

BANGLADESH TECHNICAL EDUCATION BOARD



***Transport Equipment Sector
Industry Skills Council
Bangladesh***

NATIONAL COMPETENCY STANDARDS

for

MACHINE SHOP PRACTICE

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INTRODUCTION:

These Competency Standards were developed by the Technical Sub Committee (TSC) that was established under the Project for **Enhancing the Vocational Training Program of TTC, Chittagong** which is implemented by KOICA (Korea International Cooperation Agency) funded by the Government of Korea. The rules of Skill Development Policy are maintained to develop the standards. The competency standards are the foundation on which new competency based curriculum will be developed that responds better to the needs of industry for skilled workers. The members of the TSC are primarily from industry but with representatives from TTC Chittagong. Persons who will successfully complete the new TVET programs based on these competency standards will receive a qualification in the new National Technical and Vocational Qualification Framework (NTVQF).

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Endorsed by

Industry Skills Council

Date:

Bangladesh Technical Education Board (BTEB)

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National Competency Standards for Machine Shop Practice in the Transport Sector

Proposed Bangladesh NTVQF with Job Classifications

NTVQF Levels	Education Sectors			Job Classification
	Pre Vocation Education	Vocational Education	Technical Education	
NTVQF 6			Diploma in Engineering or Equivalent	Middle level Manager/ Sub Assistant Engineer etc.
NTVQF 5		National Skill Certificate 5 (NSC 5)		High Skilled Worker/Supervisor
NTVQF 4		National Skill Certificate 4 (NSC 4)		Skilled Worker
NTVQF 3		National Skill Certificate 3 (NSC 3)		Semi Skilled Worker
NTVQF 2		National Skill Certificate 2 (NSC 2)		Medium Skilled Worker
NTVQF 1		National Skill Certificate 1 (NSC 1)		Basic Skilled Worker
Pre-Voc 2	National Pre-Vocation Certificate in NPVC 2			Pre-Vocation Trainee
Pre-Voc 1	National Pre-Vocation Certificate in NPVC 1			Pre-Vocation Trainee

NTVQF level Descriptors

NTVQF level	Knowledge	Skill	Responsibility	Job Class
6	Comprehensive actual and theoretical knowledge within a specific study area with an awareness of the limits of that knowledge	Specialized and restricted range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems	Manage a team or teams in workplace activities where there is unpredictable change. Identify and design learning programs to develop performance of team members.	Supervisor/Middle Level Manager /Sub Assistant Engr. Etc.
5	Very broad knowledge of the underlying. Concepts, principles, and processes in a specific study area	Very broad range of cognitive and practical skills required to generate solutions to specific problems in one or more study areas.	Take overall responsibility for completion of tasks in work or study. Apply past experiences in solving similar problems	Highly Skilled Worker/ Supervisor.
4	Very broad knowledge of the underlying. Concepts, principles, and processes in a specific study area	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.	Take responsibility, within reason, for completion of tasks in work or study. Apply past experiences in solving similar problems	Skilled Worker
3	Moderately broad knowledge in a specific study area.	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.	Work or study under supervision with some autonomy	Semi- Skilled Worker.
2	Basic underpinning knowledge in a specific study area	Basic skills required to carry out simple tasks	Work or study under indirect supervision in a structured context.	Medium Skilled Worker
1	Elementary understanding of the underpinning knowledge in a specific study area	Limited range of skills required to carry out simple tasks	Work or study under direct supervision in a structured context	Basic Skilled Worker
Pre-Voc 2	Limited general knowledge	Very limited range of skills and use of tools required to carry out simple tasks	Work or study under direct supervision in a structured context	Pre-Vocation Trainee
Pre-Voc 1	Extremely limited general knowledge	Minimal range of skills required to carry out simple tasks	Simple work or study exercises, under direct supervision in a clear, well defined structured context	Pre-Vocation Trainee

National Competency Standards for Machine shop Practice
in the **TRANSPORT EQUIPMENT** Sector

Sl. No.	Unit Code & Title		NTVQF Level	Nominal Hours
Generic - Compulsory (5 UoCs required)				200
1	GN1001A1	Use basic mathematical concepts	1	40
2	GN 1002A1	Apply OSH practices in the workplace	1	30
3	GN2003A1	Use English in the workplace	2	70
4	GN2004A1	Operate in a self-directed team	2	30
5	GN2005A1	Present and apply workplace information	2	30
Sector Specific - Compulsory (5 UoCs required)				150
6	TRASS1006A1	Interpret Technical Drawing	1	40
7	TRASS1007A1	Work in the manufacturing industry (include OSH)	1	20
8	TRASS1008A1	Use hand and power tools	1	40
9	TRASS1009A1	Use Graduated Measuring instruments	1	20
10	TRASS3010A1	Apply quality systems and procedures	3	30
Occupation Specific - Compulsory (15 UoCs required)				670
11	TRAMACH1011A1	Perform bench work	1	40
12	TRAMACH1012A1	Grind cutting tool	1	40
13	TRAMACH1013A1	Perform Lathe Operation (Basic)	1	60
14	TRAMACH1014A1	Perform shaping Operation (Basic)	1	30
15	TRAMACH1015A1	Perform Milling Operation (Basic)	1	60
16	TRAMACH2016A1	Perform Lathe Operation	2	50
17	TRAMACH2017A1	Grind Work piece	2	30
18	TRAMACH2018A1	Perform Boring & Honing Operations	2	30
19	TRAMACH2019A1	Perform Slotting Operation	2	30
20	TRAMACH2020A1	Perform Milling Operation	2	50
21	TRAMACH3021A1	Perform Basic Computer Operation	3	30
22	TRAMACH3022A1	Create drawing using CAD software	3	50
23	TRAMACH3023A1	Write basic CNC Lathe Program	3	30
24	TRAMACH3024A1	Perform CNC Lathe Machine operations	3	70
25	TRAMACH3025A1	Apply CAD CAM Program	3	70
Total Nominal Hours				1020

**Course Structure
for
National Certificate in Machine Shop Practice (NTVQF Level 1)**

Sl. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Generic (2 UoCs required)				70
1.	GN1001A1	Use basic mathematical concepts	1	40
2.	GN1002A1	Apply OSH practices in the workplace	1	30
Sector Specific (4 UoCs required)				120
3.	TRASS1006A1	Interpret technical drawing	1	40
4.	TRASS1007A1	Work in the manufacturing Industry (Include OHS)	1	20
5.	TRASS1008A1	Use hand tools and power tools	1	40
6.	TRASS1009A1	Use graduated measuring instruments	1	20
Occupation Specific - Compulsory (5 UoCs required)				230
7.	TRAMACH1011A1	Perform bench work	1	40
9.	TRAMACH1012A1	Grind cutting tool	1	40
10.	TRAMACH1013A1	Perform Lathe operation (Basic)	1	60
11	TRAMACH1014A1	Perform shaping operation (Basic)	1	30
12	TRAMACH1015A1	Perform Milling operation (Basic)	1	60
Total Nominal Learning Hours				420

GENERIC UNITS

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	GN1001A1 - Use Basic Mathematical Concept
NOMINAL HOURS	40
UNIT DESCRIPTOR	This requires the knowledge and skill to apply mathematical methods such as addition, subtraction, multiplication, division etc., in routine task of an organization.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the range of variables 1.1
1. Identify Calculation requirements in the workplace	Calculation requirements are identified from workplace information
2. Select appropriate mathematical methods for the calculation	2.1 Appropriate method is selected to carry out the calculation.
3. Use basic mathematical concepts to calculate workplace calculation.	3.1 Calculations are completed using appropriate method such as addition, subtraction, multiplication and division
Range of Variables	
Variable	Range (May include but not limited to):
1. Equipment and Tools	<input type="checkbox"/> Calculator <input type="checkbox"/> Computer with office software
2. Calculations	addition, subtraction, division, multiplication, ratio on any types of real values, such as whole number, fractional number, percentage, number with exponents
3. Application	<input type="checkbox"/> Measurement <input type="checkbox"/> Volume <input type="checkbox"/> Weight <input type="checkbox"/> Mass <input type="checkbox"/> Density <input type="checkbox"/> Percentage <input type="checkbox"/> Length / Breadth / Thickness <input type="checkbox"/> Capacity <input type="checkbox"/> Time <input type="checkbox"/> Temperature <input type="checkbox"/> Budget, Pay/ Wages, Leave entitlements <input type="checkbox"/> Material usage <input type="checkbox"/> Speed <input type="checkbox"/> Costing

4. Workplace Information	Project documents, graph, chart, tables, spread sheet, item price quotation, equipment manual
5. Budget	Budget of consumables, calculation for software components, hardware equipment's, maintenance budget of a set-up, cost estimation etc
6. Methods	Methods are basic mathematical function such as addition, subtraction, multiplication and division but not limited to these.

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Added and subtracted different types of numbers <input type="checkbox"/> Multiplied and divided different types of numbers <input type="checkbox"/> Used Calculator <input type="checkbox"/> Applied mathematical concept on: <ul style="list-style-type: none"> ➤ Volume ➤ Weight ➤ Mass ➤ Density ➤ Percentage ➤ Length / Breadth / Thickness ➤ Capacity ➤ Time ➤ Temperature ➤ Budget, Pay/ Wages, Leave entitlements ➤ Material usage ➤ Speed ➤ Costing
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 Calculation requirements in the workplace 2.2 Select appropriate mathematical methods 2.3 Equipment and Tools 2.4 Mathematical language, symbols and terminology 2.5 Application and units 2.6 Workplace information 2.7 Using arithmetic processes to find solutions to simple mathematical problems 2.8 Interaction skills (i.e., teamwork, mentoring, leadership, networking, interpersonal skills, etc.) 2.9 Job roles, responsibilities and compliances
3. Underpinning Skills	<ul style="list-style-type: none"> 3.1 Ability to calculation requirements are identified from workplace information. 3.2 Ability to select appropriate mathematical methods such as: basic mathematical concepts include (addition, subtraction, multiplication and division) etc. 3.3 Ability to use technology such as: scientific calculators, spreadsheets and/or graphics calculators etc.

