education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

WELDING

NQF Level 3

October 2007

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 Welding 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: Welding* Level 3 to prepare for and deliver Welding Level 3. 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 their 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 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 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 that 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 WELDING

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 PoE account for the other 50 percent.

The PoE and the external assessment include practical and written components. The practical assessment in Welding 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

Welding, 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 a task s cannot be contained as evidence in the PoE, its exact location must be recorded and it must be readily available for moderation purposes.

The following units guide internal assessment in Welding Level 3:

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 • Welding of components in the engineering fabrication industry

ASSESSMENT OF WELDING

LEVEL 3

3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN WELDING – LEVEL 3

Topic 1: Principles of arc welding (plate)

SUBJECT OUTCOME	
1.1. Discuss and explain the basics of welding steels	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The processes when making steel are described. • Continuous casting and hot-working processes are explained. • The nature of non-alloy steels is described. • The basis of ISO (TR) 15608 is explained and discussed. • Materials are identified according to ISO (TR) 15608. • The effects of welding on steel are explained. • The addition of elements to create alloys is explained. • Types of welding (butt and fillet) are identified and explained. • Types of joints (butt; "T"; lap and corner – EN 12345, ISO [(DIS) 17659] are identified and discussed.	• Describe the processes when making steel • Explain the influence of welding on steel. • Discuss the differences between non-alloy, stainless steels and other alloy steels. • Briefly explain the influence of alloying elements on the properties of steel.
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.2 Explain and discuss welded joints in plates and their terminology	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Characteristics of fillet welds: leg length; throat thickness; penetration; number of runs and surface finish are explained and discussed. • Characteristics of butt-welds: types of joint preparation; single and multi-run welds; excess weld metal; weld profile; penetration; surface finish; permanent and temporary backing are explained and discussed. • Examples of welded joints in typical constructions using plates (e.g. structures, tanks, and pressure vessels) are listed.	• Identify various weld joints • Identify and use welding terminology. • Perform welding calculations
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.3 Explain the weld-ability of steels	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The concept of weld-ability is defined. • Effects of composition are described *Range: thickness and temperature (preheat and inter-pass), carbon equivalent and its use.* • Heat input is explained.	• Explain the influence of alloying elements on the properties of weld-able steel • Describe the effect of plate thickness on the properties of weld-able steel • Calculate the heat input and mention its use

ASSESSMENT TASKS OR ACTIVITIES
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above

SUBJECT OUTCOME	
1.4 Discuss and explain the effects of welding in terms of shrinkage, residual stresses and distortion, and demonstrate how to minimize distortion before, during and after welding	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Thermal cycle in welding is described • Development and significance of residual stresses due to solidification, cooling and shrinkage are explained and discussed. • Distortion resulting from shrinkage is described. • Measures to minimize distortion are explained. • The effects of residual stress on a weld are discussed and explained. • Preheating and post heating are briefly explained. • Relationship between heat input and shrinkage, residual stress and distortion are discussed. • The development of distortion, effect of heat input, weld size, penetration, number of runs in single and double-sided fillet welded joints and in butt welds are discussed. • Corrective measures, procedure, welding technique, joint preparation and pre-setting are explained and discussed. • Correction of distortion after welding is discussed.	• Describe the thermal cycle during welding. • Describe the main causes of weld shrinkage. • Describe distortion and residual stresses.
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.5 Identify and explain imperfections in welds	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Weld imperfections are identified. • The causes of weld imperfections are explained. • The influence of weld imperfections on product performance is explained *Scope: Imperfections include gas pores, incomplete penetration, lack of fusion and cracks*	• Discuss the causes of weld imperfections.
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.6 Explain the most frequently used fusion welding processes	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The manual metal arc (MMA) welding process is explained and discussed • The metal inert gas and the metal active gas (MIG/MAG) welding processes are explained and discussed. • The tungsten inert gas (TIG) welding process is described and discussed. • The plasma arc welding process is described and explained. • The submerged arc welding process is described and explained.	• Describe and explain the manual metal arc (MMA) welding process • Describe and explain the metal inert gas and the metal active gas (MIG/MAG) welding processes • Describe and explain tungsten inert gas (TIG) welding • Describe and explain the plasma arc welding process • Describe and explain the submerged arc welding process
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.7 Explain and demonstrate safe welding on a construction site.	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The site environment, special problems of open air working; working at height (example, gantries and fixed staging); poor ground conditions; extreme heat and cold; wind and rain effects are discussed. • Earth-protection arrangements are discussed. • Protection of other workers from welding hazards is explained.	• Identify the hazards associated with welding on site • Discuss and describe the precautions to be taken when welding on site
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.8 Discuss and explain the principles of basic non-destructive testing (NDT) methods used in welding	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Destructive and non-destructive tests include bend tests, hardness tests, tensile tests and impact tests, VT, MT, PT, RT and UT are discussed and explained according to standards EN970 and ISO5817	• Perform simple visual inspection methods • Describe the following destructive and non-destructive methods of testing welds
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

