education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

ENGINEERING

FABRICATION - SHEET METAL WORK

NQF Level 4

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CONTENTS

SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for Engineering Fabrication and Sheet Metal Work in the National Certificates (Vocational). It must be read with the *National Policy Regarding Further Education and Training Programmes: Approval of the Documents, Policy for the National Certificates (Vocational) Qualifications at Levels 2 to 4 on the National Qualifications Framework (NQF)*. This assessment guideline will be used for National Qualifications Framework Levels 2-4.

This document explains the requirements for the internal and external subject assessment. The lecturer must use this document with the *Subject Guidelines: Engineering Fabrication and Sheet Metal Work* to prepare for and deliver Engineering Fabrication and Sheet Metal Work. Lecturers should use a variety of resources and apply a range of assessment skills in the setting, marking and recording of assessment tasks.

SECTION B: ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

1 ASSESSMENT IN THE NATIONAL CERTIFICATES (VOCATIONAL)

Assessment in the National Certificates (Vocational) is underpinned by the objectives of the National Qualifications Framework (NQF). These objectives are to:

- Create an integrated national framework for learning achievements.
- Facilitate access to and progression within education, training and career paths.
- Enhance the quality of education and training.
- Redress unfair discrimination and past imbalances and thereby accelerate employment opportunities.
- Contribute to the holistic development of the student by addressing:
  - social adjustment and responsibility;
  - moral accountability and ethical work orientation;
  - economic participation; and
  - nation-building.

The principles that drive these objectives are:

- ***Integration***

To adopt a unified approach to education and training that will strengthen the human resources development capacity of the nation.

- ***Relevance***

To be dynamic and responsive to national development needs.

- ***Credibility***

To demonstrate national and international value and recognition of qualification and acquired competencies and skills.

- ***Coherence***

To work within a consistent framework of principles and certification.

- ***Flexibility***

To allow for creativity and resourcefulness when achieving Learning Outcomes, to cater for different learning styles and use a range of assessment methods, instruments and techniques.

- ***Participation***

To enable stakeholders to participate in setting standards and co-ordinating the achievement of the qualification.

- ***Access***

To address barriers to learning at each level to facilitate students' progress.

- ***Progression***

To ensure that the qualification framework permits individuals to move through the levels of the national qualification via different, appropriate combinations of the components of the delivery system.

- ***Portability***

To enable students to transfer credits of qualifications from one learning institution and/or employer to another institution or employer.

- ***Articulation***

To allow for vertical and horizontal mobility in the education system when accredited pre-requisites have been successfully completed.

- ***Recognition of Prior Learning***

To grant credits for a unit of learning following an assessment or if a student possesses the capabilities specified in the outcomes statement.

- ***Validity of assessments***

To ensure assessment covers a broad range of knowledge, skills, values and attitudes (SKVAs) needed to demonstrate applied competency. This is achieved through:

  - clearly stating the outcome to be assessed;
  - selecting the appropriate or suitable evidence;
  - matching the evidence with a compatible or appropriate method of assessment; and
  - selecting and constructing an instrument(s) of assessment.

- ***Reliability***

To assure assessment practices are consistent so that the same result or judgment is arrived at if the assessment is replicated in the same context. This demands consistency in the interpretation of evidence; therefore, careful monitoring of assessment is vital.

- ***Fairness and transparency***

To verify that no assessment process or method(s) hinders or unfairly advantages any student. The following could constitute unfairness in assessment:

  - Inequality of opportunities, resources or teaching and learning approaches
  - Bias based on ethnicity, race, gender, age, disability or social class
  - Lack of clarity regarding Learning Outcome being assessed
  - Comparison of students' work with other students, based on learning styles and language

- ***Practicability and cost-effectiveness***

To integrate assessment practices within an outcomes-based education and training system and strive for cost and time-effective assessment.

