COMPETENCY STANDARD

Machine Shop Practice

Level: 03

(Light Engineering Sector)

Competency Standard Code: CS-LE-MSP-L3-EN-V2

National Skills Development Authority
Prime Minister's Office
Government of the People's Republic of Bangladesh

Copyright

National Skills Development Authority
Prime Minister's Office
Level: 10-11, Biniyog Bhaban,
E-6 / B, Agargaon, Sher-E-Bangla Nagar Dhaka-1207, Bangladesh.
Email: ec@nsda.gov.bd
Website: www.nsda.gov.bd.
National Skills Portal: http:\\skillsportal.gov.bd

This Competency Standard for Machine Shop Practice is a document for developing curricula, teaching, and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of the industry in order to meet the qualification of individuals who graduated through the established standard via competency-based assessment for a relevant job.

This document has been developed by NSDA in association with Light Engineering Sector, industry representatives, academia, related specialists, trainers, and related employees.

Public, and private institutions may use the information contained in this standard for activities benefitting Bangladesh.

Introduction

The NSDA aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public, and private training providers qualitatively, and quantitatively. It also aims to establish, and operationalise a responsive skills ecosystem, and delivery mechanism through a well-defined set of mechanisms, and necessary technical supports.

NSDA has targeted key priority economic growth sectors identified by the government to improve current job skills, and 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, and knowledge to enable industry growth, and increased employment through the provision of the market-responsive, inclusive skills training programme. "**Machine Shop Practice**" Level-3 is selected as one of the priority occupations of Light Engineering Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations, and employers.
Generally, a competency standard informs Curriculum, learning materials, assessment, and certification of trainees enrolled in Skills Training. Trainees who successfully pass the assessment will receive a qualification in the National Skills Qualification Framework (NSQF) under Bangladesh National Qualification Framework, and be listed on the NSDA's online portal.

This competency standard is developed to improve skills, and knowledge in accordance with the job roles, duties, and tasks of the occupation, and ensure that the required skills, and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording, and layout of the Competency Standard for an occupation which is 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 an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of a competency standards is to:

- provide a consistent, and reliable set of components for training, recognising, and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development, and delivery of flexible training which suits individual, and industry requirements
- encourage learning, and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of representative from NSDA, key Institutions, ISC, and industry experts to identify the competencies required of an occupation in Light Engineering Sector.

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

With competency standards, training, and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor

- elements, and performance criteria
- variables, and range statement
- curricular content guide
- assessment evidence guides

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes, and the Unit of Competency titles, and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements, and Performance Criteria, Range of Variables, Curricular Content Guide, and Assessment Evidence Guide.

Competency Standards for National Skills Certificate – Level-3 in Machine Shop Practice in Light Engineering Sector

Level Descriptors of NSQF (BNQF 1-6)

Level & Job Classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager	Comprehensive actual, and theoretical knowledge within a specific work or study area with an awareness of the validity, and limits of that knowledge, able to analyse, compare, relate, and evaluate.	Specialised, and wider range of cognitive, and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues, and solutions to the team, and to external partners/users.	Work under broad guidance, and self-motivation to execute strategic, and operational plan/s. Lead lower-level management. Diagnose, and resolve problems within, and among work groups.
5-Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize, and break information into parts by identifying motives or causes.	Broad range of cognitive, and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems, and possible solutions to external partners.	Work under guidance of management, and self-direction to resolve specific issues. Lead, and take responsibility for the work, and actions of group/team members. Bridge between management.
4-Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing, and applying acquired knowledge.	A range of cognitive, and practical skills required to accomplish tasks, and solve problems by selecting, and applying the full range of methods, tools, materials, and information. Communicate using technical terminology, and IT technology with partners, and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements, and lead/guide a team/ group.
3-Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas, and abstract from drawing, and design according to workplace requirements.	Basic cognitive, and practical skills required to use relevant information in order to carry out tasks, and to solve routine problems using simple rules, and tools. Communicate with his team, and limited external partners upholding the values, nature, and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams, and responsible for group coordination.
2-Semi Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret, and apply common occupational terms, and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting, and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 –Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms, and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms, and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

List of Abbreviations

CS	-	Competency Standard
ISC	-	Industry Skills Council
FPS	-	Foot, Pound and Second
LEISC	-	Light Engineering Industry Skills Councils
NSDA	-	National Skills Development Authority
NSQF	-	National Skills Qualification Framework
MKS	-	Meter, Kilogram and Second
BNQF	-	Bangladesh National Qualification Framework
OSH	-	Occupational Safety and Health
PPE	-	Personal Protective Equipment
SS	-	Stainless Steel
MS	-	Mild Steel
SCVC	-	Standards and Curriculum Validation Committee
STP	-	Skills Training Provider
SOP	-	Standard Operating Procedure
UoC	-	Unit of Competency
TDS	-	Tap Drill Size

Approval of Competency Standard:

Approved by
..... Executive Committee (EC) Meeting of NSDA
Held on …….. ……. 2023

Deputy Director (Admin)
and
Officer of Secretarial Duties for EC Meeting
National Skills Development Authority

Contents

National Competency Standards for National Skill Certificate – III in Machine Shop Practice

Course Structure

SL	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Generic Competencies				**40**
1.	GU02L3V1	Apply OSH Practices in the Workplace	1	15
2.	GU04L3V1	Perform Computations Using Basic Mathematical Concepts	2	25
Sector Specific Competencies				**40**
3.	SULE01L3V1	Work in the Light Engineering Sector	1	10
4.	SULE02L3V1	Interpret Technical Drawings and Manuals	1	30
Occupation Specific Competencies				**280**
5.	OULEMSP01L3V1	Carryout Bench Work Operations	3	70
6.	OULEMSP02L3V1	Perform Lathe Machine Operations	3	60
7.	OULEMSP03L3V1	Perform Milling Machine Operations	3	50
8.	OULEMSP04L3V1	Perform Shaper Machine Operations	3	30
9.	OULEMSP05L3V1	Perform Precision Grinding Machine Operations	3	40
10.	OULEMSP06L3V1	Perform Basic Welding	3	30
Total Nominal Learning Hours				**360**

Units & Elements at Glance:

Generic Competencies (40 hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU02L3V1	Apply OSH Practices in the Workplace	1. Identify, control and report OSH hazards 2. Conduct work safely 3. Follow emergency response procedures 4. Maintain and improve health and safety in the work place.	15
GU04L3V1	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	25
Total Hour			**40**

Sector Specific Competencies (40 hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SULE01L3V1	Work in the Light Engineering Sector	1. Describe the organizational structure within the sector 2. Identify processes and procedures 3. Identify tools, equipment and materials 4. Identify workplace requirements 5. Organize own workload 6. Practice OHS	10
SULE02L3V1	Interpret Technical Drawings and Manuals	1. Select technical drawing 2. Interpret technical drawings. 3. Interpret operation & maintenance manuals	30
		Total Hours	**40**

Occupation Specific Competencies (280 hours)

Code	Unit of Competency	Elements of Competency	Guided Learning Hours
OULEMSP01L3V1	Carryout Bench Work Operations	1. Use tools, equipment and materials for bench work. 2. Perform basic bench operations 3. Perform grinding operation 4. Clean, care maintain and store tools and equipment.	70
OULEMSP02L3V1	Perform Lathe Machine Operations	1. Prepare for lathe operation 2. Setup lathe works 3. Perform facing, and turning operations 4. Perform drilling, boring and reaming 5. Perform knurling operations 6. Perform Profile angles cutting operation 7. Clean and store tools and equipment.	60
OULEMSP03L3V1	Perform Milling Machine Operations	1. Prepare for milling machine operations 2. Carry out milling operations 3. Perform indexing operation using index head and rotary table 4. Perform gear-cutting operation on milling machine. 5. Clean and store the tools and equipment.	50
OULEMSP04L3V1	Perform Shaper Machine Operations	1. Prepare for shaping operation 2. Carryout shaping operations 3. Clean and store the tools and equipment.	30
OULEMSP05L3V1	Perform Precision Grinding Machine Operations	1. Prepare for precision grinding machine operations 2. Carry out cylindrical grinding machine operation 3. Carry out surface grinding machine operation 4. Perform universal tool and cutter grinding machine operations. 5. Clean and store tools and equipment.	40
OULEMSP06L3V1	Perform Basic Welding	1. Follow OSH practices 2. Perform arc welding 3. Clean and store tools	30
Total Hours			**280**

Generic Competencies

Unit Code and Title	GU02L3V1: Apply OSH Practices in the Workplace
Nominal Hours	**15 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitude required to identify and apply OSH in the workplace. This also covers identifying, controlling and reporting OSH hazards, conducting of work in a safe manner, following emergency response procedure and maintaining and improving health and safety in the workplace.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Identify, control and report OSH hazards	1.1 Immediate work area is routinely checked for OSH hazards prior to commencing and during work. 1.2 **Hazards** and unacceptable performance are identified and corrective action is taken within the level of responsibility. 1.3 OSH hazards and incidents are reported to appropriate personnel according to workplace procedures. 1.4 Safety Signs and symbols are identified and followed
2. Conduct work safely	2.1 Apply OSH practices in the workplace. 2.2 Appropriate **Personal Protective Equipment (*PPE)*** is selected and worn.
3. Follow emergency response procedures	3.1 Emergency situations are identified and reported according to workplace reporting requirements. 3.2 Emergency procedures are followed as appropriate to the nature of the emergency and according to workplace procedures. 3.3 **Workplace procedures** for dealing with accidents, fires and emergencies are followed whenever necessary within scope of responsibilities.
4. Maintain and improve health and safety in the work place	4.1 Risks are identified and appropriate control measures are implemented in the work area. 4.2 Recommendations arising from risk assessments are implemented within level of responsibility. 4.3 Opportunities for improving OSH performance are identified and raised with relevant personnel. 4.4 Safety records according to **company policies** are maintained.

