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NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

FITTING AND TURNING

NQF Level 3

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FITTING AND TURNING – LEVEL 3

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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 Fitting and Turning 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: Fitting and Turning* to prepare for and deliver Fitting and Turning. 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 for students who experience barriers to learning be customised 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 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 FITTING AND TURNING

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 Fitting and Turning 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

Fitting and Turning, 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 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 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 Fitting and Turning Level 3:

NUMBER OF UNITS	ASSESSMENT	COVERAGE
4	Formal written tests	2 or 3 more completed topics
1	Internal written exam	All completed topics
4	Practical assessments	Must cover the related subject outcomes.

ASSESSMENT OF FITTING AND TURNING

LEVEL 3

1 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN FITTING AND TURNING - LEVEL 3

Topic 1: Grinding tools and drill bits

SUBJECT OUTCOME	
1.1 Plan and prepare for tool grinding.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The appropriate grade and shape of grinding stone is selected.	• Select appropriate grade and shape of grinding stone.
• The material is established to cut / drill with the tool/drill bit.	• Establish material to be cut / drill with the tool/drill bit.
• The types of angles (helix, rakes, clearance etc) are identified.	• Identify the types of angles (helix, rakes, clearance etc).
• The type of material a tool is made of is identified.	• Identify type of material a tool is made of.
• Different types of stones and their bonds are identified.	• Identify different types of stones and their bonds.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
1.2 Prepare site and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The grinding wheel is inspected and dressed and the tool rest adjusted.	• Inspect the grinding wheels. • Dress the grinding wheels. • Adjust the tool rest.
• The gap between the wheel and tool rest is set to specifications	• Set the gap between the wheel and tool rest.
• Damaged or sub-standard components and equipment and are identified and appropriate corrective action is taken. *Range: Minimum grinding wheel diameter and thickness, cracks, axel nut and thrust washer, transparent safety glass.*	• Identify damaged or sub-standard components and equipment and take appropriate corrective action. *Range: Minimum grinding wheel diameter and thickness, cracks, axel nut and thrust washer, transparent safety glass.*
• Any flammable materials present which might cause an unsafe working are identified and removed.	• Identify and remove any flammable materials present which might cause an unsafe working.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
1.3 Grind tools and drill bits.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Drill bits and tool condition is inspected and assessed.	• Inspect and assess drill bits and tool condition.
• The drill bit/tool is sharpened to manufacturer's specifications and to meet job requirements.	• Sharpen the drill bit/tool to manufacturer's specifications and to meet job requirements.
• Set up angles is determined and completed using the	• Determine and complete set up angles using the correct

correct measuring instrument.	measuring instrument.
• The drill bit is positioned on the rest.	• Position the drill bit on the rest.
• The drill bit is grinded/sharpened to meet the required angle for different materials.	• Grind/sharpen the drill bit to meet the required angle for different materials.
• The tool and/drill bits are checked for compliance with specifications and further grinding is applied if necessary.	• Check tool and/drill bits for compliance with specifications and apply further grinding if necessary.
• Cooling is applied during grinding process to prevent overheating of grinding surface.	• Apply cooling during grinding process to prevent overheating of grinding surface.
• Appropriate safety practices are applied during the grinding process.	• Apply appropriate safety practices during the grinding process.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
1.4 Care for and store tool grinding tools and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Grinding tools and equipment are cleaned and stored. according to workshop procedures.	• Clean grinding tools and equipment. • Store grinding tools and equipment in a safe place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
1.5 Record information on work completed.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• An existing file is used or a new file is opened and named and information on work done is accurately recorded and safely stored	• Open a new file or use an existing file and name it. • Accurately record information on completed job. • Store information in a safe place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
1.6 Explain incidents and problems related to tool grinding.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The correct sequence of activities to follow during tool grinding and the implications of incorrect sequence of activities and operations are described.	• Explain correct sequence of activities to follow during tool grinding. • Describe the implications of incorrect sequence of activities and operations.