SUBJECT OUTCOME	
1.9 Explain the function of quality assurance (QA) in welding	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The role of inspection and quality control is explained. • The key role of welders in assuring quality is discussed. • The key roles of inspection and NDT in identifying potentially dangerous defects are discussed. • Quality requirements in welding are explained in terms of ISO3834 • The system of coordinating welding qualifications locally and internationally is explained and discussed.	• Explain the need for quality assurance in welding • Understand and discuss the standards for welding personnel and welding procedures in terms of quality assurance
ASSESSMENT TASKS OR ACTIVITIES	
• Theory test / questionnaire • Project Assignment • Research portfolio • Or combination of the above	

Topic 2: Shielded metal arc welding (all positions)

SUBJECT OUTCOME	
2.1 Describe the shielded metal arc welding (SMAW) process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Basic and major components of SMAW equipment and their functions are identified and explained. • The importance of the correct setting of the power source, choice of electrode and the consequences of incorrect selection is explained *Range: The thickness of materials, in relation to size and type of welding electrode used, and the influence of electrode manipulation during the welding process. Range: Welding consumables include misuse; mishandling; baking procedures.* • Welding characteristics of low carbon steel are identified and the implications for unsafe conditions are described. • Terms and definitions used are consistent with generally accepted welding terminology as recorded in welding standards.	• Explain the terminologies associated with shielded metal arc welding procedures. • Explain the actual chemical and mechanical processes that take place during welding. • Explain the shielded metal arc welding (SMAW) method (all positions). • Identify the various welding parameters, in relation to the thickness of materials (steel) being welded. • Demonstrate setting up procedures
ASSESSMENT TASKS OR ACTIVITIES	
Questionnaire-based activities related to: • The shielded metal arc welding process and related equipment. • The shielded metal arc welding equipment used • The shielded metal arc welding method and the application of specifications (parent material, current setting, electrode angle, electrode-type, and other consumables used). • Application of safety precautions during shielded metal arc welding. • Explaining the heat characteristics of common metals during the shielded metal arc welding process • Correct use of terminology is assessed. *Range: For the purpose of assessment: Parts include: Suitable power source, earth clamp, electrode holder and welding cable.* • Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down • Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any welding operations begin	

SUBJECT OUTCOME	
2.2 Plan and prepare for the welding process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Welding hazards are identified and eliminated in accordance with standard working practices. • The selection of shielded metal arc welding equipment as specified in the welding procedure is verified. • Work-piece/s are prepared prior to welding as specified on drawing and working practices. • Task dimensions and work-piece alignment are checked as specified on drawing	• Explain the safety aspects of shielded metal arc welding (SMAW) in the fabrication workshop. • Prepare the shielded metal arc welding (SMAW) equipment • Prepare the work-piece for welding • Prepare the welding environment.
ASSESSMENT TASKS OR ACTIVITIES	
• Students are given a welding task according to the range of coverage in Subject Outcome 3. • Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task • Before any welding can take place all students must be found competent in this activity • The shielded metal arc equipment is to be well insulated to avoid electric shock. • Work-piece tack welded in position as per drawing specifications. • Safety precautions adhered to. • Work-piece is inspected prior to welding. *Range: Parts include: Suitable power source, earth clamp, electrode holder and welding cable.* *Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* *Material thickness: minimum –1,6mm* • Despite the minimum material thickness as specified, students must display sufficient competency to prepare the groove prior to welding.	