2 ASSESSMENT FRAMEWORK FOR VOCATIONAL QUALIFICATIONS

The assessment structure for the National Certificates (Vocational) qualification is as follows:

2.1 Internal continuous assessment (ICASS)

Knowledge, skills values, and attitudes (SKVAs) are assessed throughout the year using assessment instruments such as projects, tests, assignments, investigations, role-play and case studies. The internal continuous assessment (ICASS) practical component is undertaken in a real workplace, a workshop or a "Structured Environment". This component is moderated internally and externally quality assured by Umalusi. All internal continuous assessment (ICASS) evidence is kept in a Portfolio of Evidence (PoE) and must be readily available for monitoring, moderation and verification purposes.

2.2 External summative assessment (ESASS)

The external summative assessment is either a single or a set of written papers set to the requirements of the Subject Learning Outcomes. The Department of Education administers the theoretical component according to relevant assessment policies.

A compulsory component of external summative assessment (ESASS) is the **integrated summative assessment task (ISAT).** This assessment task draws on the students' cumulative learning throughout the year. The task requires **integrated application of competence** and is executed under strict assessment conditions. The task should take place in a simulated or "Structured Environment". The integrated summative assessment task (ISAT) is the most significant test of students' ability to apply acquired knowledge.

The integrated assessment approach allows students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

External summative assessments will be conducted annually between October and December, with provision made for supplementary sittings.

3 MODERATION OF ASSESSMENT

3.1 Internal moderation

Assessment must be moderated according to the internal moderation policy of the Further Education and Training (FET) college. Internal college moderation is a continuous process. The moderator's involvement starts with the planning of assessment methods and instruments and follows with continuous collaboration with and support to the assessors. Internal moderation creates common understanding of Assessment Standards and maintains these across vocational programmes.

3.2 External moderation

External moderation is conducted by the Department of Education, Umalusi and, where relevant, an Education and Training Quality Assurance (ETQA) body according to South African Qualifications Authority (SAQA) and Umalusi standards and requirements.

The external moderator:

- monitors and evaluates the standard of all summative assessments;
- maintains standards by exercising appropriate influence and control over assessors;
- ensures proper procedures are followed;
- ensures summative integrated assessments are correctly administered;
- observes a minimum sample of ten (10) to twenty-five (25) percent of summative assessments;
- gives written feedback to the relevant quality assuror; and
- moderates in case of a dispute between an assessor and a student.

Policy on inclusive education requires that assessment procedures be customised for students who experience barriers to learning, and supported to enable these students to achieve their maximum potential.

4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

The period of validity of the internal continuous assessment mark is determined by the *National Policy on the Conduct, Administration and Management of the Assessment of the National Certificates (Vocational).*

The internal continuous assessment (ICASS) must be re-submitted with each examination enrolment for which it constitutes a component.

5 ASSESSOR REQUIREMENTS

Assessors must be subject specialists and should ideally be declared competent against the standards set by the ETDP SETA. If the lecturer conducting the assessments has not been declared a competent assessor, an assessor who has been declared competent may be appointed to oversee the assessment process to ensure the quality and integrity of assessments.

6 TYPES OF ASSESSMENT

Assessment benefits the student and the lecturer. It informs students about their progress and helps lecturers make informed decisions at different stages of the learning process. Depending on the intended purpose, different types of assessment can be used.

6.1 Baseline assessment

At the beginning of a level or learning experience, baseline assessment establishes the knowledge, skills, values and attitudes (SKVAs) that students bring to the classroom. This knowledge assists lecturers to plan learning programmes and learning activities.

6.2 Diagnostic assessment

This assessment diagnoses the nature and causes of learning barriers experienced by specific students. It is followed by guidance, appropriate support and intervention strategies. This type of assessment is useful to make referrals for students requiring specialist help.

6.3 Formative assessment

This assessment monitors and supports teaching and learning. It determines student strengths and weaknesses and provides feedback on progress. It determines if a student is ready for summative assessment.

6.4 Summative assessment

This type of assessment gives an overall picture of student progress at a given time. It determines whether the student is sufficiently competent to progress to the next level.

7 PLANNING ASSESSMENT

An assessment plan should cover three main processes:

7.1 Collecting evidence

The assessment plan indicates which Subject Outcomes and Assessment Standards will be assessed, what assessment method or activity will be used and when this assessment will be conducted.