	<p>3.4 Ability to use mathematical language, symbols and terminology</p> <p>3.5 Using different types of units such as (Mass- kg, length-meter etc) and application may include but limited to (Measurement, Volume, weight, density, percentage etc)</p> <p>3.6 Ability to include workplace information (project documents, graph, chart, tables, spread sheet, item price quotation, equipment manual)</p> <p>3.7 Ability to use arithmetic processes to find solutions to simple mathematical problems</p> <p>3.8 Work effectively with others</p> <ul style="list-style-type: none"> - Provide leadership in a variety of situations. - Deal with individual and/or group conflict <p>3.9 Ability to apply in the workplace.</p>
1. Required Attitude	<p>4.1 Commitment to occupational health and safety</p> <p>4.2 Environmental concerns</p> <p>4.3 Eagerness to learn</p> <p>4.4 Tidiness and timeliness</p> <p>4.5 Respect of peers and seniors in workplace</p>
2. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place</p> <p>5.2 Materials relevant to the proposed activity</p> <p>5.3 All tools, equipment, material and documentation required.</p> <p>5.4 Relevant specifications or work instructions</p>
6 .Methods of Assessment	<p>Competency must be assessed through:</p> <p>6.1 Oral Questioning</p> <p>6.2 Assignment</p> <p>6.3 Demonstration</p> <p>6.4 Written Exam.</p>
7 Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

UNIT CODE AND TITLE	GN1002A1 - Apply OSH practices in the workplace
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers the skills and knowledge required to identify and apply OSH in the workplace.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the range of variables
1. Identify, control and report OSH hazards	<p>1.1 Immediate work area is routinely checked for OSH hazards prior to commencing and during work.</p> <p>1.2 Hazards and unacceptable performance are identified and corrective action is taken within the level of responsibility.</p> <p>1.3 OSH hazards and incidents are reported to appropriate personnel according to workplace procedures.</p> <p>1.4 Safety Signs and symbols are identified and followed.</p>
2. Conduct work safety	<p>2.1 Apply OSH practices in the workplace.</p> <p>2.2 Appropriate personal protective equipment (PPE) is selected and worn.</p>
3. Follow emergency response procedures	<p>3.1 Emergency situations are identified and reported according to workplace reporting requirements.</p> <p>3.2 Emergency procedures are followed as appropriate to the nature of the emergency and according to workplace procedures.</p> <p>3.3 Workplace procedures for dealing with accidents, fires and emergencies are followed whenever necessary within scope of responsibilities.</p>
4. Maintain and improve health and safety in the work place	<p>4.1 Risks are identified and appropriate control measures are implemented in the work area.</p> <p>4.2 Recommendations arising from risk assessments are implemented within level of responsibility.</p> <p>4.3 Opportunities for improving OSH performance are identified and raised with relevant personnel.</p> <p>4.4 Maintain safety records according to company policies.</p>

Range of Variables	
Variable	Range (May include but not limited to):
1. Work is carried out in accordance with company procedures, regulatory and licensing requirements.	<input type="checkbox"/> Legislative requirements and industrial awards and agreements. Legislative requirements of occupational health and safety Acts and regulations, including regulations and codes of practice relating to hazards present in the workplace. They also include general duty of care under occupational health and safety legislation and common law
2. Company procedures	<input type="checkbox"/> 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
3. Workplace information	<input type="checkbox"/> OSH system and related documentation including policies and procedures, Standard Operating Procedures (SOPs), information on hazards and the work process, hazard alerts, safety signs and symbols, labels, Material Safety Data Sheets (MSDSs) and manufacturers' advice.
4. Hazards	<input type="checkbox"/> OSH incidents include near misses, injuries, illnesses and property damage, noise, handling hazardous substances, other hazards <input type="checkbox"/> Working with and near moving equipment/load shifting equipment <input type="checkbox"/> Broken or damaged equipment or materials
5. Personal Protective equipment	<input type="checkbox"/> Goggles, ear muffs, ear plugs, Gloves, Clothing, Apron, Helmet, Boots
6. Equipment	<input type="checkbox"/> Production machinery <input type="checkbox"/> Safety equipment <input type="checkbox"/> Emergency equipment <input type="checkbox"/> Tools of the trade

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Worn Personal Protective Equipment 1.2 Identified hazards 1.3 Took corrective action of different hazards 1.4 Took corrective action for emergency procedure 1.5 Reported Emergency situation to the supervisor/Manger 1.6 Satisfied the requirements mentioned in the Performance Criteria and Range of Variables
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 OHS Workplace Policies and Procedures 2.2 Work Safety Procedures 2.3 Emergency Procedures

	<ul style="list-style-type: none"> 2.4 Types of Hazards (Biological, Chemical and Physical) and Their Effects 2.5 PPE types and uses 2.6 Personal Hygiene Practices 2.7 OHS Awareness 2.8 Steps of Hazard Identification 2.9 Principles of Hazards control 2.10 Employer's Role 2.11 Supervisor's Responsibilities 2.12 Maintain Hazards inspection checklist
3. Underpinning Skills	<ul style="list-style-type: none"> 3.1 Identifying OHS policies and procedures 3.2 Following personal work safety practices 3.3 Reporting hazards and risks 3.4 Responding to emergency procedures 3.5 Maintaining physical well-being in the workplace 3.6 Identifying hazards 3.7 Assessing associated risks 3.8 Identify tools and equipment related to OSH. 3.9 Use the appropriate PPE. 3.10 Controlling hazard 3.11 Emergency situation 3.12 Fire and emergency procedures 3.13 Improving OSH performance.
4. Required Attitude	<ul style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 5.1 Work place 5.2 Tools and equipment appropriate to the work place 5.3 Materials relevant to the proposed activity 5.4 All tools, equipment, material and documentation required. 5.5 Relevant specifications or work instructions.
6 .Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 6.1 Oral Questioning 6.2 Assignment 6.3 Demonstration 6.4 Written Exam.
7 Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

Accreditation Requirements

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**National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency**

UNIT CODE AND TITLE	GN2003A1: Use English in the workplace
NOMINAL HOURS	70
UNIT DESCRIPTOR	This unit specifies the competency required to able to read, write and understand basic English in the workplace.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the range of variables
1. Read and understand workplace documents in English	1.1 Workplace a documents are read and understood. 1.2 Visual information is interpreted.
2. Write simple routine workplace documents in English	2.1 Simple <i>routine workplace</i> documents are prepared using key words, phrases, simple sentences and <i>visual aids</i> where appropriate. 2.2 Key information is written in the appropriate places in standard forms.
3. Listen to conversation in English	3.1 Active listening in English language is demonstrated to the required workplace standard.
4. Perform conversation in English	4.1 Conversation is performed in English with peers, customers and management to the required workplace standard
Range of Variables	
Variable	Range (May include but not limited to):
1. Routine and non-routine workplace documents required to be read and understood	<input type="checkbox"/> Schedules and itineraries <input type="checkbox"/> Agenda <input type="checkbox"/> Simple reports such as progress and incident reports <input type="checkbox"/> Job sheets <input type="checkbox"/> Operational manuals <input type="checkbox"/> Brochures and promotional material <input type="checkbox"/> Visual and graphic materials <input type="checkbox"/> Standards <input type="checkbox"/> OSH information
2. Visual information	<input type="checkbox"/> Signs <input type="checkbox"/> maps <input type="checkbox"/> diagrams <input type="checkbox"/> forms <input type="checkbox"/> labels <input type="checkbox"/> graphs <input type="checkbox"/> charts
EVIDENCE GUIDE	

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Spoke English with workplace fellows</p> <p>1.2 Made reports of workplace documents in English .</p>
2. Underpinning Knowledge	<p>2.1 Read workplace documents in English</p> <p>2.2 Write simple routine workplace documents in English</p> <p>2.3 Listen to conversation in English</p> <p>2.4 Perform conversation in English</p> <p>2.5 Interaction skills (i.e., teamwork, interpersonal skills, etc.)</p> <p>2.6 Job roles, responsibilities and compliances</p>
3. Underpinning Skills	<p>3.1 Ability to read and understand workplace documents in English by using appropriate vocabulary and grammar, standard spelling and punctuation.</p> <p>3.2 Ability to write simple routine workplace documents in English such as: Schedules and agenda, job sheets, operational manuals and brochures and promotional material.</p> <p>3.3 Ability in active listening in English language is demonstrated to the required workplace standard.</p> <p>3.4 Ability to perform conversation in English with peers, customers and management to the required workplace standard.</p> <p>3.5 Work effectively with others.</p> <p style="padding-left: 20px;">a. listening and questioning skills</p> <p style="padding-left: 20px;">b. ability to follow simple directions</p>
4. Required Attitude	<p>4.1 Commitment to occupational health and safety</p> <p>4.2 Environmental concerns</p> <p>4.3 Eagerness to learn</p> <p>4.4 Tidiness and timeliness</p> <p>4.5 Respect of peers and seniors in workplace</p>
5. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place Procedure</p> <p>5.2 Materials relevant to the proposed activity</p> <p>5.3 All tools, equipment, material and documentation required.</p> <p>5.4 Relevant specifications or work instructions</p>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <p>6.1 Oral Questioning</p> <p>6.2 Assignment</p> <p>6.3 Demonstration</p> <p>6.4 Written Exam.</p>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	GN2004A1 - Operate in a self-directed team
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit specifies the skills, knowledge and attitude to communicate and work with in a team in an interactive work environment as per the workplace standard.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the range of variables
1. Identify team goals and processes	1.1 Team goals and processes are identified. 1.2 Roles and responsibilities of team members are identified 1.3 Relationships within team and with other work areas identified
2. Communicate and cooperate with team members	2.1 Effective interpersonal skills are used to interact with team members and to contribute to activities and objectives. 2.2 Formal and informal forms of communication are used effectively to support team achievement. 2.3 Diversity is respected and valued in team functioning. 2.4 Views and opinions of other team members are understood and reflected accurately. 2.5 Workplace terminology is used correctly to assist communication.
3. Work as a team member	3.1 Duties, responsibilities, authorities, objectives and task requirements are identified and clarified with team 3.2 Tasks are performed in accordance with organizational and team requirements, specifications and workplace procedures. 3.3 Team members support other members as required to ensure team achieves goals and requirements. 3.4 Agreed reporting lines are followed using standard operating procedure
4. Solve problems as a team member	4.1 Current and potential problems faced by team are identified. 4.2 Procedures for avoiding and managing problems are identified. 4.3 Problems are solved effectively and in a manner which supports the team

Range of Variables	
Variable	Range (May include but not limited to):
1. Team problem-solving activities including:	<input type="checkbox"/> Identifying the problem <input type="checkbox"/> Consider solutions <input type="checkbox"/> Action <input type="checkbox"/> Follow-up.
2. Collaborative decision-making processes:	<input type="checkbox"/> Consultation <input type="checkbox"/> Conciliation <input type="checkbox"/> Negotiation <input type="checkbox"/> Principles of equity and fairness.
3. An awareness of:	<input type="checkbox"/> Organization/company's code of conduct, complaints handling/grievance policies and procedures
EVIDENCE GUIDE	
1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Work effectively within a team 1.2 Dealt with a range of communication/information at one time 1.3 Made constructive contributions in workplace issues 1.4 Sought workplace issues effectively 1.5 Responded to workplace issues promptly 1.6 Presented information clearly and effectively in written form 1.7 Used appropriate sources of information 1.8 Asked appropriate questions 1.9 Provided accurate information</p>
2. Underpinning knowledge	<p>2.1 Organization requirements for written and electronic communication methods 2.2 Effective verbal communication methods</p>
3. Underpinning Skills	<p>3.1 Organize information 3.2 Understand and convey intended meaning 3.3 Participate in variety of workplace discussions 3.4 Comply with organization requirements for the use of written and electronic communication methods</p>
4. Required Attitude	<p>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</p>
5. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place 5.2 Materials relevant to the proposed activity 5.3 All tools, equipment, material and documentation required.. 5.4 Relevant specifications or work instructions</p>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <p>6.1 Oral Questioning 6.2 Assignment 6.3 Demonstration 6.4 Written Exam.</p>

