education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATES (VOCATIONAL)

ASSESSMENT GUIDELINES

MACHINE MANUFACTURING

NQF Level 3

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CONTENTS

SECTION A: PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides the lecturer with guidelines to develop and implement a coherent, integrated assessment system for Machine Manufacturing 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: Machine Manufacturing* to prepare for and deliver Machine Manufacturing. 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 one student's work with another, 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 paper or set of written papers set to the requirements of the Subject Learning Outcomes. The Department of Education administers the theoretical component according to relevant assessment policies.

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

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

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

3 MODERATION OF ASSESSMENT

3.1 Internal moderation

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

3.2 External moderation

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

The external moderator:

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

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

4 PERIOD OF VALIDITY OF INTERNAL CONTINUOUS ASSESSMENT (ICASS)

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

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

5 ASSESSOR REQUIREMENTS

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

6 TYPES OF ASSESSMENT

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

6.1 Baseline assessment

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

6.2 Diagnostic assessment

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

6.3 Formative assessment

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

6.4 Summative assessment

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

7 PLANNING ASSESSMENT

An assessment plan should cover three main processes:

7.1 Collecting evidence

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

7.2 Recording

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

7.3 Reporting

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

8 METHODS OF ASSESSMENT

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

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

9 INSTRUMENTS AND TOOLS FOR COLLECTING EVIDENCE

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

The following table summarises a variety of methods and instruments for collecting evidence. A method and instrument is chosen to give students ample opportunity to demonstrate 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 (1-5)
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 5) 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 provides a different way of assessing that 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 which criteria they are evaluated. Space for comments is essential.

SECTION C: ASSESSMENT IN MACHINE MANUFACTURING

1 SCHEDULE OF ASSESSMENT

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

The Portfolio of Evidence and the external assessment include practical and written components. The practical assessment in Machine Manufacturing 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

Machine Manufacturing, 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 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, its exact location must be recorded and it must be readily available for moderation purposes.

The following units guide internal assessment in Machine Manufacturing - 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	The related Subject Outcomes 1.1 the identification and application of machine safety design and operating regulations. 2.1 engineering drawings for marking off purposes, machining purposes and of a simple component that needs to be machined. 3.1 identification, selection and sharpening of tools for the correct machining process. 3.2 the setting up and application of correct cutting speeds and feeds. 4.1 using a centre lathe to produce a component. 4.2 the use of a milling machine to produce a component. 5.1 the application of computer aided drafting (CAD). 5.2 producing and modifying a simple 2D engineering drawing using CAD.

ASSESSMENT OF MACHINE MANUFACTURING

LEVEL 3

3 INTERNAL ASSESSMENT OF SUBJECT OUTCOMES IN MACHINE MANUFACTURING–LEVEL 3

Topic 1: Identify and apply safety regulations when maintaining and using machine control systems

SUBJECT OUTCOME	
1.1 Identify and apply machine safety design and operating regulations	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• An explanation of the importance of machine safety is given. • Machine safety regulations are identified and applied whilst working. • Machine safety precautions during use, relevant safety function on machines, and basic machine safety requirements and related possible special requirements are described. • Suggestions are made for improving machine safety within regulations. • An accident or incident report is produced. • Hazards are identified • A basic machine hazard analysis and a machine risk assessment are performed. • Fundamental safety requirements in machine control and related safety regulations from the OHS Act 85 of 1983 (Machine Safety) are described.	• Explain why machine safety is important. • Identify and apply machine safety regulations whilst working. • Know and describe ▪ safety precautions during use of a machine ▪ the relevant safety function on machines ▪ basic machine safety requirements and related possible special requirements. • Make suggestions for improving machine safety within regulations • Produce an accident or incident report. • Identify hazards • Perform ▪ a basic machine hazard analysis. ▪ a machine risk assessment • Describe ▪ fundamental safety requirements in machine control. ▪ related safety regulations from the OHS Act 85 of 1983 (Machine Safety).
ASSESSMENT TASKS OR ACTIVITIES	
• Case studies, practical exercises, demonstrations and checklists on the identification and application of machine safety design and operating regulations	

