COMPETENCY STANDARDS
FOR
CNC OPERATION

**Skills for Employment Investment Program (SEIP)
Finance Division, Ministry of Finance**

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The Competency Standards for CNC Operation is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing trainings consistent with the requirement of industry in order for individuals who passed through the set standard via assessment would be qualified and settled for a relevant job.

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INTRODUCTION:

The Skills for Employment Investment Program (SEIP) Project of the Finance Division of the Ministry of Finance has embarked on a project which aims to qualitatively and quantitatively expand the skilling capacity of identified public and private training providers by establishing and operationalizing a responsive skill eco system and delivery mechanism through a combination of well-defined set of funding triggers and targeted capacity support.

Among the many components of the project, one is to promote a Market Responsive Inclusive Skills Training Delivery program. Key priority economic growth sectors identified by government have been targeted by the project to improve current job skills along with up-skilling of the existing workforce to ensure 'required skills to industry standards'. Training providers are encouraged and supported to work with the industry to address identified skills to enable industry growth and increased employment through the provision of market responsive inclusive skills training programs. Priority sectors were identified to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISCs), Employer Associations and Employers.

This document is developed to improve skills in accordance with the job roles and ensure that the required skills are aligned to industry requirements.

The document details the format, sequencing, wording and layout of the Competency Standard for an occupation which comprised of Units of Competence and its corresponding Elements.

OVERVIEW:

A **Competency Standard** is a written specification of the knowledge, skills and attitudes required for the performance of a job or occupation or trade corresponding to the standard of performance required in the workplace.
Competency standard:
- provides a consistent and reliable set of components for training, recognizing and assessing people's skills, and may also have optional support materials.
- enables industry recognized qualifications to be awarded through direct assessment of workplace competencies
- encourages the development and delivery of flexible training which suits individual and industry requirements
- encourages learning and assessment in a work-related environment which leads to verifiable workplace outcomes.

Competency Standards are developed by a working group who comprised of national and international process experts and the participation of worker-experts from the industry to meet the identified training needs of a particular sector.

Competency Standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. Competency Standards acknowledge that people can achieve vocational and technical competency in many ways by emphasizing what the learner can do, not how or where they learned to do it.

With Competency Standards, assessment and training may be conducted at the workplace, at training organization, during regular work, or through work experience, work placement, work simulation or any combination of these.

A Unit of Competence describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of Competence are documented in a standard format that comprises:
- Reference to Industry Sector, Occupational Title and Occupational Description
- Unit code
- Unit title
- Unit descriptor
- Unit of Competence
- Elements and performance criteria
- Variables and range statement
- Evidence guides

Together all the parts of a Unit of Competence:
- Describe a work activity
- Guide the assessor in determining whether the candidate is competent.

Identification and validation of units of competency and elements for each occupation were made by expert workers of various construction companies through an industry consultative workshop held at the Bangladesh Engineering Industry Owners Association (BEIOA) on 28th of February 2016.

Profile of expert workers and facilitators who participated in the Competency Verification and Validation Workshop.

Industry Expert Workers

Name	Company	Job Position/Expertise
Al-Hajj AbulHasim	Nipun Engineering	Lathe machine operation expert
SayedHayder Ali	Asian Tools	Lathe machine operation expert
Md. Ali Akbar	Akbar Engineering Works	Milling machine operation expert
Khandaker Nasir Uddin	Gear Center Engineering	Milling machine operation expert
Md. Nazrul Islam	NH Welding Works	Welding expert
Md. Kamal Miah	Kamal Welding Works	Welding expert
Md. Riaz	Riaz Refrigeration Works	Refrigeration and Air Conditioning expert
Md. Abdul Awoal	Joyti Refrigeration Works	Refrigeration and Air Conditioning expert
Engr. Md. Faruk Hossain	Farmamekh Engineering	CAD-CAM expert
A.K. Azad	Azad Industry	CAD-CAM expert
Salim Ahmed	Salim Engineering Works	Master Craftsman expert
AnowarulHaqueAnswari	Anowar Engineering Works	Master Craftsman expert

Workshop Facilitators:

Md. AbdurRazzaque	BEIOA-SEIP Project	Chairman
Mir Muniruzzaaman	BEIOA-SEIP Project	Chief Coordinator
Md. Mohiuzzaman	SEIP	Course Specialist
EmeterioCedillo, Jr.	SEIP	International Specialist
Md. Atiar Rahman	SEIP	National Specialist

The ensuing sections of this document comprise a description of the respective occupation with all the key components of a Unit of Competence:

- A chart with an overview of all Units of Competence for the respective occupation (Competency Map) including the Unit Codes and the Units of Competency titles.

- A template for a Unit of Competence (Unit of Competence Standard) – this includes further directions on the contents and format of the unit of competence

COMPETENCY PROFILE/CHART for
CNC LATHE AND MILLING MACHINE OPERATION

UNITS OF COMPETENCY		ELEMENTS	

A. Generic (Basic) Competencies

Unit	Element	Element	Element	Element
PERFORM COMPUTATIONS USING BASIC MATHEMATICAL CONCEPTS (SEIP-LIG-CNC-1-G)	Identify calculation requirements in the workplace.	Select appropriate mathematical methods/concepts for the calculation.	Use tool/instrument to perform calculations	
APPLY OCCUPATIONAL HEALTH AND SAFETY (OH&S) PRACTICES IN THE WORKPLACE (SEIP-LIG-CNC-2-G)	Identify OHS policies and procedures	Apply personal health and safety practices	Report hazards and risks	Respond to emergencies
COMMUNICATE IN ENGLISH IN THE WORKPLACE (SEIP-LIG-CNC-3-G)	Read and understand workplace documents in English	Write simple workplace written communications in English.	Listen and comprehend to English conversation	Perform conversations in English language
OPERATE IN A SELF-DIRECTED TEAM. (SEIP-LIG-CNC-4-G)	Identify team goals and processes.	Communicate and cooperate with team members.	Work as a team member	Solve problems as a team member

B. Sector Specific (Common) Competencies

Unit	Element	Element	Element	Element
INTERPRET TECHNICAL DRAWINGS AND PLANS (SEIP-LIG-CNC-1-S)	Select technical drawing.	Interpret technical drawings.	Store manuals, designs and plans	
WORK WITH MECHANICAL HAND AND POWER TOOLS (SEIP-LIG-CNC-2-S)	Inspect hand tools and power tools for usability	Use hand tools properly and safely	Operate power tools properly and safely	Clean/maintain hand tools and power tools after use
CARRY OUT PRECISION CHECKS AND MEASUREMENTS (SEIP-LIG-CNC-3-S)	Select the job to be measured	Select measuring and checking tool/instrument.	Obtain measurements and checks	Record and communicate measurement and check results
	Clean, maintain and store the measuring instruments.			

APPLY QUALITY SYSTEMS AND PROCEDURES (SEIP-LIG-CNC-4-S)	Work within quality system	Apply and monitor quality system improvements in the workplace.	Hold responsible for work quality	Apply standard procedures for each job.

C. Occupation Specific (Course) Competencies

OPERATE A COMPUTER (SEIP-LIG-CNC-1-O)	Start the computer	Arrange and customize desktop display/window setting	Work with files and folders	Work with user application programs
	Print information	Shutdown computer	Maintain computer equipment and systems	

GENERATE DRAWING USING CAD SOFTWARE (SEIP-LIG-CNC-2-O)	Prepare the CAD environment.	Produce 2D drawing	Produce 3D drawing	Maintain computer equipment and systems

APPLY CAD/CAM PROGRAM (SEIP-LIG-CNC-3-O)	Prepare for CAD/CAM Program application	Create/import CAD drawing	Create/edit CNC programs	Load and run program at CNC machine
	Maintain computer, CNC machine, equipment and systems			

WRITE CNC LATHE MACHINE PROGRAM (SEIP-LIG-CNC-4-O)	Determine job requirements	Write CNC Lathe Machine program	Edit CNC Lathe Machine programs	Maintain computer, CNC Lathe machine, tools equipment and systems.

CARRYOUT CNC LATHE MACHINE OPERATIONS (SEIP-LIG-CNC-5-O)	Set-up CNC lathe machine, work piece and cutting tools	Download/input simulate program.	Cut model/sample work piece.	Perform CNC lathe machine operation.
	Check and measure work piece	Maintain computer, CNC Lathe machine, tools, equipment and systems		

WRITE CNC MILLING MACHINE PROGRAM (SEIP-LIG-CNC-6-O)	Determine job requirements	Write CNC Milling Machine Program	Edit CNC Milling Machine programs	Maintain computer, CNC Milling machine, tools equipment and systems

CARRYOUT CNC MILLING MACHINE OPERATIONS (SEIP-LIG-CNC-7-O)	Set-up CNC Milling machine, work piece and cutting tools	Download/input simulate program	Cut model/sample work piece	Perform CNC Milling machine operation.
	Check and measure work piece	Maintain computer, CNC Milling machine, tools equipment and systems.		

Units & Elements at Glance:

Generic (Basic) Competencies (30 hrs.)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SEIP-LIG-CNC-1-G	Perform Computations Using Basic Mathematical Concepts	1. Identify calculation requirements in the workplace 2. Select appropriate mathematical methods/concepts for the calculation. 3. Use tool/instrument to perform calculations	10
SEIP-LIG-CNC-2-G	Apply Occupational Health and Safety (OH&S) Practices in the Workplace	1. Identify OHS policies and procedures 2. Apply personal health and safety practices 3. Report hazards and risks 4. Respond to emergencies	10
SEIP-LIG-CNC-3-G	Communicate in English in the Workplace	1. Read and understand workplace documents in English 2. Write simple workplace communications in English 3. Listen and comprehend to English conversations 4. Perform conversations in English language	5
SEIP-LIG-CNC-4-G	Operate in a Self-Directed Team	1. Identify team goals and work processes 2. Communicate and cooperate with team members. 3. Work as a team member. 4. Solve problems as a team member	5
Total Hour			**30**

Sector Specific (Common) Competencies (30 hrs.)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SEIP-LIG-CNC-1-S	Interpret Technical Drawings and Manuals	1. Select technical drawing 2. Interpret technical drawings. 3. Interpret operation & maintenance manuals	10

Code	Unit of Competency	Elements of Competency	Guided Learning Hours
SEIP-LIG-CNC-2-S	Work with Mechanical Hand and Power Tools	1. Inspect hand tools and power tools for usability 2. Use hand tools properly and safely 3. Operate power tools properly and safely 4. Clean/maintain hand tools and power tools after use	10
SEIP-LIG-CNC-3-S	Carry out Precision Checks and Measurements	1. Select the job to be checked and measured 2. Select measuring and checking tool/instrument 3. Obtain measurements and checks 4. Record/communicate measurement and check results 5. Clean, maintain and store measuring instruments.	5
SEIP-LIG-CNC-4-S	Apply Quality Systems and Procedures	1. Work within quality system 2. Apply and monitor quality system improvement in the workplace 3. Hold responsible for work quality 4. Apply standard procedures for each job.	5
Total Hours			**30**

Occupation Specific (Core) Competencies (300 hrs.)