7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	GN2005A1 - Present and apply workplace information
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers the skills, knowledge and attitude to communicate and deliver up-to-date information to all in an interactive work environment as per workplace standard.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA
	<i>Italicized</i> terms are elaborated in the range of variables
1. Identify information requirements	1.1 Information requirements in the workplace are identified
2. Process Data	2.1 Data is collected and correlated as per prescribed method. 2.2 Relevant data is used as references in accordance with the objectives of the program. 2.3 Information is applied according to the requirements.
3. Analysis, interpret and organize information	3.1 Collected information is analyzed , interpret and organize as required for workplace.
4. Apply and present workplace information	4.1 Findings and recommendations are summarized and presented in a user-friendly manner. 4.2 Draft report/forms are prepared based on standard format. 4.3 Graphs and other visual presentations are prepared to highlight analysis/interpretation of information. 4.4 Reports/forms are submitted and distributed to relevant departments/wings/persons
Range of Variables	
Variable	Range (May include but not limited to):
1. Source of information	Source of information Daily job instructions, specifications, standard operating procedures, charts, lists, documents, computer data, drawings, sketches, tables, technical manuals and/or charts, Surveys, Interviews, Front-end analysis, Functional analysis
2. Forms	Forms may include but not limited to: Questionnaires, Profile, Accident/incident report form, work order, purchase order
3. Methodologies	Qualitative, Quantitative
4. Statistical analysis	Average(mean, median, mode), percentage, frequency distribution

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Collected up-to-date information 1.2 Analysed collected information 1.3 Submitted report to relevant department</p>
2. Underpinning Knowledge	<p>2.1 Identify information 2.2 Identify data 2.3 Workplace standard</p>
3. Underpinning Skills	<p>3.1 Information collect 3.2 Data collect 3.3 Demonstrate / interpreting and following data sheet, instruction 3.4 Perform the task 3.5 Keeping record and report</p>
4. Required Attitude	<p>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 of peers and seniors in workplace</p>
5. Resource Implications	<p>The following resources must be provided:</p> <p>5.1 Work place 5.2 Materials relevant to the proposed activity 5.3 All tools, equipment, material and documentation required.. 5.4 Relevant specifications or work instructions</p>
6. Methods of Assessment	<p>Competency must be assessed through:</p> <p>6.1 Oral Questioning 6.2 Assignment 6.3 Demonstration 6.4 Written Exam.</p>
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

SECTOR SPECIFIC UNITS

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	TRASS1006A1 -Interpret technical drawing
NOMINAL HOURS	40
UNIT DESCRIPTOR	This unit covers the skills and knowledge required to interpret technical drawing.
ELEMENTS	PERFORMANCE CRITERIA
	<i>Bold & Italic</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed.
2. Select technical drawing	2.1 <i>Drawing</i> is selected and checked to ensure that it conforms to the job requirements. 2.2 Drawing is validated.
3. Interpret technical drawing	3.1 Drawing components, assemblies are identified. 3.2 Dimensions are identified according to job requirement 3.3 Clearances/tolerances are checked work place standard. 3.4 <i>Instructions</i> are identified and followed accurately. 3.5 Material specification are identified. 3.6 Symbols in drawing are interpreted.
Range of Variables	
Variable	Range (May include but not limited to):
1. Drawing	Technical drawing, sketch
2. Instructions	Note, Instruction, special instruction, precaution

EVIDENCE GUIDE	
1. Critical aspects of competency	Assessment requires 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.
2. Underpinning Knowledge	2.1 OSH 2.2 Workplace standard 2.3 Sequence of drawing 2.4 Methods of checking
3. Underpinning Skills	3.1 Practicing workplace safety 3.2 Reading / interpreting information on the drawing, following data sheet, instruction and manuals, technical drawing

	3.3 Performing measurement, calculation 3.4 Interpreting drawing 3.5 Perform checking 3.6 Keeping record
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 of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Work place Procedure 5.2 Materials relevant to the proposed activity 5.3 All tools, equipment, material and documentation required.. 5.4 Relevant specifications or work instructions
6 .Methods of Assessment	Competency must be assessed through: 6.1 Observation 6.2 Demonstration 6.3 Oral Questioning/interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	TRASS1007A1-Work in the manufacturing Industry (Include OSH)
NOMINAL HOUR	20
UNIT DESCRIPTOR	This unit specifies the knowledge and skills required to identify roles and responsibilities and work in the manufacturing industry.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the range of variables
1. Identify job roles and responsibilities in the manufacturing industry	1.1 Job roles and responsibilities in the manufacturing industry are identified. 1.2 Relationship within the manufacturing industry employees are identified.
2. Identify and observe OSH in the manufacturing industry.	2.1 OSH in the manufacturing industry is identify and observed. 2.2 Safe work practices are followed when using equipment in the work environment.
3. Plan work activities	3.1 Common goals, objectives and tasks are identified and clarified with appropriate persons. 3.2 Individual tasks are determined and agreed on according to workplace environment.
4. Work with others	4.1 Effective interpersonal skills are applied to interact with others and to contribute to activities and objectives. 4.2 Assigned tasks are performed in accordance with job requirements, specifications and workplace environment. 4.3 Work requirements are confirmed with colleagues.

Range of variables

Variables	Range (May include but not limited to):
1. OSH(Occupation safety and Health)	Personal protective equipment (PPE) Helmet, Eye shield, gloves, goggles, safety shoes, full sleeve apron, first aid kits
2. Hazards	Mechanical hazards, electrical hazards, fire hazard and other work place hazards etc
3. Effective interpersonal skills	Basic listening and speaking skills, use terminology and jargon, communicating and receiving feedback, interpretation of instructions, basic principles of effective communication.
4. Requirements	Requirements as directed in verbal modes or written in specification or procedures.

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Followed job role accordance with industries requirement. 1.2 Developed relationship with industries fellow 1.3 Identified different types of Hazards 1.4 Used PPE 1.5 Applied effective interpersonal skills to achieve the goals of industry.
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 Key duties/responsibilities of Manufacturing technician 2.2 Responsibilities of Supervisors 2.3 Responsibilities of Employers 2.4 Responsibilities of Workers 2.5 Common Hazards 2.6 Ways to reduce the risk 2.7 Common goals of the manufacturing Industry
3. Underpinning Skills	<ul style="list-style-type: none"> 3.1 Improve Employee Employer Relationships 3.2 Create a Positive Relationship with Employees 3.3 Observe OHS in manufacturing industry 3.4 Identifying OHS policies and procedures 3.5 Following personal work safety practices 3.6 Reporting hazards and risks 3.7 Responding to emergency procedures 3.8 Maintaining physical well-being in the workplace
4. Required Attitude	<ul style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 5.1 Workplace 5.2 Tools and equipment appropriate to workplace 5.3 Materials relevant to the proposed activity 5.4 Equipment and outfits appropriate in applying safety measures 5.5 OHS Policies and Procedures
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 6.1 Written Exam. 6.2 Demonstration 6.3 Oral Questioning/interview
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

UNIT CODE AND TITLE	TRASS1008A1- Use Hand & Power Tools
NOMINAL HOURS	40
UNIT DESCRIPTOR	This unit covers using a range of manual tools, hand held power tools and fixed power tools for hand held operations for a variety of general engineering applications.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the range of variables 1.1
1. Use Manual tools	<i>Manual tools</i> hammer, different type of wrenches, files, chisel, vices etc. are identified and use as per the work procedure
2. Use power tools	<p>2.1 <i>Power tools</i> are identified and selected conforming to the task requirements.</p> <p>2.2 Power tools are used for a specific sequence of operations which may include <i>clamping</i>, alignment and adjustment to Produce desired outcomes conforming to <i>job specifications</i></p> <p>2.3 All safety requirements are complied before, during and after use.</p> <p>2.4 Unsafe or faulty tools are identified and marked for repair /reject before , during and after use according to current procedures.</p> <p>2.5 <i>Operational maintenance</i> of tools, including hand sharpening, is undertaken according to standard procedures.</p> <p>2.6 Power tools are stored safely in appropriate location according to standard workshop procedures and manufacturers' recommendations.</p>

Range of Variables

Variable	Range (May include but not limited to):
1. PPE	<ul style="list-style-type: none"> ▪ Safety Shoes ▪ Goggles ▪ Hand Gloves ▪ Apron
2. Manual Tools	Hammer, different type of wrenches, files, chisel, hacksaw etc. Electric
3. Power tools	or pneumatic/hydraulic drills, grinders, nibblers, cutting saws, pedestal drills and pedestal grinders.
4. Clamping	Multi grips, vices, jigs and fixtures, clamps etc.
5. Job specifications	Finish size or shape etc.
6. Operational maintenance	Hand sharpening, cleaning, lubricating, tightening. Simple tools repairs and adjustments using engineering principles, tools, equipment and procedures to statutory and regulatory requirements.

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Followed proper using procedure of manual tools such as hammer, file, wrenches, pliers, screwdrivers, etc. 1.2 Used hand tools as per workplace requirement 1.3 Maintained safety precaution for using hand & power tools. 1.4 Maintained operation procedure of power tools. 1.5 Used power tools as per workplace requirement
2. Underpinning Knowledge	<ol style="list-style-type: none"> 2.1 Classification of tool 2.2 Safely use Hand tool & Power tools 2.3 Types of Hand & Power tools 2.4 Working Principles of Hands & Power tools: <ul style="list-style-type: none"> ➤ Hammers ➤ Punches ➤ Chisels ➤ Wrenches ➤ Pliers ➤ Hand drill ➤ Disc grinder ➤ Pedestal drill ➤ Powered screw driver 2.5 Preventive Maintenance 2.6 Methods and Techniques 2.7 Storage Procedures
3. Underpinning Skills	<ol style="list-style-type: none"> 3.1 Identifying Appropriate Tools 3.2 Using hand & Power tools safely 3.3 Performing Preventive Maintenance 3.4 Practicing OHS 3.5 Storing tools and equipment
4. Required Attitude	<ol style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource Implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> 5.1 Workplace 5.2 Tools and equipment appropriate to maintain workplace 5.3 Materials relevant to the proposed activity 5.4 Relevant drawings, manuals, codes, standards and reference material
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written Exam. 6.2 Demonstration 6.3 Oral Questioning/interview
7. Context for Assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	TRASS1009A1 - Use Graduated Measuring Instrument
NOMINAL HOURS	20
UNIT DESCRIPTOR	This unit specifies the competency required to use graduated measuring instruments and associated minor calculations
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the range of variables 1.
1. Follow OSH practices	1 Safe work practices observed and personal proactive equipment (PPE) worn as required for the work performed.
2. Select the job to be measured	2.1 Selected job is identified.
3. Select measuring device	3.1 Measuring equipment is selected according to job requirements. 3.2 Tolerance and/or clearance limit are identified according to job requirements.
4. Take measurement	4.1 <i>Measurement</i> is taken accurately 4.2 Measurement is checked against job requirement.
5. Measurements are recorded and communicated	5.1 Measurements are recoded on form/drawing/sketches. 5.2 Recorded measurements are interpreted and communicated to authority.
6. Clean and store measuring instruments.	6.1 Measuring instruments are cleaned and stored safe place as per instruction manuals

