COMPETENCY STANDARD

FOR

CNC MACHINING CENTER OPERATION WITH CAD & CAM

(Light Engineering Sector)

Level: 04

Competency Standard Code: CS-LE-CADCAM-L4-EN-V1

National Skills Development Authority
Prime Minister's Office, Bangladesh

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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 operationalize a responsive skills ecosystem and delivery mechanism through a combination of well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training program. "**CNC Machining Center Operation with CAD & CAM**" 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 (BNQF) under Bangladesh National Qualification Framework and will 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 guide

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 Skill Certificate – 4 in
CNC Machining Center Operation with CAD & CAM in Light Engineering Sector

Level descriptors of NSQF (BNQF 1-6)

Level & Job classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager/ Sub Assistant Engineer	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 analyze, 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
SCVC	-	Standards and Curriculum Validation Committee
STP	-	Skills Training Provider
SOP	-	Standard Operating Procedure
UoC	-	Unit of Competency

Approval of Competency Standard

Approved by
9th Executive Committee (EC) Meeting of NSDA
Held on 16 June 2022

16.06.22
Md. Saniul Ferdous
Deputy Director (Admin)
National Skills Development Authority
Prime Minister's Office

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

Competency Standards for National Skill Certificate – 4 in
CNC Machining Center Operation with CAD & CAM
Course Structure

SL	Unit Code and Title		UoC Level	Nominal Hours
Generic Competencies				**55**
1.	GU002L2V1	Apply Occupational Health and Safety (OHS) Procedure in The Workplace	2	15
2.	GU011L4V1	Lead Small Team	4	20
3.	GU006L3V1	Apply Basic IT Skills	3	20
Sector Specific Competencies				**30**
4.	SULE001L2V1	Interpret Manuals, Sketches and Drawings	2	15
5.	SULE002L2V1	Apply Quality System	2	15
Occupation Specific Competencies				**275**
6.	OUCNCCDM01L4V1	Use Hand and Power Tools	4	10
7.	OUCNCCDM02L4V1	Perform CNC Machining Center Operation	4	55
8.	OUCNCCDM03L4V1	Create and Use G&M Code for Machining	4	60
9.	OUCNCCDM04L4V1	Create Model Using CAD Software	4	60
10.	OUCNCCDM05L4V1	Apply CAM Software for Machining	4	50
11.	OUCNCCDM06L4V1	Perform Basic Multi-Axis Machining	4	40
			Total Nominal Hours	**360**

Units & Elements at a Glance:

Generic Competencies (55 hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU002L2V1	Apply occupational health and safety (OHS) procedure in the workplace	1. Identify OSH policies and procedures 2. Follow OSH procedure 3. Report hazards and risks 4. Respond to emergencies 5. Maintain personal well-being	15
GU011L4V1	Lead small team	1. Provide team leadership 2. Assign responsibilities 3. Set performance expectations for team members 4. Supervise team performance	20
GU006L3V1	Apply basic IT skills	1. Identify and use most commonly used IT Tools 2. Operate computer 3. Work with word processing software 4. Use spread sheet to create /prepare worksheets 5. Use presentation packages to create / prepare presentation 6. Print the documents 7. Use the internet and access E-mail	20

Sector Specific Competencies (30Hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SULE001L2V1	Interpret manuals, sketches and drawings	1. Interpret information and specifications 2. Interpret workplace documents 3. Read and interpret sketches and drawings 4. Practice professional ethics at workplace	15
SULE002L2V1	Apply quality system	1. Work within a quality system 2. Apply and monitor quality system improvement 3. Apply standard procedures for each job	15

Occupation Specific Competencies (275 Hours)

Code	Unit of Competency	Elements of Competency	Hours
OUCNCCDM01L4V1	Use hand tools and power tools	1. Identify and inspect hand and power tools 2. Use hand tools properly and safely 3. Operate power tools properly and safely 4. Clean and maintain hand and power tools	10
OUCNCCDM02L4V1	Perform CNC machining center operation	1. Prepare CNC Machining centre 2. Select cutting tools 3. Operate CNC machining center	55
OUCNCCDM03L4V1	Create and use G&M code for machining	1. Determine machine co-ordinate systems 2. Create program using G&M code 3. Set up machine and workpiece 4. Perform 2D machining operation	60
OUCNCCDM04L4V1	Create model using CAD software	1. Prepare for application of CAD software 2. Create CAD model	60
OUCNCCDM05L4V1	Apply CAM software for machining	1. Prepare for computer-aided machining operation 2. Identify the sequence of tool path and machining strategy 3. Create 2D tool paths 4. Create 3D tool paths	50
OUCNCCDM06L4V1	Perform basic multi-axis machining	1. Set dynamic work offset 2. Perform (3+2)/positional Machining	40

Generic Competencies

Unit Code and Title	**GC002L2V1: Apply Occupational Health and Safety (OHS) Procedure in the Workplace**
Unit Descriptor	This unit covers the knowledge, skills and attitudes (KSA) required in applying occupational health and safety (OHS) procedure in the workplace. It specifically includes identify OHS policies and procedures, follow OHS procedure, report hazards and risks, respond to emergencies, and maintaining personal well-being.
Nominal Hours	**15 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Identify OSH policies and procedures	1.1. **OHS policies** and **safe operating procedures** are accessed and stated 1.2. **Safety signs and symbols** are identified and followed 1.3. Emergency response, evacuation procedures and other contingency measures are determined according to workplace requirements
2. Follow OSH procedure	2.1 **Personal protective equipment (PPE)** is selected and collected as required 2.2 Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices 2.3 A clear and tidy workplace is maintained as per workplace standard 2.4 PPE is maintained to keep them operational and compliant with OHS regulations
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 designated authority
4. Respond to emergencies	4.1 Alarms and warning devices are responded 4.2 Workplace **emergency procedures** are followed 4.3 **Contingency measures** during workplace accidents, fire and other emergencies are recognized and followed in accordance with organization procedures 4.4 Frist aid procedures is applied during emergency situations
5. Maintain personal well-being	5.1 OHS policies and procedures are adhered to 5.2 OHS awareness programs are participated in as per workplace guidelines and procedures 5.3 Corrective actions are implemented to correct unsafe condition in the workplace 5.4 **"Fit to work" records** are updated and maintained according