Code	Unit of Competency	Elements of Competency	Guided Learning Hours
SEIP-LIG-CNC-1-O	Operate a Computer	1. Start the computer 2. Arrange and customize desktop display/window setting 3. Work with files and folders 4. Work with user application programs 5. Print information 6. Shutdown computer 7. Maintain computer equipment and systems	30
SEIP-LIG-CNC-2-O	Generate Drawing Using Cad Software	1. Prepare the CAD environment. 2. Produce 2D drawing 3. Produce 3D drawing 4. Maintain computer equipment and systems	30

SEIP-LIG-CNC-3-O	Apply CAD/CAM Program	1. Prepare for CAD/CAM Program application 2. Create/import CAD drawing 3. Create/edit CNC programs 4. Load and run program at CNC machine 5. Maintain computer, CNC machine, equipment and systems	40
SEIP-LIG-CNC-4-O	Write CNC Lathe Machine Program	1. Determine job requirements 2. Write CNC Lathe Machine program 3. Edit CNC Lathe Machine program 4. Maintain computer, CNC Lathe machine, tools equipment and systems.	30
SEIP-LIG-CNC-5-O	Carryout CNC Lathe Machine Operations	1. Set-up CNC lathe machine, work piece and cutting tools 2. Download/input simulate program. 3. Cut model/sample work piece. 4. Perform CNC lathe machine operation. 5. Check and measure work piece 6. Maintain computer, CNC Lathe machine, tools, equipment and systems	70
SEIP-LIG-CNC-6-O	Write CNC Milling Machine Program	1. Determine job requirements 2. Write CNC Milling Machine Program 3. Edit CNC Milling Machine programs 4. Maintain computer, CNC Milling machine, tools equipment and systems	30
SEIP-LIG-CNC-7-O	Carryout CNC Milling Machine Operations	1. Set-up CNC Milling machine, work piece and cutting tools 2. Download/input simulate program 3. Cut model/sample work piece 4. Perform CNC Milling machine operation. 5. Check and measure work piece 6. Maintain computer, CNC Milling machine, tools equipment and systems.	70
Total Hours			**300**

COMPETENCY STANDARDS: CNC LATHE MILLING OPERATION

A. The Generic (Basic Competencies)

Unit of Competency: **PERFORM COMPUTATIONS USING BASIC MATHEMATICAL CONCEPTS**	Nominal Duration: 10 hrs.	Unit Code: SEIP-LIG-CNC-1-G
Unit Descriptor: This unit of competency requires the knowledge, skills and attitude to perform computations using basic mathematical concepts in the workplace. It specifically includes the tasks of identifying calculation requirements in the workplace, selecting appropriate mathematical method/concept for the calculation and using appropriate instruments tools to carry out calculation.		

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Identify calculation requirements in the workplace	1.1 **Calculation requirements** are identified from **workplace information.**
2. Select appropriate mathematical methods/concepts for the calculation.	2.1 **Appropriate method** is selected to carry out the calculation requirements.
3. Use tool/instrument to perform calculations	3.1 Calculations are completed using appropriate **tools and instruments.**

Range of variables:

Variable	Range May include but not limited to:
1. Calculation requirements.	1.1 Area 1.2 Height 1.3 Length/Breath/thickness 1.4 Diameter 1.5 Weight 1.6 Capacity 1.7 Time 1.8 Temperature. 1.9 Material usage 1.10 Speed 1.11 Costing 1.12 Mass 1.13 Density
2. Workplace information	2.1 Mechanical Plan 2.2 Design 2.3 Working drawing

	2.4 Verbal instructions
	2.5 Job order
3. Appropriate method	3.1 Addition
	3.2 Subtraction
	3.3 Division
	3.4 Multiplication
	3.5 Conversion
	3.6 Percentage and ratio calculation
	3.7 Simple equation
4. Tools/instruments	4.1 Calculator
	4.2 Computer

Curricular Content Guide

1. Underpinning Knowledge	1.1 Numerical concept
	1.2 Basic mathematical methods such as addition, subtraction, multiplication and division and percentage.
	1.3 Mathematical language, symbols and terminology.
	1.4 Measuring units
	1.5 Knowledge of computer application
2. Underpinning Skills	2.1 Adding numbers
	2.2 Subtracting numbers
	2.3 Multiplying numbers.
	2.4 Dividing numbers.
	2.5 Measuring of linear
	2.6 Using of mathematical language, symbols, terminology and technology.
	2.7 Measuring of different physical parameter.
	2.8 Calculating geometrical parameters: angle, parallelism, perpendicularity, area and volume
3. Underpinning Attitudes	3.1 Commitment to occupational safety and health
	3.2 Promptness in carrying out activities.
	3.3 Tidiness and timeliness.
	3.4 Respect to peers, sub-ordinates and seniors in workplace.
	3.5 Environmental concern.
	3.6 Sincerity and honesty
4. Resource Implications	The following resources must be provided.
	4.1 Stationeries
	4.2 Consumables
	4.3 Calculators
	4.4 Computers
	4.5 Measuring tape

Assessment Evidence Guide

| 1. Critical Aspects of Competency | Assessment required evidence that the candidate: |
| | 1.1 Identified calculation requirements from workplace information |

	1.2 Selected appropriate method to carry out the calculation requirements
	1.3 Completed calculations using appropriate tools/instruments
2. Methods of Assessment	Methods of assessment may include but not limited to: 2.1 Written test 2.2 Oral questioning 2.3 Demonstration
5. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **APPLY OCCUPATIONAL HEALTH AND SAFETY (OHS) PRACTICES IN THE WORKPLACE**	Nominal Duration: 10 hrs.	Unit Code: SEIP-LIG-CNC-2-G
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to apply occupational health and safety (OHS) practices in the workplace. It specifically includes the tasks of identifying OHS policies and procedures, applying personal health and safety practices, reporting hazards and risks and responding to emergencies.		

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Identify OHS policies and procedures	1.1 **OHS policies** and safe operating procedures are read and understood. 1.2 Safety signs and symbols are identified and followed. 1.3 Emergency response, evacuation procedures and other contingency measures are determined.
2. Apply personal health and safety practices	2.1 OHS policies and procedures are followed and practiced 2.2 **Personal Protective Equipment (PPE)** is selected and used 2.3 Personal hygiene is maintained
3. Report hazards and risks	3.1 **Hazards and risks** are identified, assessed and controlled. 3.2 Incidents arising from hazards and risks are reported to authority. 3.3 Corrective actions are implemented to correct unsafe conditions in the workplace.
4. Respond to emergencies	4.1 Alarms and warning devices are responded. 4.2 **Emergency response plans and procedures** are implemented. 4.3 **First aid procedure** is applied during emergency situations.

Range of Variables

Variable	Range May include but not limited to:
1. OHS policies	1.1 International OHS requirements 1.2 Bangladesh standards for OHS 1.3 Building Code 1.4 Fire Safety Rules and Regulations 1.5 Light Engineering Industry Guidelines
2. Personal Protective Equipment (PPE)	2.1 Apron 2.2 Gas Mask 2.3 Gloves 2.4 Safety shoes 2.5 Helmet 2.6 Face mask 2.7 Overalls

	2.8 Goggles and safety glasses
	2.9 Ear plugs
	2.10 Sun block
	2.11 Chemical/Gas masks
3. Hazards and risks	3.1 Chemical hazards
	3.2 Biological hazards
	3.3 Physical Hazards
	3.3.1 Machine hazards
	3.3.2 Materials hazards
	3.3.3 Tools and Equipment hazards
4. Emergency response plans and procedures	4.1 Firefighting procedures
	4.2 Earthquake response procedures
	4.3 Evacuation procedures
	4.4 Medical and first aid
5. First aid procedure	5.1 Washing of open wound
	5.2 Washing chemically infected area
	5.3 Applying bandage
	5.4 Tourniquet
	5.5 Applying CPR (Cardiopulmonary Resuscitation)
	5.6 Taking appropriate medicine

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 OHS workplace policies and procedures
	1.2 Work safety procedures
	1.3 Emergency procedures
	1.3.1 Firefighting
	1.3.2 Earthquake response
	1.3.3 Explosion response
	1.3.4 Accident response
	1.4 Types of hazards (biological, chemical and physical) and their effects
	1.5 PPE types and uses
	1.6 Personal hygiene practices
	1.7 OHS awareness
2. Underpinning Skills	2.1 Identifying OHS policies and procedures
	2.2 Following personal work safety practices
	2.3 Reporting hazards and risks
	2.4 Responding to emergency procedures
	2.5 Maintaining physical well-being in the workplace
	2.6 Performing first aids
	2.7 Performing basic firefighting accessories using fire extinguishers
	2.8 Applying basic first aid procedures
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace
	3.3 Promptness in carrying out activities

	3.4 Tidiness and timeliness
	3.5 Respect of peers, sub-ordinates and seniors in workplace
	3.6 Environmental concern
	3.7 Sincere and honest to duties
4. Resource Implications	4.1 Workplace (simulated or actual)
	4.2 PPEs
	4.3 Firefighting equipment
	4.4 Emergency response manual
	4.5 First aid kits

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Followed OHS policies and procedures
	1.2 Selected and used personal protective equipment (PPE)
	1.3 Reported incidents arising from hazards and risks to authority
	1.4 Emergency response plans and procedures are implemented
	1.5 Applied basic first aid procedure
2. Methods of Assessment	Methods of assessment may include but not limited to:
	2.1 Written test
	2.2 Demonstration
	2.3 Oral questioning
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **COMMUNICATE IN ENGLISH IN THE WORKPLACE**	Nominal Duration: 5 hrs.	Unit Code: SEIP-LIG-CNC-3-G
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to communication in English in the workplace. It specifically includes work tasks of reading and understanding workplace documents in English, writing simple workplace written communications in English, listening and comprehending to English conversations and performing conversations in English.		

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Read and understand workplace documents in English	1.1 Workplace documents are read and understood. 1.2 Visual information is interpreted.
2. Write simple workplace communications in English	2.1 Simple **routine workplace documents** are prepared using key words, phrases, simple sentences and **visual aids** are prepared. 2.2 Key information is written in the appropriate places in standard forms.
3. Listen and comprehend to English conversations	3.1 Active listening is demonstrated.
4. Perform conversations in English language	4.1 Conversation is performed in English with peers, customers and management to the required workplace standard.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Routine workplace documents	1.1 Agenda 1.2 Simple reports such as progress and incident reports 1.3 Job sheets 1.4 Operational manuals 1.5 Brochures and promotional material 1.6 Visual and graphic materials 1.7 Standards 1.8 OSH information 1.9 Signs
2. Visual aids	2.1 Maps 2.2 Diagrams 2.3 Forms 2.4 Labels 2.5 Graphs 2.6 Charts

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 Read workplace documents in English
	1.2 Write simple routine workplace documents in English
	1.3 Listen to conversation in English
	1.4 Perform conversation in English
	1.5 Interaction skills (i.e., teamwork, interpersonal skills, etc.)
	1.6 Job roles, responsibilities and compliances
2. Underpinning Skills	2.1 Ability to read and understand workplace documents in English by using appropriate vocabulary and grammar, standard spelling and punctuation
	2.2 Ability to write simple routine workplace documents in English such as: Schedules and agenda, job sheets, operational manuals and brochures and promotional material
	2.3 Ability of listening in English and interpreting
	2.4 Ability to perform conversation in English with peers, customers and management to the required workplace standard
	2.5 Work effectively with others
	2.5.1 Listening and questioning skills
	2.5.2 Ability to follow simple directions
3. Underpinning Attitudes	3.1 Commitment to occupational safety and health
	3.2 Promptness in carrying out activities
	3.3 Tidiness and timeliness
	3.4 Respect of peers, sub-ordinates and seniors in workplace
	3.5 Environmental concern
	3.6 Sincere and honest to duties
4. Resource Implications	The following resources must be provided:
	4.1 Work place Procedure
	4.2 Materials relevant to the proposed activity
	4.3 All tools, equipment, material and documentation required.
	4.4 Relevant specifications or work instructions

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Converse in English with peers and customers.
	1.2 Made reports of workplace documents.
2. Methods of Assessment	Methods of assessment may include but not limited to:
	2.1 Written test
	2.2 Demonstration
	2.3 Oral questioning
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **OPERATE IN A SELF-DIRECTED TEAM**	Nominal Duration: 5 hrs.	Unit Code: SEIP-LIG-CNC-4-G
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to operate in a self-directed team. It specifically includes work tasks of identifying team goals and work processes, communicating and cooperating with team members, working and solving problems as a team member.		

