. The Learning Programme Guidelines should be read in conjunction with the National Senior Certificate policy and the National Curriculum Statement Subject Statements.

Section 2 of the Learning Programme Guidelines suggests how teaching the particular subject may be informed by the principles which underpin the National Curriculum Statement.

Section 3 suggests how schools and teachers might plan for the introduction of the National Curriculum Statement. The Department of Education encourages careful planning to ensure that the high skills, high knowledge goals of the National Curriculum Statement are attained.

The Learning Programme Guidelines do not include sections on assessment. The assessment requirements for each subject are provided in the Subject Assessment Guidelines which come into effect on 1 January 2008.

1.2.2 WHAT IS A LEARNING PROGRAMME

INTRODUCTION

A Learning Programme assists teachers to plan for sequenced learning, teaching and assessment in Grades 10 to 12 so that all Learning Outcomes in a subject are achieved in a progressive manner. The following three phases of planning are recommended:

- Phase 1 – develop a *Subject Framework* for grades 10 to 12

- Phase 2 – develop a *Work Schedule* for each grade

- Phase 3 – develop *Lesson Plans*

It is recommended that the teachers of a subject at a school or cluster of schools first put together a broad subject outline (Subject Framework) for the three grades to arrive at an understanding of the content of the subject and the progression which needs to take place across the grades (see Section 3.3.1). This will assist with the demarcation of content for each grade. Thereafter, teachers of the subject teaching the same grade need to work together to develop a year long Work Schedule. The Work Schedule should indicate the sequence in which the content and context will be presented for the subject in that particular grade (see Section 3.3.2). Finally, individual teachers should design Lesson Plans using the grade-specific Work Schedule as the starting point. The Lesson Plans should include learning, teaching and assessment activities that reflect the Learning Outcomes and Assessment Standards set out in the Subject Statements (see Section 3.3.3). Learning Programmes should accommodate diversity in schools and classrooms but reflect the core content of the national curriculum.

An outline of the process involved in the design of a Learning Programme is provided on page 6.

DESIGNING A LEARNING PROGRAMME

A detailed description of the process involved in the design of a Learning Programme is provided in Sections 3.3.1 – 3.3.3 of the Learning Programme Guidelines. The first stage, the development of a Subject Framework does not require a written document but teachers are strongly advised to spend time with subject experts in developing a deep understanding of the skills, knowledge and values set out in the Subject Statements. The quality and rigour of this engagement will determine the quality of teaching and learning in the classroom.

Once the Subject Framework has been completed, teachers should develop Work Schedules and Lesson Plans. Examples of Work Schedules and Lesson Plans are provided in the Learning Programme Guidelines. Teachers are encouraged to critically engage with these formats and develop their own.

Developing a Subject Framework (Grades 10-12)

Planning for the teaching of subjects in Grades 10 to 12 should begin with a detailed examination of the scope of the subject as set out in the Subject Statement. No particular format or template is recommended for this first phase of planning but the steps recommended should be used as a checklist.

Although no prescribed document is required for this stage of planning, school-wide planning (timetables, requisitioning, teacher development, classroom allocation) as well as the development of grade-specific work schedules would benefit from short documents which spell out:

- The scope of the subject – the knowledge, skills and values; the content; the contexts or themes; electives etc. to be covered in the three grades for each subject
- A three-year assessment plan for the subject
- The list of LTSM required for the subject

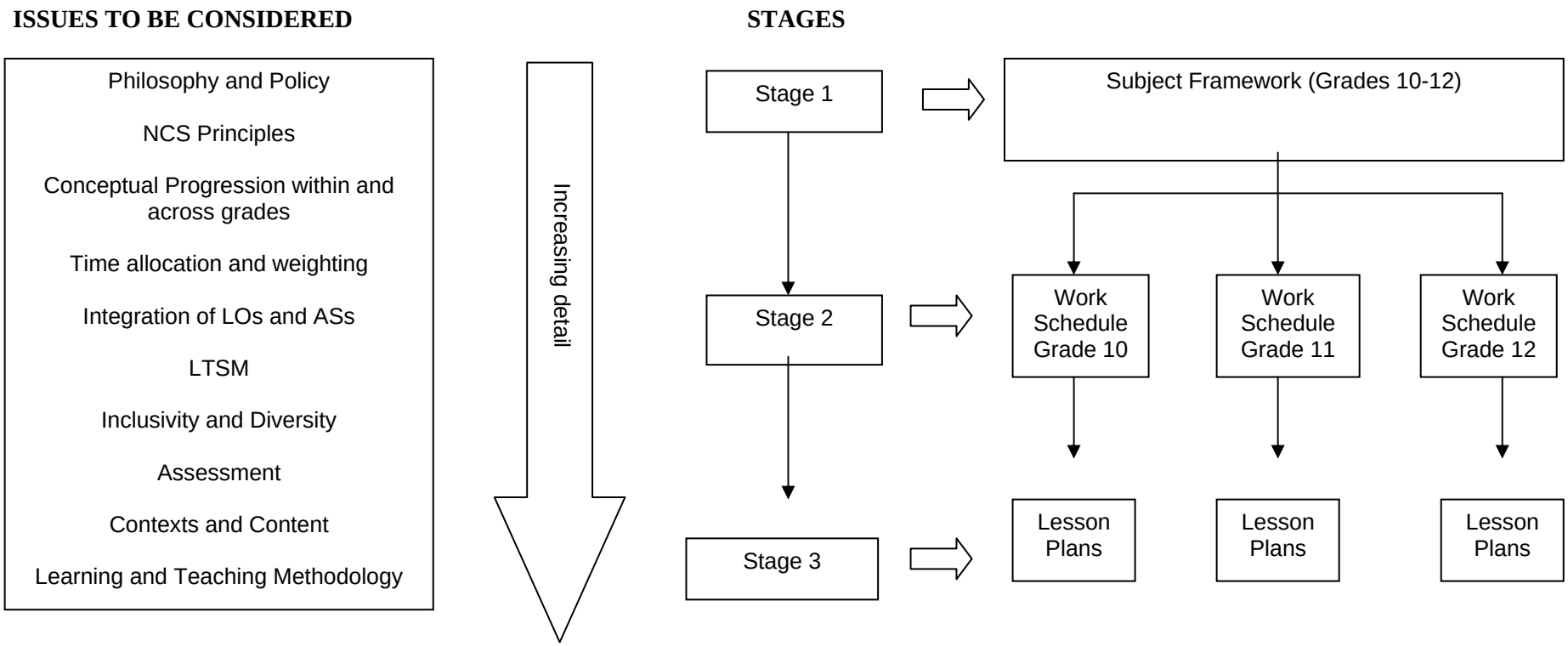
Designing Work Schedules

This is the second phase in the design of a Learning Programme. In this phase teachers develop Work Schedules for each grade. The Work Schedules are informed by the planning undertaken for the Subject Framework. The Work Schedules should be carefully prepared documents that reflect what teaching and assessment will take place in the 36-40 weeks of the school year.

Designing Lesson Plans

Each grade-specific Work Schedule must be divided into units of deliverable learning experiences, that is, Lesson Plans. Lesson Plans are not equivalent to periods in the school timetable. Each Lesson Plan should contain a coherent series of teaching, learning and assessment activities. A Lesson Plan adds to the level of detail for each issue addressed in the Work Schedule. It also indicates other relevant issues to be considered when teaching and assessing a subject.

FIGURE 1: RELATIONSHIP BETWEEN THE 3 STAGES OF PLANNING WHEN DEVELOPING A LEARNING PROGRAMME



SECTION 2

INTRODUCING CIVIL TECHNOLOGY

2.1 WHAT IS CIVIL TECHNOLOGY?

Civil Engineering and the related professions such as architecture, building and quantity surveying, collectively known as the Built Environment, are the basis on which the modern world was founded. It is through these professions that essential services such as roads, bridges, purified water, water-borne sewage, railway lines, high rise buildings, factories and housing are provided. The subject Civil Technology aims to create an awareness of these in learners and society.

Civil Technology focuses on concepts and principles in the Built Environment, as well as on the technological process. It embraces practical skills and the application of scientific principles. This subject creates and improves the Built Environment in a way that enhances the quality of life of the individual and society and ensures sustainable use of the natural environment.

Civil Technology falls in the Engineering and Technology learning field and gives learners the opportunity to solve problems by practically carrying out simulations and doing real-life projects using a variety of processes and skills.

The four Learning Outcomes for Civil Technology are as follows:

LO 1: Technology, Society and the Environment	The learner is able to demonstrate an awareness and understanding of the interrelationship between Technology, society and the environment.
LO 2: Technological Process	Learners develop the skill to identify, investigate, design, make and evaluate processes and products and/or projects related to Civil Technology and to communicate the findings through the use of appropriate terminology and a variety of communication media.
LO 3: Knowledge and understanding	The learner is able to demonstrate an understanding of the knowledge, principles and concepts used in Civil Technology
LO 4 : Application of knowledge	The learner is able to demonstrate and apply the concepts, principles and practices related to Civil Technology by organising and managing activities responsibly and effectively.