	to workplace requirements
Range of Variables	
Variables	**Range** (may include but not limited to):
1. OHS policies	1.1. Bangladesh standards for OHS 1.2. Fire Safety Rules and Regulations 1.3. Code of Practice 1.4. Industry Guidelines
2. Safe operating procedures	2.1 Orientation on emergency exits, fire extinguishers, fire escape, etc. 2.2 Emergency procedures 2.3 First Aid procedures 2.4 Tagging procedures 2.5 Use of PPE 2.6 Safety procedures for hazardous substances
3. Safety signs and symbols	3.1 Direction signs (exit, emergency exit, etc.) 3.2 First aid signs 3.3 Danger Tags 3.4 Hazard signs 3.5 Safety tags 3.6 Warning signs
4. Personal Protective Equipment (PPE)	4.1 Gas Mask 4.2 Gloves 4.3 Safety boots 4.4 Face mask 4.5 Overalls 4.6 Goggles and safety glasses 4.7 Sun block 4.8 Chemical/Gas detectors
5. Hazards	5.1 Chemical hazards 5.2 Biological hazards 5.3 Physical Hazards 5.4 Mechanical and Electrical Hazard 5.5 Mental hazard 5.6 Ergonomic hazard
6. Emergency Procedures	6.1 Fire fighting 6.2 Earthquake 6.3 Medical and first aid 6.4 Evacuation
7. Contingency measures	7.1 Evacuation 7.2 Isolation 7.3 Decontamination
8. “Fit to Work” records	8.1 Medical Certificate every year

	8.2 Accident reports, if any 8.3 Eye vision certificate
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 stated OHS policies and safe operating procedures 1.2 followed safety signs and symbols 1.3 used personal protective equipment (PPE) 1.4 maintained workplace clear and tidy 1.5 assessed and Controlled hazards 1.6 followed emergency procedures 1.7 followed contingency measures 1.8 implemented corrective actions
2. Underpinning knowledge	2.1 Define OHS 2.2 OHS Workplace Policies and Procedures 2.3 Work Safety Procedures 2.4 Emergency Procedures 2.5 Hazard control procedure 2.6 Different types of Hazards 2.7 PPE and there uses 2.8 Personal Hygiene Practices 2.9 OHS Awareness
3. Underpinning skills	3.1 Accessing OHS policies 3.2 Handling of PPE 3.3 Handling cleaning tools and equipment 3.4 Writing report 3.5 Responding to emergency procedures
4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Sincere and honest to duties 4.3 Promptness in carrying out activities 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace
5. Resource implications	5.1 Workplace 5.2 Equipment and outfits appropriate in applying safety measures 5.3 Tools, materials and documentation required 5.4 OHS Policies and Procedures

6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
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 National Skills Development Authority (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 qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	**GU011L4V1: Lead Small Team**
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to lead small team. It specifically includes provide team leadership, assign responsibilities, set performance expectations for team members and supervise team performance.
Nominal Hours	**20 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Provide team leadership	1.1 **Work requirements** are identified and presented to team members 1.2 Reasons for instructions and requirements are communicated to team members 1.3 **Team members' queries and concerns** are recognized, discussed and dealt with
2. Assign responsibilities	2.1 Duties, and responsibilities are allocated having regard to the skills, knowledge and attitudes required to properly undertake the assigned task 2.2 Duties are allocated having regard to individual preference, domestic and personal considerations, whenever possible
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs and according to assignment requirements 3.2 Performance expectations are based on individual team members' duties and area of responsibility 3.3 Performance expectations are discussed and directed to implement in the workplace
4. Supervise team performance	4.1 **Monitoring of performance** are taken place against defined performance criteria and / or assignment instructions and corrective action taken if required 4.2 Team members are provided **feedback,** positive support and advice on strategies to overcome any deficiencies 4.3 **Performance issues** which cannot be rectified or addressed within the team are referenced to appropriate personnel 4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on clients' / customers' needs and satisfaction 4.5 Team operations are monitored to ensure that employer / client needs and requirements are met

	4.6 Follow-up communication is provided on all issues affecting the team 4.7 All relevant documentation is completed
Range of Variables	
Variable	**Range** (may include but are not limited to):
1. Work requirements	1.1 Client Profile 1.2 Assignment instructions
2. Team member's queries and concerns	2.1 Roster 2.2 Shift details
3. Monitoring of performance	3.1 Formal process 3.2 Informal process
4. Feedback	4.1 Formal process 4.2 Informal process 4.3 Sandwich process
5. Performance issues	5.1 Work output 5.2 Work quality 5.3 Team participation 5.4 Compliance with workplace protocols 5.5 Safety 5.6 Customer service
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 maintained or improved individuals and / or team performance given a variety of possible scenario 1.2 assessed and monitored team and individual performance against set criteria 1.3 represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf 1.4 allocated duties and responsibilities, having regard to individual's knowledge, skills and attitude and the needs of the tasks to be performed 1.5 set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members

2. Underpinning knowledge	2.1 Company policies and procedures 2.2 Relevant legal requirements 2.3 How performance expectations are set 2.4 Methods of Monitoring Performance 2.5 Client expectations 2.6 Team members' duties and responsibilities
3. Underpinning skills	3.1 Informal performance counselling skills 3.2 Team building skills 3.3 Negotiating skills
4. Required 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 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1 Workplace (actual or simulated) 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
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completion of the training module 7.2 Assessment should be done by NSDA certified assessor