ASSESSMENT TASKS OR ACTIVITIES
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks

SUBJECT OUTCOME	
1.7 Explain correct safety procedures and care when grinding tool and drill bits. *Range: Human beings, machines, equipment, materials and environment..*	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Applicable worksite health and safety practices and good housekeeping are explained.	• Explain worksite health and safety practices. • Explain good housekeeping.
• Safety precautions before and after using the grinding machine are explained.	• Explain the safety precautions before and after using the grinding machine.
• Importance of a clean and tidy work environment is explained.	• Explain the importance of a clean working area.
• The importance of cleaning equipment, materials and machines is explained.	• Describe the necessity of cleaning equipment, materials and machines.
• The appropriate safety clothes for a grinding process are identified and their importance explained.	• Identify the appropriate safety clothes for a grinding process and explain their importance.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

Topic 2: Bearings

SUBJECT OUTCOME	
2.1 Plan and prepare for bearing replacement.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Documents to investigate bearing history are obtained.	• Obtain documents to investigate bearing history.
• Engineering drawings are interpreted and maintenance schedule determined.	• Interpret engineering drawings. • Determine maintenance schedule
• Type of bearing is identified *Range: Anti-friction bearings include ball (single and double thrust) and roller (needle, spherical, taper) types. Plain bearings include plain, wrapped, flanged, split and thrust types in brass, bronze, white metal, phosphor bronze, aluminium and synthetics.*	• Identify type of bearing.
• Tools, equipment needed for the job are identified.	• Identify appropriate tools and equipment for the job.
• Bearing replacement required is explained.	• Explain bearing replacement to be completed.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME
2.2 Prepare site and equipment for bearing replacement.

ASSESSMENT STANDARD	LEARNING OUTCOME
• Site and equipment preparation for bearing replacement is conducted according to workplace procedures. *Range: Site and equipment preparation includes isolating equipment electrically, mechanically and from other energy sources and selection of tools*	• Isolate equipment electrically from other energy sources. • Isolate equipment mechanically from other energy sources. • Select appropriate tools and equipment.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
2.3 Check bearings.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Bearing assemblies are inspected for conformance to manufacturer's specifications.	• Inspect bearing assemblies for conformance to manufacturer's specifications.
• Bearing lubrication and cooling devices and/or systems are checked for operation according to manufacturer specifications.	• Check bearing lubrication. • Check bearing cooling devices.
• Bearing diagnostic equipment is used to establish bearing condition.	• Use bearing diagnostic equipment to establish bearing conditions.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
2.4 Remove and inspect bearings.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Bearings and/or assemblies are removed.	• Remove bearings and/or assemblies.
• Bearings and/or assemblies are stripped and parts are identified.	• Identify the bearing parts.
• Bearings and associated parts are cleaned.	• Strip bearing assemblies. • Clean bearing and associated parts.
• Bearings and associated parts are inspected for damage and measured for wear in accordance with manufacturer specifications.	• Inspect damage and wear.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
2.5 Install bearings to machines and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Bearing parts and fitting equipment are selected to match bearing type and fitting procedure.	• Select bearing parts. • Select fitting equipment. •

• Bearing and / or assemblies are installed in accordance with manufacturer specifications.	• Install bearing assemblies in accordance with manufacturer specifications.
• Locking devices, if any, are secured in accordance with machine requirements.	• Secure locking devices in accordance with machine requirements.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOMES	
2.6 Check installation for compliance with operational requirements.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Replacement parts and/or assemblies are functionally checked and/or tested.	• Check replacement parts. • Test replacement parts.
• Appropriate safety practices are applied during the maintenance process.	• Apply appropriate safety practices during the maintenance process.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
2.7 Record information on work completed.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• An existing file is used or a new file is opened and named and information on bearing replacement is accurately recorded and safely stored.	• Open a new file and name it or use an existing file. • Accurately record information on completed job. • Store information in a safe place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
2.8 Explain incidents and problems related to bearing replacement.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The correct sequence of activities to follow during bearing maintenance and the implications of incorrect sequence of activities and operations are discussed.	• Explain correct sequence of activities to follow when maintaining bearings.
• Possible incorrect decisions that can be taken during the maintenance of bearings are indicated.	• Create an awareness of possible incorrect decisions that can be taken during the maintaining of bearings. • Explain and discuss the implications of incorrect sequence of activities and operations.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
2.9 Explain correct safety procedures and care when maintaining bearings in machines and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Applicable worksite health and safety practices and good housekeeping is explained.	• Explain worksite health and safety practices. • Explain good housekeeping.
• Importance of a clean and tidy work environment is explained.	• Explain the importance of a clean working area.
• Safety precautions before and after bearing replacements is explained.	• .Explain the safety precautions before and after replacing bearings.
• The importance of cleaning equipment, materials and machines is explained.	• Describe the necessity of tools, equipment and cleaning materials.
• The appropriate safety clothes is identified and the importance thereof is explained.	• Describe the importance of and identify the appropriate safety clothes.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