Range of Variables	
Variable	**Range** (may include but not limited to):
1. Company policies	1.1 Job-related Standard Operating Procedures (SOPs) and OSH-specific procedures. Examples of OSH procedures include consultation and participation, emergency response, response to specific hazards, incident investigation, risk assessment, reporting arrangements and issue resolution procedures
2. Workplace procedures	2.1 OSH system and related documentation including policies and procedures 2.2 Standard Operating Procedures (SOPs) 2.3 Information on hazards and the work process, hazard alerts, safety signs and symbols 2.4 Labels 2.5 Material Safety Data Sheets (MSDSs) and manufacturers' advice.
3. Hazards	3.1 OSH incidents include near misses, injuries, illnesses and property damage, noise, handling hazardous substances, other hazards 3.2 Working with and near moving equipment/load shifting equipment 3.3 Broken or damaged equipment or materials
4. Personal Protective Equipment (PPE)	4.1 Goggles 4.2 Ear muffs 4.3 Ear plugs 4.4 Gloves 4.5 Clothing 4.6 Apron 4.7 Helmet 4.8 Boots
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	1.1 Identified, controlled and reported OSH hazards 1.2 Followed work safety. 1.3 Followed emergency response procedures. 1.4 Maintained and improved health and safety in the workplace.

2. Underpinning knowledge	2.1 Personal protective equipment - Hand gloves, safety shoes, safety goggles, masks, apron, 2.2 Identification of tools and equipment 2.3 Hazardous events 2.4 Tools, equipment, machinery and relevant accessories. 2.5 Communication 2.6 Job roles, responsibilities and compliance 2.7 Workplace laws
3. Underpinning skill	3.1 Ability to use the appropriate PPE. 3.2 Ability to identify tools and equipment. 3.3 Ability to quick response and to take safety precautions for different hazardous situations. 3.4 Ability to operate and use tools, equipment, machinery and accessories properly as per SOP (Company standards). 3.5 Ability to communicate with peers and supervisors. 3.6 Ability to apply in the workplace.
4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace 4.6 Communication with peers and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities.
6. Methods of assessment	6.1 Demonstration 6.2 Oral questioning 6.3 Written test 6.4 Portfolio
7. Context of assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated work place after Completion of the training module. 7.2 Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF	

qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	**GU04L3V1: Perform Computations Using Basic Mathematical Concepts**
Nominal Hours	**25 Hours**
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 of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables Training Components.
1. Identify calculation requirements in the workplace	1.1 **Workplace information** is recognized. 1.2 **Calculation requirements** are identified from workplace information
2. Select appropriate mathematical methods/concepts for the calculation.	2.1 **Mathematical methods/concepts** for the calculation are identified 2.2 Appropriate method is selected to carry out the calculation requirements
3. Use tool/instrument to perform calculations	3.1 Required **tools and instruments** for calculations are identified. 3.2 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/Breadth/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. Mathematical methods/concepts	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

Evidence Guide

The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.

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. Underpinning Knowledge	2.1 Numerical concept 2.2 Basic mathematical methods such as addition, subtraction, multiplication, division, and percentage. 2.3 Mathematical language, symbols and terminology. 2.4 Measuring units 2.5 Knowledge of computer application
3. Underpinning Skills	3.1 Adding numbers 3.2 Subtracting numbers 3.3 Multiplying numbers. 3.4 Dividing numbers. 3.5 Measuring of linear 3.6 Using of mathematical language, symbols, terminology and technology. 3.7 Measuring of different physical parameter. 3.8 Calculating geometrical parameters: angle, parallelism, perpendicularity, area and volume
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace 4.6 Communication with peers and seniors in workplace

5. Resource Implications	The following resources must be provided: 5.1 Stationeries 5.2 Consumables 5.3 Calculators 5.4 Computers 5.5 Measuring tape
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral questioning 6.4 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after Completion of the training module. 7.2 Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Sector Specific Competencies

Unit Code and Title	SULE01L3V1: Work in the Light Engineering Sector
Nominal Hours	**10 Hours**
Unit Descriptor	This unit covers the skills, knowledge and attitude required in working in the Light Engineering sector. It includes describe the organizational structure within the Light Engineering sector, identify processes and procedures, identify tools, equipment and materials, identify workplace practices, and organize own workload, and practice OHS.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Describe the organizational structure within the sector	1.1 Scope, nature and major fields of the Light Engineering sector are determined 1.2 The profile of the Light Engineering sector in relation to Bangladesh **employment conditions** is determined 1.3 Trends and technologies relevant to the sector are explained 1.4 Relevant policies and guidelines are identified and interpreted 1.5 **Instructions** as to procedures in achieving quality are obtained, understood and clarified
2. Identify processes and procedures	2.1 Light Engineering processes are identified, described and explained 2.2 Work activities are correctly identified 2.3 Adjustments are interpreted
3. Identify tools, equipment and materials	3.1 Appropriate **manuals** are accessed to ensure up-to-date specifications of tools, materials and equipment 3.2 Light Engineering **tools, materials and equipment** are identified 3.3 Substitutes are identified in case of non-availability
4. Identify workplace requirements	4.1 **Workplace requirements** are identified and clarified. 4.2 Roles and responsibilities of all personnel are described 4.3 Workplace's practices are identified 4.4 **Problem-solving strategies** are used to address bottlenecks, inconsistencies and other concerns
5. Organize own workload	5.1 Own work activities are planned and progress of work is communicated to relevant staff 5.2 Work activities are completed

	5.3 Difficulties and bottlenecks are identified, and solutions are put forwarded 5.4 Own work is monitored against workplace standards and areas for improvement identified and acted upon
6. Practice OSH	6.1. Relevant **OSH** practices are identified 6.2. Relevant OSH practices are interpreted and implemented
Range of Variables	
Variables	**Range** (may include but not limited to):
1. Employment conditions	1.1 Code of Practice 1.2 Salary/Wage System 1.3 Labor Practices 1.4 Anti-Discrimination Policy 1.5 Gender Issues 1.6 Collective Bargaining and Other Practices 1.7 Awards 1.8 Procedures for Handling Disputes 1.9 Innovations in the Sector
2. Instructions	2.1 Specifications and requirements 2.2 Standard operating procedures 2.3 Manuals of Instruction 2.4 Operations Manual 2.5 Environmental Guidelines 2.6 Gender and Develop Guidelines
3. Manuals	3.1 Manual of Instructions 3.2 Manual of Specifications 3.3 Repair Manual 3.4 Quality Manual 3.5 Maintenance Procedure and Troubleshooting
4. Tools, equipment and materials	4.1 Refers to all tools, equipment and materials appropriate for any of the Light Engineering fields
5. Workplace requirements	5.1 Goals and objectives 5.2 Strategic and Operational Plans 5.3 Systems and Processes 5.4 Monitoring and Evaluation 5.5 Reports and Documentation
6. Problem-solving strategies	6.1. Asking questions 6.2. Feedback and Feed forward system 6.3. Reference to Standard Operating Procedures 6.4. Accessing Information 6.5. Reviews

	6.6. Brainstorming
7. OSH	7.1 Reporting hazards, risks and emergencies 7.2 Arrangement of workplaces 7.3 Standard Operating Procedure 7.4 Workplace environment and safety 7.5 Safe storage of tools and equipment 7.6 Use of PPE
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 demonstrated knowledge in working in the Light Engineering sector 1.2 satisfying all the requirements mentioned in the Performance Criteria and Range of Variables
2. Underpinning knowledge	2.1 Scope and Major Divisions of the Light Engineering Sector 2.2 Relevant Policies and Guidelines in the Light Engineering Sector 2.3 Manuals used in the Light Engineering Sector 2.4 Relevant Terminologies and Acronyms 2.5 Types and Uses of Light Engineering Tools and Materials. 2.6 Workplace Practices 2.7 Occupational Health and Safety Practices 2.8 Recording and Reporting practices
3. Underpinning skills	3.1 Describing the organization structure 3.2 Identifying Light Engineering processes and procedures 3.3 Identifying tools, equipment and materials 3.4 Identifying workplace practices 3.5 Organizing own workload 3.6 Practicing OHS
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace

5. Resource implications	5.1. Pens 5.2. Telephone 5.3. Computer 5.4. Writing materials 5.5. Online communication
6. Methods of assessment	6.1 Workplace observation 6.2 Demonstration 6.3 Oral questioning 6.4 Written test 6.5 Portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	SULE02L3V1: Interpret Technical Drawings and manuals
Nominal Hours	**30 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required of a worker to translate technical drawings and manuals. It specifically includes the tasks of selecting technical drawing, interpreting technical drawings and storing manuals, designs and plans.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
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 and interpreted 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 while 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
Evidence Guide	

The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
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. Underpinning knowledge	2.1. Technical drawing interpretation 2.2. Sequence of drawing 2.3. Methods of checking and applying drawing for work 2.4. Drawing selection and checking method to ensure conformity to the job requirements. 2.5. Drawing components, assemblies 2.6. Identification of dimensions according to job requirement 2.7. Procedure of checking clearances/tolerances 2.8. Work instructions 2.9. Material specifications 2.10. Drawing symbols interpretation 2.11. Use of operation and maintenance manuals
3. Underpinning skills	3.1. Practicing workplace safety 3.2. Interpreting drawing, following operation and maintenance manuals, 3.3. Performing jobs in accordance with the drawing 3.4. Performing calculation as per drawing 3.5. Selecting and checking of drawing to ensure conformity to the job requirements. 3.6. Identifying drawing components and assemblies 3.7. Identifying dimensions according to job requirement 3.8. Checking clearances/tolerances in accordance with workplace standard 3.9. Following operation and maintenance manuals when operating and maintaining lathe machine
4. Underpinning attitudes	4.1. Commitment to occupational health and safety 4.2. Environmental concerns 4.3. Eagerness to learn 4.4. Tidiness and timeliness 4.5. Respect for rights of peers and seniors in workplace 4.6. Communication with peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Relevant drawing/manuals 5.3. Pens 5.4. Papers 5.5. Work books

	5.6. Learning manuals
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Written test 6.2 Oral questioning 6.3 Demonstration
7. Context of Assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module 7.2 Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Occupation Specific Competencies

Unit Code and Title	**OULEMSP01L3V1: Carryout Bench Work Operations**
Nominal Hours	**70 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required of a worker to perform bench-work operations. It specifically includes the tasks of using tools, equipment and materials for bench work, performing basic bench operations, performing grinding operation, and cleaning, care maintaining and storing tools and equipment.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Use tools, equipment and materials for bench work.	1.1 Personal Protective Equipment **(PPE)** is selected and used. 1.2 **Tools, Equipment & Materials** are selected for **bench work** and gathered as per job requirement specified in the drawing. 1.3 Layout is performed and marked in accordance with drawing.
2. Perform basic bench operations	2.1. Bench is prepared for performing bench work. 2.2. Job is fixed with appropriate **holding device**. 2.3. Job is cut with standard procedure following layout and markings. 2.4. Filing is performed on the job following **standard procedure**. 2.5. Drilling and reaming operations are carried out on the job as per drawing following standard procedure. 2.6. Manual **thread** cutting is performed according to job requirements following standard procedure.
3. Perform grinding operation	3.1. Work piece is held and clamped in accordance with standard work procedures. 3.2. Appropriate grinder and grinding disc are selected as per job requirement. 3.3. Grinding operation is performed according to job requirements following standard procedure.
4. Clean, care maintain and store tools and equipment.	4.1. Hand tools and equipment are maintained and cleaned as per instruction manual. 4.2. Work place is cleaned in accordance with environmental requirement. 4.3. Tools and equipment are stored safely in appropriate location. 4.4. Waste materials are disposed in proper place.

Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1 Safety helmet 1.2 Safety shoes 1.3 Safety goggles 1.4 Hand gloves 1.5 Apron
2. Tools, equipment & materials	2.1 **Hand Tools** 1.5.1 Tool box 1.5.1.1 Hammer 1.5.1.2 Screw driver 1.5.1.3 Spanner 1.5.1.4 Pliers 1.5.1.5 Letter punch 1.5.2 Layout tools. 1.5.2.1 V Block 1.5.2.2 Angle plate 1.5.2.3 Surface plate 1.5.2.4 Steel rule 1.5.2.5 Scriber 1.5.2.6 Protector 1.5.2.7 Measuring tape 1.5.2.8 Inside calipers 1.5.2.9 Outside calipers 1.5.2.10 Try square 1.5.2.11 Vernier height gauge 1.5.2.12 Trammel 1.5.2.13 Center punch 1.5.2.14 Divider 1.5.3 Hacksaw. 1.5.4 Chisel. 1.5.5 Files 1.5.6 Drills, reamer, tap and die. 1.5.7 Tap and screw extractors. 2.2 **Measuring tools** 2.2.1 Steel rule. 2.2.2 Steel tape. 2.2.3 Meter rule 2.2.4 Vernier caliper. 2.2.5 Vernier height gauge. 2.2.6 Micrometer. 2.2.7 Bevel protector 2.2.8 Vernier Bevel protector. **2.3 Checking tools.** 2.3.1 Bevel tri-squire. 2.3.2 Straight edge. 2.3.3 Dial indicator

	2.3.4 Slip gauge. 2.3.5 Plug gauge 2.3.6 Snap gauge 2.3.7 Ring gauge 2.3.8 Filler gauge 2.3.9 Telescoping gauge 2.3.10 Screw gauge 2.3.11 Center gauge 2.3.12 Side bar 2.3.13 Radius Gauge **2.4 Equipment.** 2.4.1 Marking table. 2.4.2 Drill press 2.4.3 Hand grinder 2.4.4 Surface plate 2.4.5 Surface gauge 2.4.6 Anvil. 2.4.7 Swage block 2.4.8 Vice **2.5 Materials** 2.5.1 Fiber 2.5.2 Mild steel 2.5.3 Dead mild steel 2.5.4 Medium carbon steel. 2.5.5 High carbon steel 2.5.6 Cast iron. 2.5.7 Brass 2.5.8 Copper 2.5.9 Aluminum 2.5.10 Alloy steel
3. Bench work	3.1. Layout and marking 3.2. Cutting 3.3. Chipping 3.4. Filing 3.5. Drilling 3.6. Reaming 3.7. Thread cutting 3.8. Off-hand grinding 3.9. Damage bolt and stud removing 3.10. Broken tool removing 3.11. Fitting 3.12. Forging 3.13. Riveting 3.14. Assembling 3.15. Cleaning 3.16. Maintenance

4. Holding devices	4.1. Clamps 4.2. Vices. 4.3. Surface plate. 4.4. Zig and fixture
5. Filing standard procedure	5.1. Using hacksaw 5.2. Using chisel
6. Thread	6.1. British standard Whitworth thread (BSW- 55-degree thread angle) 6.2. Matric standard thread (M-series 60-degree thread angle)
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical Aspects of Competency	1.1 Performed basic bench operations 1.2 Performed grinding operation
2. Underpinning knowledge	2.1. Proper use of PPE 2.2. Types of benches works tools, equipment and materials and their function. 2.3. Methods of Machine setting 2.4. Types and use of work holding devices 2.5. Drawing interpretation 2.6. Procedure in Grinding operations and safety requirements 2.7. TDS (Tap Drill size) 2.8. Types of twist drills and nomenclature 2.9. Techniques of drilling and reaming hole. 2.10. Types of benches working processes and techniques
3. Underpinning skills	3.1 Selecting and using PPE 3.2 Selecting and gathering tools, equipment & materials 3.3 Preparing bench work machine, job holding devices and related tools and equipment. 3.4 Grinding appropriate disc is selected as per job requirement. 3.5 Extracting damage screw and tap. 3.6 Performing drill and ream hole. 3.7 Performing sawing, chipping, filling, taping and reaming. 3.8 Cleaning. Tools & equipment. 3.9 Disposing waste materials in designated place.
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties

	4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Addressing and accepting feedback 4.7 Tidiness and timeliness 4.8 Respect for rights of peers and seniors in workplace 4.9 Communication with peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1 Workplace 5.2 Tools, equipment and facilities appropriate to processes or activity. 5.3 Materials relevant to the proposed activity. 5.4 Relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Oral questioning 6.3 Demonstration 6.4 Portfolio
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module 7.2 Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	**OULEMSP02L3V1: Perform Lathe Machine Operations**
Nominal Hours	**60 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required of a machinist to perform lathe machine operation. It specifically includes the tasks of preparing for lathe operation, setting up lathe works, performing facing, and turning operations, performing drilling, boring and reaming, performing knurling operations, performing thread cutting operation, and cleaning and storing tools and equipment.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for lathe operation	1.1 Safe work practices are maintained and personal protective equipment (**PPE**) are worn as required for the job performed 1.2 Appropriate **type of lathe machine**s selected for different lathe operations 1.3 **Parts of lathe machine** are identified 1.4 Drawings are interpreted to produce component in accordance with the job specifications 1.5 Sequence of operation is determined to produce component in accordance with required specifications 1.6 Job materials, cutting **tools and equipment** are selected and collected according to the job specifications 1.7 Cutting speed and feed rate are selected according to the job specifications
2. Setup lathe works	2.1 Work piece is centered and clamped on chuck to required level of accuracy using tools and equipment in accordance with work procedures. 2.2 Work piece is setup and clamped to required level of accuracy using instruments/equipment according to work procedures. 2.3 Cutting tool is set in accordance with the requirement of the operation. 2.4 **Lathe accessories** are used appropriately to the requirements of the jobs. 2.5 Cutting speed, RPM, feed rate and depth of cut are calculated as per job requirement. 2.6 Machine guards and coolant devices are checked according to work requirement.
3. Perform facing, and turning operations	3.1 Machine performance is checked in accordance with requirements of **tapper jobs** and **eccentric jobs.**

	3.2 Coolant is applied to prevent over heating of work piece and cutting tool. 3.3 Straight, step and tapper turning are performed after facing to produce component in accordance with specifications in the drawing and finished using the lathe turning tool. 3.4 **Taper turning methods** are used in accordance with the job specifications 3.5 Grooving operation is performed after turning and to produce component in accordance with specifications in the drawing and finished using lathe grooving tool. 3.6 Eccentric turning method using 4-jaw independent chuck is selected in accordance with the job requirement. 3.7 Eccentric turning is performed in accordance with specifications in the drawing 3.8 Parting-off operation is performed after all operation is completed and produce job in accordance with specification in the drawing. 3.9 Job is checked/measured in conforming to specification using appropriate techniques, measuring tools and equipment.
4. Perform drilling, boring and reaming	4.1 Required tools are set as per job requirement 4.2 Cutting speed, RPM, feed rate and depth of cut are calculated as per job requirement 4.3 Coolant is applied to prevent over heating of work piece and cutting tool 4.4 Drilling and reaming are performed as per job requirement 4.5 Boring is performed as per job requirement 4.6 Job is checked and measured in conforming to the specification by using appropriate techniques, measuring tools and equipment.
5. Perform knurling operations	5.1 Knurling tools are set as per job requirement 5.2 Cutting speed and RPM are calculated as per job requirement 5.3 Coolant is applied to prevent over heating of work piece and knurling tool 5.4 Knurling is performed as per job requirement 5.5 Job is checked in conforming to the specification by using appropriate techniques

6. Perform Profile angles cutting operation	6.1 **Profile angles** are interpreted. 6.2 Cutting speed, RPM, feed rate and depth of cut are calculated as per job requirement. 6.3 Different **types of thread** are cut in accordance with the specifications outlined in the drawing. 6.4 Machine performance is checked in accordance with the job requirement. 6.5 Coolant is applied to prevent over heating of work piece and cutting tool. 6.6 External and internal V-threads are cut in accordance with specifications in the drawing. 6.7 External and internal ACME (29 & 30 degree)-threads are cut in accordance with the specifications in the drawing. 6.8 Square-threads are cut in accordance with the specifications in the drawing. 6.9 Job is checked and measured in accordance with by using appropriate techniques, measuring tools and equipment.
7. Clean and store tools and equipment.	7.1 Workplace, Tools, equipment are cleaned and maintained in accordance with workplace requirements. 7.2 **Preventive maintenance** schedules are applied in accordance with workplace requirement. 7.3 Waste materials are disposed in proper place. 7.4 Tools, equipment and finished products are stored safely in accordance with workplace procedures
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1. Dust mask. 1.2. Safety goggles. 1.3. Ear plug 1.4. Hand gloves 1.5. Safety shoes. 1.6. Apron
2. Types of lathe machine.	2.1 Center lathe/engine lathe/bench lathe. 2.2 Tool room lathe. 2.3 Turret lathe and capstan lathe. 2.4 Multi spindle lathe. 2.5 CNC lathe
3. Parts of lathe machine	3.1. Headstock 3.2. Chuck

	3.3. Spindle 3.4. Tailstock 3.5. Bed 3.6. Carriage 3.7. Tool post 3.8. Lead screw 3.9. Saddle 3.10. Feed rod mechanism 3.11. Bed slide ways 3.12. Cross-slide 3.13. Compound rest
4. Tools and Equipment	4.1 Tools 4.1.1 Clamps 4.1.2 Soft hammer 4.1.3 Pliers 4.1.4 Cleaning brush 4.1.5 Job holding devices/fixture 4.1.6 Adjustable wrench 4.1.7 Hand grinder 4.1.8 Chuck key 4.2 Equipment 4.2.1 3- Jaw chuck 4.2.2 4- Jaw independent chuck 4.2.3 Taper attachment 4.2.4 Face plate 4.2.5 Driving plate 4.2.6 Live center 4.2.7 Dead center 4.2.8 Follower rest 4.2.9 Steady rest 4.2.10 Lathe dog 4.2.11 Head stock sleeve 4.2.12 Reduction sleeve 4.2.13 Mandrel 4.2.14 Packing pieces 4.2.15 V-block with clamps
5. Lathe accessories	5.1. 3- and 4-jaw chucks 5.2. Lathe center 5.3. Drill chucks 5.4. Knurling tools 5.5. Boring bar 5.6. Face plate 5.7. Drive plate 5.8. Ball Bearing center 5.9. Steady rest. 5.10. Follower rest 5.11. Lathe dog

	5.12. Dead center 5.13. Live center 5.14. Carbide lathe tool 5.15. Quick release vice
6. Taper jobs	6.1. Self-holding taper 6.2. Self- releasing taper
7. Eccentric jobs	7.1. Cam 7.2. Crank shaft 7.3. Off-center job
8. Taper turning methods.	8.1. Form tool methods 8.2. Compound slide methods. 8.3. Setting over the tailstock. 8.4. Taper turning with attachment.
9. Profile angles	9.1. Back/rake angle. 9.2. Front clearance angle. 9.3. Side rake angle 9.4. Side clearance angle. 9.5. End cutting-edge angle. 9.6. Side cutting-edge angle.
10. Types of thread	10.1. British standard whit (BSW) worth threads. Thread angle- 55 degrees. 10.2. Matric threads. Thread angles- 60 degrees. 10.3. Acme threads. Thread angle- 29 degrees. 10.4. Acme threads. Thread angle- 30 degrees. 10.5. Square threads. Thread angle- 90 degrees. 10.6. Buttress threads. Thread angle- 90/45 degrees. 10.7. Knuckle threads. Thread angle- 30 degrees
11. Preventive maintenance	11.1. Oil and grease the machine sliding parts, daily, weekly and monthly. 11.2. Coolant tank schedule cleaning. 11.3. Electrical fixture & connections regularly Checkup. 11.4. Cleaning the table and vice after each operation.
Evidence Guide The evidence must be authentic, valid, sufficient, reliable and consistent to meet the requirements of the current version of the unit of competency.	
1. Critical aspects of competency	1.1. Performed facing, and turning operations 1.2. Performed drilling, boring and reaming 1.3. Performed knurling operations 1.4. Performed thread cutting operation
2. Underpinning knowledge	2.1. Selection procedure of type of lathe machine for different lathe operations. 2.2. Different parts of lathe machine

	2.3. Method of identifying lathe accessories appropriate to the requirements of the operations. 2.4. Cutting speed and feed rate selection procedure according to the job specifications. 2.5. Method of interpreting drawings to produce component to the job specifications. 2.6. Job materials selection and collection procedure according to the job specifications. 2.7. Determining sequence of operation to produce component to the specified requirement.
3. Underpinning skills	3.1. Performing straight, step, and shoulder turning after facing and producing component as per specifications in the drawing and finishing using lathe turning tool. 3.2. Performing grooving operation after turning and producing component as per specifications in the drawing and finishing using lathe-grooving tool. 3.3. Performing parting-off operation after completing all operation and produce job in accordance with specification in the drawing. 3.4. Performing taper turning operation using form tool, compound slide, off-setting tailstock and taper turning attachment and to produce component in accordance with specifications in the drawing. 3.5. Performing eccentric turning operation in accordance with specifications in the drawing 3.6. Performing external and internal V-thread cutting in accordance with specifications in the drawing. 3.7. Performing external and internal acme (29 & 30 degree)-threads cutting in accordance with specifications in the drawing. 3.8. Performing square-thread cutting in accordance with specifications in the drawing.
4. Underpinning attitudes	4.1. Commitment to occupational health and safety 4.2. Promptness in carrying out activities 4.3. Sincere and honest to duties 4.4. Environmental concerns 4.5. Eagerness to learn 4.6. Addressing and accepting feedback 4.7. Tidiness and timeliness 4.8. Respect for rights of peers and seniors in workplace 4.9. Communication with peers and seniors in workplace.
5. Resource implications	The following resources must be provided: 5.1. Workplace. 5.2. Tools, equipment and facilities appropriate to processes or activity 5.3. Materials relevant to the proposed activity.