Topic 2: Read, interpret, produce and apply engineering drawings to machine mechatronic sub-systems

SUBJECT OUTCOME	
2.1 Read and interpret engineering machine drawings and produce a machine drawing *Range: machines: grinding machines, drilling machines, centre lathes and milling machines; Processes: grinding, milling, turning operations, boring, drilling, screw cutting*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The following are explained: ▪ the difference between a free hand working drawing and an engineering drawing ▪ tolerance specification in relation to quality ▪ machining processes and related symbols. ▪ different materials that are commonly machined and their related characteristics. • Machine symbol types, and the use and importance of material lists are explained and applied. • Engineering drawings are read and interpreted for marking off purposes and machining purposes. • An engineering drawing of a simple component to be machined is produced.	• Explain ▪ the difference between a free hand working drawing and an engineering drawing ▪ tolerance specification in relation to quality ▪ machining processes and related symbols. ▪ different materials that are commonly machined and their related characteristics. ▪ and apply machine symbols types. ▪ and apply the use and importance of material lists. • Read and interpret engineering drawings for marking off purposes and machining purposes. • Produce an engineering drawing of a simple component to be machined.
ASSESSMENT TASKS OR ACTIVITIES	
• An assignment or task on the theoretical concepts. • Case studies with rubrics on machine symbol types and the use and importance of material lists. • Practical exercises on engineering drawings for marking off purposes, machining purposes, and of a simple component to be machined	

Topic 3: Identify and explain function and selection of tooling requirements, speed setting and materials for related machining applications

SUBJECT OUTCOME	
3.1 Select, maintain and use tooling *Range: Tooling: twist drills, reamers, chip breaking, cutting, parting, turning, milling, boring, chamfering, tapping, knurling;* *Accessories: tool holders, clamps*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The chip making process of drilling is explained. • Various cutting angles of twist drills is explained for different materials. • The purpose of cutting fluids and coolants and their related properties during machining are explained. • The purpose of various accessories and work holding fixtures is explained. • The importance of clamping work pieces is explained. • Tools are identified and selected for the correct machining process, and sharpened. • Machine accessories are identified for the relevant machine processes. • Safety is observed when dressing and sharpening tooling. • Work processes and relevant requirement lists (materials, tooling, accessories, speeds and safety) are planned.	• Explain ▪ the chip making process of drilling. ▪ the various cutting angles of twist drills for different materials ▪ the purpose of cutting fluids and coolants, and their related properties during machining ▪ the purpose of various accessories and work holding fixtures ▪ the importance of clamping work pieces. • Identify, select and sharpen tooling for the correct machining process. • Identify machine accessories for the relevant machine processes. • Observe relevant safety when dressing and sharpening tooling. • Plan work processes and relevant requirement lists (materials, tooling, accessories, speeds and safety).
ASSESSMENT TASKS OR ACTIVITIES	
• Practical exercises on identification, selection and sharpening of tools for the correct machining process. • Demonstrations and assignments or tasks on chip making processes, cutting angles of twist drills, cutting fluids and coolants, accessories and work holding fixtures. • Demonstrations and checklists on identified, selected and sharpened tools for the correct machining processes	

SUBJECT OUTCOME	
3.2 Select and determine cutting speeds and feeds *Range: Hammers, files, hacksaws, chisels, hole-punches, hand taps and tap wrenches, stocks and dies, reamers, sheet metal cutters, clamping devices, drill bits, drilling machines (hand held or power, fixed or /manual), related cutting fluids, grindstones and grinding machines.*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The importance of selecting the correct cutting speeds and feeds is explained. • Consequences of not selecting the correct cutting speeds and feeds are explained. • Correct cutting speed and feeds are set up on related machinery. • Correct cutting speeds and feeds are determined by calculations and application.	• Explain the importance of selecting the correct cutting speeds and feeds. • Explain consequences of not selecting the correct cutting speeds and feeds. • Set up correct cutting speed and feeds on related machinery. • Determine correct cutting speeds and feeds by calculations and application.
ASSESSMENT TASKS OR ACTIVITIES	
• Practical exercises, demonstrations, rubrics and checklists on the setting up and application of correct cutting speeds and feeds.	