The new subject Civil Technology is based on the following NATED 550 subjects: Building Construction, Bricklaying and Plastering, Woodwork, Woodworking, Technika Civil, Plumbing and Sheet Metalwork.

Civil Technology is a vibrant new subject. While it has its roots in the above-mentioned NATED 550 subjects, the emphasis is on the Technological process, which builds on the technological literacy achieved in the Grades R-9. The focus has shifted from gaining knowledge and practical skills to the integration of high knowledge and high skills, concentrating on the principles and concepts embedded in Civil Technology. The Technological Process is the rationale and driving force behind this subject. Creativity, innovation and ingenuity play a major role in developing the learners' full potential in this field.

2.2 WHAT IS THE PURPOSE OF CIVIL TECHNOLOGY?

Civil Technology will expose learners to knowledge, skills, values and attitudes relevant to construction processes, life and environmental sustainability. It takes cognisance of and relates to the Critical and Developmental Outcomes by teaching learners to:

- understand the social contribution of Civil Technology to improving quality of life, the promotion of human rights, economic growth, entrepreneurship, sustainability, and to providing solutions that are responsive to individual and community needs;
- understand the ethical considerations, values and attitudes, which relate to Civil Technology;
- use technology effectively and critically showing responsibility towards the environment and the health of others, with particular reference to sustainability, understanding and managing the impact of Civil Technology on natural resources, cultural values and socio-economic development;
- identify and solve problems in the Built Environment and make decisions using critical, economical and creative thinking;
- collect, analyse, organise, critically evaluate and present information;
- communicate effectively using various modes;
- demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation;
- participate as responsible citizens in the life of local, national, and global communities;
- demonstrate the integration between theoretical knowledge and practical skills, enhancing dexterity and technique;
- take into account indigenous knowledge systems (IKS) and
- practise Civil Technology as an enjoyable and fulfilling life experience.

Learners are prepared for various career pathways and additional education and training opportunities by:

- developing entrepreneurial skills necessary for self–employment;
- exploring education and career opportunities to become a lifelong learner;
- learning to be sensitive to human and environmental issues; and
- being sensitive to the rights of others including those living with and affected by HIV/AIDS and learners with special educational needs.

2.3 WHAT IS THE RELATIONSHIP BETWEEN CIVIL TECHNOLOGY AND THE NATIONAL CURRICULUM STATEMENT PRINCIPLES?

The Constitution of the Republic of South Africa (Act 108 of 1996) provided a basis for curriculum transformation and development in South Africa.

The NCS Grades 10-12 (General) is based on the following principles:

2.3.1 Social transformation

The imperative to transform South African society through various transformative tools stems from a need to address the legacy of injustice in all areas of human activity, including the built environment and in education in particular.

Social transformation in education is aimed at ensuring that the educational imbalances of the past are addressed, 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. The participation of learners in decision making about the built environment ensures that they are active participants in the economy of the country.

2.3.2 Outcomes-Based Education

Civil Technology makes use of learning outcomes and assessment standards to describe what a learner should know and be able to demonstrate i.e. the skills, knowledge, and values that are the results of learning. Civil Technology encourages learners to develop inquiring and problem solving skills which support the practical application of knowledge in technology and involves active and high level teaching, learning and assessment.

2.3.3 High knowledge and high skills

Civil Technology aims at developing a high level of knowledge and skills in learners. It sets high expectations of what all South African learners can achieve. Social justice requires the empowerment of those sections of the population previously disempowered by a lack of knowledge and skills. Civil Technology specifies the minimum standards of knowledge and skills to be achieved at each grade and sets high, achievable standards in all fields. The emphasis on use and application of new technology ensures that high knowledge and high skill are not compromised in this subject.

2.3.4 Integration and applied competence

Civil Technology seeks to integrate theory, practice and reflection.

The following are some of the subjects that can be integrated with Civil Technology:

- Language – communication is key in Civil Technology
- Mathematics – there will always be a need for calculations and use of formulae in this subject
- Physical and Life Sciences – many concepts used in Civil Technology have their roots in the Physical and Life Sciences
- History – practices of years gone by hold value and lessons for Civil Technology
- Geography – climate and natural environments should inform the built environment.

2.3.5 Progression

Progression refers to the process of developing more advanced and complex knowledge and skills. The subject statement for Civil Technology shows 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 per grade. The content and context of each grade will show progression from simple to complex.

2.3.6 Articulation and Portability

Articulation refers to the Further Education and Training (FET) Band that links to the exit levels of the General Education and Training (GET) Band and the entrance levels of careers in the Built Environment in Higher Education and Training (HET).

Portability refers to the extent to which parts of the qualification (subjects or unit standards) are transferable to other qualifications in different learning pathways of the same NQF band.

2.3.7 Human Rights, Inclusivity, Environmental and Social Justice

Civil Technology seeks to promote human rights, social and environmental justice. It is sensitive to issues of diversity such as poverty, inequality, race, gender, language, age, disability and other factors. Civil Technology 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.

2.3.8 Valuing Indigenous Knowledge Systems

In the 1960s, the theory of multi-intelligences forced educationists to recognize 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 recognize the wide diversity of knowledge systems through which people make sense of and attach meaning to the world in which they live. The NCS Grades 10-12 (General) has infused IKS into the Subject Statements. It acknowledges the rich history of Civil Technology and heritage of this country as important contributors to the curriculum.

2.3.9 Credibility, quality and efficiency

Civil Technology aims to achieve credibility, quality and efficiency through pursuing a transformational agenda and providing an education that is comparable with other progressive countries. The curriculum, developed in consultation with local and international specialists, encapsulates the essence of progressive international thinking, adapted to South African conditions.

2.4 PROFILE OF A CIVIL TECHNOLOGY LEARNER ENTERING THE FURTHER EDUCATION AND TRAINING BAND.

Learners wishing to pursue a study of technology in the Built Environment and its use in a variety of situations are encouraged to take Civil Technology.

The learner, who chooses this subject, will do so for a variety of reasons, namely to:

- Pursue a career in the Built Environment;
- Acquire applied and transferable skills;
- Increase productivity levels;
- Complete a rounded education; and
- Acquire applied entrepreneurial skills.

The Civil Technology learner should demonstrate the following qualities to excel in the subject:

- Communication skills;
- Language proficiency;
- Scientific skills;
- Mathematical skills.
- Visual literacy;
- Fine psycho - motor skills;
- Logical and practical thinking skills;
- Creativity;

- Problem - solving skills;
- Willingness to learn and apply skills in different situations; and
- Willingness to engage in life long learning.

All four learning outcomes of Civil Technology have links with Learning Areas in the National Curriculum Statement for Grades R-9: Technology, Economic and Management Sciences, Mathematics, Languages, Life Orientation, Natural Sciences and Arts and Culture as illustrated in table 2.1 below.

Table 2.1 Links between the NCS Grades R-9 and the NCS Grades 10-12

Learning Areas in Grades R-9	NCS grades R-9 Learning Outcomes	NCS Grades 10-12 Civil Technology Learning Outcomes
Technology	1, 2 and 3	1,2, 3 and 4
Economic and Management Sciences	3	2 and 3
Mathematics	4 and 5	2 and 3
Languages	1, 2, 3, 4, 5 and 6	1, 2, 3 and 4
Life orientation	1, 2, 3, 4 and 5	1
Natural Sciences	1, 2 and 3	1, 2 and 3
Arts and Culture	1 and 4	2 and 3
Social Sciences	3	1,2 and 3

2.5 RELATIONSHIP BETWEEN THE CIVIL TECHNOLOGY LEARNING OUTCOMES AND THE CRITICAL- AND DEVELOPMENTAL OUTCOMES

The Critical and Developmental Outcomes can be regarded as fundamental to the aims of Civil Technology education in Grades 10-12. These outcomes enable learners to become technologically literate and sensitive across a range of social contexts.

The table below illustrates the relationship between the Critical and Developmental Outcomes, the Civil Technology Learning Outcomes as detailed in the NCS and possible application in developing Civil Technology skills, knowledge, values and attitudes.