	5.4. Equipment and outfits appropriate in applying safety measures.
6. Methods of assessment	Competency should be assessed by: 6.1. Written test 6.2. Demonstration 6.3. Oral questioning 6.4. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module 7.2. Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	OULEMSP03L3V1: Perform Milling Machine Operations
Nominal Hours	**50 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform milling machine operation. It specifically includes the tasks of preparing for milling machine operations, carrying out milling operations, performing indexing operation using index head and rotary table, performing gear-cutting operation on milling machine, and cleaning and storing the tools and equipment.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for milling machine operations	1.1 Safe work practices are maintained and personal protective equipment **(PPEs)** are worn at work 1.2 **Types of milling machine** is selected in accordance with workplace/work order requirements. 1.3 Machine is lubricated, handled and used in accordance with the instruction of machine manual. 1.4 **Milling accessories** and **attachment** are used in accordance with the requirements of the operation. 1.5 Required material and **milling cutters** are selected according to job requirements. 1.6 Cutting fluid is used in accordance with manufacturer's instruction. 1.7 **Operating parameters** of milling machine are identified in accordance to work requirements
2. Carry out milling operations	2.1 Drawings are interpreted to produce component in accordance with the job specifications 2.2 Machine performance is checked in accordance with the job requirement. 2.3 Coolant is applied to prevent over heating of work piece and milling cutter. 2.4 **Milling operations** are performed accordance with specifications in the drawing and finished using the milling cutter. 2.5 Job is checked/measured in conforming to specification using appropriate techniques, measuring tools and equipment.

3. Perform indexing operation using index head and rotary table	3.1 Types of **indexing methods** are identified and calculated in accordance with identified indexing formula 3.2 Index head is selected, collected and checked 3.3 Different parts of index head are identified, checked and tested 3.4 Index head is set on milling machine in accordance with instruction of manual. 3.5 Different indexing methods are performed in accordance with job requirement and specifications 3.6 Sequence of operation is determined to perform milling work according to specifications. 3.7 Job is checked/measured in accordance with specifications and using appropriate techniques, measuring tools and equipment.
4. Perform gear-cutting operation on milling machine.	4.1 Drawings and specification are interpreted in relation to different gear cutting milling operation. 4.2 Machine performance is checked in accordance with the job requirement 4.3 Tools, equipment, materials and cutting fluid are used as appropriate to the requirements of the operation. 4.4 Sequence of operation is determined to perform milling work according to specifications. 4.5 **Gear teeth nomenclature** and formulas are calculated for the different types of gear. 4.6 **Different types of gear** cutting operations are performed according to the job requirement. 4.7 Job is checked/measured according to specification and appropriate techniques, measuring tools and equipment are used.
5. Clean and store the tools and equipment.	5.1 Workplace, tools, equipment and milling machine are cleaned. 5.2 **Preventive maintenance** schedules are applied 5.3 Waste materials are disposed in proper place. 5.4 Tools, equipment and finished products are stored safely in appropriate location
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1. Dust mask. 1.2. Safety goggles. 1.3. Ear plug

	1.4. Hand gloves 1.5. Safety shoes. 1.6. Apron
2. Types of milling machine.	2.1 Bed type milling machine 2.1.1 Simplex milling machine. 2.1.2 Duplex milling machine. 2.1.3 Triplex milling machine. 2.2 Column and knee type milling. 2.2.1 Hand milling machine 2.2.2 Plain milling machine. 2.2.3 Universal milling machine 2.2.4 Vertical milling machine. 2.2.5 Horizontal milling machine 2.3 Planer type milling machine. 2.4 Special types milling machine. 2.4.1 Tracer controlled milling machine. 2.4.2 Thread cutting milling machine. 2.4.3 Gear shaping 2.4.4 Teeth grinding 2.5 CNC milling machine.
3. Milling accessories	3.1 Machine vice 3.2 Swivel base 3.3 Angle plate 3.4 Dividing head 3.5 Indexing plate 3.6 Rotary table 3.7 Adaptor 3.8 3-Jaw universal chuck 3.9 Support back plate 3.10 Stepped clamping shoe 3.11 Collet chuck 3.12 3-Jaw drill chuck 3.13 Boring and facing head 3.14 Short arbor 3.15 Long arbor 3.16 Adaptor with collect chuck 3.17 Quick release vice
4. Milling attachment	4.1. High speed milling attachments 4.2. Universal milling attachments 4.3. Vertical milling attachments 4.4. Slotting attachments 4.5. Rack milling attachments 4.6. Index plates 4.7. Rotary attachments 4.8. Universal spiral milling attachment

	4.9. Dividing head attachments 4.10. Grinding attachment
5. Milling cutters.	5.1. Arbor type cutters. 5.2. Side and face cutter. 5.3. Slotting cutter. 5.4. Single angle cutter. 5.5. Double angle cutter. 5.6. Convex cutter. 5.7. Concave cutter 5.8. Slitting saw cutter. 5.9. Corner radios cutter. 5.10. Shell end mill cutter. 5.11. Face milling cutter. 5.12. Involute gear cutter. 5.12.1 DP Cutter 5.12.2 Module Cutter 5.13. Gear hob cutter. 5.14. Slab milling. 5.15. Staggered tooth cutter. 5.16. Inserted blade cutter. 5.17. Inserted carbide tips cutter. 5.18. Woodruff cutter. 5.19. Shank type cutters 5.20. Taper shank cutter. 5.21. Parallel shank cutter. 5.22. T-slot cutter. 5.23. Slot drill 5.24. End mill cutter. 5.25. Milling bits. 5.26. Carbide end mill. 5.27. Roughing end mill. 5.28. Dovetail cutter. 5.29. Ball nose cutter. 5.30. Chain sprocket cutter
6. Operating parameters	6.1. RPM 6.2. Cutting speed 6.3. Feed 6.4. Depth of cut
7. Indexing methods	7.1 Direct 7.2 Simple 7.3 Compound 7.4 Complex 7.5 Angular

	7.6 Differential
8. Gear teeth nomenclature.	8.1 Addendum 8.2 Dedendum 8.3 Pressure angle 8.4 Addendum circle 8.5 Dedendum circle 8.6 Circular pitch 8.7 Tooth thickness 8.8 Pitch diameter 8.9 Working depth 8.10 Whole depth 8.11 Addendum angle 8.12 Dedendum angle 8.13 Center distance 8.14 Top land 8.15 Face width 8.16 Face 8.17 Flank 8.18 Bottom land 8.19 Clearance 8.20 Clearance circle 8.21 Fillet radios 8.22 Diametric pitch 8.23 Module 8.24 Outside diameter 8.25 Root diameter 8.26 Nominal diameter 8.27 Base diameter 8.28 Line of action 8.29 Involute and cycloid curve
9. Different types of gear.	9.1 Spur gear 9.2 Helical gear 9.3 Bevel gear 9.4 Worm gear 9.5 Rack and pinion
10. Milling operations	10.1 Plain 10.2 Face 10.3 Side 10.4 Slot 10.5 Gang

	10.6 Profile 10.7 Key way 10.8 Saw 10.9 Angular 10.10 Form
11. Preventive maintenance	11.1 Oil and grease the machine sliding parts, daily, weekly and Monthly 11.2 Coolant tank schedule cleaning 11.3 electrical fixture & connections regularly Check up 11.4 Cleaning the table and vice after each operation.
Evidence Guide The evidence must be authentic, valid, sufficient, reliable and consistent to meet the requirements of the current version of the unit of competency.	
1. Critical aspects of competency	1.1. Carried out milling operations 1.2. Performed indexing operation using index head and rotary table 1.3. Performed gear-cutting operation on milling machine.
2. Underpinning knowledge	2.1. Procedure on selecting different types of milling machine in accordance with work requirements 2.2. Methods of machine lubrication, handling and operation in accordance with instruction of machine manual. 2.3. Proper use and operation of Milling accessories and attachment 2.4. Selection of material and milling cutters 2.5. Use of cutting fluids 2.6. Operating parameters of milling machine 2.7. Different types of indexing methods and their methods of calculation in accordance with the different indexing formula 2.8. Drawings and specification in relation to plain, side face gang and straddle milling operation. 2.9. Milling machine, accessories, attachment, cutter, tools, equipment, materials and cutting fluid. 2.10. Procedure of determining sequence of operation when perform milling work according to specifications. 2.11. Procedure of checking Machine performance
3. Underpinning skills	3.1. Performing different indexing methods in accordance with job requirement of the specifications. 3.2. Performing plain, side, face, gang and straddle milling operation in accordance with the job requirement. 3.3. Performing slot, key way, parting off, end, form and angular milling operation in accordance with job requirement.