7.2 Recording

Recording refers to the assessment instruments or tools with which the assessment will be captured or recorded. Therefore, appropriate assessment instruments must be developed or adapted.

7.3 Reporting

All the evidence is put together in a report to deliver a decision for the subject.

8 METHODS OF ASSESSMENT

Methods of assessment refer to who carries out the assessment and includes lecturer assessment, self-assessment, peer assessment and group assessment.

LECTURER ASSESSMENT	The lecturer assesses students' performance against given criteria in different contexts, such as individual work, group work, etc.
SELF-ASSESSMENT	Students assess their own performance against given criteria in different contexts, such as individual work, group work, etc.
PEER ASSESSMENT	Students assess another student's or group of students' performance against given criteria in different contexts, such as individual work, group work, etc.
GROUP ASSESSMENT	Students assess the individual performance of other students within a group or the overall performance of a group of students against given criteria.

9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

All evidence collected for assessment purposes is kept or recorded in the student's Portfolio of Evidence (PoE).

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate the Subject Outcome has been attained. This will only be possible if the chosen methods and instruments are appropriate for the target group and the Specific Outcome being assessed.

	METHODS FOR COLLECTING EVIDENCE		
	Observation-based (Less structured)	**Task-based** (Structured)	**Test-based** (More structured)
Assessment instruments	• Observation • Class questions • Lecturer, student, parent discussions	• Assignments or tasks • Projects • Investigations or research • Case studies • Practical exercises • Demonstrations • Role-play • Interviews	• Examinations • Class tests • Practical examinations • Oral tests • Open-book tests
Assessment tools	• Observation sheets • Lecturer's notes • Comments	• Checklists • Rating scales • Rubrics	• Marks (e.g. %) • Rating scales (1-7)
Evidence	• Focus on individual students • Subjective evidence based on lecturer observations and impressions	**Open middle**: Students produce the same evidence but in different ways. **Open end**: Students use same process to achieve different results.	Students answer the same questions in the same way, within the same time.

10 TOOLS FOR ASSESSING STUDENT PERFORMANCE

Rating scales are marking systems where a symbol (such as 1 to 7) or a mark (such as 5/10 or 50%) is defined in detail. The detail is as important as the coded score. Traditional marking, assessment and evaluation mostly used rating scales without details such as what was right or wrong, weak or strong, etc.

Task lists and **checklists** show the student what needs to be done. These consist of short statements describing the expected performance in a particular task. The statements on the checklist can be ticked off when the student has adequately achieved the criterion. Checklists and task lists are useful in peer or group assessment activities.

Rubrics are a hierarchy (graded levels) of criteria with benchmarks that describe the minimum level of acceptable performance or achievement for each criterion. Using rubrics is a different way of assessing and cannot be compared to tests. Each criterion described in the rubric must be assessed separately. Mainly two types of rubrics, namely holistic and analytical, are used.

11 SELECTING AND/OR DESIGNING RECORDING AND REPORTING SYSTEMS

The selection or design of recording and reporting systems depends on the purpose of recording and reporting student achievement. **Why** particular information is recorded and **how** it is recorded determine which instrument will be used.

Computer-based systems, for example spreadsheets, are cost and time effective. The recording system should be user-friendly and information should be easily accessed and retrieved.

12 COMPETENCE DESCRIPTIONS

All assessment should award marks to evaluate specific assessment tasks. However, marks should be awarded against rubrics and not be simply a total of ticks for right answers. Rubrics should explain the competence level descriptors for the skills, knowledge, values and attitudes (SKVAs) that a student must demonstrate to achieve each level of the rating scale.

When lecturers or assessors prepare an assessment task or question, they must ensure that the task or question addresses an aspect of a Subject Outcome. The relevant Assessment Standard must be used to create the rubric to assess the task or question. The descriptions must clearly indicate the minimum level of attainment for each category on the rating scale.