Table: 2.2 Relationship between the Civil Technology Learning Outcomes and the Critical and Development Outcomes and their application in Civil Technology

CRITICAL AND DEVELOPMENT OUTCOMES	APPLICATION IN CIVIL TECHNOLOGY	CIVIL TECHNOLOGY LOs
Identify and solve problems and make decisions using critical and creative thinking.	Engage in creative, innovative thinking with the Technological process by solving problems, when conceptualising and realising a solution.	**1, 2, 3 and 4**
Work effectively with others as members of a team, group or organisation and community.	The Technological process often requires participants to work together which involves sharing of ideas, developing interviewing skills, democratic practices and ethical responsibilities.	**1, 2, 3 and 4**
Organise and manage themselves and their activities responsibly and effectively.	Civil Technology learners should learn to be self-disciplined and should be able to plan, organise and manage their work, keep to time schedules, be committed to the task and take responsibility for their actions.	**1, 2, 3 and 4**
Collect, analyse, organise and **critically evaluate** information.	Learners should be able to observe and record data in a variety of ways so that they are able to analyse, interpret and critically evaluate information and apply it in theory and practice of Civil Technology.	**1, 2, 3 and 4**
Communicate effectively using visual, symbolic and / or language skills in various modes.	Learners should be able to communicate through verbal, non-verbal and symbolic language forms that characterise the Technology field.	**1, 2, 3 and 4**
Use science and technology effectively and critically **showing responsibility** towards the environment and the health of others.	Civil Technology concepts and end products should show effective social, ethical and environmental responsibility.	**1, 2, 3 and 4**
Demonstrate an understanding of the world as a set of related systems by recognising that **problem solving contexts do not exist in isolation.**	Civil Technology enables learners to understand how their own problem-solving activities are influenced by, or may impact on, local, national and global contexts.	**1, 2, 3 and 4**
Reflect and explore a variety of strategies to learn more effectively.	Civil Technology combines theory with practice which enables learners to continually evaluate their knowledge and skills while at the same time supporting and enhancing teaching and learning.	**1, 2, 3 and 4**
Participate as **responsible citizens** in the life of local, national and global communities.	Learners develop responsibility towards their communities, locally, nationally and globally to understand the contribution of Civil Technology towards the development of a vibrant industry.	**1, 2, 3 and 4**
Be **culturally and aesthetically sensitive** across a range of social contexts.	Civil Technology can influence or be influenced by other cultures and has the potential to be a powerful agent for change, transformation and affirmation.	**1, 3 and 4**
Explore education and career opportunities.	The Civil Technology field offers a varied range of professional and vocational opportunities, which can enable learners to make a significant economic contribution to self and society through specific training.	**1, 3 and 4**
Develop **entrepreneurial** opportunities.	The Civil Technology field offers a varied range of professional and vocational opportunities through commitment to best practice, the ability to initiate, market and manage skills, processes and products.	**1, 2, 3 and 4**

2.6 WAYS TO ACHIEVE THE CIVIL TECHNOLOGY LEARNING OUTCOMES

2.6.1 Baseline Assessment

Learners should be assessed with the aim of establishing their prior knowledge before teaching content in Civil Technology.

2.6.2 Approach to Civil Technology

The National Curriculum Statement encourages active learning, problem solving, lateral thinking, critical reflection, decision-making, and working in groups or independently. These approaches are important for achieving the Learning Outcomes of Civil Technology.

Ongoing assessment allows learners and teachers the opportunity to continually reflect on the development and progression of SKVs over a period of time, through each grade and across Grades 10-12.

2.6.3 Every Learning Outcome should be achieved

It is important to note that the Learning Outcomes for Civil Technology are the same for all grades. Each Learning Outcome has its own number of Assessment Standards which give more detail with regard to content and context and application of such content. The Assessment Standards describe ways of achieving the Learning Outcomes. They have been crafted in such a way that there is a natural progression in the development of skills, processes, concepts, content knowledge and values within as well as across grades. The performance of learners in the learning outcomes is measured against the assessment standards. Each grade builds on the competencies developed in the previous grade.

2.6.4 Interrelationship of learning outcomes

All the Learning Outcomes are of equal importance but do not all have the same weighting in the allocation of time and resources. Learning Outcome 3 reflects knowledge and understanding, whilst Learning Outcome 4 deals with the application of this knowledge. These two Learning Outcomes and underpinned by Learning Outcome 1, which reflects the interrelationship of Technology, society and the environment and Learning Outcome 2, which outlines the technological process that is used as the organising concept.

The four Learning Outcomes are integrated and not presented in any specific order. They should not be considered sequential as each one supports and underpins each other. This approach supports and expands learners' opportunities to attain skills, acquire knowledge and develop values and attitudes across the curriculum.

2.6.5 Content within context

The Learning Outcomes are formulated in a manner that specifies the broad context in which content has to be dealt with. Context in this sense refers to cognitive context. For example, knowledge, understanding, application, analysis and evaluation, are all contexts specified in the four Learning Outcomes to deal with content. Assessment Standards give more detail.

Context has another dimension too. In terms of outcomes, context is indicated by words that come before or after a verb, phrase, statement, etc., helping to indicate a specific kind of presentation that is expected. For example, "define moments of a force ".

However, contrary to this general way of indicating context, cognitive context is always indicated by the verb in the sentence, for example ‘describe’, ‘explain’, ‘discuss’, ‘analyse’ and ‘evaluate’.

The cognitive context verbs are not all of a similar level of difficulty, and they can be staggered from least to most difficult. Such a staggering is generally known as taxonomy. Learners are accordingly required to deal with content in an increasingly more demanding manner. In other words the cognitive level required by the context specifications increases within grades and over grades. (This is evident in table 2.3 Content of Civil Technology, LO 3 of the NCS.)

The following taxonomy was designed by Bloom:

- Knowledge — memorize and recall information: arrange, define, label, list, outline and repeat order;
- Comprehension (understanding) — interpret information in one’s own words; describe, indicate, restate, review, summarize and classify;
- Application — apply knowledge to new situations: apply, calculate, draw, explain, identify, illustrate, prepare, operate, practice, solve, sketch and use;
- Analysis — breakdown knowledge into parts and show relationship among parts, analyses, categorize, compare, distinguish, discuss, examine, investigate and test;
- Synthesis — bring together parts of knowledge to form a whole; build relationships for new situation: arrange, compose, formulate, organize, plan, assemble and construct; and
- Evaluations — make judgments on basis of criteria: appraise, assess, comment on, critically analyse, evaluate, conclude, interrogate, judge, predict, compare and score.

Each one of the context words has a specific explanation. In the above taxonomy the explanations are listed next to context words. Following each explanation is a list of verbs. These verbs are used to illicit responses demonstrating the desired outcomes. For example, “appraise”, “assess”, “compare”, etc. can be used to present content in the “evaluation” context.

The teaching and learning activities should therefore provide learners with opportunities to acquire the intellectual skill to respond meaningfully to these words and thereby demonstrate achievement of the outcomes.

2.6.6 Resource materials

Textbooks, while essential to teaching Civil Technology, should not be considered as the only source of content. Other relevant resources such as newspapers, user manuals, magazines, journal articles, radio and television, other electronic media and Internet sites need to be incorporated into the content.

Learners must be encouraged to use their own initiative. Project-based learning, collaborative learning and group work need to be encouraged. Content needs to be selected in such a way that it encourages the development of creativity, critical thinking, research skills, reading proficiency and interpretation skills.

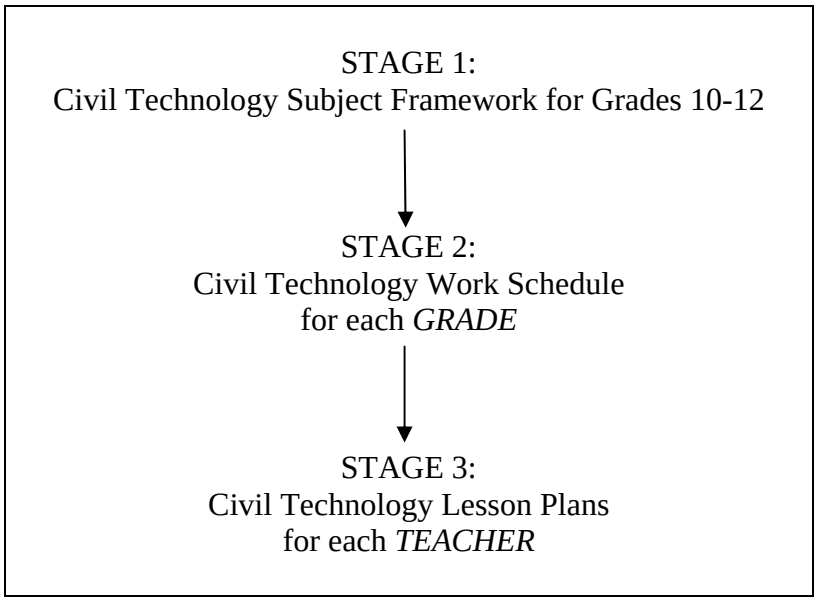
SECTION 3

DESIGNING A LEARNING PROGRAMME FOR CIVIL TECHNOLOGY

3.1 INTRODUCTION

A Learning Programme is a tool to plan for sequenced learning, teaching and assessment across Grades 10-12 so that all four Learning Outcomes in Civil Technology are achieved in a progressive manner. It is recommended that the Civil Technology teachers at a school first put together a broad subject outline (i.e. Subject Framework) for Grades 10-12 to arrive at an understanding of the progression which needs to take place across the grades (see Section 3.3.1). This will assist with the demarcation of content for each grade. Thereafter, Civil Technology teachers teaching the same grade need to work together and draw from the content and context identified for their grade in the Subject Framework, to develop a Work Schedule in which they indicate the sequence in which the content and context will be presented for Civil Technology in that particular grade (see Section 3.3.2). Finally, the individual Civil Technology teacher should design Lesson Plans using the grade-specific Work Schedule as the starting point. The Lesson Plans should include learning, teaching and assessment activities (see Section 3.3.3).