SUBJECT OUTCOME	
3.3 Identify and apply materials and machining	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• Materials that can be machined are identified and named • Relationships of speeds and feeds are identified for different material types, and explained • Materials are identified and selected according to their characteristics • Characteristics of materials that are commonly machined are explained • Correct materials are selected in accordance with instruction or drawing • Speeds and feeds are determined and selected according to material type.	• Identify ▪ and name materials that can be machined ▪ and explain relationships of speeds and feeds for different material types ▪ and select material according to their characteristics • Explain characteristics of materials that are commonly machined • Select correct materials in accordance with instruction or drawing • Determine and select speeds and feeds according to material type.
ASSESSMENT TASKS OR ACTIVITIES	
• A project, observation sheets and an open-book test on the identification and application of materials and machining	

Topic 4: Identify and explain function, and safely machine components using a milling machine and a lathe

SUBJECT OUTCOME	
4.1 Use a centre lathe to produce a component *Range: Turning operations: facing off, drilling, parallel cutting, parting off, radius cutting, boring, cutting, tapping, knurling, chamfering reaming and tapered turning. Components: headstock, carriage, tail stock, tool post, compound slide, cross slide, apron, feed shaft, lead screw, motors and gear drives*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The purpose of using a centre lathe is explained. • The parts and components that make up the lathe are explained with the aid of sketches. • The different turning operations that can be performed on a lathe, and the advantages and disadvantages where relevant, are explained. • The function of the centre lathe is identified and explained with respect to energy flow. • The function and operation of the components that make up a centre lathe are explained. • The advantages and disadvantages of work pieces being held between centres are listed. • Safety measures that are to be considered when operating a lathe are listed. • Four different types of lathe centres are listed. • Work activity is planned for. • Machine engineering drawings and instructions are read and interpreted. • The machine is prepared for operation (pre-operational checks). • Tooling and materials are on hand. • The lathe is set up for work activity. • Turning operations are performed. • Machined components meet specifications and document conformance. • Discrepancies, problems and malfunctions whilst working are reported. • A clean and tidy work area is maintained. • Safety considerations are applied whilst working.	• Explain ▪ the purpose of using a centre lathe. ▪ with the aid of sketches the parts and components that make up the lathe. ▪ the different turning operations that can be performed on a lathe and where relevant the advantages and disadvantages. • Identify and explain ▪ the function of the centre lathe with respect to energy flow. ▪ the function and operation of the components that make up a centre lathe. • List ▪ the advantages and disadvantages of work pieces being held between centres. ▪ safety measures that are to be considered when operating a lathe. ▪ four different types of lathe centres. • Plan for work activity. • Read and interpret machine engineering drawings and instructions. • Prepare machine for operation (pre-operational checks). • Ensure that tooling and materials are on hand. • Set up lathe for work activity. • Perform turning operations. • Check that machined components meet specifications and document conformance. • Report any discrepancies, problems and malfunctions whilst working. • Maintain a clean and tidy work area.

	• Apply safety considerations whilst working.
ASSESSMENT TASKS OR ACTIVITIES	
• Observation, class questions and a task on the identification and explanation of the functions of a lathe. • Practical exercises on using a centre lathe to produce a component.	