SUBJECT OUTCOME	
2.3 Weld materials. *Range: Weld positions include: Fillet welding: Flat/Horizontal Vertical. Groove welding: Flat/Horizontal Vertical*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The welding of the work-piece material is carried out in accordance with work instruction sheet and drawing requirements. • Safety precautions (applicable to the SMAW process) are applied and adhered to in accordance with OHS Act. • Quality checks on welded materials are applied. • The end product is inspected to conform to specifications as reflected on drawing or job requirement. • Welding defects are identified and corrective action is taken. *Range:* • *Defects include excessive slag, spatter and irregular weld finish (bead).* • *Hazards include fire, electrocution; incorrect set-up procedures and unsafe use of power tools are explained.*	• Describe and adhere to all safety precautions according to workshop requirements and OHS Act • Demonstrate the SMAW process, using knowledge and skills attained. • Inspect welded work-piece for defects and apply quality checks on process.

ASSESSMENT TASKS OR ACTIVITIES
• Practical project or task • Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, pressures • Students to use skills, knowledge and safety during cutting • Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn. • All welding must take place in a controlled environment and lecturers to ensure quality of cuts. *Range:* • *Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* • *Material thickness: minimum –1,6mm* • *Resources include:* • *Welding equipment, tools, protective clothing and equipment, welding procedure specification, materials as specified on drawings and weld filler material.* • *Weld positions to include:* ▪ *Fillet welding: Flat/Horizontal, Vertical* ▪ *Groove welding: Flat/Horizontal, Vertical* • *Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.*

SUBJECT OUTCOME	
2.4 Care and storage of welding equipment	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The proper care and storage of tools and equipment is explained in accordance with worksite practices. • Shielded metal arc welding equipment is dismantled and stored in accordance with manufacturer's specifications and requirements, and according to workshop procedures • The welding equipment, hand tools and consumables, are packed away neatly and safely in accordance with laid down procedures	• Explain the care and storage procedures for tools, equipment in accordance with work site practices and specifications. • Explain the dismantling and storage procedures for welding equipment in accordance with manufacturer's specifications and requirements
ASSESSMENT TASKS OR ACTIVITIES	
• Students are given a welding task according to the scope of coverage in Subject Outcome 3. • Care and storage of welding equipment is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within the practical project (welding task). For the purpose of assessment: • Tools and equipment are stored to conform to worksite practices • Defective equipment is reported.	

Topic 3: Gas welding (all positions)

SUBJECT OUTCOME	
3.1 Describe the oxy-acetylene welding process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The importance of correct setting of welding pressures, and the consequences of incorrect settings, is explained • The thickness of materials, size and type of welding nozzles in relation to fuel gas used, and the impact of welding torch manipulation during the welding process is explained and demonstrated. • Basic and major components of the oxy-acetylene welding process and equipment are identified, and the explanation, function and purpose are correctly explained in terms of cutting standards. • The consequences of incorrect start up and shut down procedures is explained. • Cutting characteristics of low carbon steel are identified and the implications for un-safe conditions are described. • Gas welding characteristics of low carbon steel are identified and explained in relation to the cutting process. • Terms and definitions used are consistent with general accepted gas welding terminology as records in resource materials.	• Identify and describe gas welding and related equipment • Explain the actual chemical and mechanical processes that take place during welding. • Explain the gas-welding method (all positions). • Identify the various welding pressures and the correct nozzles associated with each, in relation to the thickness of materials (steel) being welded. • Demonstrate start up and shut down procedures. • Identify, select and classify welding consumables • Explain and discuss the safety precautions associated with gas welding. • Explain the terminologies associated with oxygen-acetylene gas welding procedures.
ASSESSMENT TASKS OR ACTIVITIES	
Questionnaire-based activities related to: • The oxy-acetylene welding process. • The oxy-acetylene welding equipment used • The oxy-acetylene welding method and the application of specifications (pressure, torch and nozzle type, consumables to be used). • Application of safety precautions during oxy-acetylene welding. • Explaining the heat characteristics of common metals during the oxy-acetylene welding process • Correct use of terminology is assessed. *Range:* • *Parts include: oxygen, acetylene gas; hoses; nozzles; suitable welding torch; gas welding electrodes; personal protective equipment* • *Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down* • *Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any welding operations begin*	