An outline of the process involved in the design of a Learning Programme for Civil Technology is provided in the diagram below:



The process to be followed in the development of a Learning Programme is not a neatly packaged sequence of numbered steps that follow one another in a particular order. Teachers may find themselves moving back and forth in the process as they plan and critically reflect on decisions taken before moving on to the next decision in the process. The process is therefore not strictly linear and is reflective in nature. For this reason the steps provided in this Section are a guide and should be used as a checklist in the planning process.

3.2 ISSUES TO ADDRESS WHEN DESIGNING A LEARNING PROGRAMME

The issues to be addressed in the development of a Civil Technology Learning Programme are presented in a tabular format to indicate the implications of each issue at each of the three stages of the development of a Learning Programme:

- Stage 1 – Subject Framework
- Stage 2 – Work Schedule
- Stage 3 – Lesson Plan

3.2.1 Policies and Principles

STAGE 1 Subject Framework **STAGE 2 Work Schedule** **STAGE 3 Lesson Plan**	The various Policies that impact on curriculum implementation should be considered throughout the planning process. *NCS:* • Principles: Refer to Section 2.3 to see how Civil Technology supports the application of the nine principles of the NCS • Critical and Developmental Outcomes: Refer to Section 2.5 to see how Civil Technology supports the application of the Critical and Developmental Outcomes *Other Policies and Legislation:* • White Paper 6, Language in Education Policy, Religion and Education Policy, HIV/AIDS Policy– all have implications for LTSM and teaching methods in Civil Technology • White Paper 7 – gives an indication on the use of computers in the classroom and therefore has implications for LTSM and teaching methods in Civil Technology

3.2.2 Content

In the NCS Grades 10-12 content means the combination of knowledge, skills and values.

STAGE 1 Subject Framework	The content is provided by the ASs. These give an indication of the knowledge, skills and values (KSVs) to be covered in each of the three grades. The Subject Framework sets out the content for the three years (i.e. Grades 10, 11 and 12).
STAGE 2 Work Schedule	The Work Schedule sets out the content for one year. Here the focus falls on the grade-specific KSVs required by the NCS.
STAGE 3 Lesson Plan	The Lesson Plans set out the content to be covered in each coherent series of learning, teaching and assessment activities. Each Lesson Plan can be one or more weeks in duration.

3.2.3 Integration

Integration involves the grouping of Assessment Standards according to natural and authentic links.

STAGE 1 Subject Framework	Integration within the subject should be considered in broad terms during discussions at this stage. All Grade 10-12 teachers should consider integration of ASs within and across the grades.
STAGE 2 Work Schedule	The integration and sequencing of the ASs is undertaken in the Work Schedule to ensure that all ASs for a particular grade are covered in the 40-week contact period.
STAGE 3 Lesson Plan	The same groupings of LOs and ASs as arrived at in the Work Schedule should be used to develop a coherent series of learning, teaching and assessment activities for each Lesson Plan.

3.2.4 Conceptual Progression

STAGE 1 Subject Framework	The Subject Framework should indicate the increasing depth of difficulty across Grades 10-12. Progression across the three grades is shown in the ASs per Learning Outcome.

STAGE 2 Work Schedule	Progression in a grade is evident in the increasing depth of difficulty in that particular grade. Grade-specific progression is achieved by appropriately sequencing the groupings of integrated LOs and AS in the Work Schedule.
STAGE 3 Lesson Plan	In the individual Civil Technology classroom increasing depth of difficulty is shown in the activities and Lesson Plans. Progression is achieved by appropriately sequencing the activities contained within each Lesson Plan and in the series of Lesson Plans.

3.2.5 Time Allocation and Weighting

STAGE 1 Subject Framework	4 hours per week is allocated to Civil Technology in the NCS. This is approximately 160 hours per year. The teachers of the subject should plan how this time will be used for the teaching of Civil Technology in the three grades.
STAGE 2 Work Schedule	The groupings of ASs as arrived at in the integration process should be paced across the 40 weeks of the school year to ensure coverage of the curriculum.
STAGE 3 Lesson Plan	The amount of time to be spent on activities should be indicated in the Lesson Plans.

3.2.6 LTSM

LTSM refers to any materials that facilitate learning and teaching. LTSM need to be chosen judiciously because they have cost implications for the school and the learner. The NCS provides scope for the use of a variety of resources. All teachers and learners must have a textbook. However, teachers are required to go beyond the textbook. They do not necessarily need exotic, specialised materials. Rather common and readily available items can be used.

STAGE 1 Subject Framework	Compile a list of general LTSM (text books and other resources) that will be necessary and useful in the teaching, learning and assessment of the content. This assists with the requisition and availability of LTSM at a school.
STAGE 2 Work Schedule	List grade-specific LTSM (resources) required in the learning, teaching and assessment process for the grade.
STAGE 3 Lesson Plan	Identify specific resources related to the individual activities contained within a Lesson Plan.

3.2.7 Assessment

All Grade 10, 11 and 12 learners are expected to complete seven internal tasks for Civil Technology. Of the seven tasks, two must be tests, two must be examinations and the remaining three tasks can take any form suitable to the teaching and assessment of Civil Technology – See Section 3 of the Subject Assessment Guidelines for Civil Technology.

In order to administer effective assessment one must have a clearly defined purpose. It is important that all the tasks are well covered as spelt out in the Subject Assessment Guideline document. By answering the following questions the teacher can decide what assessment activity is most appropriate:

- What concept, skill or knowledge needs to be assessed?
- What should the learners know?
- At what level should the learners be performing?
- What type of knowledge is being assessed: reasoning, memory or process?

Observation-based assessment requires that learner performance be assessed while the learner is actually performing a skill in the classroom as there will be no concrete product for the teacher to

assess after the performance. Not all observations need culminate in a formally recorded assessment of learner performance. **Performance-based** assessment relies on the availability of a product as evidence of learner performance that can be assessed by the teacher after the completion of the performance. **Test-based** assessment focuses on assessing the presentation and application of knowledge.

STAGE 1 Subject Framework	Develop a three-year assessment plan using the Subject Assessment Guidelines for Civil Technology. This should ensure the use of a variety of assessment forms relevant to the subject and progression across the three grades.
STAGE 2 Work Schedule	Use the Subject Assessment Guidelines for Civil Technology to develop a grade-specific assessment plan. The forms of assessment listed must facilitate the achievement of the particular LOs and ASs in each grouping.
STAGE 3 Lesson Plan	Indicate more classroom-specific assessment strategies, by mentioning the methods, forms and tools that will be used to assess learner performance in each activity. HINT: Not all activities need to be assessed – some may just be introductory in nature or for enrichment. The choice of an assessment strategy is determined by the LOs and ASs that have been grouped together for a particular Lesson Plan. The assessment strategy chosen must facilitate the achievement of these particular LOs and ASs in the classroom.

3.2.8 Inclusivity and Diversity

The following steps can be taken to effectively address diversity in the classroom when planning Civil Technology teaching activities:

- consider individual past experiences, learning styles and preferences;
- develop questions and activities that are aimed at different levels of ability;
- provide opportunity for a variety of participation levels such as individual, pairs and small group activities;
- consider the value of individual methods ; and
- assess learners based on individual progress.

STAGE 1 Subject Framework	Teachers should be sensitive to inclusivity and diversity when identifying content, teaching styles and methods, forms of assessment and LTSM (Resources). Diversity should be accommodated in the following areas:
STAGE 2 Work Schedule	• Learning styles: provide optional activities / different ways of doing same activity • Pace of learning: provide for both slower and faster learners by providing optional extra activities, reading or research, as well as multiple assessment opportunities • Differences in levels of achievement: provide optional extra activities, challenges and materials that cater for these differences between learners. • Gender diversity: ensure that teachers do not inadvertently allow or contribute towards discrimination against boys or girls in the classroom on the basis of gender. • Cultural diversity: recognise, celebrate and be sensitive when choosing content, assessment tasks and LTSM.
STAGE 3 Lesson Plan	This is catered for as EXPANDED OPPORTUNITIES in the Lesson Plan. Enrichment is provided for high achievers and remediation or other relevant opportunities for learners requiring additional support. It is not necessary to develop an activity to cater for each type of diversity which arises in the classroom. Teachers may find it possible to cater for different diversities within one activity with effective planning.

3.2.9 Learning and Teaching Methodology

STAGE 1 Subject Framework	It is not necessary to record Teaching Methods for either of these stages.
STAGE 2 Work Schedule	
STAGE 3 Lesson Plan	This is catered for as TEACHING METHOD in the Lesson Plan. It provides an indication of how teaching and learning will take place, that is, how each activity will be presented in the classroom.

3.3 DESIGNING A LEARNING PROGRAMME

A detailed description of the process involved in the design of a Learning Programme for Civil Technology is provided in this section (see Sections 3.3.1 – 3.3.3). The process presented here is a suggestion of how to go about designing a Learning Programme.