Topic 3: Brakes and clutches

SUBJECT OUTCOME	
3.1 Plan and prepare for brake and clutch maintenance.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Read and interpret job card in order to plan and prepare for brake and clutch maintenance. *Range: Planning and preparation includes obtaining documentation, interpreting engineering drawings, maintenance schedules and procedures and selecting appropriate tools and equipment.* • Brakes include disc, thrusters and electromagnetic types. • Clutches include centrifugal and multi-disc types.	• Read and interpret job card. • Obtain documents. • Interpret engineering drawings. • Schedule maintenance procedures. • Select appropriate tools and equipment. • Clean and inspect the complete assembly. • Identify the wear on the linings and score marks on the friction surface.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
3.2 Prepare site and equipment for brake and clutch maintenance.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Site and equipment for brake and clutch maintenance are prepared. *.Range: Site and equipment preparation includes isolating equipment electrically, mechanically and from other energy sources.* • Preparation includes supporting the load before the brake or clutch is released/removed/worked on/adjusted /lowered or removed.	• Isolate equipment electrically from other energy sources. • Isolate equipment mechanically from other energy sources. • Support the load before the brake or clutch is released, removed, worked on, adjusted or lowered.

ASSESSMENT TASKS OR ACTIVITIES
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks

SUBJECT OUTCOME	
3.3 Check brakes and clutches in situ.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Types of brakes and clutches are identified.	• Identify types of brakes and clutches.
• Brake and clutch assemblies are inspected for conformance to manufacturer's specifications.	• Inspect assemblies for conformance to manufacturer's specifications.
• The air gaps are measured according to manufacturer's specifications.	• Measure the air gaps according to manufacturer's specifications.
• The hydraulic systems are inspected for leaks.	• Inspect the hydraulic systems for leaks.
• The friction area is inspected for wear.	• Inspect the friction area for wear.
• Brakes and clutches are measured and adjusted according to manufacturer's specifications.	• Measure and adjust brakes and clutches according to manufacturer's specifications.
• Appropriate safety practices are applied during the process.	• Apply appropriate safety practices during the process.

ASSESSMENT TASKS OR ACTIVITIES
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks

SUBJECT OUTCOME	
3.4 Remove and maintain brakes and clutches..	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Brake and clutch is stripped.	• Strip brake and clutch.
• Brake and clutch parts are identified.	• Identify brake and clutch parts.
• Brake and clutch assemblies are removed.	• Remove brake and clutch assemblies.
• Parts are inspected for non-conformances.	• Inspect parts for non-conformances.
• Parts are cleaned.	• Clean parts.
• Brake and clutch components are assembled.	• Assemble brake and clutch components.
• Appropriate safety practices are applied during the process.	• Apply appropriate safety practices during the process.

ASSESSMENT TASKS OR ACTIVITIES
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks

SUBJECT OUTCOME	
3.5 Install brakes and clutches to machines and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Locking devices, if any, are secured in accordance with machine requirements.	• Secure locking devices in accordance with machine requirements.