Range of Variables

Variable	Range (May include but not limited to):
1. Documents may include	Drawings, sketches, technical manuals, specifications, written instructions
2. Basic calculations	Addition, Subtraction, multiplication, division, fractions and decimals. Calculations may be done using calculator.
3. Routine adjustments	Calibration, simple zeroing, scale adjustment
4. Measurements	Measuring length, angle, diameter, clearances
5. Job samples may include	Machined parts, prepared work piece, work sample etc

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Followed OSH Practices 1.2 Identified the proper graduated measuring instrument. 1.3 Taken Measurement accurately 1.4 Record measurement . 1.5 Interpreted Written Inspection.
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 Relevant OSH 2.2 Principles of using different graduated measuring Instruments 2.3 Workplace standard 2.4 Sequence of using the instruments 2.5 Maintaining rules of instruments
3. Underpinning Skills	<ul style="list-style-type: none"> 3.1 Practice workplace safety 3.2 Use PPE 3.3 Use of instruments 3.4 Demonstrate / interpreting and following data sheet, instruction and manuals, technical drawing 3.5 Performing measurement 3.6 Checking for conformance to specification 3.7 Keeping record and report
4. Required Attitude	<ul style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 5.1 Workplace 5.2 Materials relevant to the proposed activity 5.3 Measuring instruments . 5.4 Relevant drawings, manuals, codes, standards and reference material
6. Methods of Assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 6.1 Written Exam. 6.2 Demonstration 6.3 Oral Questioning/interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency - Transport

UNIT CODE AND TITLE	TRASS2010A1 - Apply quality systems and procedures
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers the knowledge, skills and attitude required for working within quality improvement systems and applying established quality procedures to his own work within a manufacturing environment.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA
	<i>Bold & Italic</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Safe work practices observed and personal protective Equipment (PPE) worn as required for the work performed.
2. Work within a quality system	2.1 Instructions and procedures are followed strictly and duties are performed in accordance with demand of <i>quality system</i> . 2.2 Conformance to specifications is ensured. 2.3 Defects are detected and reported to authority according to standard operating procedures. 2.4 Customer's satisfaction is ensured in performing an operation or quality of product or services.
3. Apply and monitor a quality system improvement	3.1 Performance measurement systems are identified. 3.2 Performance is assessed at regular interval. 3.3 Specifications and standard operating procedures are established and identified. 3.4 Defects are detected and reported according to standard operating procedures. 3.5 Process improvement procedures are participated in. 3.6 The improvement of internal / external customer / supplier relationships is participated in. 3.7 Performance of operation or quality of product or service is monitored to ensure customer satisfaction.
4. Take responsibility for his/her own quality	4.1 Concept of supplying product or service to meet the <i>customer's requirements</i> is understood and accordingly applied. 4.2 Responsibility is taken for quality of own work.
5. Apply standard procedures for each job	5.1 <i>Quality</i> system procedures for each job are followed. 5.2 Conformance to specification is ensured in every case at all situations.

Range of Variables

Variable	Range (May include but not limited to):
1. Quality improvement system	A system comprising some or all of the following elements: <ul style="list-style-type: none"> <input type="checkbox"/> Quality inspection <input type="checkbox"/> Quality control <input type="checkbox"/> Quality improvement <input type="checkbox"/> Total quality control <input type="checkbox"/> Quality assurance
2. Customer	Person or organization receiving the product or service
3. Quality	Consistently meeting customer's requirements.

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Used personal protective equipment. 1.2 Maintained proper specification and standard of product. 1.3 Checked product for quality assurance as per drawing & specification. 1.4 Detected defects and take corrective and/or quality improvement actions. 1.5 Ensured customer satisfaction.
2. Underpinning Knowledge	<ul style="list-style-type: none"> 2.1 The reasons why good quality should be maintained and poor quality should be eliminated 2.2 Meaning of the key terms - quality, quality assurance, quality control, quality inspection, quality improvement and total quality control 2.3 Process and procedures for improving and maintaining quality - Defects and procedures for addressing defects 2.4 Record keeping within the quality improvement system in workplace 2.5 Factors, which affect the successful implementation of the quality systems and procedures
3. Underpinning Skills	<ul style="list-style-type: none"> 3.1 Identifying the role of self and others within the quality improvement system 3.2 Following instructions, job sheets, and standard operating procedures and actively participate in the implementation of a quality improvement system 3.3 Identifying product and process specifications and tolerance limits 3.4 Detecting defects, take corrective and/or quality improvement actions 3.5 Keeping records in accordance with standard operating procedures. 3.6 Identifying customer requirements and always meet those requirements

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 of peers and seniors in workplace
5. Resource Implications	The following resources must be provided: 5.1 Workplace 5.2 Tools and equipment appropriate to maintain workplace 5.3 Materials relevant to the proposed activity 5.4 Relevant drawings, manuals, codes, standards and reference material
6 .Methods of Assessment	Competency must be assessed through: 6.1 Written Exam. 6.2 Demonstration 6.3 Oral Questioning/interview
7. Context for Assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

OCCUPATION SPECIFIC UNITS

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competence

UNIT CODE AND TITLE	TRAMAC1011A1 Perform Bench Work
NOMINAL HOURS	40
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to perform bench work operations. It includes layout, cutting with hacksaw and chisel, filing, drilling, tapping, external thread cutting etc. and check the components for conformance to specifications.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables 1.1
1 Prepare for Bench Work	Safe work practices observed and personal proactive equipment (PPE) worn as required for the work to be performed. 1.2 <i>Tools and equipment</i> are selected as per job requirement. 1.3 <i>Materials for bench work</i> are selected according to the requirement specified in the drawing 1.4 Layout is Performed and marked in accordance with drawing
2 Cut, chip and file	2.1 Work piece are clamped in <i>work holding devices</i> to avoid damage and accidents. 2.2 Work pieces are cut, chipped and filed within as specified in the drawing. 2.3 Broken or dull hacksaw blades are replaced according to requirements 2.4 Measurement of work piece is checked according to standard work procedures
3 Drill and ream holes	3.1 Layout is Performed and marked for drilling in accordance with drawing 3.2 Machine is set as appropriate to the work requirement. 3.3 Drilling and reaming holes are performed according to recommended sequence.
4 Cut threads and remove damaged bolt.	4.1 Tap and die are selected in accordance with job requirement 4.2 work piece is held with support as required. 4.3 <i>Thread</i> is cut to fit gage or mating screw given in the blueprint 4.4 Internal thread is cut in accordance with the recommended tapping sequence 4.5 External thread is cut in accordance with the recommended tapping sequence. 4.6 Damaged bolt and stud is removed by extractor as required.
5 Use Off-hand grinder	5.1 Work piece is hold and clamped in accordance with standard work procedures 5.2 Appropriate disc is selected as per job requirement. 5.3 Grinding operation is performed conform with specifications

6 Clean and store hand and power tools.	6.1 hand and power tools are maintained and cleaned as per instruction manual 6.2 Work place is cleaned in accordance with environmental requirement 6.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures and manufacturers' recommendations.
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Range of Variables

Variable	Range (May include but not limited to):
1. Tools and Equipment	1.1 Drill Press 1.2 Pedestal Grinder 1.3 Surface plate 1.4 Layout Tools. 1.5 Hacksaw. 1.6 Chisel. 1.7 Files 1.8 Hand Shears. 1.9 Drills, reamers, taps 1.10 Inspection and measuring tools (templates, vernier caliper, micrometer, straight edge, gages, etc...) 1.11 Bolt Extractors 1.12 Tap & Die set
2. Materials	2.1 MS, CI, SS, CS 2.2 Brass , Copper, Bronze, Gun metal 2.3 Kerosene oil, different grade cutting fluid
3. Bench work operations	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 .
4. Work holding Devices	4.1 Clamps 4.2 Vises
5. Thread	5.1 External thread (BSW , Matric) 5.2 Internal thread (BSW , Matric)

Evidence Guide	
1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Followed OSH as per work place requirement. 1.2 Laid-out and marked dimensions clamp work piece/features on the work piece 1.3 Clamped work piece 1.4 Cut, chipped and filed work piece. 1.5 Drilled and reamed holes. 1.6 Cut threads 1.7 Performed off-hand grinding 1.8 Removed damaged bolt and stud
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Linear measuring tools (rules, vernier caliper, micrometer, height gage) 2.2 Limits, fit and tolerances 2.3 Care and safety use of tools and equipment 2.4 RPM, Feed and depth of cut. 2.5 Cutting fluid 2.6 Lubricant 2.7 Tap and drill size 2.8 Lay out
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Handling tools and equipment 3.2 Using measuring instruments 3.3 Operating drill press and off-hand grinders
4. Required Attitude	<ol style="list-style-type: none"> 4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Maintenance tools & equipment 4.5 Tidiness and timeliness 4.6 Respect of peers and seniors in workplace
5. Resource implications	<p>The following resources MUST be provided:</p> <ol style="list-style-type: none"> 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. Method of assessment	<p>Competency must be assessed by-</p> <ol style="list-style-type: none"> 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet th quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH1012A1 Grind Cutting tool
NOMINAL HOURS	40
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and grind cutting tool. It includes the requirements for grinding parallel surfaces, square surfaces, angles, radii and cutting off parts
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Safe work practices observed and personal proactive equipment (<i>PPE</i>) worn as required for the work performed.
2. Determine job requirements	2.1 Drawings are interpreted to grind tools confirming to the specifications. 2.2 Tool holding devices are selected according to the requirements of the operation.
3. Select wheels and accessories	3.1 Performed Routine maintenance to prepare the machine for required operation. 3.2 <i>Accessories</i> selected are appropriate to the requirements of the operation. 3.3 <i>Grinding wheels</i> are selected, inspected, dressed according to worksite procedures. 3.4 Machine guards, coolant and dust collection devices are checked according to worksite procedure
4. Perform grinding operations	4.1 <i>Grinding machine</i> is adjusted in accordance with worksite procedures. 4.2 Cutting tool is hold or clamped to avoid damage. 4.3 Coolant is used to reduce heat of tool and prevent damage. 4.4 Grinding of cutting tools is performed as per specification mentioned in drawing 4.5 Waste materials are disposed of in accordance with environmental requirements.

Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles . 1.3 Safety Shoes. 1.4 Apron
2. Grinding wheels	Wheels are selected according to: 2.1 Silicon carbide wheel 2.2 Aluminum carbide wheel
3. Accessories	3.1 Wheel dresser 3.2 Diamond pen
4. Grinding machine	4.1 Pedestal grinder
5. Grinding operations	5.1 Angles to a square shoulder 5.2 Different form (radius nose, square nose, V nose to cut)

Evidence Guide	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Determined job requirement 1.2 Selected wheels and accessories 1.3 Performed grinding operations 1.4 Checked cutting tools angles
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1 Type of grinding wheels 2.2 Work holding devices 2.3 Grinding machine accessories, 2.4 Types of coolant to be used 2.5 Tool geometry
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Using measuring instruments 3.2 Handling of grinding machine 3.3 Selecting wheel 3.4 Applying techniques to grind cutting tools 3.5 Checking cutting tools angles
4. Required Attitude	<ul style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource implications	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 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. Method of assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH1013A1 Perform Lathe Operation (Basic)
NOMINAL HOURS	60
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and turn work piece to drawing specifications. It details the requirements for performing lathe operations such as facing , straight turning, cutting grooves, drilling, knurling; cutting single start external v - thread .
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables 1.1
2. Follow OSH practices	Safe work practices observed and personal protective equipment (<i>PPE</i>) worn as required for the work performed.
2. Determine job requirements	<p>2.1 Routine maintenance is performed to prepare the machine for required operation as per manufacturer's instruction.</p> <p>2.2 <i>Drawings</i> are interpreted to produce component to specifications.</p> <p>2.3 Sequence of operation is determined to produce component to specifications.</p> <p>2.4 <i>Cutting tools</i> are selected according to the requirements of the operation.</p>
3. Setup work piece	<p>3.1 <i>Work piece</i> is centered and clamped on chuck to required level of accuracy using tools and equipment in accordance with worksite procedures.</p> <p>3.2 Work piece is setup and clamped to required level of accuracy using <i>instruments/equipment</i> according to work site procedures. 3.3</p> <p>Cutting tool is set up in accordance with the requirement of the operation</p> <p>3.4 <i>Lathe accessories</i> are used as appropriate to the requirements of the operation.</p> <p>3.5 Machine guards and coolant devices are checked according to work requirement.</p>
4. Perform lathe operations	<p>4.1 Speeds and feeds and depth of cut are calculated as per job requirement</p> <p>4.2 Machine performance is checked conforming to the work requirement</p> <p>4.3 Coolant is applied to prevent over heating of work piece and cutting tool as per manufacturer instruction</p> <p>4.4 <i>Lathe operations</i> are performed to produce component to specifications in the drawing.</p> <p>4.5 Work piece is checked / measured for conformance to specification using appropriate techniques, <i>measuring tools and equipment</i></p>

5. Clean and store tools and equipment	<p>5.1 Waste materials are disposed of in accordance with environmental requirements.</p> <p>5.2 Cleaning of equipment is performed in accordance with standard procedures</p> <p>5.3 Tools and equipment are stored safely in appropriate location according to standard place procedures</p>
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Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles. 1.3 Safety Shoes. 1.4 Apron
2. Drawings	Reading and interpretation: 2.1 Views and projections 2.2 Drawing symbols 2.3 Dimensions and features 2.4 Limit, fit and Tolerance
3. Cutting Tools	3.1 Tool bits <ul style="list-style-type: none"> ➢ High speed steel ➢ Carbide tips 3.2 Drills 3.3 Reamers
4. Work piece materials	4.1 Mild Steel, Carbon Steel, Stainless Steel, Gum metal, Bright Steel 4.2 Aluminum, Brass
5. Instruments/equipment	5.1 Surface gage 5.2 Dial indicator on magnetic stand
6. Lathe Accessories	6.1 3- and 4-jaw chucks 6.2 Lathe center 6.3 Drill chucks 6.4 Knurling tools 6.5 Boring bar 6.6 Face plate 6.7 Ball Bearing center 6.8 Steady rest 6.9 Follower rest 6.10 Lathe dog 6.11 Dead center 6.12 Live centre

7. Lathe Operations	7.1 Facing 7.2 Straight turning 7.3 Step turning 7.4 Taper turning 7.5 Cutting recess, shoulders, grooves and chamfers 7.6 Drilling, countersinking. 7.7 Knurling 7.8 Single-start external v and square thread cutting 7.9 Parting-off 7.10 Cutting external taper using compound slide or formed tool
8. Measuring tools and equipment	8.1 Steel rule 8.2 Gage block 8.3 Ring gage 8.4 Snap gage 8.5 Go and not go gage 8.6 telescopic gage 8.7 Outside and Inside caliper 8.8 Venire calipers 8.9 Micrometer calipers 8.10 Gage (center drill, surface finish, radius, screw pitch, taper)

Evidence Guide

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Followed OSH in the work place 1.2 Performed Routine maintenance to prepare the machine for required operation. 1.3 Determined job requirements 1.4 Interpreted Drawing 1.5 Setup and clumped the work piece . 1.6 Performed lathe operations 1.7 Checked/measured and adjust the work piece
2. Underpinning knowledge	2.1 Limits and fits, tolerances 2.2 Lathe types and specifications. 2.3 Fundamentals of work holding and tool holding devices. 2.4 Fundamentals of turning tools and tool geometry. 2.5 Lathe accessories, fixtures and attachments. 2.6 Cutting speed, rpm and feed.

3. Underpinning skills	3.1 Selecting and grinding cutting tools. 3.2 Computation of feed, cutting speed and machine rpm as per job requirement 3.3 Setting cutting speed, rpm, feed rate. 3.4 Selecting and setting proper cutting tools 3.5 Holding work pieces 3.6 Performing required operation. 3.7 Using measuring instruments to check dimension and tolerance.
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 of 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. Method of assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	Participants must be assessed individually in the actual work place or in a simulated work place.
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

UNIT CODE & TITLE	TRAMACH1014A1 Perform Shaping operations
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers knowledge, skill and attitude to perform shaping operations. It includes surfacing, step cutting, shouldering, grooving, chamfering, dub tail, slotting, key way cutting.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Prepare for shaping	<p>1.1 Safe work practices observed and personal proactive equipment (<i>PPE</i>) worn as required for the work performed.</p> <p>1.2 Sequencing of operation is determined to produce components to specifications.</p> <p>1.3 Work holding devices are selected according to job requirements.</p> <p>1.4 <i>Cutting tools</i> are selected, inspected, and mounted according to manufacturer's specification and work procedure.</p> <p>1.5 Machine guards and coolant devices are checked according to work requirement.</p> <p>1.6 <i>Cutting parameters</i> are determined as per job requirement.</p>
2. Set up work piece	<p>2.1 Drawings are interpreted to produce components to specifications.</p> <p>2.2 Work piece is set up to required level of accuracy using instrument/ equipment/<i>accessories</i> according to work procedures.</p> <p>2.3 Routine maintenance is Performed to prepare the machine for required operation.</p>
3. Perform shaping operations.	<p>3.1 Speed and feeds are calculated using appropriate mathematical techniques and reference materials.</p> <p>3.2 Shaper accessories used are appropriate to the requirements of the operations.</p> <p>3.3 Coolant is applied to prevent over heating of work piece and cutting tool as per manufacturer instruction</p> <p>3.4 <i>Shaping operations</i> are performed to produce component to specifications in the working drawing.</p> <p>3.5 Shaping operations are performed using required coolant to prevent overheat of job and shaping tool.</p> <p>3.6 Work piece is checked for conformance to specifications using appropriate techniques, <i>measuring tools and equipment</i>.</p>
4. Clean and store tools and equipment	<p>4.1 Waste materials are disposed of in accordance with environmental requirements.</p> <p>4.2 Cleaning of equipment is performed in accordance with work site procedures.</p> <p>4.3 Tools and equipment are stored safely in appropriate location according to standard procedures.</p>

Range of Variables

Variable	Range (may include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles . 1.3 Safety Shoes. 1.4 Apron
2. Cutting Tool	2.1 Cutting Tool ,Shaping Tool 2.2 Radius tools 2.3 Parting tools 2.4 Side cutting tools 2.5 “V” tools 2.6 Forming Tool
3. Cutting parameter	Feeds, speeds, depth of cut, length of cut etc.
4. Accessories	4.1 Angle Plate 4.2 Dial Indicator 4.3 Rotary Table 4.4 “ C” clamp 4.5 Parallel bar 4.6 “ v “ Block 4.7 Caplets 4.8 Surface gage
5. Operations	5.1 Surfacing 5.2 Step cutting 5.3 Shouldering 5.4 Grooving 5.5 Chamfering 5.6 Dub tail 5.7 Slotting 5.8 Key way cutting
6. Work piece materials	6.1 MS, CI and SS 6.2 Brass, Copper, Brass bronze, gun metal.
7. Measuring Tool	7.1 Steel rule 7.2 Vernier calipers 7.3 Gages (depth, surface finish, radius, Filler gage, slip or block, taper) 7.4 Vernier Height Gage 7.5 Combination Set 7.6 Try Square 7.7 Telescoping gage 7.8 Spirit level 7.9 Outside and inside caliper 7.10 Bevel Protector

Evidence Guide

<p>1. Critical aspects of assessment</p>	<p>Assessors must be satisfied that the candidate</p> <ol style="list-style-type: none"> 1.1 Followed OSH in the work place 1.2 Performed Routine maintenance to prepare the machine for required operation. 1.3 Setup and clamped the work piece . 1.4 Interpreted Drawing 1.5 Performed shaping 1.6 Checked/measured and adjust the work piece
<p>2. Underpinning Knowledge</p>	<ol style="list-style-type: none"> 2.1 Procedures for setting up tools and work piece 2.2 Tool type and geometry to achieve the required specifications on different materials. 2.3 Techniques and procedures for machining flat surfaces, shoulders, slots, keyways, angles, dovetails
<p>3. Underpinning Skill</p>	<ol style="list-style-type: none"> 3.1 Performing calculations for determining cutting parameters 3.2 Setting machine as per calculated cutting parameters 3.3 Grinding cutting tools 3.4 Setting cutting tools 3.5 Holding and clamping work piece. 3.6 Applying techniques for required shaping operations 3.7 Using precision measurement equipment to check dimension and tolerance
<p>4. Required Attitude</p>	<ol style="list-style-type: none"> 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 of peers and seniors in workplace
<p>5. Resource Implication</p>	<p>The following resources MUST be provided:</p> <ol style="list-style-type: none"> 5.1 Workplace 5.2 Materials relevant to the proposed activity 5.3 All tools, equipment, material and documentation required 5.4 Relevant specifications or work instructions
<p>6. Method of assessment</p>	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
<p>7. Context for assessment</p>	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH1015A1 Perform Milling Operation (Basic)
NOMINAL HOURS	60
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and mill work piece to drawing specifications. It details the requirements for performing milling operations such as boring, spot facing; milling slots, keyways, milling circular slots, milling V and parting off.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Safe work practices observed and personal proactive equipment (<i>PPE</i>) worn as required for the work performed.
2. Determine job requirements	2.1 Drawings are interpreted to produce component to specifications. 2.2 Sequence of operation is determined to produce component to specifications. 2.3 Cutting fluid is selected according to the instruction manual. 2.4 <i>Cutting tools</i> are selected according to the requirements of the operation.
3. Setup work piece	3.1 <i>Routine maintenance</i> is performed to prepare the machine for required operation in accordance with manufacturer manuals. 3.2 <i>Work piece</i> is setup to required level of accuracy using instruments/equipment according to work site procedures. 3.3 Work piece is setup and clamped to required level of accuracy using <i>instruments/equipment</i> according to work site procedures. 3.4 Cutting tool is set up in accordance with the requirement of the operation 3.5 Machine guards and coolant devices are checked and set according to work requirement.
4. Perform milling operations	4.1 Speeds and feeds are set to requirements of the job. 4.2 <i>Milling machine accessories</i> used are appropriate to the requirements of the operation. 4.3 Machine performance is checked conforming to the work requirement 4.4 Coolant is applied to prevent over heating of work piece and cutting tool as per manufacturer instruction 4.5 <i>Milling operations</i> are performed to produce component to specifications in the drawing. 4.6 Work piece is checked/measured for conformance to specification using appropriate techniques, <i>measuring tools</i> and equipment.