3.3.1 Subject Framework (Grades 10-12) for Civil Technology

Planning for the teaching of Civil Technology in Grades 10 to 12 should begin with a detailed examination of the scope of the subject as set out in the Subject Statement. No particular format or template is recommended for this first phase of planning but the five steps below should be used as a checklist.

Although no prescribed document is required for this stage of planning, school-wide planning (timetables, ordering, teacher development, classroom allocation) as well as the development of grade-specific work schedules would benefit from short documents which spell out:

- The scope of the subject – the knowledge, skills and values; the content; the contexts or themes; electives etc. to be covered in the three grades (see APPENDIX A)
- A three-year assessment plan
- The list of LTSM required

❶ Clarify the Learning Outcomes and Assessment Standards.

The essential question for Civil Technology is: What Learning Outcomes do learners have to master by the end of Grade 12 and what Assessment Standards should they achieve to show that they are on their way to mastering these outcomes?

All learning, teaching and assessment opportunities must be designed down from what learners should know, do and produce by the end of Grade 12. The Learning Outcomes and Assessment Standards that learners should master by the end of Grade 12 are specified in the Civil Technology Subject Statement.

❷ Study the conceptual progression across the three grades.

Study the Assessment Standards for Civil Technology across the three grades. Progression should be clearly evident across the grades.

❸ **Identify the content to be taught.**

Analyse the Assessment Standards to identify the skills, knowledge and values to be addressed in each grade. Also consider the content and context in which they will be taught.

❹ **Identify three-year plan of assessment.**

Use the Subject Assessment Guidelines to guide the three-year assessment plan. Consider what forms of assessment will be best suited to each of the Learning Outcomes and Assessment Standards. This ensures that assessment remains an integral part of the learning and teaching process in Civil Technology and that learners participate in a range of assessment activities.

❺ **Identify possible LTSM (resources).**

Consider which LTSM will be best suited to the learning, teaching and assessment of each Learning Outcome in the three grades using the Assessment Standards as guidance.

3.3.2 Designing Work Schedules for Civil Technology

This is the second phase in the design of a Learning Programme. In this phase teachers develop Work Schedules for each grade. The Work Schedules are informed by the planning undertaken for the Subject Framework. The Work Schedules should be carefully prepared documents that reflect what teaching and assessment will take place in the 40 weeks of the school year. See APPENDIX B for examples of Work Schedules.

The following steps provide guidelines on how to approach the design of a Work Schedule per grade for Civil Technology:

❶ **Package the content.**

Study the Learning Outcomes and Assessment Standards prescribed for the particular grade in Civil Technology and group these according to natural and authentic links.

❷ **Sequence the content.**

Determine the order in which the groupings of Learning Outcomes and Assessment Standards will be presented in the particular grade in Civil Technology. Besides the conceptual progression in the Assessment Standards for Civil Technology, *context* can also be used to sequence groupings in Civil Technology.

❸ **Pace the content.**

Determine how much time in the school year will be spent on each grouping of Learning Outcomes and Assessment Standards in the particular grade.

❹ **Review forms of assessment.**

Revisit the forms of assessment listed for the particular grade in the Subject Assessment Guidelines, and refine them to address each grouping of Learning Outcomes and Assessment Standards as developed in Step 1.

❺ Review LTSM.

Revisit the LTSM (resources) listed for the particular grade in the Subject Framework, and refine them to address each grouping of Learning Outcomes and Assessment Standards as developed in Step 1.

3.3.3 Designing Lesson Plans for Civil Technology

Each grade-specific Work Schedule for CIVIL TECHNOLOGY must be divided into units of deliverable learning experiences, that is, Lesson Plans. A Lesson Plan adds to the level of detail in the Work Schedule. It also indicates other relevant issues to be considered when teaching and assessing Civil Technology. See APPENDIX C for an example of a Lesson Plan.

A Lesson Plan is not equivalent to a subject period in the school timetable. Its duration is dictated by how long it takes to complete the coherent series of activities contained in it.

❶ Indicate the content, context, Learning Outcomes and Assessment Standards.

Copy this information from the Work Schedule for the particular grade.

❷ Develop activities and select teaching method.

Decide how to teach the Learning Outcomes and Assessment Standards indicated in Step 1 and develop the activity or activities that will facilitate the development of the skills, knowledge and values in the particular grouping. Thereafter, determine the most suitable teaching method(s) for the activities and provide a description of how the learners will engage in each activity.

❸ Consider diversity.

Explore the various options available within each activity that will allow expanded opportunities to those learners that require individual support. The support provided must ultimately guide learners to develop the skills, knowledge and values indicated in the grouping of Learning Outcomes and Assessment Standards.

❹ Review assessment and LTSM.

Indicate the details of the assessment strategy and LTSM to be used in each activity.

❺ Allocate time.

Give an indication of how much time will be spent on each activity in the Lesson Plan.

3.3.4 Reflection and review of the Civil Technology Learning Programme

After the Learning Programme has been delivered by means of Lesson Plans in the classroom, the teacher should reflect on what worked, how well it worked and what could be improved. Teachers need to note these while the experience is still fresh in their minds, so that if necessary, they can adapt and change the affected part of the Civil Technology Learning Programme for future implementation. It is advisable to record this reflection on the Lesson Plan planning sheets.

APPENDIX A: CONTENT FRAMEWORK FOR CIVIL TECHNOLOGY

Note:

- See the Defining Content and Context document for Civil Technology (Department of Education, 2006) for further guidance on the content to be addressed in Civil Technology.
- Practical and theoretical competence must be integrated in the teaching of Civil Technology.

Introduction to Civil Technology

- The organisation and administration of any building project is an essential part of the building process and it is important for the learners to know this process to give perspective to this learning area.
- The following guidelines should be considered:
  - Needs analysis.
  - Discuss the selection of a site.
  - Discuss the roles and positions of the members of the building team.
  - It is important that learners are be exposed to real life situations in the field and not only taught in the class room.
- **The above is applicable to all the grades and is an important guideline but will not be assessed.**

Grade 10	Grade 11	Grade 12
10.1 *LO 1, 2, 3, 4* **Safety** OHS/Personal safety in the work environment.	**11.1** *LO 1, 2, 3, 4* **Safety** OHS/Personal safety in the work environment.	**12.1** *LO 1, 2, 3, 4* **Safety** OHS/Personal safety in the work environment.
Personal safety ▪ Clothing ▪ Head protection ▪ Eye and ear protection ▪ Footwear **General safety** ▪ Hand tools ▪ Power tools **Safe storage of materials and good housekeeping** ▪ Site ▪ Workshop	**Personal safety** ▪ Clothing ▪ Head protection ▪ Eye and ear protection ▪ Footwear **General safety** ▪ Hand tools ▪ Power tools ▪ Construction machinery and site/workplace: o Excavations o Scaffolding o Handling of material o Floors and stairs with open sides o Builders hoist o Ladders ▪ Fire prevention and protection: o Types of fires o Fire extinguishers for specific types of fires o Fire triangle (Oxygen, heat and fuel) o Main causes of fire	**Personal safety** ▪ Clothing ▪ Head protection ▪ Eye and ear protection ▪ Footwear **General safety** ▪ Hand tools ▪ Power tools ▪ Construction machinery and workplace ▪ Safe site working methods ▪ Safe site planning and organisation
10.2 *LO 1, 2, 3, 4* **Materials**	**11.2** *LO 1, 2, 3, 4* **Materials**	**12.2** *LO 1, 2, 3, 4* **Materials**
The properties of materials used in the Built Environment ▪ Concrete and mortar: o The properties of the following materials used in concrete: fine aggregates, coarse aggregates, water, cement and lime ▪ Bricks: o Only the classification of	**The use of materials used in the Built Environment.** ▪ Blocks and block work: o Concrete blocks o Landscape blockwork. ▪ Metal: o Basic properties of ferrous metals such as: - cast iron - malleable iron	**The sustainability of materials according to their appropriate use and nature.**

Grade 10	Grade 11	Grade 12
bricks e.g. face bricks, common / stock bricks and purpose made bricks made of clay and concrete ▪ Wood (basic properties of hard and soft woods and board products) ▪ Metal: o Basic properties of ferrous metals such as - cast iron - malleable iron - steel - low/medium/high carbon steel - galvanized sheet metal o Basic properties of non-ferrous metals such as - Aluminium - Lead - Zinc - Copper - Tin ▪ Plastics (basic properties of thermo plastic and thermo-hardened plastics) ▪ Other materials: o Make learners aware of new materials on the market	- steel - low/medium/high carbon steel - galvanized sheet metal o Basic properties of non-ferrous metals such as: - Aluminium - Lead - Zinc - Copper - Tin ▪ Glass: o Sheet glass ▪ Other materials, e.g. window putty	
10.3 *LO 1, 2, 3, 4* **Equipment**	**11.3** *LO 1, 2, 3, 4* **Equipment**	**12.3** *LO 1, 2, 3, 4* **Equipment**
Use and care ▪ Use and care of hand tools, power tools and machinery: ▪ Basic equipment relevant to the excavation up to floor level including equipment not listed, but that will be used by learners when making projects ▪ Equipment to be dealt with in Grade 10: o Basic site equipment o Measuring and setting out tools o Bricklaying tools o Woodwork tools o Plumbing tools o Power tools o Small plant equipment o Other **Basic site equipment** ▪ Round shovel ▪ Concrete wheelbarrow ▪ Square shovel ▪ Spade ▪ Pick **Measuring and setting out tools** ▪ Steel tape measure ▪ Straight edge ▪ Building line ▪ Steel square (builders) ▪ Spirit level ▪ Dumpy level	**Use and care** ▪ Use and care of hand tools, power tools and machinery ▪ Equipment as dealt with in Grade 10 and add the following: o Plastering tools o Power tools **Plastering tools** ▪ Plastering trowel ▪ Hand hawk ▪ Block brush **Power tools** ▪ Portable electric circular saw ▪ Portable electric plane ▪ Rotor	**Use and care** ▪ Use and care of hand tools, power tools, specialized tools and machinery ▪ Equipment as dealt with in Grade 11 and add the following: o Specialised tools o Power tools **Specialised tools** ▪ Dumpy level (use dumpy level to determine datum points, slopes, distances etc.) **Power tools** ▪ Angle grinder