• Replacement parts and / or assemblies are functionally checked and / or tested.	• Check replacement parts • Test replacement parts.
• Non-conformances are identified and appropriate corrective action taken.	• Identify non-conformance of parts • Take appropriate corrective action.
• Brake and clutch are installed in accordance with manufacturer specifications.	• Install brake and clutch correctly according to manufacturer's specifications
• Appropriate safety practices are applied during the process.	• Apply appropriate safety practices during the process.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
3.6 Check installation for compliance with operational requirements.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Replacement brake and clutch components are identified from manufacturer markings and parts publications.	• Identify replacement brake and clutch components from manufacturer markings and parts publications.
• Replacement parts and/or assemblies are functionally checked and/or tested.	• Check replacement parts. • Test replacement parts.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
3.7 Record information on work completed	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• An existing file is used or a new file is opened and named and information on job completed is accurately recorded and safely stored.	• Open a new file and name it or use an existing file. • Accurately record information on completed job. • Store information in a safe place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
3.8 Take care of brake and clutch maintenance tools and equipment and store it safely.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Brake and clutch maintenance equipment and tools are cleaned and safely stored according to workshop procedures.	• Clean and maintain brake and clutch equipment and tools. • Store brake and clutch equipment and tools in a safe place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
3.9 Explain incidents and problems related to brake and clutch maintenance.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The correct sequence of activities to follow during brake and clutch maintenance and the implications of incorrect sequence of activities and operations are explained	• Explain the correct sequence of activities to follow when maintaining brakes and clutches
• Possible incorrect decisions that can be taken during the maintenance of brakes and clutches are indicated.	• Create an awareness of possible incorrect decisions that can be taken while working on and maintaining brakes and clutches. • Explain and discuss the implications of incorrect sequence of activities and operations.
• Appropriate safety practices during the maintenance process are explained.	• Explain appropriate safety practices during the process
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
3.10 Explain correct safety procedures and care during the removal, replacement and maintenance of brakes and clutch systems.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Applicable worksite health and safety practices and good housekeeping is explained.	• Explain worksite health and safety practices during brake and clutch maintenance. • Explain good housekeeping.
• Importance of a clean and tidy working area is explained.	• Explain the importance of a clean working area.
• The importance of cleaning materials is explained. *Range: Water for hydraulic systems.*	• Describe the necessity of appropriate cleaning materials. *Range: Water for hydraulic systems.*
• The appropriate safety clothes and masks are identified and its importance is explained.	• Identify the appropriate safety clothes and masks and explain its importance.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome ▪ Practical tasks	

Topic 4: Direct drives

SUBJECT OUTCOME	
4.1 Plan and prepare site and equipment for direct drive maintenance.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Maintenance schedule is determined.	• Determine maintenance schedule.
• Site is prepared to ensure a hazardous free work area.	• Prepare site to ensure a hazardous free work area.
• The appropriate tools and equipment are identified to complete direct drive maintenance.	• Identify appropriate tools and equipment to complete direct drive maintenance.
• Different types of couplings available are identified.	• Identify different types of couplings available.

• Lubricants and cleaning agents are acquired in the required quantities	• Acquire lubricants and cleaning agents in the required quantities.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome ▪ Practical tasks	
SUBJECT OUTCOME	
4.2 Service and maintain a direct drive.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Direct drive is isolated in accordance with worksite procedures.	• Isolate direct drive in accordance with worksite procedures.
• Components are checked according to maintenance schedule and services required to components are determined.	• Check components according to maintenance schedule and determine services required to components.
• Components are serviced.	• Service components.
• Loose bolts, pins and links are checked.	• Check loose bolts, pins and links.
• Safety covers are checked for steadiness.	• Check safety covers for steadiness.
• Completion of maintenance is verified.	• Verify completion of maintenance.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
4.3 Replace components on direct drives.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Components to be replaced are identified.	• Identify components to be replaced.
• Appropriate tools to replace components are selected.	• Select appropriate tools to replace components.
• Components requiring service are removed. *Range: Bearings, couplings, rubber bands, fluids.*	• Remove components requiring service. *Range: Bearings, couplings, rubber bands, fluids.*
• Suitable components for the task are selected	• Select suitable components for the task.
• Components are carefully replaced to prevent damage.	• Carefully replace components to prevent damage.
• Protective guards are replaced.	• Replace protective guards.
• Replacement of components is verified.	• Verify replacement of components.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
4.4 Align direct drives after replacement of coupling and/components.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Direct drive gap, axial and radial alignment is set within manufacturer specified tolerance.	• Set direct drive gap within manufacturer specified tolerance.

	• Set axial alignment within manufacturer specified tolerance. • Set radial alignment within manufacturer specified tolerance.

ASSESSMENT TASKS OR ACTIVITIES

- Assignment or case studies
- Evaluation of students' feedback
- Class test at the end of Subject Outcome
- Practical tasks

SUBJECT OUTCOME

4.5 Apply quality checks and post-maintenance activities on work completed.

ASSESSMENT STANDARD	LEARNING OUTCOME
• A visual inspection on direct drive is carried out to ensure conformance to manufacturer specifications. • Direct drive performance is confirmed to meet operational requirements. • It is confirmed that maintenance activities meet customer requests and manufacturer's specifications.	• Carry out a visual inspection on direct drive to ensure conformance to manufacturer specifications. • Confirm direct drive performance. • Confirm that maintenance activities meet customer requests and manufacturer's specifications.