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Identify team goals and work processes	1.1 Team goals and collaborative decision making processes are identified. 1.2 Roles and responsibilities of team members are identified. 1.3 Relationships within team and with other workers are identified.
2. Communicate and cooperate with team members.	2.1 Effective interpersonal skills are used to interact with team members and to contribute to activities and objectives. 2.2 Formal and informal **forms of communication** are used effectively to support team achievement. 2.3 Diversity is respected and valued in team functioning. 2.4 Views and opinions of other team members are understood and valued. 2.5 Workplace terminology is used correctly to assist communication.
3. Work as a team member.	3.1 Duties, responsibilities, authorities, objectives and task requirements are identified and clarified with team. 3.2 Tasks are performed in accordance with organizational and team requirements, specifications and workplace procedures. 3.3 Team member's support with other members are made to ensure team achieves goals, awareness and requirements. 3.4 Agreed reporting lines are followed using standard operating procedure.
4. Solve problems as a team member	4.1 Current and potential problems faced by team are identified. 4.2 A solution to the problem is identified. 4.3 Problems are solved effectively and the outcome of the implemented solution is evaluated.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Forms of communication	1.1 Agenda 1.2 Simple reports such as progress and incident reports. 1.3 Job sheets 1.4 Operational manuals 1.5 Brochures and promotional material

	1.6 Visual and graphic materials.
	1.7 Standards
	1.8 OSH information
	1.9 Signs

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 Team goals and collaborative decision making processes
	1.2 Roles and responsibilities of team members
	1.3 Relationships within team and with other workers
	1.4 Effective interpersonal skills to interact with team members
	1.5 Effective formal and informal forms of communication
	1.6 Value of diversity in team functioning
	1.7 Correct use of workplace terminology
	1.8 Team's duties, responsibilities, authorities, objectives and task requirements
	1.9 Support mechanism to other members of team to ensure achievements of goals
	1.10 Methods of identifying current and potential problems faced by a team
	1.11 Effectively problems solving methods and evaluation of outcomes
2. Underpinning Skills	2.1 Identifying team goals and collaborative decision making processes
	2.2 Identifying roles and responsibilities of team members
	2.3 Identifying relationships within team and with other workers
	2.4 Using effective interpersonal skills to interact with team members and to contribute to activities and objectives
	2.5 Using formal and informal forms of communication
	2.6 Understanding and valuing views and opinions of other team members
	2.7 Performing tasks in accordance with organizational and team requirements, specifications and workplace procedures.
	2.8 Supporting other members of the team to ensure team achieves goals, awareness and requirements.
	2.9 Identifying current and potential problems faced by the team
	2.10 Identifying solutions to the problem
	2.11 Solving problems effectively and evaluating the outcome of the implemented solution
3. Underpinning Attitudes	3.1 Teamwork
	3.2 Promptness in carrying out activities.
	3.3 Tidiness and timeliness.
	3.4 Respect of peers, sub-ordinates and seniors in workplace.
	3.5 Sincere and honest to duties
4. Resource Implications	The following resources must be provided:
	4.1 Workplace (simulated or actual)
	4.2 Pens

	4.3 Papers
	4.4 Work books
	4.5 Learning manuals

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Identified team goals and work processes.
	1.2 Communicated and cooperated with team members.
	1.3 Worked as a team member.
	1.4 Solved problems as a team member.
2. Methods of Assessment	Methods of assessment may include but not limited to:
	2.1 Written test
	2.2 Demonstration
	2.3 Oral questioning
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

B. The Sector Specific (Common) Competencies

Unit of Competency: INTERPRET TECHNICAL DRAWINGS AND MANUALS	Nominal Duration: 10 hrs.	Unit Code: SEIP-LIG-CNC-1-S
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a worker to interpret technical drawings and manuals. It specifically includes the tasks of selecting technical drawing, interpreting technical drawings and storing manuals, designs and plans.		

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Select technical drawing	1.1 **Drawing** is selected and checked to ensure that it conforms to the job requirements. 1.2 Drawing is validated.
2. Interpret technical drawings.	2.1 Drawing components, assemblies are identified. 2.2 Dimensions are identified according to job requirement. 2.3 Clearances/tolerances are checked in accordance with workplace standard. 2.4 **Instructions** are identified and followed accurately. 2.5 Material **specifications** are interpreted. 2.6 Symbols in drawing are interpreted.
3. Interpret operation & maintenance manuals	3.1 Operation and maintenance manuals are collected and interpreted. 3.2 Operation and maintenance manuals are followed when operating and maintaining lathe machine.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Drawing	1.1 Technical drawing 1.2 Sketches 1.3 Manuals
2. Instructions	2.1 Note 2.2 Instruction 2.3 Special instruction 2.4 Precaution
3. Specifications	3.1 Product specifications 3.2 Method specifications 3.3 Material specifications

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 Technical drawing interpretation 1.2 Sequence of drawing 1.3 Methods of checking and applying drawing for work 1.4 Drawing selection and checking method to ensure conformity to the job requirements 1.5 Drawing components, assemblies 1.6 Identification of dimensions according to job requirement 1.7 Procedure of checking clearances/tolerances 1.8 Work instructions 1.9 Material specifications 1.10 Drawing symbols interpretation 1.11 Use of operation and maintenance manuals
2. Underpinning Skills	2.1 Practicing workplace safety 2.2 Interpreting drawing, following operation and maintenance manuals 2.3 Performing jobs in accordance with the drawing 2.4 Performing calculation as per drawing 2.5 Selecting and checking of drawing to ensure conformity to the job requirements 2.6 Identifying drawing components and assemblies 2.7 Identifying dimensions according to job requirement 2.8 Checking clearances/tolerances in accordance with workplace standard 2.9 Following operation and maintenance manuals when operating and maintaining lathe machine
3. Underpinning Attitudes	3.1 Care in the use of drawings/manuals 3.2 Communication with peers, sub-ordinates and seniors in workplace 3.3 Promptness in carrying out activities 3.4 Tidiness and timeliness 3.5 Respect of peers, sub-ordinates and seniors in workplace 3.6 Sincere and honest to duties
4. Resource Implications	The following resources must be provided: 4.1 Workplace (simulated or actual) 4.2 Relevant drawing/manuals 4.3 Pens 4.4 Papers 4.5 Work books 4.6 Learning manuals

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Identified dimension according to job requirement.

	1.2 Maintained clearances and tolerances according to workplace requirement.
	1.3 Interpreted drawing symbols.
	1.4 Interpreted operation & maintenance manuals.
2. Methods of Assessment	Competency should be assessed by:
	2.1 Written examination
	2.2 Demonstration
	2.3 Oral questioning
	2.4 Workplace observation
	2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **WORK WITH MECHANICAL HAND AND POWER TOOLS**	Nominal Duration: 10 hrs.	Unit Code: SEIP-LIG-CNC-2-S
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to work with mechanical hand and power tools. It specifically includes the tasks of inspecting hand tools and power tools for usability, using hand tools properly and safely, operating power tools properly and safely and cleaning/maintaining hand tools and power tools after use.		

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Inspect hand tools and power tools for usability	1.1 Appropriate tools are selected. 1.2 Application of tools to job requirement is determined. 1.3 Usability of tools are checked and verified. 1.4 **Hand tools** and **power tools** are prepared. 1.5 Sources of power supply for power tools are identified.
2. Use hand tools properly and safely	2.1 Appropriate hand tool for the job is used. 2.2 Proper and safe use/operation is applied in the different types of hand tools. 2.3 **Safety precautions** is observed when using hand tools. 2.4 Unsafe or faulty tools are identified and marked for repair.
3. Operate power tools properly and safely	3.1 Power supply outlet and electrical cord are inspected and confirmed safe for use in accordance with established workplace safety requirements. 3.2 Proper sequence of operation is applied in using power tools to produce results. 3.3 Power tools are used safely in accordance to manufacturer's operating specification.
4. Clean/maintain hand tools and power tools after use	4.1 Dust and foreign matters are removed from power tools in accordance to workplace standard. 4.2 Condition of tools is checked after use. 4.3 Appropriate lubricant is applied after use and prior to storage 4.4 **Measuring tools** are checked and calibrated. 4.5 Defective tools, instruments, power tools and accessories are inspected and corrected or replaced.

Range of Variables

Variable	Range
	May include but not limited to:
1. Hand tools	1.1 Ball peen hammer 1.29 Drill bits 1.2 Cross peen hammer 1.30 Tap extruder 1.3 Straight peen hammer 1.31 Screw Extruder 1.4 Mallet/soft hammer 1.32 Hacksaw frame

	1.5 Bench vise 1.6 Soft jaw 1.7 Rough file 1.8 Medium file 1.9 Smooth file 1.10 Punches 1.11 Chisels 1.12 Wrenches 1.13 Pliers 1.14 Scriber 1.15 Scraper 1.16 Screw drivers 1.17 Dividers 1.18 Trammels 1.19 Surface plate 1.20 Marking table 1.21 Height gauge 1.22 Layout tools 1.23 Tap sets 1.24 Die sets 1.25 Tap handle 1.26 Die handle 1.27 Hacksaw 1.28 Paint Brushes	1.33 Hacksaw blade 1.34 Rivet Gun 1.35 Sledge Hammers 1.36 Sockets 1.37 Spanners 1.38 Vice grip 1.39 Wire Cutters 1.40 Wood Planners 1.41 Hand drill machine 1.42 Hand grinding machine 1.43 Pedestal drill 1.44 Powered screw driver 1.45 Hand shear 1.46 Clamps 1.47 Jacks 1.48 Soldering iron 1.49 Allen wrenches 1.50 Draft punches
2. Power tools	2.1 Power drills 2.2 Power rivet gun 2.3 Hand grinders 2.4 Pneumatic wrenches 2.5 Press machine 2.6 Jack hammer	2.7 Planers 2.8 Pedestal drills
3. Safety precautions	3.1 Use of appropriate PPEs. 3.2 Proper hand, feet and eye coordination 3.3 Safe condition of electrical outlets, cords and lamps 3.4 Working environment 3.5 Safe operating condition of hand tools and power tools. 3.6 Awareness to OHS requirements	
4. Measuring instruments	4.1 Measuring tape 4.2 Steel rule 4.3 Meter rule 4.4 Outside & inside caliper 4.5 Protractors 4.6 Tri-square 4.7 Sprit level 4.8 Vernier caliper 4.9 Micrometer 4.10 Simple protractor 4.11 Vernier protractor 4.12 Limit gauges	

	4.13 Snap gauges

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 Types of tools, functions and use
	1.2 Types of Hand tools and their proper use and techniques
	1.3 Types of Power tools, use and safe handling method
	1.4 Technical application of tools
	1.5 Procedures in the use of hand tools and power tools
	1.6 Policies and procedures for occupational health and safety
	1.7 Use of PPE
	1.8 Handling of tools and equipment
	1.9 Reporting and documentation
	1.10 Preventive maintenance
	1.11 Methods and techniques
	1.12 Quality procedures
	1.13 Storage procedures
2. Underpinning skills	2.1 Using appropriate hand tool for the job
	2.2 Observing safety precautions when using hand tools
	2.3 Using power tools correctly and safely in accordance to manufacturer's operating specification
	2.4 Checking condition of tools after use
	2.5 Applying appropriate lubricant on hand tools and power tools after use and prior to storage
	2.6 Inspecting and correcting or replacing defective tools, instruments, power tools and accessories
	2.7 Storing Tools and power tools safely in appropriate location
3. Underpinning attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace
	Promptness in carrying out activities
	3.3 Tidiness and timeliness
	3.4 Respect of peers, sub-ordinates and seniors in workplace
	3.5 Environmental concern
	3.6 Sincere and honest to duties
4. Resource implications	4.1 Workplace (simulated or actual)
	4.2 Different types of hand tools and power tools
	4.3 Pens
	4.4 Papers
	4.5 Work books
	4.6 Tools and power tools operating and maintenance manuals

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Using appropriate hand tool for the job.
	1.2 Observing safety precautions when using hand tools.