Accreditation Requirements

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Unit Code and Title	GU006L3V1: Apply Basic IT Skills
Nominal Hours	**20 Hours**
Unit Descriptor	This unit covers the basic knowledge, skills and attitude required to apply basic IT skills. It specifically includes Identify and use most commonly used IT Tools, operate computer, work with word processing software, use spread sheet to create /prepare worksheets, use presentation packages to create / prepare presentation, print the documents and use the internet and access E-mail.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables Training Components.
1. Identify and use most commonly used IT tools	1.1 Context of IT is interpreted 1.2 Commonly used **IT tools** are identified 1.3 Safe work practice and OSH Standards are followed
2. Operate computer	2.1 **Peripherals** are checked and connected with computer as per standard 2.2 Power cords / adapter are connected with computer and power outlets socket safely 2.3 Computer is switched on gently 2.4 PC **desktop / GUI settings** are arranged and customized as per requirement 2.5 Files and folders are created, opened, copied, renamed, deleted and sorted as per requirement 2.6 Properties of files and folders are viewed and searched 2.7 Disks are defragmented, formatted as per requirement
3. Work with word processing software	3.1 Word Processing software is selected and started 3.2 Basic typing technique is demonstrated 3.3 **Documents** are created as per requirement in personal use and office environment 3.4 **Contents** are entered 3.5 Documents are **formatted**
4. Use spread sheet to create /prepare worksheets	4.1 Spreadsheet are selected and started 4.2 Worksheets are created as per requirement in Personal use and office environment 4.3 Data are entered 4.4 **Functions** are used for calculating and editing logical operation 4.5 Sheets are formatted as per requirement 4.6 Charts are created 4.7 Charts/ Sheets are previewed

5. Use presentation packages to create / prepare presentation	5.1 Appropriate presentation software packages are selected and started 5.2 Presentation is created as per requirement in personal use and office environment 5.3 Image, Illustrations, text, table, symbols and media are entered as per requirements 5.4 Presentations are formatted and animated 5.5 Presentations are previewed
6. Print the documents	6.1 Printer is connected with computer and power outlet properly 6.2 Power is switched on at both the power outlet and printer 6.3 Printer is installed and added 6.4 Correct printer settings are selected and document is printed
7. Use the Internet and Access E-Mail	7.1 Appropriate internet **browsers** are selected 7.2 Search engines are used to access information 7.3 Video / Information are Shared /downloaded / uploaded from / to web site/social media 7.4 Web based resources are used 7.5 Email services are identified and selected to create a new email address 7.6 Document is prepared, attached and sent to different types of recipients 7.7 Email is read, forwarded, replied and deleted as per requirement 7.8 Custom email folders are created and manipulated 7.9 Email message is printed
Range of Variables	
Variable	**Range** (may include but not limited to):
1. IT tools	1.1 Phone 1.2 Cell Phone 1.3 TABs 1.4 Radio 1.5 Television 1.6 Computers 1.7 Laptops 1.8 Notebooks 1.9 Internet 1.10 Software 1.11 Satellite
2. Peripherals	2.1. Monitor 2.2. Keyboard 2.3. Mouse 2.4. Modem 2.5. Scanner 2.6. Printer

3. Desktop / GUI settings	3.1 Icons 3.2 Taskbar 3.3 View 3.4 Resolutions
4. Documents	4.1 Word documents 4.2 Standard CV / Bio-Data with different text & fonts, image and table. 4.3 Application / Official letter with proper paragraph and indenting, spacing, styles, Illustrations, Tables, Header & Footers and symbols. 4.4 Standard report / newspaper items with column, footnote and endnote, drop cap, indexing and page numbering.
5. Contents	5.1 Illustrations and styles 5.2 Text 5.3 Table 5.4 Symbols 5.5 Header & Footer
6. Formatted	6.1 Bold 6.2 Italic 6.3 Underline 6.4 Font size, colour, 6.5 Change case 6.6 Alignment and intend
7. Functions	7.1. Mathematics 7.2. Logical 7.3. Simple Statistical
8. Browsers	8.1 Internet Explorer 8.2 Firefox 8.3 Google Chrome 8.4 Opera 8.5 Safari 8.6 Omni Web
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 created, opened, copied, renamed, deleted and sorted files and folders as per requirement. 1.2 completed application software Installations as per standard 1.3 performed simple trouble shooting with Computer 1.4 created email accounts. 1.5 used email account for online platforms purpose
2. Underpinning	2.1 Basic competent of PC

Knowledge	2.2 IT and IT Tools 2.3 Different type of software and application packages 2.4 Use of word processor, spread sheet and presentation software 2.5 Different type of math and logical functions 2.6 Computer Trouble Shooting 2.7 Techniques to access internet
3. Underpinning Skills	3.1 Identifying and use IT Tools 3.2 Demonstrating typing on word processing software 3.3 Saving and retrieving documents on Word Processing software. 3.4 Demonstrated ability to create email accounts 3.5 Opening an email account and use it for different purpose. 3.6 Configured appropriate printer settings and printed the document
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 IT Tools 5.3 Computers with word processing application 5.4 Internet connection 5.5 Presentations 5.6 Learning manuals
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

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Sector Specific Competencies

Unit Code and Title	**SULE001L2V1: Interpret Manuals, Sketches and Drawings**
Nominal Hours	**15 hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to interpret manuals, sketches and drawings. It specifically includes interpret information and specifications, workplace documents, read and interpret sketches and drawings and practice professional ethics at workplace.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Interpret information and specifications	1.1 Appropriate **manuals** for work activity are identified and collected 1.2 Information and specifications in the manuals are interpretedand applied
2. Interpret workplace documents	2.1 Workplace documents are interpreted as per standard 2.2 Assistance is taken to aid comprehension when required from peers / supervisors 2.3 Visual information / symbols / signage's are understood and followed 2.4 Specific and relevant information are accessed from appropriate sources 2.5 Appropriate medium is used to transfer information and ideas
3. Read and interpret sketches and drawings	3.1 Relevant **sketches and drawings** are identified for job requirement 3.2 Key terms and abbreviations are identified and interpreted 3.3 Signs and symbols are identified and interpreted 3.4 Schedules, dimensions, sketches, drawings and specifications are correctly read and interpreted
4. Practice professional ethics at workplace	4.1 Responsibilities as a team member are demonstrated and kept promises and commitments made to others 4.2 Tasks are performed in accordance with workplace procedures 4.3 Confidentiality is respected and maintained 4.4 Situations and actions considered inappropriate or which present a conflict of interest are avoided
Range of Variables	
Variable	**Range** (may include but not limited to):