Grade 10	Grade 11	Grade 12
Bricklaying tools ▪ Brick trowel ▪ Float ▪ Line block ▪ Club hammer ▪ Brick hammer ▪ Bolster ▪ Cold chisel ▪ Long / short jointer **Woodwork tools** ▪ Try and metre square ▪ Sliding bevel ▪ Marking gauge ▪ Smooth / jack and trying plane ▪ Rip saw ▪ Cross cut saw ▪ Mortise chisel ▪ Wood rasp ▪ Files ▪ Cross pein and claw Hammer ▪ Screw drivers **Plumbing tools** ▪ Monkey wrench ▪ Shifting spanner ▪ Pipe cutter ▪ Hack saw **Power tools** ▪ Safe operation of machines. ▪ Power drill. **Small plant equipment** ▪ Plate compactor. ▪ Portable concrete vibrator. ▪ Concrete mixer. ▪ Portable electric hammer. **Other** ▪ Metal pegs.		
10.4 *LO 1, 2, 3, 4* **Graphics / communication**	**11.4** *LO 1, 2, 3, 4* **Graphics / communication**	**12.4** *LO 1, 2, 3, 4* **Graphics / communication**
▪ Introduction to graphics communication. ▪ Line work (Code of practice – SANS). ▪ Freehand sketching. ▪ Instruments and instrument drawings. ▪ Constructions. ▪ Application of various scales for specific purposes as stipulated in the SA Building regulations. ▪ Orthographic projection. ▪ Isometric views e.g. a brick. ▪ Introduction to CAD. ▪ Interpretation of a building plan of a basic single story dwelling. ▪ Interpretation of basic symbols relating to the built environment.	▪ Freehand sketching. ▪ Instrument drawings. ▪ Orthographic projection with sections: o Different elevations of a building. o Vertical sections indicating labelling and measurements according to the SANS for building drawings. ▪ Isometric views e.g. corner junction in stretcher bond showing three consecutive layers with a forth loose from the rest. ▪ CAD (Basic floor plan design).	▪ Instrument drawings. ▪ Orthographic projection with sections: o Different elevations of a building. o Vertical sections indicating labelling and measurements according to the SANS for building drawings. ▪ House plans: o Floor plan o Drainage plan o Site plan o Elevations o Descriptive notes. ▪ Basic designs to specifications ▪ CAD and electronic media

Grade 10	Grade 11	Grade 12
10.5 *LO 3,4* **Terminology**	**11.5** *LO 3,4* **Terminology**	**12.5** *LO 3,4* **Terminology**
▪ Select and use the correct terminology for construction, material, forces, equipment, measuring, systems, joining and graphics.	▪ Select and use the correct terminology for construction, material, forces, equipment, measuring, systems, joining and graphics.	▪ Select and use the correct terminology for construction, material, forces, equipment, measuring, systems, joining and graphics
10.6 *LO 2, 3* **Applied mechanics**	**11.6** *LO 2, 3* **Applied mechanics**	**12.6** *LO 2, 3* **Applied mechanics**
▪ Knowledge and understanding of SI units. ▪ The difference between mass and weight. ▪ Definition of mass, weight, Newton (unit of measurement), force, gravity, resultant, equilibrium, equilibrant, parallelogram of forces, triangle of forces and polygon of forces. ▪ Bow's notation. ▪ Graphically determine triangle and polygon of forces. ▪ Centre of gravity of simple regular shapes (supply formulae sheet to learners).	▪ Calculate moments, stress and strain of a beam (max 3 point loads). ▪ Determine the solutions, graphically for force diagrams. Apply Bow's notation. ▪ Beams: o Reactions at the supports o Point loads o Shear forces and bending moments o Calculations and diagrams of shear force and bending moments o Use the correct units and terminology. ▪ The modulus of elasticity. ▪ Centre of gravity (combined regular shapes). (Supply formulae sheet to learners.)	▪ Determine graphically the nature and magnitude for the different members in force diagrams of roof frames and structures (only vertical loads). ▪ Beams: o Reactions at the supports o Uniform Distributed Loads and point loads o Shear forces and bending moments o Calculations and diagrams of shear force and bending moments o Use the correct units and terminology. ▪ The modulus of elasticity. ▪ Centre of gravity (irregular shapes). (Supply formulae sheet to learners.)
10.7 *LO 1, 2, 3, 4* **Construction**	**11.7** *LO 1, 2, 3, 4* **Construction**	**12.7** *LO 1, 2, 3, 4* **Construction**
Concrete / Mortar	***Concrete / Plaster / Mortar***	***Concrete / Plaster / Mortar***
▪ Mix proportions of concrete, plaster and mortar (low, medium and high strength). ▪ Purpose of components of concrete, plaster, and mortar. ▪ Difference between mass and reinforced concrete. ▪ Simple floor slabs and curing of concrete. ▪ Tests on concrete: o Cube test o Slump test. **Foundations (strip)** ▪ Purpose ▪ Dimensions (SANS regulations) e.g. ½, 1, and 1½ brick walls. ▪ Trenches (Foundations) ▪ Timbering ▪ Mixing of concrete: o Equipment o Mixing area o Sequence of materials o Mixing o Setting times ▪ Placing of concrete: o Equipment o Compacting o Levelling	▪ Concrete: retaining walls. ▪ Beams, cantilever beams and columns. ▪ Function and position of reinforcement: o Requirements that materials used for reinforcing must comply with. o Show sectional views only. o Minimum concrete cover. o Form oils and emulsions. o Defects that can occur in concrete due to shuttering. ▪ Purpose application and skimming of plastering.	▪ Rib and block / Block and beam construction (or similar technique) for multi story floor slabs and roofs. ▪ Ready-mix concrete. ▪ Concrete stairs. ▪ Concrete floors: o Reinforcing in concrete floors ▪ Drywall construction. ▪ Tests on concrete and the purpose of each: o Slump test o Cube test.

Grade 10	Grade 11	Grade 12
Brickwork and Blockwork	***Brickwork and Blockwork***	***Brickwork and Blockwork***
▪ Half brick wall, one brick wall and one and a half brick wall (foundation walls). ▪ Function ▪ Types of bricks ▪ Mixing of mortar ▪ Stretcher bond: o T-junction o Corners ▪ Jointing	▪ Superstructure: from floor to roof height, including beam filling. ▪ Cavity walls: o Purpose o Advantages o Disadvantages o Construction detail ▪ English bond: o T–junction o Corners ▪ Doors and windows: o Setting up and securing door and window frames into brick walls. ▪ Lintels: o Purpose. o Pre-stressed concrete lintels. o Sizes available. ▪ Wall plates: o Purpose. o Positioning on walls. ▪ Wall ties: o Purpose o Positioning	▪ Arches: o semi circle o flat arch o rough arch o gauged arches ▪ Stonework: o Cladding - Artificial - Natural ▪ Cross junction
Waterproofing	***Waterproofing***	***Waterproofing***
▪ DPC (properties and types of materials used for damp coarse). ▪ Floors. ▪ Walls.	▪ Windows ▪ Doors ▪ Roofs	▪ Basements
Formwork	***Formwork***	***Formwork***
▪ Purpose of formwork ▪ Formwork	▪ Props ▪ Scaffolding and type of support	▪ Types of formwork ▪ Types of scaffolding ▪ Regulations
Excavations	***Excavations***	***Excavations***
▪ Terminology and introduction basic trench methods: o Choice of a building site. o Setting out of the building (3-4-5 method and setting up of profile boards). o Excavations in different types of soil (timbering of trenches in hard soil, firm soil, dry loose soil, loose wet soil).	▪ Shoring of deep trenches and basements.	▪ Piling ▪ Underpinning
Woodworking	***Woodworking***	***Woodworking***
▪ Types of wood; hard and soft wood (SA Pine, Saligna, and Meranti). ▪ Seasoning of timber: o Purpose o Natural seasoning. o Artificial seasoning. ▪ Marketable dimensions and terms of timber as used in the built environment.	▪ Wooden building components e.g. skirting, quarter round, ceilings, door and window frames, etc. ▪ Cutting list. ▪ Doors and windows (Use of door and window catalogues to select the desired product). ▪ Preservation.	▪ Layout of roof truss: o Different types ▪ Cutting list.