	1.3 Used power tools safely in accordance to manufacturer's operating specification.
	1.4 Checking the condition of tools after use.
	1.5 Appling appropriate lubricant on hand tools and power tools after use and prior to storage.
	1.6 Inspecting and corrected or replaced defective tools, instruments, power tools and accessories.
	1.7 Storing tools and power tools safely in appropriate location.
2. Methods of Assessment	Competency should be assessed by:
	2.1 Written examination
	2.2 Demonstration
	2.3 Oral questioning
	2.4 Workplace observation
	2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: CARRY OUT PRECISION CHECKS AND MEASUREMENTS	Nominal Duration: 5 hrs.	Unit Code: SEIP-LIG-CNC-3-S

Unit Descriptor:
This unit covers the knowledge, skills and attitudes required to use graduated measuring instrument in the light engineering sector workplace. It specifically includes the tasks of selecting the job to be measured, selecting graduated measuring instrument, obtaining measurements, recording and communicating measurements, cleaning, maintaining and storing measuring instruments.

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Select the job to be checked and measured	1.1 Job is selected for measuring and checking. 1.2 Required **dimensional measurement** is determined in accordance with drawing/plan. 1.3 Required **physical condition** is identified in accordance with drawing/plan. 1.4 Required **geometrical dimension** is identified in accordance with drawing/plan. 1.5 Job drawing is used to select the measuring instruments.
2. Select measuring and checking tool/instrument	2.1 Appropriate measuring instruments is selected in accordance with job requirement. 2.2 **Direct** and **indirect measuring instruments** and **checking instrument** are identified. 2.3 Applications of measuring device is determined. 2.4 Usability and accuracy of measuring device is checked and verified. 2.5 Measuring device is prepared for measurement. 2.6 Fits, Tolerance, clearance and limits are identified according to job requirements.
3. Obtain measurements and checks	4.1 Measurements are obtained using appropriate measuring instrument. 4.2 **Systems of measurements** are identified and converted where necessary. 4.3 Measurement is kept accurately in accordance to specification 4.4 Measurement is checked against job requirement. 4.5 Physical conditions are checked in accordance with job requirements. 4.6 Geometrical dimensions are checked in accordance with job specifications.
4. Record/communicate measurement and check results	4.1 Measurements are recorded in accordance with workplace procedure. 4.2 Measurement is interpreted, recorded and communicated to authority.
5. Clean, maintain and store measuring instruments.	5.1 Dust and dirt are removed from the measuring instruments. 5.2 Condition of measuring instruments are checked.

	5.3 Appropriate lubricant is applied after use and prior to storage.
	5.4 Measuring instruments are checked and calibrated.
	5.5 Measuring instruments are stored in accordance with workplace procedure.

Range of Variables

Variable	Range
	May include but not limited to:
1. Dimensional measurement	1.1 Length 1.2 Width 1.3 Depth 1.4 Diameter 1.5 Radius 1.6 Height
2. Physical condition	2.1 Roughness 2.2 Color 2.3 Smoothness 2.4 Surface finish 2.5 Flatness
3. Geometrical dimension	3.1 Parallelism 3.2 Perpendicularity 3.3 Angularity 3.4 Concentricity 3.5 Eccentricity 3.6 Roundness 3.7 Circularity
4. Direct measuring instruments.	4.1 Set squares 4.2 Dial indicators 4.3 Steel tape 4.4 Steel rule 4.5 Meter rule 4.6 Calculator 4.7 Vernier slide caliper 4.8 Digital vernier slide caliper 4.9 Micrometer (inch/millimeter) 4.10 Digital micrometer 4.11 Vernier bevel protractor 4.12 Sprit level 4.13 AVO meter(analogue/digital) 4.14 Thermometers 4.15 Water meter 4.16 Gas meter 4.17 Simple protractor
5. Indirect measuring instrument	5.1 Outside caliper 5.2 Inside caliper 5.3 Bevel tri-square 5.4 Telescoping gage

	5.5 Straight edge
	5.6 Sine bar
	5.7 Trammel
6. Checking instrument.	6.1 Plug gauge
	6.2 Snap gauge
	6.3 Screw pitch gauge
	6.4 Slip gauges
	6.5 Feeler gauges
	6.6 Screw pitch gauge
	6.7 Slip gauge
	6.8 Tri-square
	6.9 Center gauge
	6.10 Bevel tri-square
7. Systems of measurements	7.1 ISO standard
	7.2 English system
	7.3 Metric system

Curricular Content Guide

1. Underpinning Knowledge	1.1 Difference between measuring and checking
	1.2 Types of measuring tools and their applications
	1.3 Types of checking tools and their applications
	1.4 Geometrical dimensions and tolerances
	1.5 Method, procedure and techniques when taking linear Measurements
	1.6 Methods, procedures and techniques when checking physical conditions of workpieces
	1.7 Methods, procedures and techniques when Checking geometrical dimensions of workpieces
	1.8 Measurement conversion systems
	1.9 Workplace record keeping procedures
	1.10 Preventive maintenance for measuring and checking tools
	1.11 Calibration and adjustment procedures for measuring and checking tools
2. Underpinning Skills	2.1 Determining required dimensional measurements, physical conditions and geometrical dimensions in accordance with drawing/plan and workplace specification
	2.2 Measuring and checking linear and geometrical dimensions within the required tolerance in accordance to specification
	2.3 Checking physical conditions using appropriate checking tool
	2.4 Identifying and converting systems of measurements where necessary.
	2.5 Recording measurements in accordance with workplace procedure
	2.6 Interpreting and communicating measurement to authority

	2.7 Applying appropriate lubricant on measuring and checking tools and instruments after use and prior to storage
	2.8 Checking condition of measuring instruments, calibrating and storing in accordance with workplace procedure
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace.
	3.3 Promptness in carrying out activities.
	3.4 Tidiness and timeliness.
	3.5 Respect of peers, sub-ordinates and seniors in workplace.
	3.6 Environmental concern.
	3.7 Sincere and honest to duties.
4. Resource Implications	4.1 Workplace (simulated or actual)
	4.2 Different types of graduated measuring and checking instruments
	4.3 Pens
	4.4 Papers
	4.5 Work books
	4.6 Measuring tools operating and maintenance manual.

Assessment Evidence Guide

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Determined required dimensional measurements, physical conditions and geometrical dimensions in accordance with drawing/plan and workplace specification
	1.2 Measured and checked linear and geometrical dimensions within the required tolerance in accordance to specification
	1.3 Checked physical conditions using appropriate checking tool
	1.4 Identified and converted systems of measurements where necessary.
	1.5 Recorded measurements in accordance with workplace procedure
	1.6 Interpreted and communicated measurement to authority
	1.7 Applied appropriate lubricant on measuring and checking tools and instruments after use and prior to storage
	1.8 Checked condition of measuring instruments, calibrated and stored in accordance with workplace procedure
2. Methods of Assessment	Competency should be assessed by:
	2.1 Written examination
	2.2 Demonstration
	2.3 Oral questioning
	2.4 Workplace observation
	2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **APPLY QUALITY SYSTEMS AND PROCEDURES**	Nominal Duration: 5 hrs.	Unit Code: SEIP-LIG-CNC-4-S
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to apply quality systems and procedures. It specifically includes the tasks of working within quality system, applying and monitoring quality system improvement in the workplace, holding responsibility for quality work and applying standard procedures for each job.		

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Work within quality system	1.1 Instructions and procedures are followed strictly and duties are performed in accordance with demand of **quality improvement system.** 1.2 Conformance to specifications is ensured. 1.3 Defects are detected and reported to authority according to standard operating procedures. 1.4 Customer's satisfaction is ensured in performing an operation or quality of product or services.
2. Apply and monitor quality system improvement in the workplace	2.1 Performance measurement systems are identified 2.2 Performance is assessed at regular interval. 2.3 Specifications and standard operating procedures are established and identified. 2.4 Defects are detected and reported according to standard operating procedures. 2.5 Process improvement procedures are applied 2.6 Quality of product is checked and verified.
3. Hold responsible for work quality	3.1 Concept of supplying product or service to meet the **customer quality requirements** is understood and accordingly applied. 3.2 Responsibility is taken for quality work.
4. Apply standard procedures for each job.	4.1 **Quality control and quality assurance** system procedures for each job are followed. 4.2 Conformance to specification is ensured in every case at all situations.

Range of Variables

Variable	Range
	May include but not limited to:
1. Quality improvement system	A system comprising some or all of the following elements: 1.1 Quality inspection 1.2 Quality control. 1.3 Quality improvement. 1.4 Quality assurance

2. Customer quality requirements.	2.1 Appropriateness of product 2.2 Appearance 2.3 Durability. 2.4 Grade or quality design 2.5 Usability life span 2.6 Conformance to Quality 2.7 Reliability 2.8 Maintainability	

3. Quality control and quality assurance	3.1 Quality control
	   3.1.1 Product
	   3.1.2 Reactive
	   3.1.3 Line function
	   3.1.4 Find the defects
	   3.1.5 Walk through
	   3.1.6 Testing
	   3.1.7 Inspection
	   3.1.8 Checkpoint Review
		3.2 Quality Assurance
		   3.2.1 Process
		   3.2.2 Pro-active
		   3.2.3 Staff function
		   3.2.4 Prevent the defects
		   3.2.5 Quality audit
		   3.2.6 Defining process
		   3.2.7 Selection of tools
		   3.2.8 Training

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 The reasons why good quality should be maintained and poor quality should be eliminated 1.2 Meaning of the key terms - quality, quality assurance, quality control, quality inspection, quality improvement and total quality control. 1.3 Process and procedures for improving and maintaining quality 1.4 Procedures for addressing defects. 1.5 Record keeping within the quality improvement system in workplace 1.6 Factors, which affect successful implementi0n of the quality systems and procedures.
2. Underpinning Skills	2.1 Maintaining good quality 2.2 Eliminating poor quality 2.3 Understanding the meaning of the key terms - quality, quality assurance, quality control, quality inspection, quality improvement and total quality control. 2.4 Improving and maintaining quality 2.5 Addressing defects and procedures 2.6 Recording within the quality improvement system in workplace. 2.7 Implementing quality systems and procedures
3. Under pinning Attitudes	3.1 Commitment to occupational health and safety practices 3.2 Communication with peers, sub-ordinates and seniors in workplace. 3.3 Promptness in carrying out activities. 3.4 Tidiness and timeliness. 3.5 Respect of peers, sub-ordinates and seniors in workplace. 3.6 Environmental concern.