13 STRATEGIES FOR COLLECTING EVIDENCE

A number of different assessment instruments may be used to collect and record evidence. Examples of instruments that can be (adapted and) used in the classroom include:

13.1 Record sheets

The lecturer observes students working in a group. These observations are recorded in a summary table at the end of each project. The lecturer can design a record sheet to observe students' interactive and problem-solving skills, attitudes towards group work and involvement in a group activity.

13.2 Checklists

Checklists should have clear categories to ensure that the objectives are effectively met. The categories should describe how the activities are evaluated and against what criteria they are evaluated. Space for comments is essential.

SECTION C: ASSESSMENT IN ENGINEERING FABRICATION - SHEET METAL WORK

1 SCHEDULE OF ASSESSMENT

At NQF levels 2, 3 and 4, lecturers will conduct assessments as well as develop a schedule of formal assessments that will be undertaken in the year. All three levels also have an external examination that accounts for 50 percent of the total mark. The marks allocated to assessment tasks completed during the year, kept or recorded in a Portfolio of Evidence (PoE) account for the other 50 percent.

The Portfolio of Evidence (PoE) and the external assessment include practical and written components. The practical assessment in Engineering Fabrication and Sheet Metal Work must, where necessary, be subjected to external moderation by Umalusi or an appropriate Education and Training Quality Assurance (ETQA) body, appointed by the Umalusi Council in terms of Section 28(2) of the *General and Further Education and Training Quality Assurance Act, 2001 (Act No. 58 of 2001).*

2 RECORDING AND REPORTING

Engineering Fabrication and Sheet Metal Work, as is the case for all the other Vocational subjects, is assessed according to five levels of competence. The level descriptions are explained in the following table.

Scale of Achievement for the Vocational component

RATING CODE	RATING	MARKS %
5	Outstanding	80-100
4	Highly Competent	70-79
3	Competent	50-69
2	Not yet competent	40-49
1	Not achieved	0-39

The programme of assessment should be recorded in the Lecturer's Portfolio of Assessment for each subject. The following at least should be included in the Lecturer's Assessment Portfolio:

- A contents page
- The formal schedule of assessment
- The requirements for each assessment task
- The tools used for each assessment task
- Recording instrument(s) for each assessment task
- A mark sheet and report for each assessment task

The college must standardise these documents.

The student's Portfolio of Evidence (PoE) must include at least:

- A contents page
- The assessment tasks according to the assessment schedule
- The assessment tools or instruments for the task
- A record of the marks (and comments) achieved for each task

Where tasks cannot be contained as evidence in the Portfolio of Evidence (PoE), its exact location must be recorded and it must be readily available for moderation purposes.

The following units guide internal assessment in Engineering Fabrication and Sheet Metal Work Level 4:

NUMBER OF UNITS	ASSESSMENT	COVERAGE
2	Formal written tests	One or more completed topics
1	Internal written exam	All completed topics
3	Practical assessments	Must cover the related Subject Outcomes EXAMPLES: • A research project on subject-related current issues from different sources, e.g. the Internet, magazines and newspapers • Fabrication of components in the sheet metal work industry