SUBJECT OUTCOME	
3.2 Plan and prepare for the gas welding process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Hazards relating to the welding process are identified and eliminated in accordance with standard working practices. • The selection of oxy-acetylene gas welding equipment is verified as specified in the welding procedure. • Work-piece/s are prepared prior to welding as specified on drawing and working practices. • The task dimensions and work-piece alignment are checked as specified on drawing	• Explain the safety aspects of gas welding in the fabrication workshop. • Prepare the welding equipment • Prepare the work-piece for welding • Prepare the welding environment
ASSESSMENT TASKS OR ACTIVITIES	
Students are given a welding task according to the scope of coverage in Subject Outcome 3. • Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task • Before any welding can take place all students must be found competent in this activity • The oxy-acetylene equipment is to be assembled and ensured to be leak-tested and leak-free • Work-piece clamped or secured in position as per drawing specifications. • Safety precautions adhered to. • Inspection work-piece prior to welding. *Range:* *Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* *Material thickness: minimum –1,6mm* *Despite the minimum material thickness as specified, students have to display sufficient competency to prepare the groove prior to welding.*	

SUBJECT OUTCOME	
3.3 Weld materials *Range: Weld positions to include: Fillet welding: Flat/Horizontal Vertical, Overhead.* *Groove welding: Flat/Horizontal, Vertical, Overhead*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The welding of material is carried out in accordance with work instruction sheet and drawing requirements. • Relevant safety precautions are applied and adhered to in accordance with OHS Act. • Quality checks on the welded materials are applied. • The end product is inspected to conform to specifications as reflected on drawing or job requirement. • Safety Hazards include flashbacks are avoided. • Weld-defects are identified and corrective action is taken. *Scope: Defects include excessive slag, rough surface and edges and a rounded top corner*	• Adhere to all safety precautions according to workshop requirements and OHS Act • Demonstrate the gas welding process, using knowledge and skills attained • Inspect welded work-piece for defects and apply quality checks on process.
ASSESSMENT TASKS OR ACTIVITIES	
• Practical project or task • Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, correct pressures and flame-setting. • Students to use skills, knowledge and safety during cutting • Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn. • All welding must take place in a controlled environment and lecturers to ensure quality of weld. *Range:* • *Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* • *Material thickness: minimum –1,6mm* • *Resources include: Welding equipment, tools, protective clothing and equipment, welding procedure specification, materials as specified on drawings and weld filler material.* • *Weld positions to include:* ▪ *Fillet welding: Flat/Horizontal, Vertical, Overhead* ▪ *Groove welding: Flat/Horizontal, Vertical, Overhead* • *Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.*	

SUBJECT OUTCOME	
3.4 Care and storage of welding equipment	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The proper care and storage procedures for tools and equipment is explained and demonstrated according to worksite practices. • The oxy-acetylene welding equipment is dismantled and stored in accordance with manufacturer's specifications and requirements according to workshop procedures. • Cylinders, hoses, gauges and torch are packed away neatly and safely in accordance with workshop procedures.	• Explain the care and storage procedures for tools and equipment in accordance with work site practices and specifications. • Describe the dismantling and storage procedures in accordance with manufacturer's specifications and requirements.
ASSESSMENT TASKS OR ACTIVITIES	
• Assessment by observation checklist and/or theoretical assessment. • Tools and equipment are stored to conform to worksite practices • Defective equipment is reported.	