	3.7 Sincere and honest to duties.
4. Resource Implications	The following resources must be provided: 4.1 Workplace 4.2 Tools and equipment appropriate to maintain workplace 4.3 Materials relevant to the proposed activity 4.4 Relevant drawings, manuals, codes, standards and reference material

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Followed instructions and procedures strictly 1.2 Performed duties in accordance with demand of quality system 1.3 Ensured conformance to specifications 1.4 Detected defects and reported to authority in accordance to standard operating procedures. 1.5 Understood concept of supplying product or service to meet the customer quality requirements 1.6 Held responsible for quality work 1.7 Followed quality control and quality assurance system procedures for each job
2. Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

C. Occupation Specific (Core) Competencies

Unit of Competency: **OPERATE A COMPUTER**	Nominal Duration: 30 hrs.	Unit Code: SEIP-LIG-CNC-1-O
Unit descriptor: This unit covers the knowledge, skills and attitudes required of a CAD/CAM operator to operate a computer. It specifically includes the tasks of starting the computer, arranging and customizing desktop display/window setting, working with files and folders, working with user application programs, printing information, shutting down computer, and maintaining computer equipment and systems.		

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Start the computer	1.1 The keyboard, mouse, and printer are correctly connected. 1.2 Power is checked according to procedure. 1.3 Computer logging in and logging off is successfully made. 1.4 Hardware and software are selected according to task assigned and required outcome. 1.5 Hardware configuration is checked according to requirements. 1.6 Safe work practices are observed and personal protective equipment (PPE) is worn where required for the work performed.
2. Arrange and customize desktop display / window setting	2.1 Desktop screen or Windows elements are changed as required. 2.2 **Desktop icons** are added according to requirements. 2.3 Desktop icons are renamed as required. 2.4 Desktop icons are moved as required. 2.5 Desktop icons are copied or deleted according to requirements. 2.6 Desktop settings are saved and restored according to requirements.
3. Work with files and folders	3.1 A file or folder created, opened, moved, renamed or copied according to job specification. 3.2 Files and folders deleted and restored as required. 3.3 Details or properties of files and folders are displayed or viewed as required. 3.4 Various files are organized for easy lookup and use as required. 3.5 Files and information are searched according to requirements.
4. Work with user application programs	4.1 Application programs (Word, Excel, PowerPoint) are added, changed, removed or ran according to requirements. 4.2 User **software** or application programs are installed

	according to requirements. 4.3 User software or application programs are updated or upgraded according to requirements. 4.4 **Storage media** are selected as required
5. Print information	5.1 Printer is added or installed as required. 5.2 Correct printer settings is made according to requirements. 5.3 Default printer is assigned as specified. 5.4 Information or document is printed on the installed printer according to requirements.
6. Shutdown computer	6.1 All open application programs are closed according to requirements. 6.2 **Hardware and peripheral** devices are correctly shut down according to requirements.
7. Maintain computer equipment and systems	7.1 Systems for cleaning, minor maintenance and replacement of consumables are implemented. 7.2 Procedures for ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures. 7.3 Basic **software maintenance** procedures are implemented in line with the standard operating procedures.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Desktop icons	1.1 Directories/folders 1.2 Files 1.3 Network devices 1.4 Recycle bin
2. Software	2.1 Word processing packages 2.2 Data base packages 2.3 Spread sheets 2.4 Auto CAD
3. Storage media	3.1 Diskettes 3.2 CDS 3.3 Zip disks 3.4 Hard disk drives, local and remote 3.5 USB
4. Hardware and peripheral devices	4.1 Personal computers 4.2 Communication equipment 4.3 Printers 4.4 Scanners 4.5 Keyboard 4.6 Mouse 4.7 Internet Modem/Broad Band Internet connection

5. Software Maintenance	5.1 Creating more space in the hard disk
	5.2 Reviewing programs
	5.3 Deleting unwanted files
	5.4 Backing up files
	5.5 5.5 Checking hard drive for errors
	5.6 Using up to date anti-virus programs
	5.7 Cleaning dust from internal and external surfaces

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Principles of computer operation
	1.2 Procedure in logging in and logging off of the computer.
	1.3 Hardware and software selection
	1.4 Hardware configuration checking procedure
	1.5 Procedure of adding, renaming, and moving desktop
	1.6 Procedure of copying or deleting desktop icons
	1.7 Procedure of saving and restoring desktop settings
	1.8 Files organizing procedure for easy lookup and use
	1.9 Files and information searching
	1.10 User software or application programs installation
	1.11 User software or application programs updating or upgrading procedure
	1.12 Storage media selection process
2. Underpinning Skills	2.1 Making successful logging in and logging off of the computer.
	2.2 Selecting hardware and software according to task assigned and required outcome.
	2.3 Checking hardware configuration according to requirements
	2.4 Adding, renaming, and moving desktop icons according to requirements.
	2.5 Copying or deleting desktop icons according to requirements.
	2.6 Saving and restoring desktop settings according to requirements.
	2.7 Organizing various files for easy lookup and use as required.
	2.8 Searching files and information according to requirements.
	2.9 Installing user software or application programs according to requirements.
	2.10 Updating or upgrading user software or application programs according to requirements.
	2.11 Selecting storage media as required
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices

	3.2 Communication with peers, sub-ordinates and seniors in workplace.
	3.3 Promptness in carrying out activities.
	3.4 Tidiness and timeliness.
	3.5 Respect of peers, sub-ordinates and seniors in workplace.
	3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided:
	4.1 Workplace
	4.2 Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity.
	4.3 Materials relevant to the proposed activity.
	4.4 Relevant drawings, manuals, codes, standards and reference material.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Made successful logging in and logging off of the computer.
	1.2 Added, renamed, and moved desktop icons according to requirements.
	1.3 Searched Files and information according to requirements.
	1.4 Updated or upgraded user software or application programs according to requirements.
	1.5 Selected storage media as required
	1.6 Printed information or document on the installed printer according to requirements.
	1.7 Shut down hardware and peripheral devices correctly according to requirements.
	1.8 Implemented Basic software maintenance procedures in line with the standard operating procedures.
2. Methods of Assessment	Competency should be assessed by:
	2.1 Written examination
	2.2 Demonstration
	2.3 Oral questioning
	2.4 Workplace observation
	2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **GENERATE DRAWING USING CAD SOFTWARE**	Nominal Duration: 30 hrs.	Unit Code: SEIP-LIG-CNC-2-O
Unit Descriptor:		
This unit covers the knowledge, skills and attitudes required of CAD/CAM operator to generate drawing using cad software. It specifically includes the tasks of preparing the cad environment, produce 2D drawing, producing 3d drawing and maintaining computer equipment and systems		

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Prepare the CAD environment	1.1 **Software and equipment** for CAD are gathered to produce drawing as per requirement. 1.2 All **relevant materials, instructions** manuals and operating procedures for CAD software are obtained in according with job requirements. 1.3 The CAD package is booted up according to standard work procedures. 1.4 Screen display areas and **basic parameters** are set in accordance with instructions manual. 1.5 Drawing files are saved in the designated folder in accordance with standard operating procedures. 1.6 Drawing files are printed out in accordance with standard operating procedures.
2. Produce 2D drawing	2.1 Page set-up and scaling procedure is performed based on technical drawing requirements and printer characteristics. 2.2 **Basic 2D drawings** are created using required CAD commands. 2.3 Assembled 2D drawings are created using required CAD commands. 2.4 2D sectional drawings are created accordance with the CAD commands. 2.5 CAD drawings are reviewed and modified, if necessary. 2.6 Drawing files are saved in the designated folder in accordance with standard operating procedures. 2.7 Drawing files are printed in accordance with standard operating procedures.
3. Produce 3D drawing	3.1 2D drawing is selected for creating 3D drawing. 3.2 **3D CAD drawings** are created using required commands according to specifications. 3.3 CAD drawings are reviewed and modified, if necessary. 3.4 3D CAD section drawing are created in accordance with standard operating procedures. 3.5 Assembled 2D drawings are created using required CAD commands. 3.6 Drawing files are saved in the designated folder in accordance with standard operating procedures.

	3.7	Drawing files are printed out in accordance with standard operating procedures.
4. Maintain computer equipment and systems	4.1	Proper shutdown is carried out in accordance with standard operating procedures.
	4.2	Systems and workplace is cleaned according to worksite procedures.
	4.3	Security of data, regular back-ups and virus checks are implemented in accordance with standard operating procedures
	4.4	Basic file maintenance procedures are implemented in line with the standard operating procedures

Range of Variable

Variable	Range
	May Include but not limited to:

1. Software and equipment	1.1 CAD software
	       1.1.1 AUTOCAD
	       1.1.2 CATIA
	       1.1.3 Solid works
	1.2 Computer
	1.3 Plotter
	1.4 Printer
	1.5 USB

2. Relevant materials and Instructions	2.6 Instructions manuals 2.2 Sample product / work piece 2.7 Drawings and/or sketches 2.8 Paper 2.9 Flash disk 2.10 External drive 2.11 Recordable or rewritable CD
3. Basic Parameters	3.1 Layer 3.2 Line types 3.3 Line width 3.4 Dimension style 3.5 Color and text format 3.6 Hatch style 3.7 Annotations 3.8 Create, add, edit block, tool palettes
4. Basic 2D Drawings.	4.1 lines, poly line, conics, cubic splines, Bezier, curve, linear, radial, angular. 4.2 Arcs 4.3 Circles 4.4 Polygons 4.5 4.5 Ellipses 4.6 Hatching or filling of areas 4.7 Dimensions

	4.8 Text
	4.9 Geometric techniques
	4.10 4.9 Mechanical working drawing
	4.11 Drawing interpretation
	4.12 Object constructions
	4.13 Parts modeling
	4.14 Creation of drawing views
	4.15 Prototyping
	4.16 Limits and fits
	4.17 Surface condition (surface finish/texture)
	4.18 Dimensioning
	4.19 Sections
5. 3D CAD drawings	5.1 Drawing interpretation
	5.2 Object constructions
	5.3 Parts modeling
	5.4 Creation of drawing views
	5.5 Prototyping
	5.6 Drawing object and defining relations between objects
	5.7 Geometric constraints
	5.8 Creating and modifying wire frames
	5.9 Extruded objects
	5.10 Rotated objects
	5.11 Joining objects
	5.12 Cursor shapes
	5.13 Prisms
	5.14 Correcting errors

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 CAD Software and equipment
	1.2 Page set-up and scaling procedure
	1.3 Procedure of Creating basic 2D drawings
	1.4 Procedure of Creating assembled 2D drawings
	1.5 Procedure of Created 2D sectional drawings
	1.6 Method of Reviewing and modifying cad drawings.
	1.7 Printing procedure of files
	1.8 Procedure of Selecting 2D drawing to generate a 3D drawing.
	1.9 Procedure of Creating 3D CAD drawings
	1.10 Procedure of creating 3D CAD section drawing
	1.11 Procedure of Creating assembled 3D drawings
	1.12 Saving drawing files
	1.13 Printing of files
2. Underpinning Skills	2.1 Performing page set-up and scaling procedure base on technical drawing requirements and printer characteristics.
	2.2 Creating basic 2d drawings using required cad commands.
	2.3 Creating assembled 2d drawings using required cad commands.