1. Manuals	1.1. Buyers' specification 1.2. Compliance 1.3. Maintenance procedure 1.4. Periodic maintenance 1.5. Quality assurance 1.6. Standard operating procedure (SOP)
2. Sketches and drawings	2.1. Technical 2.2. Measurement 2.3. Design
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 information and specifications 1.2 read and interpreted sketches and drawings
2. Underpinning knowledge	2.1. Describe Manuals 2.2. Types of manuals 2.3. Units of measurement 2.4. Units of conversion 2.5. Signs and symbols 2.6. Define Sketch 2.7. Define drawings 2.8. Define specifications
3. Underpinning Skills	3.1 Interpreting performance of workplace communication and etiquette 3.2 Interpreting workplace instructions and symbol 3.3 Interpreting workplace code of conducts is as per organizational guidelines 3.4 Interpreting workplace documents as per standard 3.5 Interpreting and implementing meeting outcomes
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 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Computer/laptop/notebook 5.3. Software 5.4. Stationary 5.5. Learning manual

	5.6. Fire extinguisher
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

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Unit Code and Title	SULE002L2V1: Apply Quality System
Nominal Hours	15 hours
Unit Descriptor	This unit covers the knowledge, skills, and attitudes required to apply quality system. It specifically includes the tasks of work within a quality system, apply and monitor quality system improvement, and the apply standard procedures to each job.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Work within a quality system	1.1. Instructions and procedures are strictly followed following the **quality improvement system** 1.2. Duties are performed following the demand of the quality improvement system 1.3. Defects are detected and reported according to standard operating procedures 1.4. Quality service is ensured and delivered to the customer in providing a product or service
2. Apply and monitor quality system improvement	2.1. Performance measurement systems are identified 2.2. Specifications and standard operating procedures are identified and established 2.3. Performance is assessed at regular intervals 2.4. Defects are detected and reported to authority according to standard operating procedure 2.5. Process improvement procedures are contributed to and implemented 2.6. Improvement of internal/external customer and supplier relationships is contributed to 2.7. Performance of operation or quality of product or service is monitored to ensure customer satisfaction
3. Apply standard procedures for each job	3.1. The concept of supplying a product or service to meet the customer's requirements is understood and applied accordingly 3.2. Responsibility is taken for the quality of own work 3.3. Quality system procedures for each job are followed 3.4. 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	1.1. Quality inspection 1.2. Quality control 1.3. Quality improvement 1.4. Total quality control 1.5. Quality assurance
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 used personal protective equipment (PPE) 1.2 maintained proper specification and standard of product 1.3 checked product for quality assurance as per drawing and specification 1.4 detected defects and take corrective and/or quality improvement actions 1.5 ensured customer satisfaction
2. Underpinning knowledge	2.1 Quality improvement systems 2.2 Common defects and procedures for addressing defects 2.3 Performance measurement systems 2.4 The implementation process of quality improvement system 2.5 Process improvement procedures
3. Underpinning Skills	3.1 Identifying the role of self and others within the equality improvement system 3.2 Identifying product and process specifications and tolerance limits 3.3 Detecting defects, taking corrective and/or quality improvement action 3.4 Keeping records following standard operating procedure 3.5 Identifying customer requirements and always meeting those 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 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace

5. Resource Implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Personal protective equipment (PPE) 5.3. Hand tools 5.4. Power tools 5.5. Measuring tools 5.6. Projector 5.7. Stationary 5.8. Learning manual
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (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 qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Occupation Specific Competencies

Unit Code and Title	**OUCNCCDM01L4V1: Use Hand Tools and Power Tools**
Nominal Hours	**10 hours**
Unit Descriptor	This unit covers the skills, knowledge, and attitudes required to using hand tools and power tools. It specifically includes identify and inspect hand and power tools, use hand tools properly and safely, operate power tools properly and safely and clean and maintain hand and power tools.
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Identify and inspect hand and power tools	1.1 Appropriate **hand tools** and **power tools** are identified 1.2 Application of hand and power tools is recognized 1.3 Usability of hand and power tools is checked and verified
2. Use hand tools properly and safely	2.1 Appropriate hand tools are selected 2.2 Safety precautions are ensured before using hand tools 2.3 Unsafe or faulty hand tools are identified and marked for repair 2.4 **Measuring tools** are checked and calibrated before use 2.5 Use hand tools properly and safely to perform a work activity
3. Operate power tools properly and safely	3.1 Appropriate power tools are selected 3.2 Safe work practice is observed and **Personal Protective Equipment (PPE)** is worn as perusing power tools 3.3 Power supply outlet and electrical cord are inspected and confirmed safe for use following established workplace safety requirements 3.4 Safety precautions are ensured before using power tools following the manufacturer's operating specifications 3.5 The proper sequence of operation is applied for using power tools 3.6 Unsafe or faulty power tools are identified and marked for repair 3.7 Operate power tools properly and safely to perform a

	work activity
4. Clean and maintain hand and power tools	4.1 Dust and foreign matter are removed from hand and power tools following workplace standards 4.2 Condition of hand and power tools is checked after use and reported 4.3 Appropriate lubricant is applied after use and before storage 4.4 Measuring tools are checked and calibrated after use 4.5 Defective hand and power tools are inspected and repaired or replaced 4.6 Hand and power tools are stored and secured following workplace requirements
Range of Variables	
Variable	**Range** (may include but not limited to):
1. Hand tools	1.1. Ball pein hammer 1.2. Soft hammer 1.3. Bench vice 1.4. Flat File 1.5. Half round file 1.6. Triangular file 1.7. Square file 1.8. Knife file 1.9. Round file 1.10. Jewelry file set 1.11. Center punch 1.12. Prick punch 1.13. Drift punches 1.14. Cold chisel 1.15. Spanner set 1.16. Chisels 1.17. Adjustable wrenches 1.18. Nose pliers 1.19. Combination pliers 1.20. Side cutting pliers 1.21. Neon tester 1.22. Allen key set 1.23. C-clamp 1.24. Scriber 1.25. Screwdrivers 1.26. Hacksaw