Grade 10	Grade 11	Grade 12
Steel	***Steel***	***Steel***
▪ Properties and cross sections of rolled steel sections e.g. square tubing and pipes.	▪ Columns and structural beams e.g. I-beam, H-beam, U-channel, etc. ▪ Doors and windows. (Use of door and window catalogues to select the desired product). ▪ Cladding: o Insulated and bonded metal panels are used primarily to clad industrial type buildings. They may have facings of anodised aluminium or steel with porcelain, vinyl, acrylic or enamel finishing.	Layout of steel roof truss and purlins. ▪ Connection of gusset plates to the different members of a steel structure, using the following methods: o Bolts and nuts o Welding o Rivets
Roof covering	***Roof covering***	***Roof covering***
▪ Will be dealt with in Grade 11	▪ Purpose of roof cover ▪ Properties of roof covering ▪ Types and materials of roof covering: o Concrete roof tiles o Thatch o IBR o Corrugated iron sheeting	▪ Methods of installation: o Spacing of roof trusses for a particular type of roof cover o Spacing of purlins for a particular type of roof cover ▪ Regulations
Finishing	***Finishing***	***Finishing***
▪ Screeds: o Materials used, thickness and levelling. o Two types of finishing (Coarse and smooth).	▪ Plastering: o Different finishings ▪ Tiling: o Floor o Walls ▪ Painting: o Interior o Exterior o Different applications ▪ Covering of plumbing, electrical and drainage pipes etc. by chasing it into the wall or floor and covering it with plaster, tiles etc.	▪ Special finishes
Cabinet Making	***Cabinet Making***	***Cabinet Making***
Manufacturing process ▪ Choice of materials e.g. board products or solid wood. ▪ Cutting list. ▪ Construction method. ▪ Finishing. E.g. Bathroom cabinets, kitchen cupboards, etc.	**Manufacturing process** ▪ Choice of materials e.g. board products or solid wood. ▪ Cutting list. ▪ Construction method. ▪ Finishing. E.g. Bathroom cabinets, kitchen cupboards, etc.	**Manufacturing process** ▪ Choice of materials e.g. board products or solid wood. ▪ Cutting list. ▪ Construction method. ▪ Finishing. ▪ Fitting of the project. E.g. Bathroom cabinets, kitchen cupboards, etc.
Technical advances	***Technical advances***	***Technical advances***
▪ New materials.	▪ New materials ▪ Construction methods	▪ New materials ▪ Construction methods ▪ Regulations

Grade 10	Grade 11	Grade 12
10.8 *LO 1, 2, 3, 4* **Civil services**	**11.8** *LO 1, 2, 3, 4* **Civil services**	**12.8** *LO 1, 2, 3, 4* **Civil services**
Water supply	***Water supply***	***Water supply***
▪ Introduction to cold water systems: catchments, dams, purification, reservoirs and distribution: o A brief explanation of the natural water cycle o Runoff to dams / catchments o Municipal purification plant o Storing of water in reservoirs o Distribution. ▪ Introduction to hot water systems: boilers, geysers and gravity geysers. ▪ Types of pipe materials (Polly cop pipe, copper pipe, galvanised steel pipe)	▪ Basic plumbing in a house: o Fitments o Distribution o Placement (surface or chased) ▪ Types of pipe materials ▪ Pressure geysers: o Horizontal o Vertical ▪ Pressure reducing valves: o Purpose o various types ▪ Regulations	▪ Other water supplies: o boreholes o shallow wells o desalination etc ▪ Solar heaters, gas heaters etc.
Sewerage	***Sewerage***	***Sewerage***
▪ Introduction to drainage: sewage, soil water, wastewater. ▪ Regulations. ▪ Abbreviations. ▪ Types of pipe materials (PVC pipes and fittings)	▪ Drainage for residential dwellings: o Plumbing (Line diagram of the layout of a drainage plan for a simple single story dwelling, up to the connection point of the local authority). o Slope / gradient (Minimum and maximum fall) o Invert levels o Abbreviations o Colour coding ▪ Regulations ▪ Sectional view (Identification of different components)	▪ Grease trap (purpose) ▪ Conservancy tank (purpose and functioning) ▪ Septic tank (purpose and functioning) ▪ French drain (purpose and functioning)
Storm water	***Storm water***	
▪ Introduction to storm water: municipal reticulation, MHs and inlets. ▪ Types of pipe materials (Concrete pipes and blocks) ▪ Regulations / basic principles that will lead to the achievement of the following objectives: o Prevent loss of life. o Prevent damage to property. o Provide convenience to community. o Find solutions to run-off problems. o Provide the most economical control facilities compatible with the environment. o Protect water resources from pollution.	▪ Removal / draining of large quantities of water from a site. ▪ Regulations	

Grade 10	Grade 11	Grade 12
Electrical system	***Electrical system***	***Electrical system***
▪ Introduction to electrical system. ▪ Identification and interpretation of basic electrical symbols. ▪ Installation of conduit pipes and kick pipes for the provision of electrical cables and wires.	▪ Positioning of: o Meter box o Distribution box o Card supply (prepaid) etc o Conduits	▪ Alternative sources of electricity supply: o Solar o Hydro o Nuclear etc.
10.9 *LO 2, 3 4* **Quantities**	**11.9** *LO 2, 3 4* **Quantities**	**12.9** *LO 2, 3 4* **Quantities**
▪ Conversions SI units. ▪ Measurement of quantities e.g. Areas, volumes etc. ▪ Quantities for a small project such as the foundations of a building.	▪ Extract quantities of materials for a simple structure e.g. Single garage (apply basic mathematical formulae). ▪ Quantities of materials for a project such as the walls and finishing in a building.	▪ Extract quantities of materials for a small house (apply basic mathematical formulae). ▪ Costing for a project such as a small house (compare prices from different suppliers).
10.10 *LO 1, 2, 3, 4* **Joining**	**11.10** *LO 1, 2, 3, 4* **Joining**	**12.10** *LO 1, 2, 3, 4* **Joining**
Brickwork		
▪ Joining bricks together. ▪ Joining other materials to brickwork.		
	Steel / metals	***Steel / metals***
	▪ Steel roof trusses ▪ Gusset plates ▪ Joining concrete to steel e.g. flanges, gusset plates	▪ Joining column to roof truss ▪ Special precautions: joining dissimilar metals
Wood	***Wood***	***Wood***
▪ Bolts, screws, nails, gang nails. ▪ Joining wood to metal. ▪ Glue. ▪ Woodwork joints applicable to cabinet making.	▪ Joints applicable to cabinet making.	▪ Joints applicable to cabinet making.
Plumbing / pipes	***Plumbing / pipes***	***Plumbing / pipes***
▪ Cold water supply under ground level from municipal supply. ▪ Materials used.	▪ Joining methods: o Capillary joint o Compression joints	▪ Thread joints, PVC weld, flanges etc.

APPENDIX B: EXAMPLES OF WORK SCHEDULES FOR CIVIL TECHNOLOGY

GRADE 10 WORK SCHEDULE

1ST TERM

Week	Description		LO1	LO2	LO3	LO4	Activities		Assessment		Date completed	
	Knowledge	Application	ASs	ASs	ASs	ASs	Knowledge	Application	Knowledge	Application		
1	• Planning • Introduction to the subject		All	All	All	All	Presentation					
2 3	• Technological Process • Administration & Organisation • Safety	Graphics / Communication • Introduction • Instruments • Line work • Constructions • Orthographic projection • Isometric	3	1 - 5	1 5	4 5	• Assignment • Research Task	• Worksheets • Freehand drawing • Draw with instruments	• Teacher • Group	• Teacher • Self • Peer • Group • Task based		
4	Building equipment				3 1 5							
5 6 7	Materials		4		2 5		Assignments, tasks and descriptions		Task based			
8 9 10 11 12	Construction: • Foundations • Concrete • Brickwork • Waterproofing		4		7 5		• Assignments • Drawings • Description and identification					

2nd TERM

Week	Description		LO1	LO2	LO3	LO4	Activities		Assessment		Date completed	
	Knowledge	Application	ASs	ASs	ASs	ASs	Knowledge	Application	Knowledge	Application		
13 14	Construction (continue)	Construction: • Foundations • Concrete • Brickwork • Waterproofing • Quantities			7 5	7 5	Exercises Assignment Experiments	• Experiments • Site work • Models • Case study • Calculations (Foundations) • Simulation	Teacher Task based	• Teacher • Peer • Group		
15 16 17 18 19	Applied mechanics: • Triangle and polygon of forces • Centre of gravity				6 5							
20	Revision		All	All	All	All						
21 22	Summative Assessment and Recording of 2nd Quarter CASS								Tests and examinations			