ASSESSMENT TASKS OR ACTIVITIES

- Assignment or case studies
- Evaluation of students' feedback
- Class test at the end of Subject Outcome
- Practical tasks

SUBJECT OUTCOME

4.6 Take care of direct drive maintenance tools and equipment and store it safely.

ASSESSMENT STANDARD	LEARNING OUTCOME
• Direct drive maintenance equipment are cleaned and stored according to workshop procedures.	• Clean direct drive maintenance equipment. • Store direct drive maintenance equipment according to workshop procedures.

ASSESSMENT TASKS OR ACTIVITIES

- Assignment or case studies
- Evaluation of students' feedback
- Class test at the end of Subject Outcome
- Practical tasks

SUBJECT OUTCOME

4.7 Report on system condition.

ASSESSMENT STANDARD	LEARNING OUTCOME
• A report is compiled and processed on condition of direct drive and components, services and maintenance Completed.	• Compile an accurate condition report on direct drive and components services and maintenance completed. • Process direct drive and components service report timeously.

ASSESSMENT TASKS OR ACTIVITIES

- Assignment or case studies
- Evaluation of students' feedback
- Class test at the end of Subject Outcome
- Practical tasks

SUBJECT OUTCOME	
4.8 Explain principles, incidents and problems related to direct drive maintenance.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Working principles and components of direct drives are explained.	• Explain working principles and components of direct drives.
• The correct sequence of activities to follow when maintaining direct drives are explained as well as the implications of incorrect sequence of activities and operations.	• Explain correct sequence of activities to follow when maintaining direct drives. • Discuss the implications of incorrect sequence of activities and operations.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
4.9 Explain correct safety procedures and care while maintaining direct drives. *Range: Human beings, machines, equipment, materials.*	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Importance of a clean working area is explained.	• Explain the importance of a clean working area.
• The correct disposal of waste materials is explained.	• Explain the correct disposal of waste materials.
• The appropriate safety covers for direct drives are explained. *Range: functions, importance, dimensions, materials used for drives.*	• Explain appropriate safety covers for direct drives. *Range: functions, importance, dimensions, materials used for drives.*
• The correct displays of safety instructions for direct drive installations are explained.	• Explain the correct display of safety instructions for direct drive installations.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

Topic 5: Dynamic seals in machines and equipment

SUBJECT OUTCOME	
5.1 Plan and prepare for dynamic seal replacement.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Seal replacement history is obtained from documents.	• Obtain documents to investigate seal replacement history.
• Engineering drawings are interpreted.	• Interpret engineering drawings.
• Maintenance schedule is determined.	• Determine maintenance schedule.
• Type of seals and appropriate tools and equipment for the job are identified.	• Identify type of seals. • Identify appropriate tools and equipment for the job.

• Seal replacement to be completed is explained.	• Explain seal replacement to be completed.
• Protective safety equipment is selected.	• Select protective safety equipment.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
5.2 Prepare site and equipment for seal replacement.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The site is prepared to ensure a hazardous free work area.	• Prepare site to ensure a hazardous free work area.
• Appropriate tools and equipment to complete the task are identified and selected.	• Identify and select appropriate tools and equipment to complete the task.
• Lubricants and cleaning agents are acquired in the required quantities.	• Acquire lubricants and cleaning agents in the required quantities.
• The system is isolated and depressurized.	• Isolate system. • Depressurize system.
• It is ensured that the system is safe to work on.	• Ensure system is safe to work on.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
5.3 Maintain dynamic seals.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The specific seals used in the machine or equipment are identified.	• Identify the specific seals used in the machine or equipment.
• The working condition of seals and seal assembly is inspected to determine deterioration and a comparison is made according to manufacturer's specifications.	• Inspect the working condition of seals and seal assembly to determine deterioration and compare to manufacturer's specifications.
• Seal assembly is removed from machine in correct sequence.	• Remove seal assembly in correct sequence from machine.
• Worn seals and assembly parts to be replaced are identified.	• Identify worn seals and assembly parts to be replaced.
• Seals and seal assembly are carefully handled and installed to machines or equipment.	• Carefully handle and install seals and seal assembly to machines or equipment.
• Appropriate lubrication is applied to seals and seal assembly according to manufacturer's specifications.	• Apply appropriate lubrication to seals and seal assembly according to manufacturer's specifications.
• Seal assembly is tested to ensure no leaks or overheating.	• Test seal assembly to ensure there are no leaks or overheating.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback	