ASSESSMENT OF

ENGINEERING FABRICATION - SHEET METAL WORK

LEVEL 4

3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN ENGINEERING FABRICATION - SHEET METAL WORK – LEVEL 4

Topic 1: Join stainless steel with the Tungsten Inert Gas (TIG) welding process

SUBJECT OUTCOME	
1.1 Prepare for the work activity.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• General safety precautions and fire prevention measures are clearly and comprehensively explained. • TIG welding equipment is correctly identified and functions correctly described. • TIG welding shielding gases are correctly identified and properties correctly explained. • TIG welding equipment is assembled according to manufacturer's specification. • Pre-operational checks and tests are carried out on TIG welding equipment. • Start-up and shut down procedures are correctly demonstrated. • Material is correctly prepared for welding.	• Explain general safety precautions and fire prevention measures applicable to the TIG welding process. • Identify and describe the functions of TIG welding equipment. • Identify and describe the properties of the different shielding gases used for TIG welding. • Set up TIG welding equipment in accordance with manufacturer's instructions. • Carry out pre-operational checks and tests on TIG welding equipment. • Demonstrate start-up and shut down procedure. • Prepare the material for welding.
ASSESSMENT TASKS OR ACTIVITIES	
Theory • Written test on TIG welding equipment and its functions. • Oral test on shielding gasses for stainless steel welding. **Practical** • Students must set up the TIG welding equipment, perform pre-operational tests and checks on the equipment and demonstrate correct start-up and shut down procedures. **NOTE** • Students are to fabricate and weld a stainless steel square- to- round transition piece. • Base dimensions are 300mm x 300mm, top diameter is 150mm and the vertical height is 250mm. • Grade of stainless steel 304 and thickness of material is 2mm.	

SUBJECT OUTCOME	
1.2 Weld work pieces.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Provision for safety and fire hazards is made. • Tungsten electrodes and filler rods are correctly selected and examined to suit material. • Amperage correctly adjusted for the type and thickness of material. • Regulator/flowmeter pressures correctly set for the type and thickness of the material. • Down hand welding technique correctly applied. • Correct personal protective equipment is identified and used worn during the welding process.	• Prepare the work area (provide for ventilation, fume extraction and fire hazards). • Select and examine tungsten electrodes and filler rods to suit material that is to be welded. • Adjust amperage to suit the type and thickness of material that is to be welded. • Adjust and set the regulator or flowmeter to suit the type and thickness of metal that is to be welded. • Weld stainless steel components in a down hand position using knowledge and skills acquired. • Identify and use the correct personal protective equipment.
ASSESSMENT TASKS OR ACTIVITIES	
Theory Written test on the different types of tungsten electrodes used in TIG welding. **Practical** Weld the fabricated square -to- round transition piece in the down hand position.	

SUBJECT OUTCOME	
1.3 Apply quality checks on welded work pieces.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Cleaning, pickling and passivating treatments are correctly applied to the welded joint. • Nature and causes of weld defects are correctly explained. • Welded joint comply with WSP and drawing specifications.	• Restore passivity of welded joint by applying the cleaning, pickling and passivating treatments correctly. • Explain the nature and causes of TIG welding defects. • Determine whether welded joints comply with WSP and drawing specifications.
ASSESSMENT TASKS OR ACTIVITIES	
Theory Assignment on cleaning, pickling and passivating treatments applicable to stainless steel restoration. **Practical** Students to check for weld defects and restore passivity of welded joint.	

SUBJECT OUTCOME	
1.4 Care and store TIG welding equipment and consumables.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Caring and storing procedures are correctly explained and carried out according to worksite procedure. • TIG welding equipment is dismantled as per work site procedure. • Tools and equipment are stored as per worksite practices. • Gas cylinders are safely stored in accordance with safety regulations.	• Explain caring and storing procedure for tools and equipment according to worksite procedure. • Dismantle TIG welding equipment as per worksite procedure. • Store tools and equipment according to worksite practices. • Store gas cylinders safely in accordance with safety regulations.
ASSESSMENT TASKS OR ACTIVITIES	
Theory Assignment on the importance of tidiness, safety and hygiene when working with stainless steel. **Practical** Dismantle and store tools, equipment and cylinders and restore work area.	

Topic 2: Design and develop sheet metal work components with the use of computer-aided drawing software (CAD).

SUBJECT OUTCOME	
2.1 Explain sheet metal work components for air-conditioning and ventilation duct layout.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The fittings used and terminology applicable to square/rectangular ductwork is explained and identified. • The fittings used and terminology applicable to round ductwork is explained and identified.	• Explain the terminology applicable to square/ rectangular ductwork and identify the fittings used. • Explain the terminology applicable to round ductwork and identify the fittings used.
ASSESSMENT TASKS OR ACTIVITIES	
Theory Written test on fittings and terminology applicable to square/rectangular and round ductwork. **Practical** Students to identify from drawings types of fittings used for square/rectangular and round ductwork.	