Topic 4: Gas brazing

SUBJECT OUTCOME	
4.1 Describe the oxy-acetylene brazing process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The importance of correct setting of brazing pressures, and the consequences of incorrect settings, are explained • The thickness of materials, size and type of brazing nozzles in relation to fuel gas used, and the impact of brazing torch manipulation during the brazing process are explained and demonstrated. • Basic and major components of the oxy-acetylene brazing process and equipment are identified, and the explanation, function and purpose are correctly explained in terms of cutting standards. • The consequences of incorrect start up and shut down procedures are explained. • Cutting characteristics of low carbon steel are identified and the implications for unsafe conditions are described. • Gas brazing characteristics of low carbon steel are identified and explained in relation to the cutting process. • Terms and definitions used are consistent with generally accepted gas brazing terminology as records in resource materials.	• Identify and describe gas brazing and related equipment • Explain the actual chemical and mechanical processes that take place during brazing. • Explain the gas-brazing method. • Identify the various brazing pressures and the correct nozzles associated with each, in relation to the thickness of materials (steel) being welded. • Demonstrate start up and shut down procedures. • Identify, select and classify brazing consumables • Explain and discuss the safety precautions associated with gas brazing. • Explain the terminologies associated with oxygen-acetylene gas brazing procedures.
ASSESSMENT TASKS OR ACTIVITIES	
Questionnaire-based activities related to: • The oxy-acetylene brazing process. • The oxy-acetylene brazing equipment used • The oxy-acetylene brazing method and the application of specifications (pressure, torch and nozzle type, consumables to be used). • Application of safety precautions during oxy-acetylene brazing. • Explaining the heat characteristics of common metals during the oxy-acetylene brazing process • Correct use of terminology is assessed. *Range for the purpose of assessment:* • *Parts include: oxygen, acetylene gas; hoses; nozzles; suitable brazing torch; gas brazing electrodes; personal protective equipment* • *Students must request all the necessary equipment they require to set up the brazing equipment correctly. If anything is left out they should be penalised and the lecturer should note this down* • *Using knowledge and skills acquired, the equipment is set up correctly and checked by the lecturer before any brazing operations begin*	

SUBJECT OUTCOME	
4.2 Plan and prepare for the gas brazing process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Hazards relating to the brazing process are identified and eliminated in accordance with standard working practices. • The selection of oxy-acetylene gas brazing equipment is verified as specified in the brazing procedure. • Work-piece/s are prepared prior to brazing as specified on drawing and working practices. • The task dimensions and work-piece alignment are checked as specified on drawing	• Explain the safety aspects of gas brazing in the fabrication workshop. • Prepare the brazing equipment • Prepare the work-piece prior to brazing • Prepare the brazing environment
ASSESSMENT TASKS OR ACTIVITIES	
Students are given a brazing task according to the range of coverage in Subject Outcome 3. Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task • Before any brazing can take place all students must be found competent in this activity • The oxy-acetylene equipment is to be assembled and ensured to be leak-tested and leak-free • Work-piece clamped or secured in position as per drawing specifications. • Safety precautions adhered to. • Inspection work-piece prior to brazing. *Range:* • *Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* • *Material thickness: minimum –1,6mm* • *Despite the minimum material thickness as specified, students must display sufficient competency to prepare the groove prior to brazing.*	

SUBJECT OUTCOME	
4.3 Braze the work-piece/s *Range: Braze positions to include fillet and grooves: Flat/Horizontal*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The brazing of material is carried out in accordance with work instruction sheet and drawing requirements. • Safety precautions are applied and adhered to in accordance with OHS Act (applicable to the brazing process). • Quality checks on the welded materials are applied. • The end product is inspected to conform to specifications as reflected on drawing or job requirement. • Safety hazards including flashbacks are avoided. • Weld-defects are identified and corrective action is taken. *Range: Defects include excessive slag, rough surface and edges and a rounded top corner*	• Adhere to all safety precautions according to workshop requirements and OHS Act • Demonstrate the gas brazing process, using knowledge and skills attained • Inspect brazed work-piece for defects and apply quality checks on process.