• Class test at the end of Subject Outcome ▪ Practical tasks

SUBJECT OUTCOME	
5.4 Take care of system maintenance tools and equipment and store safely.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Dynamic seal maintenance equipment is cleaned.	• Clean dynamic seal maintenance equipment.
• Dynamic seal maintenance equipment is stored according to workshop procedures.	• Store dynamic seal maintenance equipment according to workshop procedures.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome ▪ Practical tasks	

SUBJECT OUTCOME	
5.5 Record information on work completed.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• An existing file is used or a new file is opened and named and information on job completed is accurately recorded and safely stored.	• Open a new file and name it or use an existing file.. • Accurately record information on completed job. • Store information in a save place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
5.6 Explain principles, incidents and problems related to dynamic seals in machines and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The working principles and types of dynamic seals are explained.	• Explain working principles and types of dynamic seals.
• The correct sequence of activities to follow when maintaining dynamic seals are explained as well as the implications of incorrect sequence of activities and operations.	• Explain correct sequence of activities to follow when maintaining dynamic seals. • Discuss the implications of incorrect sequence of activities and operations.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
5.7 Explain correct safety procedures and care while maintaining dynamic seals drives. *Range: Human beings, machines, equipment, materials.*	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Importance of a clean working area is explained.	• Explain the importance of a clean working area.
• The correct disposal of waste materials is explained.	• Explain the correct disposal of waste materials.

• Health and safety work procedures are explained and applied while completing work according to schedules and manufacturer's specifications.	• Explain and apply health and safety procedures while completing work in accordance to schedules and manufacturer's specifications.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

Topic 6: Heat exchangers and pressure vessels

SUBJECT OUTCOME	
6.1 Plan and prepare for heat exchanger and pressure vessel maintenance and pressure testing.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The type of heat exchangers and pressure vessels are identified.	• Identify type of heat exchangers and pressure vessels.
• History of maintenance schedule on a heat exchanger and a pressure vessel is obtained from documents.	• Obtain documents to investigate history of maintenance schedule on a heat exchanger and a pressure vessel.
• Heat exchanger and pressure vessel is carefully inspected and possible faults and parts to be replaced are identified.	• Carefully inspect a heat exchanger and pressure vessel and identify possible faults and parts to be replaced.
• Tools and equipment as well as protective safety equipment for the job required are identified and selected.	• Identify appropriate tools and equipment for the job required • Select protective safety equipment.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME	
6.2 Prepare site and equipment.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The site is prepared to ensure a hazard free work area.	• Prepare site to ensure a hazard free work area
• The system is depressurized cooled.	• Depressurize and cool the system
• Electrical and mechanical energy is isolated.	• Isolate electrical and mechanical energy.
• Lubricants and cleaning agents are acquired in the required quantities.	• Acquire lubricants and cleaning agents in the required quantities.
• It is confirmed that the system is safe to work on.	• Ensure the system is safe to work on.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	