	3.4. Calculating gear teeth nomenclature and formulas for the different types of gear. 3.5. Performing different types of gear cutting operations in accordance with the job requirement. 3.6. Checking and measuring of work piece in conformance with specification using appropriate techniques, measuring tools and equipment. 3.7. Applying preventive maintenance schedules in accordance to the machine manufacturer's requirement.
4. Underpinning attitudes	4.1. Commitment to occupational health and safety 4.2. Promptness in carrying out activities 4.3. Sincere and honest to duties 4.4. Environmental concerns 4.5. Eagerness to learn 4.6. Addressing and accepting feedback 4.7. Tidiness and timeliness 4.8. Respect for rights of peers and seniors in workplace 4.9. Communication with peers and seniors in workplace.
5. Resource implications	The following resources must be provided: 5.1. Workplace. 5.2. Tools, equipment and facilities appropriate to processes or activity 5.3. Materials relevant to the proposed activity. 5.4. Equipment and outfits appropriate in applying safety measures. 5.5. Relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	Competency should be assessed by: 6.1. Written test 6.2. Demonstration 6.3. Oral questioning 6.4. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module 7.2. Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	OULEMSP04L3V1: Perform Shaper Machine Operations
Nominal Hours	**30 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required of a machinist to perform shaper machine operation. It specifically includes the tasks of preparing for shaping operation, carrying out shaping operations, and cleaning and storing the tools and equipment.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for shaping operation	1.1 Safe work practices are maintained and personal protective equipment **(PPEs)** are worn in accordance with workplace requirements. 1.2 **Shaper machine types, main and auxiliary parts** and **accessories** are identified 1.3 Shaper machine function, **quick return mechanism, principle of shaping** and specifications are demonstrated 1.4 Drawings are interpreted in accordance with job specifications 1.5 Cutting speed, feed rate, and depth of cut are selected in accordance with the job specifications 1.6 Materials and cutting tools are selected and collected in accordance with job specifications 1.7 Sequence of operation is determined to produce component in accordance with job requirements
2. Carryout shaping operations	2.1. Tool holding devices and tool blanks are selected in accordance with requirements of the operation. 2.2. Shaper machine, accessories, single point cutting tools, equipment, materials, cutting fluid, tools and equipment are used in accordance with the requirements of the operation. 2.3. Sequence of operation in shaping work is determined in accordance with specifications. 2.4. Machine performance is checked in accordance with job requirement. 2.5. **Shaping operations** are performed in accordance with the job requirement. 2.6. Job is checked and measured in conformance with specification using appropriate techniques, measuring

	tools and equipment.
3. Clean and store the tools and equipment.	3.1 Workplace, tools, equipment and shaper machine are cleaned. 3.2 **Preventive maintenance** schedules are applied in accordance to workplace requirement. 3.3 Waste materials are disposed in proper place. 3.4 Tools, equipment and finished products are stored safely in appropriate location.
Range of Variables	
Variable	**Range** (may include but not limited to):
1. PPE	1.1. Dust musk. 1.2. Machine goggles. 1.3. Safety shoes. 1.4. Apron
2. Shaper machine types	2.1 Based on type of mechanism employed for the movement of the cutting tool i.e. tool carrying ram the shapers are classified into three types: 2.1.1 Crank type 2.1.2 Gear type 2.1.3 Hydraulic type 2.2 According to position and movement of ram the shapers are classified into three types: 2.2.1 Horizontal type 2.2.2 Vertical type 2.2.3 Travelling head type 2.3 Shapers are classified into two types based on design of the worktable: 2.3.1 Standard shaper 2.3.2 Universal shaper 2.4 Based on type of cutting stroke employed these are classified into: 2.4.1 Push type 2.5 Draw type
3. Main parts of shaper machine.	3.1 Ram 3.2 Tool head 3.3 Base 3.4 Column 3.5 Table 3.6 Saddle 3.7 Cross rail 3.8 Quick return mechanism

4. Auxiliary parts of shaper machine.	4.1. Adjustable sliding support 4.2. Vice 4.3. Tool post 4.4. Clapper box 4.5. Tool feed handle 4.6. Graduated collar 4.7. Ram clamping nut 4.8. Scale indicator 4.9. Clutch handle 4.10. Cross traverse handle 4.11. Tool slide 4.12. Swivel base 4.13. Cross rail 4.14. Cross rail elevating screw 4.15. Frame 4.16. Driving motor
5. Shaper accessories	5.1. Angle plate 5.2. Index plate 5.3. Clamp 5.4. T – bolt 5.5. Stop pin 5.6. V-block 5.7. Adjustable stop
6. Quick return mechanism	6.1. Ram 6.2. Ram locking lever 6.3. Hand wheel for stroke adjustment 6.4. Bevel gears 6.5. Link arm 6.6. Screwed spindle 6.7. Rocker arm 6.8. Crank pin 6.9. Slotted lever 6.10. Bull gear 6.11. Crank adjusting screw
7. Principle of shaping	7.1. The arm is in reciprocating motion to push ram back and forward across the work piece. 7.2. Cutting stroke arm move 220 degrees 7.3. Return stroke arm quick return to 140 degrees

8. Shaping operations	8.1. Horizontal plain surface 8.2. Vertical plain surface 8.3. Inclin``1ed surface 8.4. Grooved surface 8.5. Slotted surface 8.6. Internal splines and gear teeth 8.7. Blind hole, key way, spline and gear teeth.
9. Preventive maintenance	9.1 Oiling and greasing the machine sliding parts on daily, weekly or monthly basis 9.2 Cleaning coolant tank 9.3 Checking up electrical fixture & connections regularly 9.4 Cleaning the table and vice after each operation.
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	1.1. Prepared for shaping operation 1.2. Carried out shaping operations
2. Underpinning Knowledge	2.1. Shaper machine types, main and different parts and accessories 2.2. Shaper machine functions, quick return mechanism, principle and specifications of shaper machine 2.3. Cutting speed, feed rate, and depth of cut selection procedures. 2.4. Methods of interpreting Drawings 2.5. Selection procedure of job materials and cutting tools 2.6. Method of determining sequence of operation. 2.7. Safe work practices and personal protective equipment (PPE) used when performing shaping operations
3. Underpinning Skills	3.1. Determining sequence of operation to produce component to the specifications of requirement. 3.2. Grinding of tool blank in accordance with the profile angles of shaping single point cutting tool 3.3. Interpreting drawings and specification 3.4. Using shaper machine, accessories, single point cutting tools, equipment, materials, cutting fluid, tools and equipment appropriate to the requirements of the operation. 3.5. Determining sequence of operation to perform shaping work in accordance with specifications. 3.6. Checking machine performance in conformance with the job requirement. 3.7. Performing shaping operations in accordance with the job requirement.

	3.8. Checking and measuring the job in conformance with specification and using appropriate techniques, measuring tools and equipment
4. Underpinning attitudes	4.1. Commitment to occupational health and safety 4.2. Environmental concerns 4.3. Eagerness to learn 4.4. Tidiness and timeliness 4.5. Respect for rights of peers and seniors in workplace 4.6. Communication with peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1. Workplace 5.2. Tools, equipment, TIG guide line and facilities appropriate to processes or activity 5.3. Materials relevant to the proposed activity 5.4. Equipment and outfits appropriate in applying safety measures 5.5. Relevant drawings, manuals, training manuals, poster, codes, standards and reference material
6. Methods of assessment	Competency should be assessed by: 6.1. Written test 6.2. Oral questioning 6.3. Demonstration 6.4. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module 7.2. Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	OULEMSP05L3V1: Perform Precision Grinding Machine Operations
Nominal Hours	**40 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform precision grinding machine operations. It specifically includes the tasks of preparing for precession grinding machine operations, carrying out cylindrical grinding machine operation, carrying out surface grinding machine operation, performing universal tools and cutter grinding machine operations, and cleaning, storing tools and equipment.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for precision grinding machine operations	1.1 **PPE's** are selected and used 1.2 Different **types of grinding machine** are identified and made ready. 1.3 **Different parts of the grinding machine** are identified. 1.4 RPM, cutting speed, feed rate and depth of grind are determined. 1.5 Grinding machine **accessories and attachment** are identified and set 1.6 Different **abrasive/grinding wheels** are identified, selected and balanced according to the **abrasive wheel specifications.** 1.7 Machine is degreased, selected, handled and operated according to the machine instruction manual
2. Carry out cylindrical grinding machine operation	2.1 Cylindrical grinding machine are selected and set according to the job requirement. 2.2 Grinding wheels are selected, balanced, and dressed according to the requirement. 2.3 Cylindrical work piece is set between live and revolving centers. 2.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 2.5 Machine performance is checked in conformance with job requirement. 2.6 Coolant is applied to prevent over heating of work piece and cutting tool.