SUBJECT OUTCOME	
2.2 Identify and draw a schematic duct layout drawing.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Materials are identified for construction of ductwork. • Standards, types of joints and connections are explained for the manufacturing of ductwork. • Types and methods of thermal and acoustic acquisition are identified and explained. • Schematic ductwork layouts are drawn to scale and duct sizes and dimensions are inserted into the drawing.	• Identify materials for construction of ductwork. • Explain standards, types of joints and connections for the manufacturing of ductwork. • Identify and explain the types and methods of thermal and acoustic acquisition. • Produce schematic ductwork layouts to scale.
ASSESSMENT TASKS OR ACTIVITIES	
Theory • Written test on the types of joints and connections and standards applicable to duct manufacturing. • Assignment on types and methods of thermal and acoustic application used in industry. **Practical** Students to produce a schematic duct layout drawing to scale.	

SUBJECT OUTCOME	
2.3 Draw ductwork schematic within an architectural layout drawing.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Ductwork components and fittings are drawn within an architectural building layout drawing, taking into account available space, constraints and other services. • A ductwork layout within an architectural layout is drawn to scale and duct sizes and dimensions are inserted into the drawing. • The terminology for air diffusion terminals within the ductwork layout is identified. • A schematic layout is drawn within agreed timeframes.	• Produce ductwork components and fittings within an architectural building layout drawing. • Draw to scale a ductwork layout within an architectural layout which includes dimensioning. • Identify the terminology for air diffusion terminals within the ductwork layout. • Produce a schematic layout within agreed timeframes.
ASSESSMENT TASKS OR ACTIVITIES	
Theory Written test on air diffusion terminals applicable to ductwork layout. **Practical** Students to draw ductwork schematic within an architectural layout drawing and within agreed time frames.	

SUBJECT OUTCOME	
2.4 Identify and describe air conditioning and ventilation plant and equipment in relation to a duct layout.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The applicable terminology for air movement equipment is identified and described. • (to include fans, package and air handling units) • A schematic plant layout is drawn and described for an air conditioning and ventilation plant. • Mark numbers, equipment sizes and dimensions are shown on the drawing. • Layout of plant and equipment with flow symbols and dimensions are drawn within agreed time frames. • Air diffusion terminals within the ductwork layout is identified and described.	• Identify and describe the applicable terminology for air movement equipment. • Draw and describe a schematic plant layout for an air conditioning and ventilation plant. • Insert mark numbers, equipment sizes and dimensions on the drawing. • Produce a layout of plant and equipment with flow symbols and dimensions within agreed time frames. • Identify and describe air diffusion terminals within the ductwork layout.

ASSESSMENT TASKS OR ACTIVITIES
Theory Written test on air movement equipment applicable to air-conditioning and ventilation. **Practical** Students to draw a schematic plant layout drawing for an air conditioning and ventilation plant within agreed time frames.

Topic 3: Computer numerical control (CNC) sheet metal work fabrication

SUBJECT OUTCOME	
3.1 Explain and demonstrate various aspects of CNC technology.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Different types of CNC machines and controls used in industry are correctly identified and described. • Working principles of conventional machine operation to that of CNC machine operation are compared and understood. • Correct method for production is selected. • Operating cost is established prior to selecting particular method.	• Identify and describe different types of CNC machines and controls used in industry. • Compare conventional machine operation methods with CNC machine operations. • Choose between conventional method or CNC method. • Understand the cost difference between the different operating systems.
ASSESSMENT TASKS OR ACTIVITIES	
Theory • Written test on the advantages and disadvantages of conventional versus CNC machine operation. • Assignment on the different types of CNC machines used in a sheet metal fabrication workshop. **Practical** Students to conduct a survey on CNC production cost versus conventional production cost.	