5. Clean and store tools and equipment	5.1 Waste materials are disposed of in accordance with environmental requirements. 5.2 Cleaning of equipment is performed in accordance with work site procedures 5.3 Tools and equipment are stored safely in appropriate location according to standard procedures
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Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles . 1.3 Safety Shoes. 1.4 Apron
2. Cutting Tools	2.1 Drills 2.2 Reamers 2.3 Slab mills 2.4 End mills 2.5 Shell mills 2.6 Side and face cutters 2.7 Formed cutter 2.8 Slitter 2.9 T-slot cut
3. Routine maintenance	3.1 Checking and adjust Machine guards, 3.2 Checking and use coolant and lubricant 3.3 Checking and adjust chips extraction devices. 3.4 Checking machine performance
4. Work piece	Work piece materials used in milling operations 4.1 MS, Cast Steel, Cast iron, 4.2 Brass, SS, Aluminum
5. Measuring tools	5.1 Steel rule 5.2 Vernier calipers 5.3 Micrometer calipers 5.4 Gages (bore, surface finish, radius, depth) 5.5 Depth micrometer 5.6 Telescopic gage
6. Milling machine accessories	6.1 Work holding devices a. clamps b. vises c. angle plates 6.2 Rotary tables 6.3 Jig & Fixture
7. Milling Operations	7.1 Boring 7.2 Spot facing 7.3 Milling slot and keyways 7.4 Milling serrations 7.5 Milling v 7.6 Parting-off 7.7 Milling circular slots

Evidence Guide	
1. Critical aspects of evidence	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Followed OSH in the work place 1.2 Performed Routine maintenance to prepare the machine for required operation. 1.3 Determined job requirements 1.4 Setup and clamped the work piece . 1.5 Interpreted Drawing 1.6 Performed Milling operation 1.7 Checked/measured st the work piece
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Types and function of Lubricants and coolants 2.2 Milling types 2.3 Milling machine parts and functions 2.4 Fundamentals of milling cutters and holders 2.5 Cutting speed, rpm, feed rate 2.6 Functions of milling machine accessories, fixtures and attachments
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Handling tools and equipment 3.2 Selecting and setting proper cutting tools 3.3 Computation of feed, cutting speed and machine rpm as per job requirement 3.4 Setting Cutting speed, rpm, feed 3.5 Apply the techniques of required milling operation. 3.6 Using measuring instruments to check dimension.
4. Required Attitude	<ol style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> 5.1 Work place 5.2 Tools and equipment appropriate to workplace 5.3 Materials relevant to the proposed activity/task 5.4 Drawings and specifications relevant to the task 5.5 Relevant manuals, codes, standards and reference material.
6. Method of assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH2016A1 Perform Lathe Operations
NOMINAL HOURS	50
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and turn work piece to drawing specifications. It includes Face and turn external shapes (radii, cones), Multi-start external v-thread cutting, Cutting inside taper using taper turning attachment or offset tailstock and compound method, turning internal thread
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA
	<i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Safe work practices observed and personal proactive equipment (<i>PPE</i>) worn as required for the work performed.
2. Determine job requirements	2.1 <i>Routine maintenance</i> is performed to prepare the machine for required operation as per manufacturer's instruction 2.2 <i>Drawings</i> are interpreted to produce component to specifications. 2.3 Sequence of operation is determined to produce component to specifications. 2.4 <i>Cutting tools</i> are selected according to the requirements of the operation.
3. Setup work piece	3.1 <i>Work piece</i> is centered and clamped on chuck to required level of accuracy using tools and equipment in accordance with worksite procedures. 3.2 Work piece is setup and clamped to required level of accuracy using <i>instruments/equipment</i> according to work site procedures. 3.3 <i>Cutting tool</i> is set up in accordance with the requirement of the operation 3.4 <i>Lathe accessories</i> are used as appropriate to the requirements of the operation. 3.5 Machine guards and coolant devices are checked according to work requirement.
4. Perform turning operations	4.1 Speeds and feeds and depth of cut are calculated as per job requirement 4.2 Machine performance is checked conforming to the work requirement 4.3 Coolant is applied to prevent over heating of work piece and cutting tool as per manufacturer instruction. 4.4 <i>Lathe operations</i> are performed to produce component to specifications in the drawing. 4.5 Work piece is checked / measured for conformance to specification using appropriate techniques, <i>measuring tools</i> and equipment.

5. Clean and store tools and equipment	<p>5.1 Waste materials are disposed of in accordance with environmental requirements.</p> <p>5.2 Cleaning of equipment is performed in accordance with standard procedures</p> <p>5.3 Tools and equipment are stored safely in appropriate location according to standard place procedures</p>
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Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles. 1.3 Safety Shoes. 1.4 Apron
2. Routine Maintenance	2.1 Checking and adjust Machine guards, 2.2 Checking and use coolant and lubricant 2.3 Checking and adjust chips extraction devices. 2.4 Checking machine performance
3. Drawings	Reading and interpretation: 3.1 Views and projections 3.2 Drawing symbols 3.3 Dimensions and features 3.4 Limit, fit and Tolerance
4. Cutting Tools	4.1 Inserts 4.2 Tool bits ➤ High speed steel ➤ Carbide tips 4.3 Drills 4.4 Reamers
5. Work piece	Mild Steel, Carbon Steel, Stainless Steel, Gum metal, Bright Steel Aluminum, Brass, Plastic
6. Lathe Accessories	6.1 3- and 4-jaw chucks 6.2 Lathe center 6.3 Drill chucks 6.4 Knurling tools 6.5 Boring bar 6.6 Face plate 6.7 Ball Bearing center 6.8 Steady rest 6.9 Follower rest 6.10 Lathe dog 6.11 Dead center 6.12 Live center

7. Lathe Operations	7.1 Face and turn external shapes (radii, cones) 7.2 Multi-start external v-thread cutting 7.3 Cutting inside taper using taper turning attachment or offset tailstock and compound method 7.4 Turning internal thread
8. Measuring Tools	8.1 Steel rule 8.2 Gage block 8.3 Ring gage 8.4 Snap gage 8.5 Go and not go gage 8.6 Telescopic gage 8.7 Outside and Inside caliper 8.8 Venire calipers 8.9 Micrometer calipers 8.10 Gages (thread, drill, depth, surface gage, radius, screw pitch, slip or block, taper)

Evidence Guide	
1. Critical aspects of evidence	Assessment requires evidence that the candidate: <ol style="list-style-type: none"> 1.1 Followed OSH in the work place 1.2 Performed Routine maintenance to prepare the machine for required operation. 1.3 Determined job requirements 1.4 Interpreted Drawing 1.5 Setup and clumped the work piece . 1.6 Performed lathe operations 1.7 Checked/measured and adjust the work piece
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Limits and fits, tolerances 2.2 Lathe types and specifications. 2.3 Fundamentals of work holding and tool holding devices. 2.4 Fundamentals of turning tools and tool geometry. 2.5 Lathe accessories, fixtures and attachments. 2.6 Cutting speed, rpm and feed.
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Selecting and grinding cutting tools. 3.2 Computation of feed, cutting speed and machine rpm as per job requirement 3.3 Setting cutting speed, rpm, feed rate. 3.4 Selecting and setting proper cutting tools 3.5 Holding work pieces 3.6 Performing required operation. 3.7 Using measuring instruments to check dimension and tolerance.

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 of 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. Method of assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module
<p>Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH2017A1 Grind Work piece
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and grind work piece. It includes grinding tapers, internal radii and recess, to remove warp, and polishing components.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA
	<i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Safe work practices observed and personal protective equipment (<i>PPE</i>) worn as required for the work performed.
2. Determine job requirements	2.1 Drawings are interpreted to produce component to specifications. 2.2 Sequence of operation is determined to produce component to specifications. 2.3 Work holding devices are selected according to the requirements of the operation.
3. Select wheels and accessories	3.1 <i>Grinding wheels</i> are selected, balanced and dressed to the required form and size 3.2 <i>Accessories</i> selected are appropriate to the requirements of the operation. 3.3 Machine guards, coolant and dust extraction devices are checked according to worksite procedure.
4. Perform grinding operations	4.1 <i>Grinding machine</i> is setup and adjusted in accordance with worksite procedures. 4.2 Work piece is set up and held or clamped to required level of accuracy as per specifications. 4.3 Cutting speed and feed are selected according to the type of <i>grinding operation</i> 4.4 Grinding operations are performed to produce component to specifications in the drawing 4.5 Work piece is checked / measured for conformance to specification using measuring tools and equipment
5. Clean and store tools and equipment	5.1 Waste materials are disposed of in accordance with environmental requirements. 5.2 Cleaning of equipment is performed in accordance with standard procedures 5.3 Tools and equipment are stored safely in appropriate location according to standard place procedures

Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles . 1.3 Safety Shoes. 1.4 Apron
2. Grinding wheels	2.1 Straight type, Cylindrical type, taper type, straight cup type, disc type and soccer type 2.2 Grades [Rough, semi rough, smooth and dead smooth)
3. Accessories	3.1 magnetic chuck 3.2 vices 3.3 clamps 3.4 angle plates 3.5 adapter plates 3.6 parallels 3.7 wheel dresser 3.8 mandrels 3.9 balancing stand with weights 3.10 de-burring tools 3.11 templates 3.12 headstock/footstock 3.13 Centre
4. Grinding machine	4.1 Horizontal spindle surface grinder 4.2 Vertical spindle surface grinder 4.3 Plain cylindrical grinder 4.4 Universal cylindrical grind
5. Grinding operations	5.1 Surface grinding 5.2 Cylindrical grinding 5.3 External taper grinding

Evidence Guide	
1. Critical aspects of evidence	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Followed OSH in the work place 1.2 Determined job requirements 1.3 Selected wheels and accessories. 1.4 Interpreted Drawing 1.5 Performed grinding operations 1.6 Checked/measured the work piece
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Lubricants and coolants 2.2 Types and specification of Grinding machine 2.3 Grinding machine parts and functions 2.4 Selection criteria of grinding wheels 2.5 Work holding devices 2.6 Grinding machine accessories, fixtures and attachments
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Selecting grinding Wheel. 3.2 Computation of feed and machine rpm 3.3 Setting feed and machine rpm 3.4 Using techniques to performing different grinding operations 3.5 Using measuring instruments to check dimension and tolerance.
4. Required Attitude	<ol style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> 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. Method of assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH2018A1 Perform Boring and honing operations
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and Boring work piece to drawing specifications. It details the requirements for straight Boring, step Boring taper Boring, chamfering operation
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Determine job requirements	1.1 <i>PPE</i> are select and worn as required for work 1.2 <i>Materials</i> for boring are selected conforming to the job requirement 1.3 Performed <i>routine maintenance</i> to prepare the machine for required operation 1.4 Drawings are interpreted to produce component to specifications. 1.5 Sequence of operation is determined to produce component to specifications. 1.6 <i>Accessories</i> are selected according to the requirements of the operation.
2. Setup work piece and cutting tool	2.1 Work piece is setup and clamped to required level of accuracy using <i>instruments/equipment</i> according to work site procedures. 2.2 <i>Cutting tool</i> is set up in accordance with the requirement of the operation 2.3 <i>Accessories</i> are used as appropriate to the requirements of the operation.
3. Perform boring operations	3.1 Component of boring machine is set up and adjusted in accordance with the work specification. 3.2 <i>Boring and honing operations</i> are carried out conforming to the drawing specifications. 3.3 Work piece is checked and measured using <i>measuring tools</i> and equipment.
4. Clean and store tools and equipment,	4.1 Waste materials are disposed of in accordance with environmental requirements. 4.2 Cleaning of equipment is performed in accordance with standard procedures 4.3 Tools and equipment are stored safely in appropriate location according to standard place procedures

Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles . 1.3 Safety Shoes. 1.4 Apron
2. Materials	2.1 Mild Steel, Carbon Steel, Stainless Steel, Gun metal, Bright Steel 2.2 Aluminum, Brass
3. Routine Maintenance	3.1 Checking and adjust Machine guards. 3.2 Checking and use coolant and lubricant. 3.3 Checking and adjust chips extraction devices. 3.4 Checking machine performance.
4. Cutting Tool	4.1 Boring Tool. 4.2 Internal Thread cutting tool. 4.3 Grooving tool.
5. Accessories	5.1 Angle Plate 5.2 Dial Indicator 5.3 Rotary Table
6. Boring and honing operations	6.1 Boring 6.2 Shoulder boring 6.3 Grooving 6.4 Parallel line and taper boring 6.5 Honing
7. Measuring tool and gage	7.1 Steel rule 7.2 Vernier calipers 7.3 Micrometer 7.4 Go and not go gage 7.5 telescopic gage 7.6 Gages (drill, depth, surface, radius, taper)

Evidence Guide	
1. Critical aspects of evidence	Assessment requires evidence that the candidate: 1.1 Followed OSH in the work place 1.2 Interpreted Drawing 1.3 Determined job requirements 1.4 Selected Boring, honing tools and accessories . 1.5 Performed Boring and honing operations 1.6 Checked and measured the work piece
2. Underpinning knowledge	2.1 types and specifications of boring machine 2.2 Functions of different parts of boring and honing machine

	<p>2.3 Work holding devices</p> <p>2.4 accessories, fixtures and attachments of boring and honing machine</p> <p>2.5 Cutting speed, feed and rpm</p>
3. Underpinning Skill	<p>3.1 Interpreting drawings</p> <p>3.2 Selecting proper coolant and lubricants</p> <p>3.3 Selecting and positioning cutting tools</p> <p>3.4 Calculating and selecting cutting parameters, including speeds, feeds and depth of cut.</p> <p>3.5 Applying techniques of boring and honing machine operation.</p> <p>3.6 Using measuring instruments</p>
3. Required Attitude	<p>4.1 Commitment to occupational health and safety</p> <p>4.2 Environmental concerns</p> <p>4.3 Eagerness to learn</p> <p>4.4 Tidiness and timeliness</p> <p>4.5 Respect of peers and seniors in workplace</p>
5. Resource implications	<p>The following resources must be provided:</p> <p>5.1 Work place</p> <p>5.2 Tools and equipment appropriate to workplace</p> <p>5.3 Materials relevant to the proposed activity/task</p> <p>5.4 Drawings and specifications relevant to the task</p> <p>5.5 Relevant manuals, codes, standards and reference material.</p>
6. Method of assessment	<p>Competency must be assessed through:</p> <p>6.1 Written test.</p> <p>6.2 Demonstration</p> <p>6.3 Oral Questioning/Interview</p>
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

UNIT CODE & TITLE	TRAMACH2019A1 Perform Slotting operations
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers knowledge; skill and attitude require to perform slotting operations. It includes slotting keyways, internal cavities, circular surfaces, internal splines and grooving,
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Determine job requirements	<p>1.1 Safe work practices observed and personal proactive equipment (<i>PPE</i>) worn as required for the work performed.</p> <p>1.2 Drawings are interpreted to produce components to specifications.</p> <p>1.3 Sequencing of operation is determined to produce components to specifications.</p> <p>1.4 Work holding devices are selected according to job requirements.</p> <p>1.5 <i>Cutting tools</i> are selected, inspected, and mounted according to manufacturer's specification and work procedure.</p> <p>1.6 Machine guards and coolant devices are checked according to work requirement.</p>
2. Set up Work Piece	<p>2.1 Routine maintenance is performed to prepare the machine for required operation as per manufacturer instruction.</p> <p>2.2 <i>Work piece</i> is set up to required level of accuracy using instrument/ equipment according to work procedures.</p> <p>2.3 <i>Cutting tool</i> is set up in accordance with the requirement of the operation</p> <p>2.4 Slotting machine <i>accessories</i> are used as appropriate to the requirements of the operation</p>
3. Perform slotting operations	<p>3.1 Stroke, cutting speed and feeds are set according to job requirements</p> <p>3.2 <i>Slotting accessories</i> are used according to the requirements of the operations.</p> <p>3.3 Coolant is applied to prevent over heating of work piece and cutting tool as per manufacturer instruction</p> <p>3.4 <i>Slotting operations</i> are performed to produce component according to the specifications in the working drawing.</p> <p>3.5 Work piece is checked and measured conformance to specifications by using <i>measuring tools</i> and equipment.</p>

4. Clean and store tools and equipment	4.1 Waste materials are disposed of in accordance with environmental requirements.
	4.2 Cleaning of equipment is performed in accordance with standard procedures
	4.3 Tools and equipment are stored safely in appropriate location according to standard place procedures.

Range of Variables	
Variable	Range (May include but not limited to):
1 PPE	1.1 Hand Gloves. 1.2 Goggles. 1.3 Safety Shoes. 1.4 Apron
2 Cutting Tool	2.1 Slotting Tool 2.2 Radios tools 2.3 Parting tools 2.4 Side cutting tools 2.5 "V" tools
3 Accessories	3.1 Angle Plate 3.2 Dial Indicator 3.3 Rotary Table 3.4 "C" clamp 3.5 Parallel bar 3.6 "v" Block 3.7 Caplets
4 Operations	4.1 Grooving 4.2 feathered keyways 4.3 tapered keyways 4.4 slotting internal cavities 4.5 slotting circular surfaces 4.6 slotting internal splines
5 Materials	5.1 Mild Steel, Carbon Steel, Stainless Steel, Gum metal, Bright Steel 5.2 Aluminum, Brass
6 Measuring tools and gages	6.1 Steel rule 6.2 Vernier calipers 6.3 Micrometer , Gages (depth, surface finish, radius, Filler gage, slip or block, taper) 6.4 Vernier Height Gage 6.5 Combination Set 6.6 Try Square 6.7 Telescoping gage

Evidence Guide	
1. Critical aspects of assessment.	Assessors must be satisfied that the candidate 1.1 Followed OSH in the work place 1.2 Performed Routine maintenance to prepare the machine for required operation. 1.3 Determined job requirements. 1.4 Interpreted drawing. 1.5 Setup and clamped the work piece. 1.6 Performed slotting operations. 1.7 Checked/measured and adjust the work piece
2. Underpinning Knowledge	2.1 Tool type and geometry. 2.2 Techniques of using tools and equipment to measure machined components. 2.3 Cutting speed, feed and depth of cut. 2.4 Type of coolant. 2.5 Causes of heating.
3. Underpinning Skill	3.1 Handling slotting machine 3.2 Using precision measurement equipment 3.3 Indexing 3.4 Setting stroke, cutting speed and feeds 3.5 Applying techniques to perform required slotting operation 3.6 Using measuring tools and equipment to check dimension and tolerance.
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 of peers and seniors in workplace
5. Resource Implication	The following resources must be provided: 5.1 Work place 5.2 Tools and equipment appropriate to workplace 5.3 Materials relevant to the proposed activity/task 5.4 Drawings and specifications relevant to the task 5.5 Relevant manuals, codes, standards and reference material.
6. Method of assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competence

UNIT CODE & UNIT TITLE	TRAMACH2020A1 Perform Milling Operation
NOMINAL HOURS	50
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to setup and mill work piece to drawing specifications. It includes indexing, milling splines, equally-spaced grooves, 45° serrations in cylindrical work piece, spur gear and rack, ratchets, converging faces, large radial slots, internal radii and plain bevel gear.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA
1. Follow OSH practices	<i>Bold & Italic</i> terms are elaborated in the Range of Variables 1.1 Safe work practices observed and personal proactive equipment (<i>PPE</i>) worn as required for the work performed.
2. Determine job requirements	2.1 Drawings are interpreted to produce component to specifications. 2.2 Sequence of operation is determined to produce component to specifications. 2.3 Required <i>material</i> is selected according to job requirements 2.4 Cutting fluid is selected according to the instruction manual. 2.5 <i>Cutting tools</i> are selected according to the requirements of the operation.
3. Setup work piece	3.1 <i>Routine maintenance</i> is performed to prepare the machine for required operation in accordance with manufacturer manuals. 3.2 <i>Work piece</i> is setup and clamped to required level of accuracy using instruments/equipment according to work site procedures.. 3.3 <i>Cutting tool</i> is set up in accordance with the requirement of the operation
4. Perform milling operations	4.1 Speeds and feeds are set appropriate to the job. 4.2 <i>Milling machine accessories</i> used are appropriate to the requirements of the operation. 4.3 Coolant is applied to prevent over heating of work piece and cutting tool as per manufacturer instruction 4.4 <i>Milling operations</i> are performed to produce component to specifications in the drawing. 4.5 Work piece is checked/measured for conformance to specification using <i>measuring tools and equipment</i> .