	2.7 Cylindrical grinding operation is performed in accordance with workplace requirement. 2.8 Job is checked and measured in conformance with specification and appropriate techniques**, measuring tools,** and **equipment** are used.
3. Carry out surface grinding machine operation	3.1 Surface grinding machine are selected and set in accordance with the job requirement. 3.2 Grinding wheels are selected, balanced, and dressed in accordance with the job requirement. 3.3 Work piece is set on the magnetic vice / magnetic table. 3.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 3.5 Machine performance is checked in conformance with the job requirement. 3.6 Coolant is applied to prevent over heating of the work piece and grinding wheel. 3.7 Surface grinding operation is performed in accordance with workplace requirement. 3.8 Job is checked and measured in conformance with specification and appropriate techniques, measuring tools, and equipment are used.
4. Perform universal tool and cutter grinding machine operations.	4.1 Universal tools and cutter grinding machine are selected and set in according with the job requirement. 4.2 Grinding wheels are selected, balanced, and dressed according to the job requirement. 4.3 **Cutting tools** and cutters are set on the machine vice/universal vice. 4.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 4.5 Machine performance is checked in conformance with the job requirement. 4.6 Coolant is applied to prevent over heating of the work piece and grinding wheel. 4.7 Universal tools and cutter grinding operation is performed in accordance with the work place requirement. 4.8 Job is checked and measured in conformance with specification and appropriate techniques, measuring tools, and equipment are used.
5. Clean and store tools and equipment.	5.1. Workplace, tools, equipment and shaper machine are cleaned. 5.2. **Preventive maintenance** schedules are applied in accordance with workplace requirement. 5.3. Waste materials are disposed in proper place.

	5.4. Tools, equipment and finished products are stored safely in appropriate location
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE	1.1 Dust musk. 1.2 Safety goggles. 1.3 Safety shoes. 1.4 Apron
2. Types of grinding machine	2.1 Hand grinding machine. 2.2 Bench grinding machine. 2.3 Pedestal grinding machine. 2.4 Cylindrical grinding machine. 2.5 Surface grinding machine. 2.6 Universal tools and cutter grinding machine. 2.7 Internal grinding machine. 2.8 Center less grinding machine. 2.9 Universal grinding. 2.10 Crankshaft grinding machine
3. Parts of grinding machine	3.1 Bed 3.2 Work head 3.3 Wheel head 3.4 Tail stock 3.5 Upper table 3.6 Lower table 3.7 Base 3.8 Magnetic table
4. Accessories and attachment	4.1 Swivel base motor work head 4.2 Travers operated tail stock 4.3 Standard grinding wheel 4.4 Wheel dresser holder 4.5 Coolant supply unit 4.6 Lubricant supply unit 4.7 Table swivel indicator 4.8 Diamond dressing tools 4.9 Tools and tool box
5. Abrasive	5.1 Natural 5.2 Emery 5.3 Corundum 5.4 Diamond 5.5 Artificial 5.6 Silicon carbide (SiC) 5.7 Aluminum oxide (Al_2O_3)

	5.8 Cubic Boron 5.9 Nitride (CBN)
6. Grinding wheels	6.1 Straight 6.2 Recessed wheel 6.3 Offset 6.4 Countersunk dovetail 6.5 Tapered wheel 6.6 Ring (cylindrical) 6.7 Cup wheel 6.8 Dish saucer (saw gummer) 6.9 Cutting off and slitting 6.10 Supper diamond
7. Abrasive wheel specifications	7.1 WA46 - K5V17 7.2 W - Prefix 7.3 A - Abrasive (Aluminum oxide) 7.4 46 - Grain size 7.5 K- Grade 7.6 5- Structure 7.7 V - Bond type (Vitrified) 7.8 17- suffix
8. Measuring tools	8.1 Vernier caliper 8.2 Inside and outside micro meter 8.3 Dial indicator
9. Equipment	9.1 Machine vice. 9.2 Universal vice. 9.3 Universal chuck. 9.4 Wheel balancer. 9.5 Work steadies. 9.6 Permanent magnetic chuck 9.7 Diamond wheel dresser
10. Cutting tools	10.1 Drill bits. 10.2 Single point cutting tools (Lathe & shaper) tools 10.3 Milling cutters
11. Preventive maintenance	11.1 Oil and grease the machine sliding parts, daily, weekly and monthly 11.2 Coolant tank schedule cleaning 11.3 Electrical fixture and connections regularly check up 11.4 Cleaning the table and vice after each operation.

Evidence Guide

The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.

1. Critical aspects of competency	1.1 Carried out cylindrical grinding machine operation 1.2 Carried out surface grinding machine operation 1.3 Performed universal tool and cutter grinding machine operations.
2. Underpinning knowledge	2.1 RPM, cutting speed, feed rate and depth of grind 2.2 Procedure for setting up a grinding machine accessories and attachment 2.3 Grinding machine accessories and attachment 2.4 Types of abrasives/grinding wheels 2.5 Grinding machine performance 2.6 Operation of cylindrical grinding machine 2.7 Procedure of surface grinding operation 2.8 Procedure of universal tools and cutter grinding operation 2.9 Types of coolant 2.10 Functions of coolant 2.11 Types of checking and measuring instruments 2.12 Use of checking and measuring instruments applied in RAC operation 2.13 Checking/measuring work piece for conformance to specification using appropriate techniques, measuring tools, and equipment.
3. Underpinning skills	3.1 Determining RPM, cutting speed, feed rate and depth of grind 3.2 Identifying and setting grinding machine accessories and attachment 3.3 Identifying, different abrasive/grinding wheels, selecting, and balancing according to the abrasive wheel specifications. 3.4 Checking machine performance conforming to the job requirement. 3.5 Performing cylindrical grinding operation according to the work place requirement. 3.6 Performing surface grinding operation according to the work place requirement. 3.7 Performing universal tools and cutter grinding operation in accordance to workplace requirement 3.8 Applying coolant to prevent over heating of work piece and cutting tool. 3.9 Checking/measuring Job for conformance to specification using appropriate techniques, measuring tools, and equipment.
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Addressing and accepting feedback

	4.7 Tidiness and timeliness 4.8 Respect for rights of peers and seniors in workplace 4.9 Communication with peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1. Workplace 5.2. Tools, equipment, TIG guide line and facilities appropriate to processes or activity. 5.3. Materials relevant to the proposed activity. 5.4. Equipment and outfits appropriate in applying safety measures. 5.5. Relevant drawings, manuals, training manuals, poster, codes, standards and reference material.
6. Methods of assessment	Competency should be assessed by: 6.1. Written test 6.2. Oral questioning 6.3. Demonstration 6.4. Portfolio
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module 7.2 Assessment should be done by a NSDA certified assessor
Accreditation Requirements Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	OULEMSP06L3V1: Perform Basic Welding
Nominal Hours	**30 Hours**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to Perform basic welding. It specifically includes the tasks of following OSH practices, preparing materials for gas and arc welding, setting up equipment, performing arc welding, performing gas welding, performing welding: 1F and 2F position, and cleaning and storing tools.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Follow OSH practices	1.1 **PPE** is selected and collected as per requirements. 1.2 PPE is worn as required. 1.3 Safe work practices followed as per workplace standard.
2. Perform arc welding	4.1 Arc welding requirements are identified and noted from procedures, drawings and specifications 4.2 Arc welding equipment is set as per standard 4.3 Ampere and electrode are selected as per metal thickness 4.4 Welding is performed following standard procedure. 4.5 Tack welding is performed as per workplace requirement
3. Clean and store tools	7.1 Tools and equipment are cleaned and stored as per workplace standard 7.2 Waste material are disposed as per workplace procedure 7.3 Workplace is cleaned as per workplace standard
Range of Variables	
Variables	**Range** (may include but not limited to):
1. PPE for basic welding	1.1 Gas mask 1.2 Safety glasses/Goggles 1.3 Leather hand Gloves 1.4 Ear plugs 1.5 Air respirator 1.6 Safety shoes/boots 1.7 Aprons 1.8 Face shield

	1.9 Overalls 1.10 Safety helmet 1.11 Arm guard 1.12 Leg guard
2. Tools	2.1. Jig and fixture 2.2. Ball pin hammer 2.3. Chipping hammer 2.4. Try square 2.5. Tongs 2.6. Steel wire brush 2.7. Tip cleaner 2.8. Spark lighter
3. Materials	3.1 MS plate 3.2 SS plate 3.3 MS shaft 3.4 SS shaft 3.5 Metal sheet 3.6 Electrode 3.6.1 MS 3.6.2 SS 3.6.3 Brass 3.6.4 Cast iron 3.7 Filler metal 3.7.1 MS 3.7.2 SS 3.7.3 Brass
4. Defects	5.1 Cracks 5.2 Crater cracks 5.3 Lack of fusion/penetration 5.4 Overlap 5.5 Pinholes/blowholes 5.6 Porosity 5.7 Under fill 5.8 Undercut
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	1.1 Set up equipment for welding 1.2 Perform tack welding
2. Underpinning knowledge	2.1 Filler metal 2.2 Flux

3. Underpinning skills	3.1 Selecting and using PPE 3.2 Using tools and equipment 3.3 Interpreting drawings and specification 3.4 Interpreting job requirements
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Addressing and accepting feedback 4.7 Tidiness and timeliness 4.8 Respect for rights of peers and seniors in workplace 4.9 Communication with peers and seniors in workplace.
5. Resource implications	5.1 Workplace 5.2 Tools, equipment and facilities appropriate to processes or activity. 5.3 Stand by firefighting equipment 5.4 Materials relevant to the proposed activity. 5.5 Equipment and outfits appropriate in applying safety measures. 5.6 Relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	6.1 Demonstration 6.2 Oral questioning 6.3 Written test 6.4 Portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

Training Providers must be accredited by NSDA, the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of any NSQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Development of Competency Standard

The technical subcommittee for developing Competency Standards for National Skills Certificate in **Machine Shop Practice** at NSDA on 1-3 November, 2021.