ASSESSMENT TASKS OR ACTIVITIES
• Practical project or task • Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, correct pressures and flame-setting. • Students to use skills, knowledge and safety during cutting • Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn. • All brazing must take place in a controlled environment and lecturers to ensure quality of weld. *Range:* • *Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* • *Material thickness: minimum –1,6mm* • *Resources include: Brazing equipment, tools, protective clothing and equipment, materials as specified on drawings and weld filler material.* • *Braze positions to include:* ▪ *Fillet : Flat/Horizontal* ▪ *Grooves: Flat/Horizontal* • Brazed joints acceptance criteria to be in accordance with a national and/or international standard

SUBJECT OUTCOME	
4.4 Care and storage of brazing equipment	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The proper care and storage procedures for tools and equipment is explained and demonstrated according to worksite practices. • The oxy-acetylene brazing equipment is dismantled according to workshop procedures. • Cylinders, hoses, gauges and torch are packed away neatly and safely in accordance with workshop procedures.	• Explain the care and storage procedures for tools, equipment in accordance with work site practices and specifications. • Dismantle and store gas brazing equipment in accordance with manufacturer's specifications and requirements.
ASSESSMENT TASKS OR ACTIVITIES	
• Assessment by observation checklist and/or theoretical assessment. • Tools and equipment are stored to conform to worksite practices • Defective equipment is reported.	

Topic 5: Gas metal arc welding (down hand position)

SUBJECT OUTCOME	
5.1 Describe the gas metal arc welding (GMAW) process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Basic and major components of GMAW equipment and their functions are identified and explained. • The importance of the correct setting of the power source and choice of electrode and the consequences of incorrect selection are explained *Range: The thickness of materials in relation to size and type of welding electrode used, and the influence of electrode manipulation during the welding process. Range: Welding consumables include misuse; mishandling; baking procedures*. • Welding characteristics of low carbon steel are identified and the implications for unsafe conditions are described. • Terms and definitions used are consistent with generally accepted welding terminology as recorded in welding standards.	• Explain the terminologies associated with gas metal arc welding procedures. • Explain the actual chemical and mechanical processes that take place during welding. • Explain the gas metal arc welding (GMAW) method (down hand position). • Identify the various welding parameters, in relation to the thickness of materials (steel) being welded. • Demonstrate setting up procedures
ASSESSMENT TASKS OR ACTIVITIES	
Questionnaire-based activities related to: • The gas metal arc welding process and related equipment. • The gas metal arc welding equipment used • The gas metal arc welding method and the application of specifications (parent material, current setting, electrode angle, and electrode-wire, shielding gas, pressure settings and other consumables used). • Application of safety precautions during gas metal arc welding. • Explaining the heat characteristics of common metals during the gas metal arc welding process • Correct use of terminology is assessed. For the purpose of assessment: • Parts include: Suitable power source, earth clamp, wire-feeder, shielding gas, electrode holder and welding cable. • Students must request all the necessary equipment they require to set up the welding equipment correctly. If anything is left out they should be penalised and the lecturer should note this down • Using knowledge and skills acquired, the equipment is set up correctly and check ed by the lecturer before any welding operations begin	

SUBJECT OUTCOME	
5.2 Plan and prepare for the welding process	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Welding hazards are identified and eliminated in accordance with standard working practices. • The selection of gas metal arc welding equipment is verified as specified in the welding procedure. • Work-piece/s prepared prior to welding as specified on drawing and working practices. • Task dimensions and work-piece alignment are checked as specified on drawing	• Explain the safety aspects of GMAW in the fabrication workshop. • Prepare the GMAW equipment • Prepare the work-piece for welding • Prepare the welding environment.