SUBJECT OUTCOME

6.3 Complete a visual and certified inspection and assessment of the heat exchanger and pressure vessel condition.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• A visual inspection is carried out to determine the overall condition of the pressure vessel or heat exchanger. *Range: Valves, cracks, corrosion, gauges and instruments*	• Carry out a visual inspection to determine the overall condition of the pressure vessel or heat exchanger. *Range: Valves, cracks, corrosion, gauges and instruments*
• The outcome of the assessment is documented and reported.	• Document and report outcome of the assessment.
• The heat exchanger is checked for compliance with operational requirements.	• Check heat exchanger for compliance with operational requirements.
• Equipment is blanked off for pressure testing.	• Blank off equipment for pressure testing.
• Pressure test equipment is calibrated and pressure is set not to exceed safe maximum working pressure.	• Calibrate pressure test equipment and set pressure not to exceed safe maximum working pressure.
• The pressure vessel is filled with water.	• Fill pressure vessel with water.
• Pressure is applied to maximum pressure levels using certified pressure test equipment.	• Apply pressure to maximum pressure levels using certified pressure test equipment.
• Gauges are read and pressure readings and other details necessary for certification is recorded.	• Read gauges and record pressure readings and other details necessary for certification.
• A pressure test conduction by an approved inspection officer of a statutory authority is witnessed and a certificate is issued.	• Witness a pressure test conducted by an approved inspection officer of a statutory authority if required. • Issue a certificate •
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
6.4 Maintain and care for heat exchanger and pressure vessels.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Safe maximum working pressure of heat exchangers and pressure vessels is adjusted and secured.	• Adjust and secure safe maximum working pressure of heat exchangers and pressure vessels.
• Worn seals are replaced where necessary.	• Replace worn seals where necessary.
• A full operational test is run to identify problems and determine working condition of automatic controls.	• Run a full operational test to identify problems and determine working condition of automatic controls.
• Control points on heat exchangers and pressure vessels are adjusted according to operational requirements.	• Adjust control points on heat exchangers and pressure vessels according to operational requirements.
• Maintenance parts, consumables or components which are not adjustable are selected and replaced.	• Select and replace maintenance parts, consumables or components which are not adjustable.
• Heat exchanger and pressure vessel maintenance equipment is cleaned according to workshop procedures.	• Clean heat exchanger and pressure vessel maintenance equipment according to workshop procedures.
• Equipment used for maintenance is stored according to workshop procedures.	• Store equipment used for maintenance according to workshop procedures.

ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome ▪ Practical tasks	
SUBJECT OUTCOME	
6.5 Record information on work done.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• An existing file is used or a new file is opened and named and information on job completed is accurately recorded and safely stored.	• Open a new file and name it or use an existing file. • Accurately record information of work done on heat exchanger and pressure vessel. • Store information in a save place.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks • Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome ▪ Practical tasks	
SUBJECT OUTCOME	
6.6 Explain principles, incidents and problems related to heat exchangers and pressure vessels.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The working principles and types of heat exchangers and pressure vessels are explained.	• Explain working principles and types of heat exchangers and pressure vessels.
• The correct sequence of activities to follow when maintaining heat exchangers and pressure vessels are explained.	• Explain correct sequence of activities to follow when maintaining heat exchangers and pressure vessels.
• The implications of incorrect sequence of activities and operations are indicated.	• Indicate the implications of incorrect sequence of activities and operations.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks • Assignment or case studies • Evaluation of students' feedback • Class test at the end of Subject Outcome • Practical tasks	
SUBJECT OUTCOME	
6.7 Explain correct safety procedures and care while maintaining heat exchangers and pressure vessels. *Range: Human beings, machines, equipment, materials, environment.*	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• The importance of a clean working area is explained.	• Explain the importance of a clean working area.
• The correct disposal of waste materials is explained.	• Explain the correct disposal of waste materials.
• Safe working procedures according to schedules and manufacturer's specifications are explained.	• Explain safe working procedures according to schedules and manufacturer's specifications.
• Safe maximum working pressure of heat exchangers and pressure vessels are explained.	• Explain safe maximum working pressure of heat exchangers and pressure vessels.
• Personal health and safety while working on pressure	• Explain personal health and safety while working on

vessels and heat exchangers are explained.	pressure vessels and heat exchangers.

ASSESSMENT TASKS OR ACTIVITIES

- Assignment or case studies
- Evaluation of students' feedback
- Class test at the end of Subject Outcome
- Practical tasks

Topic 7: Lubrication systems

SUBJECT OUTCOME

7.1 Plan maintenance on lubrication systems.

ASSESSMENT STANDARD	LEARNING OUTCOME
• Read and interpret job card in order to plan and prepare for brake and clutch maintenance. *Range: Planning and preparation includes obtaining documentation, interpreting engineering drawings, maintenance schedules and procedures and selecting appropriate tools and equipment*. • Brakes include disc, thrusters and electromagnetic types. • Clutches include centrifugal and multi-disc types.	• Investigate service history through collection of information from documents and data plate • Determine appropriate lubricants from machine/equipment records and manuals. • Determine filtration components to be replaced. • List appropriate tools and equipment required for maintenance.