Respectable members:

1.	Mohammed Abul Shahin Kowser Sarker, Deputy Controller, BTEB, Cell: 01712251917, Email: kowser73@yahoo.com	Member
2.	Md. Hemayet Jossain, Instructor, General Mechanics, Bangladesh-German Technical Training Institute, Nirpur-2, Dhaka. Cell: 01552419620, Email: hemayetbgttc@gmail.com	Member
3.	Mohammad Jayad Hossain, Manager, Maintenance, Matin Spinning Mills Ltd. Sardaganj, Kashimpur, Gazipur, Bangladesh. Cell: 01711940012, 01955538467. Email: maintenance@msml.dbl-group.com	Member
4.	Abul Hossain Khan, Proprietor, Abul Gasket Center & Engineering Works, 74/1 Lalmohon Shaha Street, Dholaikhal, Dhaka-1000, Cell: 01711614496, Emaail: boiea2008@gmail.com	Member
5.	Md. Borhan Uddin, Pragati Auto Engineering Works, 276, East Dholairpar, Dhaka. Cell: 01819191403	Member
6.	Protap Kumar Shil, Deputy Program Officer, TVET & Skills Development, UCEP-Bangladesh. Cell: 01718750814, Email: protap.shil@ucepbd.org	Member
7.	Md. Omar Faruq Khan, Group in-charge, MAWTS, Pallabi, Mirpur-12, Dhaka-1216. Cell: 01716724949. Email: omarfaruq85@yahoo.com	Member
8.	Anowarul Haque Ansari, Proprietor, Anowar Engineering Works, 64, Taherbag Lane (Thatari Bazar), Wari, Dhaka-1203. Cell: 01711530619 Email: ahansari007@yahoo.com	Member
9.	Md. Jahangir Alam, Executive Engineer, Bangladesh Industrial Technical Assistance Centre (BITAC), Tejgaon I/A, Dhaka -1208. Cell: 01312506027, 01712506027, jahangir216@gmail.com	Member
10.	Samorendra Podder, Senior Instructor, Mechanical, BKTTC, Technical, Dhaka. Cell: 01746700091 Email: samorendrapodder@gmail.com	Member
11.	Swapan Sarker, Senior Instructor Mechincal (Mechinist), SOS Vocational Training Centre, Dhaka. Cell: 01721808192, Email: swaponsarker886@yahoo.com	Member
12.	Md. Amir Hossain, Process Expert (CS, CBLM and Curriculum), Trainer and Assessor CBT&A Phone: +88 01631670445, Email: razib.consultant@yahoo.com	Member
13.	Mahbub Ul Huda, Specialist (CS, Curiculum, CBLM, Assessment), NSDA, Cell: 01735490491, email: huda73@gmail.com	Member
14.	Md. Quamruzzaman, Designation Director (Skills Standard &Curriculum) National Skills Development Authority, Cell: 01819189320, E-mail: dir.skillsstandard@nsda.gov.bd	Member
15.	Iffat Jahan, Designation Deputy Director (Skills Standard), National Skills Development Authority, Cell: 01811458150, E-mail: dd.skillsstandard@nsda.gov.bd	Member
16.	Saida Khanam, Designation Assistant Director (Skills Standard), National Skills Development Authority, Cell: 01763083438, E-mail: ad.skillsstandard@nsda.gov.bd	Member

Validation of Competency Standard by Standard and Curriculum Validation Committee (SCVC)

The Competency Standards for National Skills Certificate in **Machine Shop Practice** Standard is validated by SCVC on 21 December, 2021.

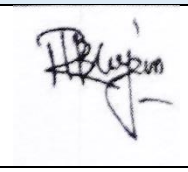
Respectable members of the SCVC:

1.	Abdur Razzaque, Chairman, Light Engineering Industry Skills Council	Chairman
2.	Dulal Krishna Saha, Executive Chairman (Secretary), NSDA	Chief Guest
3.	Anowarul Haque Ansari, Proprietor, Anowar Engineering Works, 64, Taherbag Lane (Thatari Bazar), Wari, Dhaka-1203. Cell: 01711530619 Email: ahansari007@yahoo.com	Member
4.	Abul Hossain Khan, Proprietor, Abul Gasket Center & Engineering Works, 74/1 Lalmohon Shaha Street, Dholaikhal, Dhaka-1000, Cell: 01711614496, Email: boiea2008@gmail.com	Member
5.	Abul Kashem Titu, BEIOA, Director, Zakia Engineering, Cell: 01711286477	Member
6.	Engr. Md. Fazlul Karim, Additional Director, Bangladesh Industrial Technical Assistance Centre (BITAC), Tejgaon I/A, Dhaka -1208. Cell: 01716869042, Email: fazlulkarimbitac@gmail.com	Member
7.	Swapan Sarker, Senior Instructor Mechanical (Machinist), SOS Vocational Training Centre, Dhaka. Cell: 01721808192, Email: swaponsarker886@yahoo.com	Member
8.	Samorendra Podder, Senior Instructor, Mechanical, BKTTC, Technical, Dhaka. Cell: 01746700091 Email: samorendrapodder@gmail.com	Member
9.	Md. Hemayet Jossain, Instructor, General Mechanics, Bangladesh-German Technical Training Institute, Nirpur-2, Dhaka. Cell: 01552419620, Email: hemayetbgttc@gmail.com	Member
10.	Sk. Rawshan Amin, Deputy Manager, TVET and Skills, UCEP Bangladesh. Cell: 01765718183	Member
11.	Md. Borhan Uddin, Pragati Auto Engineering Works, 276, East Dholairpar, Dhaka. Cell: 01819191403	Member
12.	Mahbub Ul Huda, Specialist (CS, Curriculum, CBLM, Assessment), NSDA, Cell: 01735490491, email: huda73@gmail.com	Member
13.	Md. Quamruzzaman, Designation Director (Skills Standard &Curriculum) National Skills Development Authority, Cell: 01819189320, E-mail: dir.skillsstandard@nsda.gov.bd	Member
14.	Iffat Jahan, Designation Deputy Director (Skills Standard), National Skills Development Authority, Cell: 01811458150, E-mail: dd.skillsstandard@nsda.gov.bd	Member
15.	Saida Khanam, Designation Assistant Director (Skills Standard), National Skills Development Authority, Cell: 01763083438, E-mail: ad.skillsstandard@nsda.gov.bd	Member

Review workshop for Competency Standard

The Competency Standards for National Skills Certificate in **Machine Shop Practice** Standard is validated by SCVC on 12 July, 2023.

Respectable members of the Workshop:

Serial No.	Participant Name	Designation, Institution Name and Contact information	
1	Md. Rafiqul Islam Bhuian	CEO, Light Engineering ISC, Email: ceo.leisc.seip@gmail.com	
2	Engr. Md. Fazlul Karim	Additional Director, Bangladesh Industrial Technical Assistance Centre (BITAC), Tejgaon I/A, Dhaka -1208. Cell: 01716869042, Email: fazlulkarimbitac@gmail.com	
3	Siddiqur Rahman	Workahop Super, Dhaka Polytechnic Institute, Dhaka. Cell: 01716059720, Email: siddiqurdpi83@gmail.com	
4	Md. Hemayet Hossain,	Instructor, General Mechanics, Bangladesh-German Technical Training Institute, Mirpur-2, Dhaka. Cell: 01552419620, Email: hemayetbgttc@gmail.com	
5	Md. Omar Faruq Khan,	Group in-charge, MAWTS, Pallabi, Mirpur-12, Dhaka-1216. Cell: 01716724949. Email: omarfaruq85@yahoo.com	
6	Mahbub Ul Huda	Consultant-3, NSDA, Agargaon, Dhaka