ASSESSMENT TASKS OR ACTIVITIES
Students are given a welding task according to the scope of coverage in Subject Outcome 3. Planning and preparation is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within a practical project or task • Before any welding can take place all students must be found competent in this activity • The gas metal arc welding equipment is to be well insulated to avoid electric shock. • Work-piece tack welded in position as per drawing specifications. • Safety precautions adhered to. • Inspection work-piece prior to welding. *Range: Parts include: suitable power source, earth clamp, shielding gas, wire-feeder, electrode-wire, and welding cable.* *Range: Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* *Range: Material thickness: minimum –1,6mm* • Despite the minimum material thickness as specified,, students must display sufficient competency to prepare the groove prior to welding.

SUBJECT OUTCOME	
5.3 Weld the work-piece *Range: Weld positions to include: Fillet welding: Flat/Horizontal Vertical* *Groove welding: Flat/Horizontal Vertical*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The welding of the work-piece material is carried out in accordance with work instruction sheet and drawing requirements. • Safety precautions are applied and adhered to in accordance with OHS Act (applicable to the GMAW process.). • Quality checks on welded materials are applied. • The end product is inspected to conform to specifications as reflected on drawing or job requirement. *Range: Defects include excessive slag, spatter and irregular weld finish (bead).* *Range: Hazards include fire, electrocution; incorrect set-up procedures and unsafe use of power tools are explained.* • Welding defects are identified and corrective action is taken.	• Adhere to all safety precautions according to workshop requirements and OHS Act • Demonstrate the GMAW process, using knowledge and skills attained. • Inspect welded work-piece for defects and apply quality checks on process.

ASSESSMENT TASKS OR ACTIVITIES
Practical project or task • Lecturer to ensure correct posture, weld-direction, angle of electrode to work-piece, pressures • Students to use skills, knowledge and safety during cutting • Lecturers are to ensure that all personal protective equipment (PPE) is correctly and appropriately worn. • All welding must take place in a controlled environment and lecturers to ensure quality of cuts. *Range: Material type to be used: May be selected from the range of carbon steels (plate only), applicable to the material groups 1, 2, 3 or 11 [according to ISO (TR) 15608).* *Range: Material thickness: minimum –1,6mm* *Range: Resources include: Welding equipment, tools, protective clothing and equipment, welding procedure specification, materials as specified on drawings and weld filler material.* *Range: Weld positions to include:* ▪ Fillet welding: Flat/Horizontal, Vertical ▪ Groove welding: Flat/Horizontal, Vertical • Welded joints acceptance criteria to be in accordance with a national and/or international welding standard.

SUBJECT OUTCOME	
5.4 Care and storage of welding equipment	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The proper care and storage of tools and equipment is explained in accordance with worksite practices. • Gas metal arc welding equipment is dismantled according to workshop procedures • The welding equipment, hand tools and consumables, are packed away neatly and safely in accordance with laid down procedures	• Explain the care and storage procedures for tools, equipment in accordance with work site practices and specifications. • Dismantle and store the welding equipment in accordance with manufacturer's specifications and requirements.
ASSESSMENT TASKS OR ACTIVITIES	
• Students are given a welding task according to the range of coverage in Subject Outcome 3. • Care and storage of welding equipment is to be assessed by a theory test questionnaire accompanied by an observation checklist contained within the practical project (welding task). For the purpose of assessment: • Tools and equipment are stored to conform to worksite practices • Defective equipment is reported.	

4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN WELDING – LEVEL 3

4.1 Integrated Summative Assessment Task (ISAT)

A compulsory component of the external assessment (ESASS) is the **Integrated Summative Assessment Task (ISAT)**. The 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 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 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 ISAT.

4.4 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:

LEVEL 3	KNOWLEDGE AND COMPREHENSION	APPLICATION	ANALYSIS, SYNTHESIS AND EVALUATION
	30%	50%	20%