	2.4 Created 2d sectional drawings in accordance with cad commands.
	2.5 Reviewing and modified cad drawings.
	2.6 Saving drawing files in the designated folder
	2.7 Printing files in accordance with standard operating procedures.
	2.8 Selecting 2d drawing to generate a 3d drawing.
	2.9 Creating 3d cad drawings using required commands according to specifications.
	2.10 Reviewing and modifying cad drawings
	2.11 Creating 3d cad section drawing in accordance with standard operating procedures.
	2.12 Creating assembled 2d drawings using required cad commands.
	2.13 Saving drawing files in the designated folder
	2.14 Drawing files are printed out in accordance with standard operating procedures.
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace.
	3.3 Promptness in carrying out activities.
	3.4 Tidiness and timeliness.
	3.5 Respect of peers, sub-ordinates and seniors in workplace.
	3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided:
	4.1 Workplace
	4.2 Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity.
	4.3 Materials relevant to the proposed activity.
	4.4 Relevant drawings, manuals, codes, standards and reference material.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Performed page set-up and scaling procedure base on technical drawing requirements and printer characteristics.
	1.2 Created basic 2D drawings using required CAD commands.
	1.3 Created assembled 2D drawings using required CAD commands.
	1.4 Created 2D sectional drawings using the CAD commands.
	1.5 Reviewed and modified CAD drawings, if necessary.
	1.6 Printed drawing files in accordance with standard operating procedures.

	1.7 Selected 2D drawing that will be used to generate a 3D drawing.
	1.8 Created 3D CAD drawings using required commands and in accordance with specifications.
	1.9 Created 3D CAD section drawings in accordance with standard operating procedures.
	1.10 Saved drawing files in the designated folder in accordance with standard operating procedures.
2. Methods of Assessment	Competency should be assessed by:
	2.1 Written examination
	2.2 Demonstration
	2.3 Oral questioning
	2.4 Workplace observation
	2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency:	Nominal Duration:	Unit Code:
APPLY CAD/CAM PROGRAM	40 hrs.	SEIP-LIG-CNC-3-O
Unit Descriptor:		
This unit covers the knowledge, skills and attitudes required of a CAD/CAM operator to apply CAD/CAM program. It specifically includes the tasks of preparing for CAD/CAM program application, creating /importing CAD drawing, creating /editing CNC programs, Loading and running program at CNC machine and maintaining computer, CNC machine, equipment and systems.		

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Prepare for CAD/CAM Program application	1.1 Safe work practices are observed in accordance with work place requirement. 1.2 Work piece, drawing, model or a concept of a new design are analyzed to produce CAD drawing and CAM program. 1.3 **CNC Parameters** are selected according to the requirements of the operation. 1.4 Tools and equipment are gathered to produce drawing as per requirement. 1.5 All relevant materials, instruction manuals and operating procedures are obtained according to job requirements. 1.6 Basic parameters of CNC machine are set in accordance with instructions manual.
2. Create/import CAD drawing	2.1 Work piece, drawing, model or a concept of a new design are analyzed to produce CAD drawing and CAM program. 2.2 **System parameters** are selected according to the requirements of the operations. 2.3 Drawing reference point is established based on job requirement/work piece. 2.4 Profile, shape, contour of the work pieces are created/imported using CAD according to job requirements and drawing standards. 2.5 Created/imported drawings are edited according to **drawing standards**. 2.6 Created/edited drawing are saved according to job requirements.
3. Create/edit CNC programs	3.1 **CAM parameters** are identified and set according to job requirements /part to be produced. 3.2 Tools are created (if required) for the tool library and loaded based on job requirements. 3.3 Coordinates are set for tool path or machining functions based on the CAD drawing. 3.4 Work piece Zero point identified based on the CAD drawing. 3.5 Tool paths movement generated in cycles format in accordance with the **software** used.

	3.6	Tool paths movement are simulated in moderate speed to determine the correctness of the tool movements and other work parameters.
	3.7	Cycles are edited if required.
	3.8	CNC program generated through post processor in accordance with selected machine control standard.
4. Load and run program at CNC machine	4.1	Program is loaded using the appropriate devices.
	4.2	Dry run is performed in the machine in accordance with established procedures.
	4.3	Program is executed to produce part/work piece as per specifications.
	4.4	**Problems encountered** are documented, reported or referred to **concerned personne**l in accordance with institutional standards.
5. Maintain computer, CNC machine, equipment and systems.	5.1	Proper shutdown is carried out in accordance with standard operating procedures.
	5.2	Systems and workplace is cleaned according to worksite procedures.
	5.3	Ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures.
	5.4	Basic file maintenance procedures are implemented in line with the standard operating procedures.
	5.5	CNC lathe/milling machine are cleaned and maintained with the standard operating procedures.

Range of Variables

Variable	Range
	May Include but not limited to:

1. CNC Parameters	1.1 CNC machine preparation.
	 1.2 CNC machine coordinate system.
	 1.3 Ending.
	 1.4 Reference point.
	     1.4.1 Machine zero point
	     1.4.2 Reference point
	     1.4.3 Tool mount reference point
	     1.4.4 Work piece zero point
	     1.4.5 Tool change
	     1.4.6 Tool geometry/information
	     1.4.7 Tool pocket number

2. System parameters	2.1 Importing CAD drawing 2.2 Creating CAD drawing 2.3 Basic File Operation 2.4 Opening a Program file

	2.5 Creating a New Program file
	2.6 Importing and Exporting DXF files
	2.7 Saving and Printing a Program file
3. Drawing standards.	3.1 ISO
	3.2 American (ANSI)
	3.3 And other existing standards
4. CAM parameters	4.1 G – Code
	4.1.1 Preparatory function
	4.1.2 Axis movement (X, Y, Z) etc.
	4.2 M – Code
	4.2.1 Miscellaneous function
	4.2.2 Other function e.g. tool change, coolant on etc.
5. Software	5.1 Master CAM
	5.2 Edge CAM
	5.3 CATIA
6. Problems encountered	6.1 Incorrect machine set-up
	6.2 Incorrect parameter setting
	6.3 Defective raw materials
7. Concerned personnel	7.1 Production supervisor
	7.2 CNC Programmer
	7.3 Designer
	7.4 Other operators
	7.5 Quality control inspector

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Work place safe work practices requirements
	1.2 concept of a designing Work piece, drawing, model
	1.3 CAD drawing and CAM program analysis
	1.4 Selection of CNC Parameters
	1.5 Procedure of gathering tools and equipment for producing drawing
	1.6 Materials, instructions manuals and operating procedures
	1.7 Setting procedure of basic parameters of CNC machine
	1.8 Analyzing process of work piece, drawing, model or a concept of a new design to produce CAD drawing and cam program.
	1.9 Selection of System parameters based on requirements

2. Underpinning Skills	2.1 Selecting System parameters according to the requirements of the operations.
	2.2 Creating/importing profile, shape, contour of the work piece using cad according to job requirements and drawing standards.

	2.3 Saving the Created/edited drawing according to job requirements.
	2.4 Identifying and set cam parameters according to job requirements/part to be produced.
	2.5 Creating tools (if required) for the tool library and loading based on job requirements.
	2.6 Setting coordinates for tool path or machining functions base on the CAD drawing.
	2.7 Generating tool paths movement in cycles format
	2.8 Generating NC program through post processor in accordance with selecting machine control standard.
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace.
	3.3 Promptness in carrying out activities.
	3.4 Tidiness and timeliness.
	3.5 Respect of peers, sub-ordinates and seniors in workplace.
	3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided:
	4.1 Workplace
	4.2 Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity.
	4.3 Materials relevant to the proposed activity.
	4.4 Relevant drawings, manuals, codes, standards and reference material.
	4.5 CNC lathe/milling machine and accessories.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Selected system parameters according to the requirements of the operations.
	1.2 Created/imported profile, shape, contour of the work piece using cad according to job requirements and drawing standards.
	1.3 Saved created/edited drawing according to job requirements.
	1.4 Identified and set CAM parameters according to job requirements/part to be produced.
	1.5 Created tools (if required) for the tool library and loaded base on job requirements.
	1.6 Set coordinates for tool path or machining functions base on the cad drawing.
	1.7 Generated tool paths movement in cycles format in accordance with the software using.

	1.8 Generated NC program through post processor in accordance with selecting machine control standard.
2. Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **WRITE CNC LATHE MACHINE PROGRAM**	Nominal Duration: 30 hrs.	Unit Code: SEIP-LIG-CNC-4-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a CNC Lathe operator to write CNC Lathe machine program. It specifically includes the tasks of preparing to determine job requirements, write CNC Lathe Machine program, edit CNC Lathe Machine programs and maintain computer, CNC Lathe machine, tools, equipment and systems.		

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Determine job requirements	1.1 **Drawings** are interpreted to produce component to specifications. 1.2 Sequence of operation is determined to produce component according to specification. 1.3 **Cutting tools** are selected according to the requirements of the process. 1.4 Cutting speed and feed rate are calculated based on work piece and cutting tool material. 1.5 Process/job adjustment sheets are filled up with relevant machine, tool and raw material
2. Write CNC Lathe Machine program	2.1 **Programming method** is identified in accordance with industry standard. 2.2 Work piece (axis) coordinates is calculated for **machining functions (two axis machine)** based on part or product to be produced. 2.3 Program is written in standard **CNC lathe operation's code format** in accordance with machine standard operating procedures.
3. Edit CNC Lathe Machine programs	3.1 Program is simulated and edited in accordance with standard operating procedures. 3.2 Program is saved in accordance with standard operating procedures. 3.3 Program is downloaded to the machine in accordance with standard operating procedures (Optional).
4. Maintain computer, CNC Lathe machine, tools equipment and systems.	4.1 Proper shutdown is carried out in accordance with standard operating procedures. 4.2 Systems and workplace is cleaned in accordance with worksite procedures. 4.3 Security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures. 4.4 Basic file maintenance procedures are implemented in line with the standard operating procedures. 4.5 CNC lathe machine are cleaned and maintained in accordance with the standard operating procedures.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Drawings	Reading and interpretation 1.1 Dimensions and symbols 1.2 Tolerances
2. Cutting tools	2.1 External and internal cutting tools 2.2 Grooving tools 2.3 Drilling tools 2.4 Threading tools 2.5 Parting-off tools
3. Machining functions (two axis machine)	3.1 Absolute 3.2 Incremental
4. Programming method	4.1 Absolute programming 4.2 Incremental programming 4.3 Canned cycle programming 4.4 linear programming
5. CNC Lathe operation's code format	5.1 G-Code (Preparatory function/ Axis movement X,Y,Z etc. **Command** **Meaning** G 01 --- Linear Interpolation G 02 --- Circular Interpolation clock wise G 03 --- Circular Interpolation Counter clock wise G 72 --- Finishing Cycle G 73 --- Turning Cycle G 74 --- Facing Cycle G 78 --- Multiple thread Cycle G 83 --- Drilling Cycle G 84 --- Taping Cycle G 85 --- Reaming Cycle G 90 --- Absolute programming G 98 --- Return to Initial plane G 99 --- Return to withdrawal plane G 28 --- Return to reference point 5.2 M-Code (Miscellaneous function) M 03 --- Main spindle on clock wise M 04 --- Main spindle on counter clock wise M 05 --- Main spindle stop M 08 --- Coolant on M 09 --- Coolant off M 20 --- Tailstock back M 21 --- Tailstock forward M 25 --- Open clamping devices M 26 --- Close clamping devices M 30 --- Main program end M 98 --- Sub- program call M 99 --- Sub- program end

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Drawings interpretation methods
	1.2 Sequence of operation in producing component according to specification.
	1.3 Selection process of cutting tools
	1.4 Calculation of Cutting speed and feed rate
	1.5 Filling up procedure of process/job adjustment sheets
	1.6 CNC programming methods
	1.7 Calculation procedure of work piece (axis) coordinates for two axis machine
	1.8 Program writing on a standard CNC lathe operation's code format
	1.9 Program simulation and editing
	1.10 Program saving procedure
	1.11 Program downloading procedure
	1.12 CNC machine proper shutdown procedure
	1.13 Systems and workplace cleaning
	1.14 Implementation of data Security procedures including regular back-ups and virus checks
	1.15 Implementation procedures on Basic file maintenance
	1.16 CNC lathe machine cleaning and maintenance procedures

2. Underpinning Skills	2.1 Interpreting drawings to produce component to specifications.
	2.2 Determining sequence of operation to produce components according to specification.
	2.3 Selecting cutting tools according to the requirements of the process.
	2.4 Calculating cutting speed and feed rate based on work piece and cutting tool material.
	2.5 Filling up process/job adjustment sheets with relevant machine, tool and raw material
	2.6 Identifying programming method in accordance to industry standard.
	2.7 Calculating work piece (axis) coordinates for machining functions (two axis machine) based on part or product to be produced.
	2.8 Writing program in standard CNC lathe operation's code format in accordance with machine standard operating procedures.
	2.9 Simulating and editing program accordance with standard operating procedures.
	2.10 Saving program in accordance with standard operating procedures.