	1.27. Socket spanner set 1.28. Grip vice
2. Power tools	2.1. Pedestal grinding machine 2.2. Drill machine 2.3. Universal tool grinder 2.4. Power torque wrench 2.5. Blower machine
3. Measuring tools	3.1. Measuring steel tape 3.2. Sprit level 3.3. Vernier caliper 3.4. Vernier bevel protector 3.5. Vernier height gauge 3.6. Inside vernier micrometer 3.7. Outside vernier micrometer 3.8. Thread gauge 3.9. Radius gauge 3.10. Filler gauge 3.11. Surface plate 3.12. Tri-square 3.13. Dial indicators
4. Personal Protective Equipment (PPE)	4.1 Safety helmets 4.2 Earplugs 4.3 Safety goggles 4.4 Face shields 4.5 Hand gloves 4.6 Safety 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	Assessment required evidence that the candidate: 1.1 identified and selected appropriate hand and power tools for work to be performed 1.2 identified and used measuring and testing tools appropriate to work activity 1.3 followed safety precautions when using hand and power tools 1.4 operated power tools safely and according to manufacturer's operating specification 1.5 performed cleaning and maintenance of hand and power tools after use and before storing

2. Underpinning knowledge	2.1 Information on types of hand and power tools, their functions, and use 2.2 Procedures for safely using hand and power tools
3. Underpinning Skills	3.1 Identifying hand, power, and measuring tools 3.2 Following safety precautions when using hand, power, and measuring tools 3.3 Using hand and measuring tools correctly and safely following manufacturer's operating specification 3.4 Operating power tools correctly and safely following manufacturer's operating specification 3.5 Cleaning and maintaining hand and power tools after use 3.6 Applying appropriate lubricant on hand and power tools after use and before storing
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 Tidiness and timeliness
5. Resource Implications	5.1 Workplace (simulated or actual) 5.2 Personal protective equipment (PPE) 5.3 Hand tools 5.4 Power tools 5.5 Measuring tools 5.6 Stationary 5.7 Learning manual
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

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Unit Code and Title	**OUCNCCDM02L4V1: Perform CNC Machining Center Operation**
Nominal Hours	**55 hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to perform CNC machining center operation. It specifically includes prepare CNC machining center, select cutting tools and operat CNC machining center.
Elements of Competency	**Performance Criteria** (**bold and underlined** terms are elaborated in the Range of Variables)
1. Prepare CNC machining Centre	1.1 **Major components of CNC machining center** in identified 1.2 Air pressure, coolant level and lubrication oil are checked 1.3 CNC Machining center power on & off is performed 1.4 Machine reference is performed 1.5 Override keys are adjusted as required 1.6 Hand Jog rate is performed as required 1.7 ATC function is performed 1.8 Workpiece is clamped with clamping kits
2. Select cutting tools	2.1. Various types of **cutting tools** are identified 2.2. The appropriate sequence of cutting tools for an operation is selected 2.3. Appropriate cutting tools are selected as per job **materials** 2.4. Appropriate **cutting parameters** are followed as per manufacturer chart 2.5. Different types of cutting tools inserts are selected
3. Operate CNC machining center	3.1. CNC machine **axes** positioning is performed as per job requirement 3.2. Copy, edit, load, and create files are executed 3.3. Program start, program stop, and a single block, dry run, feed hold is performed 3.4. Manual data input (MDI) in CNC machining center is performed 3.5. **Auxiliary function keys** are performed 3.6. Tool length compensation is performed 3.7. **Work offset and tool offset** are performed 3.8. Program is transferred from **storage devices** 3.9. **Dry and actual run** is executed
Range of Variables	

Variable	**Range** (may include but not limited to):
1. Major components of CNC machining center	1.1 Machine on-off switch 1.2 Emergency switch 1.3 Machine reference switch 1.4 Override controller 1.5 Hand jog rate 1.6 Work holding 1.7 Clamping kits 1.7.1 Vice 1.7.2 Clamping set 1.7.3 Parallel bar
2. Cutting tools	2.1 Face mill 2.2 Drill 2.3 T-slot cutter 2.4 Solid end mill 2.5 Ball nose end mill 2.6 Bull nose end mill 2.7 Boring bar 2.8 Tapping tool 2.9 Inserts
3. Materials	3.1 Mild Steel 3.2 Aluminum 3.3 Alloy steel 3.4 Bronze 3.5 Copper 3.6 Stainless steel
4. Cutting parameters	4.1 Table feed 4.2 Spindle speed 4.3 Depth of cut 4.4 Cutting speed 4.5 Stepover 4.6 Feed per tooth 4.7 Plunge rate
5. Axes	5.1 X-axis 5.2 Y-axis 5.3 Z-axis
6. Auxiliary function keys	6.1 F1 6.2 F2 6.3 F3 6.4 F4

7. Work offset and tool offset	7.1 Jog Keys 7.2 Handle Jog 7.3 Jog rate 7.4 Axes 7.5 Edge finder 7.6 Probe tool
8. Storage devices	8.1 Pen drive 8.2 LAN 8.3 Device manager
9. Dry and actual run	9.1 Program load 9.2 Memory mode 9.3 Graphics mode 9.4 Cycle start
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 CNC Machining center power on & off and machine reference switch are identified 1.2 CNC controller key's function is identified 1.3 work holding and clamping mechanisms are identified 1.4 required cutting tools are identified 1.5 work offset and tool length are identified 1.6 cutting parameters are computed 1.7 program transferring from flash/USB to controller is identified
2. Underpinning knowledge	2.1. Basic machining operation 2.2. Basic CNC control 2.3. Basic hand tools & work holding mechanism 2.4. Machine able material, and machineability 2.5. Selection of Cutting tool 2.6. Cutting speed 2.7. Feed 2.8. Cutting tools inserts and holders 2.9. Basic measurement after machining
3. Underpinning Skills	3.1 Power on/off of the machine 3.2 Machine reference of jog operation 3.3 Taking work offset and tool length measure 3.4 CNC controller keyboard operation 3.5 Feed and spindle override key operation 3.6 Program transferring from Memory stick to CNC

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 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Workplace (simulated or actual) 5.2 CNC Machine 5.3 Work holding device, vice, etc 5.4 CNC controller 5.5 Memory stick 5.6 Sample part/model 5.7 Measuring instruments 5.8 Job specifications, drawings, or work instructions 5.9 Job operation sheet. 5.10 Stationary 5.11 Learning manual
6. Methods of Assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of Assessment	7.1 Competency assessment must be done in a NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor

Accreditation Requirements

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Unit Code and Title	**OUCNCCDM03L4V1: Create and Use G&M Code for Machining**
Nominal Hours	**60 Hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to create and use G&M code for machining. It specifically includes determine machine co-ordinate systems, create program using G&M code, set up machine and workpiece and perform 2D machining operation.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Determine machine co-ordinate systems	1.1. Reference position of a machining center is determined 1.2. **Work coordinates** are set
2. Create program using G & M code	2.1 Preparatory **G & M code** is created 2.2 Modal and non-modal codes are identified 2.3 **Absolute and Incremental** positioning code is created 2.4 Circular and linear interpolation are created 2.5 Cutter radius compensation is selected 2.6 Tools offset (G43) and work offset (G54) are set 2.7 Spindle commands and program stop commands are executed 2.8 **Canned cycles** are executed 2.9 **Bolt hole codes** are executed 2.10 **Pocket milling and contour milling** is programmed 2.11 **Sub-program** is executed
3. Set up machine and workpiece	3.1 Work holding mechanism is selected 3.2 Required cutting tools are selected and loaded 3.3 **Datum** is defined 3.4 Entry and exit points are selected
4. Perform 2D machining operation	4.1 Sequence of cutting operations is selected 4.2 **2D operations** are performed 4.3 Canned cycles structures are identified 4.4 Sub-program structures are identified 4.5 Pocket milling program structures are identified 4.6 Canned cycle tricks with subprogram are executed
Range of Variables	
Variables	**Range** (may include but not limited to):
1. Work co-ordinates	1.1 Machine co-ordinate 1.2 WCS / Work co-ordinate

	1.3 Machine reference
2. G & M code	2.1. Rapid 2.2. Absolute 2.3. Incremental 2.4. Linear interpolation 2.5. Circular interpolation 2.6. Tool change command 2.7. Spindle command 2.8. Tool radius compensation.
3. Absolute and Incremental	3.1. G90 3.2. G91
4. Canned cycle	4.1. Drilling Canned cycle 4.2. Spot drilling Canned cycle 4.3. Boring Canned cycle 4.4. Tapping Canned cycle 4.5. Reverse tapping Canned cycle
5. Bolt hole codes	5.1 G70 (Circle) 5.2 G71 (Curve) 5.3 G72 (Straight line)
6. Pocket milling and engraving codes	6.1 G12 (Clockwise) 6.2 G13 (Anticlockwise) 6.3 G47 (Engraving)
7. Subprogram	7.1 M97 (Internal) 7.2 M98 (External) 7.3 Looping
8. Datum	8.1 Origin point 8.2 Z zero point
9. 2D operation	9.1 Facing 9.2 Contour 9.3 Pocket 9.4 Drilling 9.5 Engraving
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. work offset & tool length are performed 1.2. appropriate cutting tools are selected 1.3. the workpiece is fastened securely on the machine table. 1.4. determined cutting speed, feed rate, and depth of cut 1.5. wrote basic CNC milling machine program

	1.6. edited basic CNC milling machine program 1.7. implemented basic file maintenance procedures
2. Underpinning knowledge	2.1 Job requirements 2.2 Drawing interpretation methods 2.3 The sequence of operation in producing component 2.4 The selection process of cutting tools 2.5 Calculation of cutting speed, feed rate, and depth of cut 2.6 CNC programming 2.7 Program simulation, editing, downloading, and saving procedure 2.8 Basic file maintenance procedures 2.9 CNC milling machine cleaning and maintenance procedures 2.10 Procedures for conducting data security.
3. Underpinning skills	3.1 Establishing job requirements 3.2 Interpreting drawings to produce component 3.3 Determining the sequence of operation 3.4 Selecting cutting tools 3.5 Calculating cutting speed, feed rate, and depth of cut 3.6 Simulating and editing program 3.7 Saving and downloading program 3.8 Writing CNC program 3.9 Determining the optimum sequence of operations 3.10 Conducting data security
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 Workplace (simulated or actual) 5.2 Personal protective equipment (PPE) 5.3 CNC machining center and accessories 5.4 Tools and equipment 5.5 Materials 5.6 Internet 5.7 Instructions, specifications, and drawings 5.8 Projector 5.9 Stationary 5.10 Learning manual
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration

	6.3 Oral Questioning
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

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Unit Code and Title	**OUCNCCDM04L4V1: Create Model Using CAD Software**
Nominal Hours	**60 Hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to create model using CAD software. It specifically includes prepare for application of CAD software and create CAD model.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for application of CAD software	1.1 **Workpiece orientation** of the 3D model is analysed to produce a CAD model 1.2 All general symbol, the standard of drawing is identified 1.3 **Tools and equipment** are selected and collected as per job requirements 1.4 Appropriate **CAD software** is installed as per the standard operating procedure 1.5 **System parameters** are selected according to the job requirement
2. Create CAD model	2.1 Drawing **interface** is set required for 2D drawing 2.2 **Drafting tools** are used for 2D drawing 2.3 Smart dimension is used 2.4 **Feature tool** is used 2.5 Parts are assembled using **assembly tools** 2.6 Created model is saved as per standard file format 2.7 Model is printed as required
Range of Variables	
Variables	**Range** (may include but not limited to):
1. Workpiece orientation	1.1. Top view 1.2. Front view 1.3. Oblique view 1.4. Isometric view 1.5. Sectional view
2. Tools and equipment	2.1 Measuring steel tape 2.2 Vernier caliper 2.3 Vernier height gauge 2.4 Inside vernier micrometer 2.5 Outside vernier micrometer 2.6 Radius gauge