SUBJECT OUTCOME	
3.2 Prepare and write CNC programme.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Drawings are correctly interpreted and tool-path geometry correctly calculated. • Tool part co-ordinates are correctly calculated. • Programme elements and machine codes are clearly defined. • Appropriate tools for the CNC operation are correctly selected. • Programme is correctly written and simulated.	• Interpret drawings and define tool-path geometry calculations. • Calculate tool part co-ordinates. • Define programme elements and machine codes. • Select appropriate tools for CNC operation. • Write and simulate the programme.
ASSESSMENT TASKS OR ACTIVITIES	
Theory • Students to write a manual programme to produce components effectively and efficiently. • Calculate the time it would take to produce a single component. **Practical** Students to simulate the programme and determine whether programme editing is required.	

SUBJECT OUTCOME	
3.3 Prepare and set machine.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Free hand sketches are correctly produced. • Engineering drawings are correctly interpreted. • Tools are correctly set up. • Pre-operational checks are correctly carried out. • Clamping pressures are correctly selected and adjusted.	• Produce freehand sketches. • Interpret engineering drawings. • Set up tools. • Prepare, lubricate and perform pre-operational checks on the machine. • Check, select and adjust clamping pressures appropriate for the task.

ASSESSMENT TASKS OR ACTIVITIES
Practical demonstration Students to prepare and set the CNC machine in accordance with manufacturer's instruction manuals and job specifications and requirements.

SUBJECT OUTCOME	
3.4 Programme machine.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Basic geometry for CNC machining is correctly applied. • G-Codes and M-Codes and their functions are clearly and comprehensively understood. • Programme is correctly transferred from PC to CNC machine. • Machine control panel is thoroughly understood. • Programme is correctly edited.	• Apply basic geometry for CNC machining (axis directions, co-ordinate systems, zero and reference points). • Understand and apply G-codes and M-codes and their functions. • Transfer programme from PC to the machine. • Read and understand the machine control panel. • Edit programme.
ASSESSMENT TASKS OR ACTIVITIES	
Theory Written test on basic CNC geometry and the functions of G-Codes and M-Codes. **Practical demonstration** Students to programme CNC machine in accordance with manufacturer's instruction manuals and job specifications and requirements.	

SUBJECT OUTCOME	
3.5 Operate CNC machine.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Tools are correctly selected as per job requirements. • Worn/damaged tools are identified and replaced. • Components are measured for compliance to drawing specifications. • Lubricants and coolants are correctly identified and used for machine maintenance. • Machine is cleaned in accordance with worksite cleaning procedures.	• Select the correct tools for a specific job. • Monitor, adjust and replace worn or damaged tooling. • Remove and measure components. • Identify lubricants and coolants needed to maintain machine. • Clean the machine.
ASSESSMENT TASKS OR ACTIVITIES	
Theory • Written test on tool-wear interventions. • Oral test on component removal procedure. **Practical demonstration** • Students to operate the machine in accordance with manufacturer's instruction manuals and job specifications and requirements. • Students to clean the machine in accordance with worksite cleaning procedures.	

4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN ENGINEERING FABRICATION - SHEET METAL WORK – LEVEL 4

4.1 Integrated summative assessment task (ISAT)

A compulsory component of the external assessment (ESASS) is the **integrated summative assessment task (ISAT)**. The integrated summative assessment task (ISAT) draws on the students' cumulative learning achieved throughout the year. The task requires **integrated application of competence** and is executed and recorded in compliance with assessment conditions.

Two approaches to the integrated summative assessment task (ISAT) may be as follows:

- The students are assigned a task at the beginning of the year which they will have to complete in phases during the year to obtain an assessment mark. A final assessment is made at the end of the year when the task is completed.

OR

- Students achieve the competencies during the year but the competencies are assessed cumulatively in a single assessment or examination session at the end of the year.

The integrated summative assessment task (ISAT) is set by an externally appointed examiner and is conveyed to colleges in the first quarter of the year.

The integrated assessment approach enables students to be assessed in more than one subject with the same integrated summative assessment task (ISAT).

4.2 National Examination

A national examination is conducted annually in October or November by means of a paper(s) set and moderated externally. The following distribution of cognitive application is suggested:

	KNOWLEDGE AND COMPREHENSION	APPLICATION	ANALYSIS, SYNTHESIS AND EVALUATION
LEVEL 4	30%	50%	20%