SUBJECT OUTCOME	
4.2 Use a milling machine to produce a component *Range: Components: arbour support, spindle, column, table, saddler, knee, base, gear drive, motors. Operations: profile, flat, shaped surfaces, drilling, boring, gear cutting, spiral shapes, cams, vertical work, slotting, grooving, keyways not to deep*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The purpose of using a milling machine is explained. • The parts and components that make up a milling machine are explained with the aid of sketches. • The operation of a milling machine is identified and explained with respect to energy flow. • Safety measures for operating a milling machine are listed. • Work activities are planned. • Machine engineering drawings and instructions are read and interpreted. • Machine is prepared for operation (pre-operational checks are done) and tooling and materials are on hand. • The milling machine is set up for work activity. • Milling operations are performed. • Machined components meet specifications and document conformances. • Safety considerations are applied whilst working. • All discrepancies, problems and malfunctions whilst working are reported. • A clean and tidy work area is maintained.	• Explain ▪ the purpose of using a milling machine. ▪ with the aid of sketches the parts and components that make up a milling machine. • Identify and explain the operation of a milling machine with respect to energy flow. • List safety measures for operating a milling machine. • Plan for work activity. • Read and interpret machine engineering drawings and instructions. • Prepare machine for operation (pre-operational checks). • Ensure that tooling and materials are on hand. • Set up milling machine for work activity. • Perform milling operations. • Check that machined components meet specifications and document conformances. • Apply safety considerations whilst working. • Report any discrepancies, problems and malfunctions whilst working. • Maintain a clean and tidy work area.
ASSESSMENT TASKS OR ACTIVITIES	
• Demonstrations, practical exercises and rubrics on the use of a milling machine to produce a component.	

Topic 5: Identify, explain and use a basic CAD application software program to produce a simple component machine drawing

SUBJECT OUTCOME	
5.1 Describe and use computer aided drafting *Range: System elements: Hardware: input, processing and output devices. Software: any relevant CAD application package. Elementary CAD commands: layers, line types, geometrical figures, tangential lines, sectional views, insertion of dimension, stretch, mirror, modify, fillets, chamfers, radii, enlarging/reducing, patterns and blocks, insertion of text, copy, move, rotate, measurements, scales, lengths, angles, areas, zoom in/out, trim, snap*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The meaning of the term *CAD* and the purpose of CAD in manufacturing is described. • The various elements that make up a CAD system are identified and their functions described. • CAD applications in industry, and the advantages and possible disadvantages of CAD applications are listed. • Elementary terminology and applications used in CAD applications are explained. • A CAD system is set up. • Elementary CAD commands are used.	• Describe ▪ what is meant by CAD. ▪ the purpose of CAD in manufacturing. • Identify and describe the function of the various elements that make up a CAD system. • List ▪ CAD applications in industry. ▪ the advantages and possible disadvantages of CAD applications. • Explain various elementary terminology and applications used in CAD. • Set up a CAD system. • Use elementary CAD commands.

ASSESSMENT TASKS OR ACTIVITIES
• A project on the description of CAD related concepts. • Practical exercises and demonstrations on the application of computer aided drafting (CAD).

SUBJECT OUTCOME	
5.2 Produce a CAD engineering drawing *Range: Drawing types: general, electrical, electronic, mechanical.*	
ASSESSMENT STANDARDS	**LEARNING OUTCOMES**
• The procedure to produce a CAD drawing is explained. • The purpose of CAD drawing symbols is explained. • An understanding of using the tool box of a CAD application program is demonstrated. • A simple 2D engineering drawing is produced and modified using CAD.	• Explain the procedure to produce a CAD drawing. • Explain the purpose of CAD drawing symbols. • Demonstrate understanding of using the tool box of a CAD application program. • Produce and modify a simple 2D engineering drawing using CAD.
ASSESSMENT TASKS OR ACTIVITIES	
• Assignments or tasks on the procedure to produce a CAD drawing, purpose of CAD drawing symbols and use of the tool box of a CAD application program. • Practical exercises on producing and modifying a simple 2D engineering drawing using CAD	

4 SPECIFICATIONS FOR EXTERNAL ASSESSMENT IN MACHINE MANUFACTURING – 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 integrated summative assessment task (ISAT) draws on the student's 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 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 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.

4.2 National Examination

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

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

MARK ALLOCATION PER QUESTION		
Students complete four of five possible application questions covering all the topics.		
Question 1:	Identify and apply safety regulations when maintaining and using machine control systems.	15%
Question 2:	Read, interpret, produce and apply engineering drawings to machine mechatronic sub-systems.	15%
Question 3:	Identify & explain function and selection of tooling requirements, speed setting and materials for related machining applications	15%
Question 4:	Identify & explain function and safely machine components whilst using a milling machine and a lathe.	40%
Question 5:	Identify explain and use a basic CAD application software programme to produce a simple component machine drawing	15%
	TOTAL	**100**