	2.7 Filler gauge 2.8 Surface plate 2.9 Personal computer/laptop 2.10 Printer
3. CAD Software	3.1 Solidworks/CATIA/Fusion 360/Siemens NX
4. System parameter	4.1 Metric 4.2 English
5. Interface	5.1 Menus 5.2 Toolbars
6. Drafting tools	6.1 2D sketch 6.1.1 Points 6.1.2 Lines 6.1.3 Circle 6.1.4 Arcs 6.1.5 Rectangles 6.1.6 Splines 6.1.7 Ellipses 6.1.8 Polygons 6.1.9 Slots 6.1.10 Chamfer and fillet 6.2 Edit and modify 6.2.1 Trim 6.2.2 Extend 6.2.3 Mirror 6.2.4 Offset 6.2.5 Copy 6.2.6 Move 6.2.7 Delete 6.3 Relation 6.3.1 Parallel 6.3.2 horizontal 6.3.3 Vertical 6.3.4 Coincide 6.3.5 Colinear 6.3.6 Tangent 6.3.7 Fix 6.4 Modelling tools 6.5 Pattern tools
7. Feature tools	7.1 Extrude boss 7.2 Extrude Cut 7.3 Draft 7.4 Revolve boss and cut

	7.5 Lofted boss and cut 7.6 Swept boss and cut 7.7 Boundary boss and cut 7.8 Pattern 7.9 Linear pattern 7.10 Circular pattern 7.11 Shell and rib 7.12 Mirror 7.13 Hole wizard 7.14 Wrap
8. Assembly tools	8.1 Edit component 8.2 Insert component 8.3 Mate 8.4 Component preview window 8.5 Linear component pattern 8.6 Smart fastener 8.7 Move component
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. determined job requirements 1.2. created/imported CAD drawing 1.3. set CAD parameters 1.4. created and edited 2D Sketch 1.5. created 3D model 1.6. modify CAD model 1.7. assembled of 3D model 1.8. exported the drawing with the appropriate dimension
2. Underpinning knowledge	2.1. Common software packages 2.2. Computer hardware safety 2.3. Software maintenance and virus protection 2.4. Drawing interpretation: 2.4.1 Standard drawing scales, symbols, and abbreviations 2.4.2 Orthographic projection (1st and 3rd angle) 2.4.3 Perspective projection 2.4.4 Section view 2.4.5 Dimensioning 2.4.6 Measurements tolerances 2.4.7 Surface condition (surface finish/texture) 2.4.8 Limits and fits 2.4.9 Clearance

3. Underpinning skills	3.1 Performing measurement 3.2 Drafting and designing 3.3 Determining workpiece specifications 3.4 Using coordinate system 3.5 Performing geometry and calculation 3.6 Using measuring tools 3.7 Computer skill
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 Workplace (simulated or actual) 5.2 Computer/laptop/notebook 5.3 Software 5.4 Printer/plotter 5.5 Internet 5.6 Sample part/model 5.7 Measuring instruments 5.8 Job specifications, drawings, or work instructions 5.9 Projector 5.10 Stationary 5.11 Learning manual
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning **Note**: Assessment will cover only for one of the following Solidworks/CATIA/Fusion 360/Siemens NX as per demand of STP/Assessment centre.
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

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Unit Code and Title	**OUCNCCDM05L4V1: Apply CAM Software for Machining**
Nominal Hours	**50 Hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to apply CAM software machining. It specifically includes prepare for computer aided machining operation, identify the sequence of tool path and machining strategy, create 2D tool paths, and create 3D tool paths.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Prepare for computer-aided machining operation	1.1 **Computer-aided machining software** is installed and verify the system requirement 1.2 **Basic parameter** is set of the CAM software 1.3 **Menu functions** are identified 1.4 Appropriate tools and equipment are used to produce a drawing as per job requirements 1.5 CAD files are imported as required 1.6 CAD models are created as required
2. Identify the sequence of tool path and machining strategy	2.1. The workpiece is verified and required machines are identified 2.2. Appropriate tool path sequence is selected for a model-specific machining operation 2.3. Appropriate tool diameter and length is selected to avoid chattering 2.4. **Pre-machining** operation is selected if required 2.5. **Work holding & clamping** is prepared to avoid tool clash 2.6. Appropriate **cutting parameter** is selected
3. Create 2D tool paths	3.1 **Planes** are identified 3.2 Machine definition and post-processor is selected 3.3 Origin & stock setup is defined 3.4 **2D tool paths** are executed 3.5 **Tapping and thread milling** is executed 3.6 Tool paths are verified 3.7 G&M codes are generated
4. Create 3D tool paths	4.1 3D tool path is prepared 4.2 **level** as per matching strategy is set 4.3 **Surface** is created as per requirement 4.4 Silhouette command is executed 4.5 **Edge curve** command is executed 4.6 Drive surface, containment region, check surface is

	selected 4.7 **3D rough & finishing tool path** is executed 4.8 Stock model & rest milling is executed 4.9 3D tool path is verified 4.10 G&M code is generated
Range of Variables	
Variables	**Range** (may include but not limited to):
1. Computer-aided machining software	1.1 Mastercam/Solid CAM/Siemens NX/Fusion 360
2. Basic parameter	2.1 Inch 2.2 Metric 2.3 Decimal
3. Manu function	3.1 File 3.2 Edit 3.3 View 3.4 Analyze 3.5 Create 3.6 Solids 3.7 Transform 3.8 Machine type 3.9 Toolpaths 3.10 Setting 3.11 Wireframe 3.12 help
4. Pre-machining	4.1 Face milling 4.2 Side milling
5. Work holding & clamping	5.1 Vice 5.2 Chuck 5.3 Clamping kit set
6. Cutting parameter	6.1 Feed 6.2 RPM 6.3 Depth of cut 6.4 Plunge 6.5 Cutting speed
7. Planes	7.1 Construction plane 7.2 WCS plane 7.3 Tool plane
8. 2D tool paths	8.1 Facing 8.1.1 Cutting Style

	8.1.2 Tip compensation 8.1.3 Max. stepover 8.1.4 Across overlap 8.1.5 Along overlap 8.1.6 Approach distance 8.1.7 Exit distance 8.1.8 Climb 8.1.9 Conventional 8.2 Contour 8.3 Pocket 8.3.1 Machining direction 8.3.2 Pocket type 8.3.3 Tip compensation 8.3.4 Stock to leave 8.3.5 Lead-in/out 8.3.6 Cutting method 8.3.7 Entry motion 8.3.8 Finishing 8.4 Drilling 8.4.1 Point/Arc geometry 8.4.2 Cycle 8.4.3 Tip compensation 8.4.4 Spindle direction 8.4.5 Feed speed 8.5 Dynamic 8.5.1 Toolpath type 8.5.2 Cutting method 8.5.3 Max. stepover 8.5.4 Stock to leave 8.5.5 Lead-in/out 8.5.6 Machining region 8.5.7 Avoidance region 8.5.8 Air region 8.5.9 Containment boundary
9. Tapping and thread milling	9.1 Pitch 9.2 Thread angle 9.3 Thread depth 9.4 Major and minor diameter 9.5 Internal and external thread 9.6 Right- and left-hand thread
10. Level	10.1 Level number 10.2 Level on/off 10.3 Level increment