	2.11 Downloading program to the machine in accordance with standard operating procedures (optional).
	2.12 Carrying out proper shutdown in accordance with standard operating procedures.
	2.13 Cleaning systems and work area in accordance with workplace procedures.
	2.14 Implementing security of data, including regular back-ups and virus checks in accordance with standard operating procedures.
	2.15 Implementing basic file maintenance procedures in line with the standard operating procedures.
	2.16 Cleaning and maintaining CNC lathe machine in accordance with machine manufacturer's standard requirements
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace.
	3.3 Promptness in carrying out activities.
	3.4 Tidiness and timeliness.
	3.5 Respect of peers, subordinates and seniors in workplace.
	3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided:
	4.1 Workplace
	4.2 Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity.
	4.3 Materials relevant to the proposed activity.
	4.4 Relevant drawings, manuals, codes, standards and reference material.
	4.5 CNC lathe machine and accessories.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate:
	1.1 Identified programming methods according to industry standard.
	1.2 Calculated work piece (axis) coordinates for machining functions based on part or product to be producing.
	1.3 Wrote test program in standard CNC lathe operations code format in accordance with standard operating procedures.
	1.4 Simulated and edited program according to standard operating procedures.
	1.5 Saved program according to standard operating procedures.
	1.6 Downloaded program to the machine according to standard operating procedures (optional).

	1.7 Implemented security of data, including regular back-ups and virus checks in accordance with standard operating procedures. 1.8 Implemented basic file maintenance procedures in line with the standard operating procedures.
2. Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **CARRYOUT CNC LATHE MACHINE OPERATIONS**	Nominal Duration: 70 hrs.	Unit Code: SEIP-LIG-CNC-5-O

Unit Descriptor:
This unit covers the knowledge, skills and attitudes required of a CNC lathe operator to carryout CNC lathe machine operations. It specifically includes the tasks of setting-up CNC lathe machine, work piece and cutting tools, downloading/inputting and simulating program, cutting model/sample work piece, performing CNC lathe machine operation, checking and measuring work piece and maintaining computer, CNC lathe machine, tools equipment and systems.

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria	
1. Set-up CNC lathe machine, workpiece and cutting tools.	1.1	Oil and coolant is checked in accordance with manufacturer's specification.
	1.2	Air and hydraulic pressure is checked in accordance with manufacturer's specification.
	1.3	Machine zero point is set to the required position.
	1.4	**Cutting Tools** are set according to required sequence of operations.
	1.5	**Work holding and clamping devices** are set and tightened according to standard operating procedures.
	1.6	**Tool set-up** is performed according to standard operating procedures.
	1.7	Work piece is mounted and centered on clamping device to required level of accuracy using tools and instruments in accordance with workplace procedures.
	1.8	Set-up is performed in accordance with safety requirements.
2. Download/input and simulate program.	2.1	**Program** is downloaded / inputted to the machine using appropriate devices.
	2.2	Program is simulated to determine the correctness of the tool path and other work parameters.
3. Cut model/sample work piece.	3.1	Dry run is performed in accordance with the desired tool movement.
	3.2	Work piece is cut as programmed.
	3.3	Work piece is checked and measured using appropriate measuring instruments.
	3.4	Program is edited and tool parameters are corrected/adjusted as required.
4. Perform CNC lathe machine operation.	4.1	Work piece is mounted or set in accordance with standard operating procedures.
	4.2	**CNC Lathe operations** are performed to produce component as programmed.
	4.3	**Corrective measures/adjustments** are performed if necessary.

	4.4	Personal protective equipment (**PPE**) are used in accordance with occupational health and safety (OHS) requirements
5. Check and measure work piece.	5.1	Work piece is checked and measured in conformance to specification using appropriate methods, **measuring tools** and equipment
	5.2	Defective work pieces are marked, recorded and reported for proper action.
6. Maintain computer, CNC Lathe machine, tools equipment and systems.	6.1	Proper shutdown is carried out in accordance with standard operating procedures.
	6.2	Systems and workplace is cleaned according to worksite procedures.
	6.3	Ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures.
	6.4	Basic file maintenance procedures are implemented in line with the standard operating procedures.
	6.5	CNC lathe machine are cleaned and maintained with the standard operating procedures.
	6.6	Tools, equipment and **materials** are stored safely in appropriate location according to standard work place procedures.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Cutting tools	1.1 External and internal cutting tools 1.2 Turning tool 1.3 Grooving tool 1.4 Drilling tool 1.5 Threading tool 1.6 Parting-off tool 1.7 Boring tool 1.8 Taping tool 1.9 Finishing tool
2. Work holding and clamping devices	2.1 Three jaw chuck 2.2 Collect chuck 2.3 Live center 2.4 Bar feeder 2.5 Part catcher 2.6 Tool center
3. Tool set-up	3.1 Scratch method 3.2 Tool-setting device method

4. Programming	4.1 Absolute programming
	4.2 Incremental programming
	4.3 Canned cycle programming
	4.4 linear programming
5. CNC Lathe operations	5.1 Facing (transversal)
	5.2 Straight turning (longitudinal/plain)
	5.3 Contour turning (circular, taper)
	5.4 Recess, shoulders, grooves, fillets and chamfers,
	5.5 Thread cutting
	5.6 Parting-off
	5.7 Drilling
	5.8 Boring
	5.9 Taping
6. Corrective measures/adjustments.	6.1 Replacement of cutting tools
	6.2 Adjustment of tool offset
	6.3 Adjustment of cutting speed and feed rate
7. PPE	7.1 Hand Gloves
	7.2 Goggles
	7.3 Safety Shoes.
	7.4 Apron
8. Materials	8.1 Aluminum
	8.2 Brass
	8.3 Magnesium
	8.4 Nickel
	8.5 Steel
	8.6 Thermoset plastics
	8.7 Titanium
	8.8 Zinc

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Procedure of checking Oil and coolant
	1.2 Method of checking Air and hydraulic pressure
	1.3 setting procedure of Machine zero point
	1.4 Procedure of setting Cutting Tools
	1.5 Proper shutdown procedure of CNC machine
	1.6 Systems and workplace cleaning procedure
	1.7 Implementing security of data and methods of regular backing-ups of data and virus checking methods
2. Underpinning Skills	2.1 Setting and tightening of work holding and clamping devices in accordance to standard operating procedures.
	2.2 Performing tool set-up in accordance with standard operating procedures.
	2.3 Mounting and centering of work piece on clamping device to required level of accuracy
	2.4 Performing set-up in accordance with safety requirements.

	2.5 Downloading / inputting program to the machine using appropriate devices.
	2.6 Determining the correctness of program by means of simulating to of the tool path and other work parameters.
	2.7 Performing dry run in accordance with the desired tool movement.
	2.8 Editing program and correcting/adjusting tool parameters as required.
	2.9 Mounting Workpiece and setting in accordance with standard operating procedures.
	2.10 Performing CNC lathe operations to produce component as programed.
	2.11 Performing corrective measures and adjustments where necessary.
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices
	3.2 Communication with peers, sub-ordinates and seniors in workplace.
	3.3 Promptness in carrying out activities.
	3.4 Tidiness and timeliness.
	3.5 Respect of peers, sub-ordinates and seniors in workplace.
	3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided:
	4.1 Workplace
	4.2 Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity.
	4.3 Materials relevant to the proposed activity.
	4.4 Relevant drawings, manuals, codes, standards and reference material.
	4.5 CNC Lathe machine and accessories.

Assessment Evidence Guide:

1. Critical aspects of competency	1.1 Set and tightened work holding and clamping devices according to standard operating procedures.
	1.2 Performed tool set-up according to standard operating procedures.
	1.3 Mounted and centered work piece on clamping device to required level of accuracy using tools and instruments in accordance with workplace procedures.
	1.4 Performed setting-up in accordance with safety requirements.
	1.5 Downloaded/inputted program to the machine using appropriate devices.
	1.6 Simulated program to determine the correctness of the tool path and other work parameters.

	1.7	Edited program and tool parameters are corrected/adjusted as required.
	1.8	Mounted work piece or set in accordance with standard operating procedures.
	1.9	Performed CNC lathe operations to produce component as per program.
2. Methods of Assessment	Competency should be assessed by:	
	2.1	Written examination
	2.2	Demonstration
	2.3	Oral questioning
	2.4	Workplace observation
	2.5	Portfolio
3. Context of Assessment	3.1	Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency: **WRITE CNC MILLING MACHINE PROGRAM**	Nominal Duration: 30 hrs.	Unit Code: SEIP-LIG-CNC-6-O

Unit Descriptor:

This unit covers the knowledge, skills and attitudes required of a CNC milling operator to write CNC milling machine program. It specifically includes the tasks of determining job requirements, writing CNC milling machine program, editing CNC milling machine programs and maintaining computer, CNC milling machine, tools, equipment and systems.

Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Determine job requirements	1.1 **Drawings** are interpreted to produce component in accordance with specification
	1.2 **Milling sequence of operation** is determined to produce component in accordance with specification.
	1.3 **CNC milling Cutters** are selected according to the requirements of the process.
	1.4 Cutting speed and feed rate are calculated based on work piece and cutting tool material.
	1.5 Process / job / adjustment sheets are filled up with relevant machine, tool and raw material
2. Write CNC Milling Machine Program	2.1 **Programming methods** are identified in accordance with industry standard.
	2.2 Work piece (axis) coordinates is calculated for **machining functions (three axis machine)** based on part or product to be produced.
	2.3 Program is written in standard CNC **Milling operations code format** in accordance with standard programming procedures.
3. Edit CNC Milling Machine programs	3.1 Program is simulated and edited according to standard operating procedures.
	3.2 **Program** is saved according to standard operating procedures.
	3.3 Program is downloaded to the machine according to standard operating procedures. (Optional)
4. Maintain computer, CNC Milling machine, tools equipment and systems.	4.1 Proper shutdown is carried out in accordance with standard operating procedures.
	4.2 Systems and workplace is cleaned according to workplace requirements.
	4.3 Security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures.
	4.4 Basic file maintenance procedures are implemented in accordance with standard procedures.
	4.5 CNC milling machine is cleaned and maintained in accordance with manufacturer's instructions.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Drawings	Reading and interpretation 1.1 Dimensions and symbols 1.2 Tolerances
2. Milling sequence of operation	2.1 Face milling (transversal) 2.2 Side milling 2.3 Shoulder facing 2.4 Recess, shoulders, grooves, fillets and chamfers milling 2.5 Threading, boring, Drilling, Counter boring, Counter sinking, Rigid taping 2.6 Spur gear involute milling 2.7 Sprocket milling 2.8 Profile milling 2.9 Parting-off
3. CNC milling Cutters	3.1 Face milling cutter 3.2 End milling cutter 3.3 Drilling tools 3.4 Boring tool 3.5 Threading tools 3.6 Side milling cutter 3.7 Form milling cutter 3.8 Profile milling cutter 3.9 Tap
4. Programming methods	4.1 Absolute programming 4.2 Incremental programming 4.3 Canned cycle programming 4.4 linear programming
5. Machining functions (three axis machine- X, Y & Z)	Fanuc 21 M 5.1 X, Y = Plain axis 5.2 Z = Feed axis
6. Milling operations code format	6.1 G-Code (Preparatory function/ Axis movement X, Y, Z etc.) **Command** **Meaning** G 01 --- Linear Interpolation G 02 --- Circular Interpolation clock wise G 03 --- Circular Interpolation Counter clock wise G 72 --- Finishing Cycle G 73 --- Turning Cycle G 74 --- Facing Cycle G 78 --- Multiple thread Cycle G 83 --- Drilling Cycle G 84 --- Taping Cycle G 85 --- Reaming Cycle G 90 --- Absolute programming G 98 --- Return to Initial plane

	G 99	---	Return to withdrawal plane
	G 28	---	Return to reference point
	6.2 M-Code (Miscellaneous function)		
	M 03	---	Main spindle on clock wise
	M 04	---	Main spindle on counter clock wise
	M 05	---	Main spindle stop
	M 08	---	Coolant on
	M 09	---	Coolant off
	M 20	---	Tailstock back
	M 21	---	Tailstock forward
	M 25	---	Open clamping devices
	M 26	---	Close clamping devices
	M 30	---	Main program end
	M 98	---	Sub- program call
	M 99	---	Sub- program end

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Procedure of interpreting Drawings to produce component to specifications. 1.2 Method of determining Sequence of operation to produce component according to specification. 1.3 Procedure of selecting Cutting tools 1.4 Calculation of cutting speed and feed rate 1.5 Means of filling up of process / job / adjustment sheets
2. Underpinning Skills	2.1 Identifying of programming methods according to industry standard. 2.2 Calculating work piece (axis) coordinates for machining functions based on part or product to be producing. 2.3 Writing program in standard CNC milling operations code format 2.4 Simulating and editing program according to standard operating procedures. 2.5 Saving program according to standard operating procedures. 2.6 Downloading program to the machine according to standard operating procedures (optional). 2.7 Implementing security of data, including regular back-ups and virus checks in accordance with standard operating procedures. 2.8 Implementing basic file maintenance procedures in accordance with standard operating procedures.
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety pracctices 3.2 Communication with peers, sub-ordinates and seniors in workplace. 3.3 Promptness in carrying out activities. 3.4 Tidiness and timeliness. 3.5 Respect of peers, sub-ordinates and seniors in workplace.

	3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided: 4.1 Workplace 4.2 Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity. 4.3 Materials relevant to the proposed activity. 4.4 Relevant drawings, manuals, codes, standards and reference material. 4.5 CNC lathe machine and accessories.

Assessment Evidence Guide:

1.	Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Identified programming methods according to industry standard. 1.2 Calculating work piece (axis) coordinates for machining functions based on part or product to be producing. 1.3 Wrote program in standard CNC milling operations code format in accordance with standard operating procedures. 1.4 Simulated and edited program in accordance with standard operating procedures. 1.5 Saved program in accordance with standard operating procedures. 1.6 Downloaded program to the machine in accordance to standard operating procedures (optional). 1.7 Implemented security of data, including regular back-ups and virus checks in accordance with standard operating procedures. 1.8 Implemented basic file maintenance procedures in accordance with machine manufacturer's instructions
2.	Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3.	Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

Unit of Competency:	Nominal Duration:	Unit Code:
CARRYOUT CNC MILLING MACHINE OPERATIONS	70 hrs.	SEIP-LIG-CNC-7-O

Unit Descriptor:
This unit covers the knowledge, skills and attitudes required of a CNC milling operator to carryout CNC milling machine operations. It specifically includes the tasks of setting-up CNC lathe machine, workpiece and cutting tools, downloading/inputting simulated program, cutting model/sample work piece, performing CNC milling machine operation, checking and measuring work piece and maintain computer, CNC milling machine, tools equipment and systems.

Elements and Performance Criteria:
(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria	
1. Set-up CNC Milling machine, work piece and cutting tools.	1.1	Oil and coolant is checked in accordance with manufacturer's specification.
	1.2	Air and hydraulic pressure is checked in accordance with manufacturer's specification.
	1.3	Machine zero point is set to the required position.
	1.4	**Cutting Tools** are set in accordance with required sequence of operations.
	1.5	**Work holding and clamping devices** are set and tightened according to standard operating procedures.
	1.6	**Tool set-up** is performed according to standard operating procedures.
	1.7	Work piece is mounted and centered on clamping device to required level of accuracy using tools and instruments in accordance with workplace procedures.
	1.8	Set-up is performed in accordance with safety requirements.
2. Download/input simulate program.	2.1	**Program** is downloaded/inputted to the machine using appropriate devices.
	2.3	Program is simulated to determine the correctness of the tool path and other work parameters.
3. Cut model/sample work piece.	3.1	Dry run is performed in accordance with the desired tool movement.
	3.2	Work piece is cut as programmed.
	3.3	Work piece is checked and measured using appropriate measuring instruments.
	3.4	Program is edited and tool parameters are corrected/adjusted as required.
4. Perform CNC Milling machine operation.	4.1	Work piece is mounted or set in accordance with standard operating procedures.
	4.2	**CNC Milling operations** are performed to produce component as per program.
	4.3	Corrective measures/adjustments are performed if necessary.

	4.4	Personal protective equipment (PPE) are used in accordance with occupational health and safety (OHS) requirements
5. Check and measure work piece.	5.1	Work piece is checked and measured in conformance to specification using appropriate methods, measuring tools and equipment.
	5.2	Defective work pieces are marked, recorded and reported for proper action.
6. Maintain computer, CNC Milling machine, tools equipment and systems.	6.1	Proper shutdown is carried out in accordance with standard operating procedures.
	6.2	Systems and workplace is cleaned in accordance with worksite procedures.
	6.3	Security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures.
	6.4	Basic file maintenance procedures are implemented in line with the standard operating procedures.
	6.5	CNC milling machine are cleaned and maintained with the standard operating procedures.
	6.6	Tools, equipment and **materials** are stored safely in appropriate location according to standard work place procedures.

Range of Variables

Variable	Range
	May Include but not limited to:
1. Cutting tools	1.1 Face milling cutter 1.2 End milling cutter 1.3 Drilling tools 1.4 Boring tool 1.5 Threading tools 1.6 Side milling cutter 1.7 Form milling cutter 1.8 Profile milling cutter 1.9 Tap
2. Work holding and clamping devices	2.1 Angle plate 2.2 V-Block and clamp 2.3 U-Clamp 2.4 C-Clamp 2.5 Step-Block 2.6 Bent-Tail machine clamp 2.7 Finger machine clamp 2.8 Machine strap clamp 2.9 T-Slot bolt 2.10 Machine vice

	2.11	Toggle clamps
	2.12	Machine clamps
	2.13	Pneumatic Fastening Clamps
	2.14	Jig and Fixtures
3. Tool set-up	3.1	Scratch method
	3.2	Tool-setting device method
4. Programming	4.1	Absolute programming
	4.2	Incremental programming
	4.3	Canned cycle programming
	4.4	linear programming
5. CNC Milling operations	5.1	Face milling (transversal)
	5.2	Side milling
	5.3	Shoulder facing
	5.4	Recess, shoulders, grooves, fillets and chamfers milling
	5.5	Threading, boring, Drilling, Counter boring, Counter sinking, Rigid taping
	5.6	Spur gear involute milling
	5.7	Sprocket milling
	5.8	Profile milling
	5.9	Parting-off
	5.10	Plane (helical) mill
	5.11	Form relieved mill
	5.12	Staggered tooth mill
	5.13	Double angle mill
6. Materials	6.1	Aluminum
	6.2	Brass
	6.3	Magnesium
	6.4	Nickel
	6.5	Steel
	6.6	Thermoset plastics
	6.7	Titanium
	6.8	9Zinc

Curricular Evidence Guide

1. Underpinning Knowledge	1.1	Checked Oil and coolant in accordance with manufacturer's specification.
	1.2	Checked air and hydraulic pressure in accordance with manufacturer's specification.
	1.3	Set machine zero point to the required position.
	1.4	Set cutting tools according to required sequence of operations.
	1.5	Carried out proper shutdown in accordance with standard operating procedures.
	1.6	Cleaned Systems and workplace in accordance with workplace procedures.

	1.7	Implemented security of data, including regular back-ups and virus checks in accordance with standard operating procedures.
2. Underpinning Skills	2.1	Setting and tightening work holding and clamping devices in accordance with standard operating procedures
	2.2	Performing tool set-up in accordance with standard operating procedures.
	2.3	Mounting and centering the work piece on clamping device to required level of accuracy using tools and instruments in accordance with workplace procedures.
	2.4	Performing set-up in accordance with safety requirements.
	2.5	Downloading / inputting program to the machine using appropriate devices.
	2.6	Simulating program to determine accuracy of the tool path and other work parameters.
	2.7	Performing dry run in accordance with the desired tool movement.
	2.8	Cutting of work piece as per programming.
	2.9	Editing Program and correcting/adjusting tool parameters as required.
	2.10	Mounting or setting work piece in accordance with standard operating procedures.
	2.11	Performing CNC milling operations to produce component as per program
	2.12	Performing corrective measures/adjustments if necessary.
3. Underpinning Attitudes	3.1	Commitment to occupational health and safety practices
	3.2	Communication with peers, sub-ordinates and seniors in workplace.
	3.3	Promptness in carrying out activities.
	3.4	Tidiness and timeliness.
	3.5	Respect of peers, sub-ordinates and seniors in workplace.
	3.6	Environmental concern.
	3.7	Sincere and honest to duties.
4. Resource Implications	The following resources MUST be provided:	
	4.1	Workplace
	4.2	Computer, printer, voltage regulator, UPS, operating system, application program and facilities appropriate to processes or activity.
	4.3	Materials relevant to the proposed activity.
	4.4	Relevant drawings, manuals, codes, standards and reference material.
	4.5	CNC Milling machine and accessories.

Assessment Evidence Guide:

1. Critical Aspects of Competency	1.1	Set and tightened work holding and clamping devices according to standard operating procedures.
	1.2	Performed tool set-up in accordance with standard operating procedures.
	1.3	Mounted and centered work piece on clamping device to required level of accuracy using tools and instruments in accordance with workplace procedures.
	1.4	Performed setting-up in accordance with safety requirements.
	1.5	Downloaded / inputted program to the machine using appropriate devices.
	1.6	Simulating program to determine the accuracy of the tool path and other work parameters.
	1.7	Cut work piece as per program
	1.8	Edited program and corrected/adjusted tool parameters as required.
	1.9	Mounted or set work piece in accordance with standard operating procedures.
	1.10	Performed CNC milling operations to produce component programmed
2. Methods of Assessment	Competency should be assessed by:	
	2.1	Written examination
	2.2	Demonstration
	2.3	Oral questioning
	2.4	Workplace observation
	2.5	Portfolio
3. Context of Assessment	3.1	Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

End of Competency Standard