3rd TERM

Week	Description		LO1	LO2	LO3	LO4	Activities		Assessment		Date completed	
	Knowledge	Application	ASs	ASs	ASs	ASs	Knowledge	Application	Knowledge	Application		
23 24 25 26 27 28 29 30 31 32	Woodworking: • Types of wood • Seasoning • Safety • Tools • Joining • Finishing • Entrepreneurship	Cabinet making: • Design • Work drawing • Cutting list • Use of hand tools and power tools • Joining • Finishing	3 5	1 – 5	1 2 3 4 5 7 9	1 2 3 4 5 7 9	• Research • Assignment • Worksheet	Applied theory and project: • Sketching • Drawing • Planning • Preparing • Making • Finishing	• Tests • Peer	• Task based • Teacher		

4th TERM											
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
33 **34** **35** **36** **37**	Civil services: • Water supply • Sewage • Plumbing • Electrical systems		1 - 4	1 - 5	8 5	8 5	• Research • Assignments • Experiments	• Site inspection • Drawings	• Teacher • Self • Peer • Group	• Teacher • Self • Peer • Group • Task based		
38	Revision		All	All	All	All						
39 **40** **41**	Summative Assessment and Consolidation of yearly CASS								Tests and examinations			
Final examination					**50% of final promotion mark**							
Practical assessment Task (PAT)					**25% of final promotion mark**							

GRADE 11 WORK SCHEDULE

1ST TERM												
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
1	• Planning • Wrap up Gr 10 work		All	All	All	All						
2 **3** **4**	Administration & Organisation						• Demonstration • Assignment	• Practical task	• Teacher • Group	• Teacher		
5 **6**	Materials (building)		4		2 4 5		• Assignments, tasks and descriptions		• Task based			
7 **8** **9** **10** **11** **12**	Construction: • Excavations • Concrete / Plaster / Mortar • Brickwork and block-work • Waterproofing • Formwork	Graphics / Communication: • Orthographic projection • Isometric views CAD	1 3 4	1 2 3 4 5	1 3 4 5 7	3 4 5	• Assignments • Drawings • Description and identification		• Teacher • Self • Peer • Group • Task based			

2ND TERM												
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
13	Cabinet making	• Design • Work drawing • Cutting list • Use of hand tools and power tools • Joining • Finishing	1 3 4 5	1 2 3 4 5	1 2 3 4 5 7 9 10	1 2 3 4 5 7 9 10	• Research • Assignment • Worksheet	Applied theory and project	Teacher	• Teacher • Self • Peer • Project based		
14 **15** **16** **17** **18** **19**	Construction (continue) • Woodworking • Steel • Roof covering • Finishing		1 3 4	1 2 3 4 5	1 3 4 5 7 10	1 3 4 5 7 10	• Assignments • Drawings • Description and identification • Model building		• Teacher • Self • Peer • Group • Task based			
20	Revision		All	All	All	All						
21 **22**	Summative Assessment and Recording of 2nd Quarter CASS						Tests and Examinations					

3RD TERM

Week	Description		LO1	LO2	LO3	LO4	Activities		Assessment		Date completed	
	Knowledge	Application	ASs	ASs	ASs	ASs	Knowledge	Application	Knowledge	Application		
23 24 25 26	Applied mechanics	Cabinet making (continue)			6 4 5	6 4 5	• Exercises • Assignments		• Teacher • Group			
27 28 29 30	Civil services: • Water supply • Sewage • Plumbing • Electrical systems		1 2 3 4	1 2 3 4 5	8 2 3 4 5 10	8 4 5 10	• Experiments • Assignments • Drawings	• Site visits • Model building	• Teacher • Self • Peer • Group • Task based			
31 32	Technical advances				7 5		• Research • Assignment		• Teacher • Self • Peer			

4TH TERM

Week	Description		LO1	LO2	LO3	LO4	Activities		Assessment		Date completed	
	Knowledge	Application	ASs	ASs	ASs	ASs	Knowledge	Application	Knowledge	Application		
33 34 35 36	Quantities	• Calculate the quantities of materials for a simple structure			9 2	9 2	• Exercises • Assignments		• Teacher • Self • Peer			
37 38	Revision		All	All	All	All						
39 40 41	Summative Assessment and Consolidation of yearly CASS								Tests and examinations			

Final examination **50% of final promotion mark**

Practical Assessment Task (PAT) **25% of final promotion mark**

GRADE 12 WORK SCHEDULE

1ST TERM												
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
1	• Planning • Wrap up Gr 11		All	All	All	All						
2 **3** **4**	Safety Materials Construction: • Concrete • Plaster • Mortar	Civil Practicals Slump Test Cube Test	3 4 4 5	All	1 2 3 5 7	1 2 3 4 5	• Demonstration • Assignment	• Practical task	• Teacher • Group	• Teacher		
5 **6** **7**	Brickwork Block work	Building Drawings Models (House)	4 5	All	1 2 3 4 5	1 2 3 4 5	• Assignments, tasks and descriptions	• Practical task	• Task based			
8 **9** **10**	Waterproofing Formwork	Concrete Work: Columns Beams Slabs Stairs		1 4	1 2 5		• Assignments • Drawings • Description and identification		• Teacher • Self • Peer • Group • Task based			

2ND TERM												
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
11 **12** **13**	Water Sewage	Civil Practises	1 2 3 4	All	1 2 3 4 5 8 10	1 2 3 4 5 8 10	• Research • Assignment • Worksheet	Applied theory and project	Teacher	• Teacher • Self • Peer • Project based		
14 **15** **16** **17** **18**	Quantities Quantities Quantities Steelwork Finishing	Columns Beams Slabs Stairs	5	1	1 2 5 7 8 10		• Assignments • Drawings • Description and identification		• Teacher • Self • Peer • Group • Task based			
19 **20**	Excavations	Buildings	1 4 5	All	1 3 4 5	1 3 4 5	• Assignments • Drawings • Description and identification	Applied theory and project	Teacher	• Teacher • Self • Peer • Project based		
21 **22**	Summative Assessment and Recording of 2nd Quarter CASS						Tests and Examinations					

3RD TERM												
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
23 **24** **25**	Electrical Wood Joining	Equipments and buildings	5	All	1 2 3 4 5 10	1 2 3 4 5 10	• Research • Assignment • Worksheet	Applied theory and project	Teacher	• Teacher • Self • Peer • Project based		
26 **27** **28**	Applied Mechanics	Buildings			6	6	• Assignments • Drawings • Descriptions • Identifications		• Teacher • Self • Peer • Group Task based			
29 **30**	Roof covering Finishing	Buildings	1 2 4	1 4	1 2 5		• Assignments • Drawings • Descriptions • Identifications		• Teacher • Self • Peer • Group • Task based			
31 **32**	Preparatory exam											

4TH TERM												
Week	**Description**		**LO1**	**LO2**	**LO3**	**LO4**	**Activities**		**Assessment**		**Date completed**	
	Knowledge	Application	**ASs**	**ASs**	**ASs**	**ASs**	Knowledge	Application	Knowledge	Application		
33 **34** **35**	Civil Services	Immediate environment	All	All	1 2 3 5 8 10	1 2 3 5 8 10	• Research • Assignment • Worksheet	Applied theory and project	Teacher	• Teacher • Self • Peer • Project based		
36 **37**	Completion of Practical Assessment Task (PAT)	Practical Models Product/Artefact	All	All	All	All		Applied theory and project	Teacher	Teacher		
38 **39** **40** **41**	**NATIONAL SENIOR CERTIFICATE EXAMINATION**		All	All	All	All						
Final examination					**50% of total promotion mark**							
Practical Assessment Task (PAT)					**25% of total promotion mark**							

APPENDIX C: EXAMPLE OF A LESSON PLAN FOR GRADE 10

CIVIL TECHNOLOGY	GRADE: 10 CLASS…	Duration: 3 hours
Core Knowledge Area: Joints **Theme:** Joining of different materials. **Context:** Civil Technology: Joining	**Assessment Standards** **LO 3:** Demonstrate knowledge and understanding of methods of joining materials. **LO 4:** Apply the principles of joining different materials.	

Concepts	Teaching Strategy		Resources	Evidence of Achievement	Assessment Strategy		Time frame
	Teacher Activity	Learner Activity			Method	Tools	
Joining of brickwork.	Introduce the concept of joining and materials with charts and models. Demonstrate bonds and mixes in the yard.	Draw brick bonding joints. Make a scale model. Mix mortar in the yard.	Chalkboard; Models; OHP; Worksheets: Charts.	Learners demonstrate understanding by completing worksheet and project.	Peer; self; Teacher	Answer on chalkboard, OHP	1½ hours
Joining of wood.	Introduce the concept of joining materials and different joints in wood. Demonstrate using the correct tools and machines in the workshop. Prepare worksheet	Draw different types of joints and make a joint in the workshop.	Chalkboard; Models; OHP; Charts. actual materials in workshop with tools.	Completed product. Completed worksheet.	Peer; Teacher	Mark sheet	1½ hours
Enrichment: More complex joints with different bonding materials.							