	10.4 Visibility 10.5 Entities
11. Surface	11.1 From solid 11.2 Flat boundary 11.3 Extend 11.4 Fill holes
14. Edge curve	12.1 Curve on one edge 12.2 Curve on all edges 12.3 Flowline curve 12.4 Curve slice
13. 3D rough & finishing tool path.	13.1 Pocket 13.2 Area rough 13.3 Opti rough 13.4 Contour 13.5 Scallop 13.6 Waterline 13.7 Horizontal 13.8 Raster 13.9 Hybrid
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 determined job requirements 1.2 identified cutting tools 1.3 determined cutting speed, feed rate, and depth of cut 1.4 performed face, pocket, contour, drill on a single workpiece 1.5 G & M code generated and transferred to the machine 1.6 executed the generated program on the machine
2. Underpinning Knowledge	2.1 Basic geometry 2.2 Basic drawing 2.3 Machine operating knowledge 2.4 G & M code knowledge 2.5 Tool selection knowledge
3. Underpinning skills	3.1 Machine operation on off 3.2 Machine reference & work offset 3.3 Work holding mechanism 3.4 Planning and sequencing of operations 3.5 Selecting cutting tools 3.6 Acknowledgment of CAM parameters 3.7 Using measuring instruments

	3.8 Calculating cutting speed, feed rate, and depth of cut 3.9 Simulating and editing program 3.10 Saving and downloading program 3.11 Writing CNC program 3.12 Determining the optimum sequence of operations 3.13 Conducting data security
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 Workplace (simulated or actual) 5.2 Personal protective equipment (PPE) 5.3 CNC milling machine and accessories 5.4 Tools and equipment 5.5 Materials 5.6 Software
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning **Note**: Assessment will cover only for one of the following Mastercam/Solid CAM/Siemens NX/Fusion 360 as per demand of STP/Assessment centre.
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 National Skills Development Authority (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 qualification under NSQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	**OUCNCCDM06L4V1: Perform Basic Multi-Axis Machining**
Nominal Hours	**40 Hours**
Unit Descriptor	This unit covers the skills, knowledge and attitudes required to perform basic multi-axis machining. It specifically includes set dynamic work offset and perform (3+2)/positional machining.
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables.
1. Set dynamic work offset	1.1 **5 axis** is identified in the machine 1.2 Machine rotary zero points (MRZP) are identified 1.3 Dynamic work offset is set
2. Perform (3+2)/positional Machining	2.1. **Stock model** is performed 2.2. **Collision control** is checked 2.3. G&M code is created for (3+2)/positional machining 2.4. **Required plane** is selected for (3+2)/positional machining in CAM software 2.5. Positional machining is executed using CAM software 2.6. Cutting in the machine is executed.
Range of Variables	
Variables	**Range** (may include but not limited to):
1. 5 axis	1.1 X 1.2 -axis 1.3 Y-axis 1.4 Z-axis 1.5 B axis 1.6 C axis
2. Stock model	2.1 Stock definition 2.2 Stock name 2.3 Stock color 2.4 Stock materials 2.5 Additional offset 2.6 Source operation 2.7 Stock compare
3. Collision control	3.1 Check flute, shoulder, shank, holder 3.2 Strategy and parameters 3.3 Check geometry 3.4 Clearances

	2.8 Misc.
4. Required plane	4.1 WCS plane 4.2 C plane 4.3 T plane 4.4 Top 4.5 Front 4.6 Right 4.7 Left 4.8 Back 4.9 Bottom 4.10 Customized
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 determined job requirements 1.2 identified cutting tools 1.3 determined cutting speed, feed rate, and depth of cut 1.4 performed 5 axis machining 1.5 G & M code generated and transferred to the machine 1.6 executed the generated program on the machine
2. Underpinning knowledge	2.1 Basic geometry 2.2 Define CAM 2.3 5 axis 2.4 Plane 2.5 Machine operating 2.6 G & M code 2.7 Tool selection 2.8 Collison control 2.9 Stock model
3. Underpinning skills	3.1 Machine operation on off 3.2 Machine reference & work offset 3.3 Work holding mechanism 3.4 Planning and sequencing of operations 3.5 Selecting cutting tools 3.6 Acknowledgment of CAM parameters 3.7 Using measuring instruments 3.8 Calculating cutting speed, feed rate, and depth of cut 3.9 Simulating and editing program 3.10 Saving and downloading program 3.11 Writing CNC program 3.12 Determining the optimum sequence of operations 3.13 Conducting data security

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 Workplace (simulated or actual) 5.2 Personal protective equipment (PPE) 5.3 CNC milling machine and accessories 5.4 Tools and equipment 5.5 Materials 5.6 Computer/laptop/notebook 5.7 Software 5.8 Internet 5.9 Instructions, specifications, and drawings 5.10 Projector 5.11 Stationary 5.12 Learning manual
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment center 7.2 Assessment should be done by a NSDA certified/nominated assessor

Accreditation Requirements

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Development of Competency Standard

The Competency Standards for National Skills Certificate in **CNC Machining Center Operation with CAD CAM,** Level-4 is developed by BITAC on 10 March, 2021.

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2.	MD Masud Rana, Executive Engineer, BITAC	Member
3.	Md.Mamunur Rashid, Assistant Engineer, BITAC	Member
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Validation of Competency Standard by Standard and Curriculum Validation Committee (SCVC)

The Competency Standards for National Skills Certificate in **CNC Machining Center Operation with CAD CAM,** Level- 4 is validated by SCVC on 28 March, 2022.

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This Competency Standard for **CNC machining center operation with CAD & CAM** is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of 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 specialist, trainer and related employee.

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