ASSESSMENT TASKS OR ACTIVITIES

Written test
Practical task

SUBJECT OUTCOME

7.2 Prepare site and equipment..

ASSESSMENT STANDARD	LEARNING OUTCOME
• Type of lubrication system is identified. • Site is prepared to ensure a hazard free work area. • Tools and equipment to complete the task are collected. • Lubricants and cleaning agents are acquired in the required quantities. • The system is isolated.	• Identify type of lubrication system. • Prepare site to ensure a hazard free work area • Collect appropriate tools and equipment to complete the task • Acquire lubricants and cleaning agents in the required quantities. • Isolate the system.

ASSESSMENT TASKS OR ACTIVITIES

- Assignment or case studies
- Evaluation of students' feedback
- Class test at the end of Subject Outcome
- Practical task

SUBJECT OUTCOME

7.3 Inspect and assess functioning of the lubrication system.

ASSESSMENT STANDARD	LEARNING OUTCOME
• The working condition of the lubrication system is inspected to determine deterioration and compare to manufacturer specifications. *Range: pressure or gravity test, dynamic and static* • System faults are diagnosed. *Range: lubricants include oils, greases (including*	• Inspect the working condition of the lubrication system to determine deterioration and compare to manufacturer's specifications. *Range: pressure or gravity test, dynamic and static.* • Diagnose system fault(s). *Range: Lubricants include oils, greases (including*

synthetics) and self lubricating materials.	*synthetics) and self-lubricating materials.*
ASSESSMENT TASKS OR ACTIVITIES	
Practical task	
SUBJECT OUTCOME	
7.4 .Rectify lubrication system faults.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Components or parts in need of a service are identified as well as components or parts to be replaced. • Serviceable components or parts are removed, serviced and replaced. • Unserviceable components or parts are removed and new parts fitted. • Components or parts on lubrication system are adjusted where needed.	• Determine components or parts in need of a service and components or parts to be replaced. • Remove serviceable components or parts, service and replace. • Remove unserviceable components or parts and fit new parts. • Adjust components or parts on lubrication system where needed.
ASSESSMENT TASKS OR ACTIVITIES	
Practical task	
SUBJECT OUTCOME	
7.5 Check system operation for compliance with operational requirements.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Testing tools and equipment are selected and used to run a full operational test to confirm the system is operating according to operational requirements.	• Select testing tools and equipment. • Test lubricating system. • Run a full operational test to confirm working of lubrication system is in accordance to the manufacturer's operational specifications.
ASSESSMENT TASKS OR ACTIVITIES	
Practical task	
SUBJECT OUTCOME	
7.6 Record information on work completed.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• An existing file is used or a new file is opened and named and information on work done is accurately recorded and safely.	• Open a new file and name it or use an existing file. • Accurately record information on completed job. • Store information in a save place.
ASSESSMENT TASKS OR ACTIVITIES	
Practical assignment.	
SUBJECT OUTCOME	
7.7 Discuss and explain incidents and problems related to maintaining lubrication systems.	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Working principles and types of lubrication systems are explained.	• Explain working principles and types of lubrication systems.
• The correct sequence of activities to follow and the implications of incorrect sequence of activities and operations when maintaining lubrication systems are explained.	• Explain correct sequence of activities to follow when maintaining lubrication systems. • Discuss the implications of incorrect sequence of activities and operations.
ASSESSMENT TASKS OR ACTIVITIES	
• Written test • Practical tasks • Case study	

SUBJECT OUTCOME	
7.8 Explain correct safety procedures and care while maintaining lubrication systems. *Range: Human beings, machines, equipment, materials, environment.*	
ASSESSMENT STANDARD	**LEARNING OUTCOME**
• Importance of a clean and tidy working area is explained.	• Explain the importance of a clean working area.
• The correct disposal of waste materials is explained.	• Explain the correct disposal of waste materials.
• Applicable worksite health and safety procedures are explained.	• Explain safe working procedures according to schedules and manufacturer's specifications.
• Personal health and safety while working on lubrication systems is explained.	• Explain personal health and safety while working on lubrication systems.
ASSESSMENT TASKS OR ACTIVITIES	
• Written test • Practical task	

14 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN FITTING AND TURNING - LEVEL 3

14.1Integrated 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 throughout 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 throughout 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).

14.2National 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
	40%	50%	10%