5. Clean and store tools and equipment	<p>5.1 Waste materials are disposed of in accordance with environmental requirements.</p> <p>5.2 Cleaning of equipment is performed in accordance with standard procedures</p> <p>5.3 Tools and equipment are stored safely in appropriate location according to standard place procedures</p>
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Range of Variables

Variable	Range (May include but not limited to):												
1. PPE	<p>1.1 Hand Gloves.</p> <p>1.2 Goggles.</p> <p>1.3 Safety Shoes.</p> <p>1.4 Apron</p>												
2. Cutting Tools	<p>2.1 Side and face cutters</p> <p>2.2 Gear cutter and other formed cutter</p> <p>2.3 Slitter</p> <p>2.4 Slot cutter</p>												
3. Routine maintenance	<p>3.1 Checking and adjust Machine guards,</p> <p>3.2 Checking and use lubricant as necessary</p> <p>3.3 Checking and adjust chips extraction devices.</p> <p>3.4 Checking machine performance</p> <p>3.5 Check and set Machine guards and coolant devices</p>												
4. Work piece materials	<p>4.1 Mild Steel, Carbon Steel, Gum metal, Bright Steel</p> <p>4.2 Aluminum, Brass</p>												
5. Milling machine accessories	<p>5.1 Work holding devices</p> <p style="padding-left: 20px;">a. clamps</p> <p style="padding-left: 20px;">b. vises</p> <p>5.2 angle plates</p> <p>5.3 Rotary tables</p> <p>5.4 Indexing head</p> <p>5.5 Footstock</p>												
6. Milling Operations	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">6.1 Indexing</td> <td style="width: 50%;">6.6 Milling bevel gear</td> </tr> <tr> <td>6.2 Milling splines</td> <td>6.7 Milling ratchet</td> </tr> <tr> <td>6.3 Milling equally-spaced grooves</td> <td>6.8 Milling converging faces</td> </tr> <tr> <td>6.4 Milling 45° serrations on cylindrical work piece</td> <td>6.11 Milling large radial slots</td> </tr> <tr> <td>6.5 Milling spur gear and rack</td> <td>6.12 Milling internal radii</td> </tr> <tr> <td></td> <td>6.13 Milling helical gear</td> </tr> </table>	6.1 Indexing	6.6 Milling bevel gear	6.2 Milling splines	6.7 Milling ratchet	6.3 Milling equally-spaced grooves	6.8 Milling converging faces	6.4 Milling 45° serrations on cylindrical work piece	6.11 Milling large radial slots	6.5 Milling spur gear and rack	6.12 Milling internal radii		6.13 Milling helical gear
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6.5 Milling spur gear and rack	6.12 Milling internal radii												
	6.13 Milling helical gear												
7. Measuring tools and equipment	<p>7.1 Vernier calipers</p> <p>7.2 Micrometer</p> <p>7.3 Gages</p> <p>7.4 Gear tooth calipers</p> <p>7.5 Dial indicator</p>												

Evidence Guide	
1. Critical aspects of evidence	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Followed OSH in the work place 1.2 Performed Routine maintenance to prepare the machine for required operation. 1.3 Determined job requirements 1.4 Setup and clamped the work piece . 1.5 Interpreted Drawing 1.6 Performed Milling operation 1.7 Checked/measured st the work piece
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Types and function of Lubricants and coolants 2.2 Milling types 2.3 Milling machine parts and functions 2.4 Fundamentals of milling cutters and holders 2.5 Cutting speed, rpm, feed rate 2.6 Functions of milling machine accessories, fixtures and attachments
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Handling tools and equipment 3.2 Selecting and setting proper cutting tools (Proper Milling cutter) 3.3 Computation of feed, cutting speed and machine rpm as per job requirement 3.4 Setting Cutting speed, rpm, feed 3.5 Apply the techniques of required milling operation. 3.6 Using measuring instruments to check dimension.
4. Required Attitude	<ol style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> 5.1 Work place 5.2 Tools and equipment appropriate to workplace 5.3 Materials relevant to the proposed activity/task 5.4 Drawings and specifications relevant to the task 5.5 Relevant manuals, codes, standards and reference material.
6. Method of assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code & Title	LECONELE3021A1 Perform Basic computer operations
Nominal Hours	30
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform basic computer operations which include inputting, accessing, producing and transferring data using the appropriate hardware and software
Elements of Competency	Performance Criteria <i>Bold & Italic</i> terms are elaborated in the range of variables
1. prepare for computer operation	<p>1.1. Requirements of task are determined according to job specifications</p> <p>1.2. Appropriate hardware and software are selected according to task assigned and required outcome</p> <p>1.3. Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed.</p>
2. Input data into computer	<p>2.1. Data are entered into the computer using appropriate program/application in accordance with company procedures</p> <p>2.2. Accuracy of information is checked and information is saved in accordance with standard operating procedures</p> <p>2.3. Inputted data are stored in storage media according to requirements</p> <p>2.4. Work is performed within ergonomic guidelines</p>
3. Access information using computer	<p>3.1. Correct program/application is selected based on job requirements</p> <p>3.2. Program/application containing the information required is accessed according to company procedures</p> <p>3.3. Desktop icons are correctly selected, opened and closed for navigation purposes</p> <p>3.4. Keyboard techniques are carried out in line with OH & S requirements for safe use of keyboards</p>
4. Produce/output data using computer system	<p>4.1. Entered data are processed using appropriate software commands</p> <p>4.2. Data printed out as required using computer hardware/peripheral devices in accordance with standard operating procedures</p> <p>4.3. Files, data are transferred between compatible systems using computer software, hardware/ peripheral devices in accordance with standard operating procedures</p>
5. Maintain computer equipment and systems	<p>5.1. Systems for cleaning, minor maintenance and replacement of consumables are implemented</p> <p>5.2. Procedures for ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures</p> <p>5.3. Basic file maintenance procedures are implemented in line with the standard operating procedures</p>

RANGE OF VARIABLES	
Variable	Range (Included but not limited to):
1. Hardware and peripheral devices	1.1. Personal computers 1.2. Communication equipment 1.3. Printers 1.4. Scanners 1.5. Keyboard 1.6. Mouse 1.7. Internet Modem/Broad Band Internet connection
2. Software	2.1. Word processing packages 2.2. Data base packages 2.3. Spread sheets
3. Storage media	3.1. Diskettes 3.2. CDS 3.3. zip disks 3.4. Hard disk drives, local and remote 3.5. USB
4. Ergonomic guidelines	4.1. Types of equipment used 4.2. Appropriate furniture 4.3. Seating posture 4.4. Lifting posture 4.5. Visual display unit screen brightness
5. Desktop icons	5.1 Directories/folders 5.2 Files 5.3 Network devices 5.4 Recycle bin
6. Software Maintenance	6.1 Creating more space in the hard disk 6.2 Reviewing programs 6.3 Deleting unwanted files 6.4 Backing up files 6.5 Checking hard drive for errors 6.6 Using up to date anti-virus programs 6.7 Cleaning dust from internal and external surfaces

EVIDENCE GUIDE	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1. Selected and used hardware components correctly and according to the task requirement 1.2. Produced accurate and complete data in accordance with the requirements 1.3. Used appropriate devices and procedures to transfer files/data accurately 1.4. Maintained computer system 1.5. Received and sent data through internet
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Basic ergonomics of keyboard and computer use 2.2 types of computers and basic features of different operating systems 2.3 Relevant types of software 2.4 General security 2.5 Viruses and anti-viruses 2.6 Elements of internet browsing
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Input & output the information 3.2 Producing accurate and complete data in accordance with the requirements 3.3 Using devices and procedures to transfer files/data accurately 3.4 Receiving and sending data through internet
4. Required Attitude	<ol style="list-style-type: none"> 4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Tidiness and timeliness 4.4 Respect of peers and seniors in workplace
5. Resource implications	<ol style="list-style-type: none"> 5.1 Computer hardware with peripherals 5.2 Appropriate software 5.3 Work place Procedure 5.4 Tools, equipment and facilities appropriate to processes or activity 5.5 Equipment and outfits appropriate in applying safety measures
6. Method of assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context of assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module</p>
<p>Accreditation Requirements</p> <p>Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification.</p> <p>Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE AND TITLE	TRAMACH 3022A1 Create Drawing Using CAD Software
NOMINAL HOURS	50
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to create drawing using CAD. It details the requirements for creating drawings with the aid of computer software (CAD).
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Safe work practices observed and personal proactive equipment (PPE) worn as required for the work performed.
2. Prepare for CAD drawing	2.1 Software and equipment for CAD are gathered to produce drawing as per requirement. 2.2 All relevant materials, instructions manuals and operating procedures for CAD software are obtained according to job requirements 2.3 The CAD package is booted up according to standard work procedures 2.4 Screen display areas and basic parameters are set in accordance with instructions manual
3. Produce 2D drawing	3.1 Drawing Sheet is selected following technical drawing standards and symbols 3.2 Page set-up and scaling procedure is performed based on technical drawing requirements and printer characteristics. 3.3 Basic 2D drawings are created using required CAD commands. 3.4 CAD drawings are reviewed and modified, if necessary. 3.5 Drawing files are saved in the designated folder in accordance with standard operating procedures. 3.6 Drawing files are printed out in accordance with standard operating procedures
4. Produce 3D drawing	4.1 2D drawing is selected for creating 3D drawing 4.2 3D CAD drawings are created using required commands according to specifications. 4.3 CAD drawings are reviewed and modified, if necessary. 4.4 Drawing files are saved in the designated folder in accordance with standard operating procedures. 4.5 Drawing files are printed out in accordance with standard operating procedures

5. Maintain computer equipment and systems	<p>5.1 Proper shutdown is carried out in accordance with standard operating procedures</p> <p>5.2 Systems and workplace is cleaned according to worksite procedures.</p> <p>5.3 Ensuring security of data, including regular back-ups and virus checks are implemented in accordance with standard operating procedures</p> <p>5.4 Basic file maintenance procedures are implemented in line with the standard operating procedures</p>
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Range of Variables

Variable	Range (May include but not limited to):
1. Software and equipment	<p>1.1 CAD software</p> <ul style="list-style-type: none"> ➤ AUTOCAD ➤ CATIA ➤ Solid works <p>1.2 Computer</p> <p>1.3 Plotter</p> <p>1.4 Printer</p> <p>1.5 USB</p>
2. Instructions and relevant materials	<p>2.1 Instructions manuals</p> <p>2.2 Sample product / work piece</p> <p>2.3 Drawings and/or sketches</p> <p>2.4 Paper</p> <p>2.5 Flash disk</p> <p>2.6 External drive</p> <p>2.7 Recordable or rewritable CD</p>
3. Basic Parameters	<p>3.1 Layer</p> <p>3.2 Line types</p> <p>3.3 Line width</p> <p>3.4 Dimension style</p> <p>3.5 Color and text format</p> <p>3.6 Hatch style</p>
4. Basic 2D Drawings	<p>4.1 lines</p> <p>4.2 Arcs</p> <p>4.3 Circles</p> <p>4.4 Polygons</p> <p>4.5 Ellipses</p> <p>4.6 Hatching or filling of areas</p> <p>4.7 Dimensions</p> <p>4.8 Text</p> <p>4.9 Mechanical working drawing</p>

Evidence Guide	
1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Prepared for CAD drawing 1.2 Produced basic drawing 1.3 Produce 2D working drawing 1.4 Produce 3D working drawing 1.5 Saved and printed drawing
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1 Standard drawing scales, symbols and abbreviations 2.2 Isometric 2.3 Sections <ul style="list-style-type: none"> ➤ full section ➤ half section 2.4 Fundamental of commands under Format, Draw, Dimension and modify menu.
3. Underpinning skills	<ol style="list-style-type: none"> 3.1 Laying out and page set up 3.2 Setting basic parameter 3.3 Using commands to prepare drawing 3.4 Using techniques to make working Drawing of 2D and 3D 3.5 Printing and plotting operations 3.6 Managing files
4. Required Attitude	<ol style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource implications	<p>The following resources must be provided:</p> <ol style="list-style-type: none"> 5.1 Work place 5.2 Tools and equipment appropriate to work requirement 5.3 Computer equipment, printer/plotter, software and facilities appropriate to processes or activities 5.4 Sample part/model 5.5 Relevant manuals, codes, standards and reference material.
6. Method of assessment	<p>Competency must be assessed through:</p> <ol style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
<p>Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.</p>	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

UNIT CODE & TITLE	TRAMACH 3023A1 Write basic CNC Lathe Machine Program
NOMINAL HOURS	30
UNIT DESCRIPTOR	This unit covers the skills, knowledge and attitude required to write program for CNC lathe with multiple axis to drawing specifications. It details the requirements for performing CNC lathe programming such as facing, straight and contour turning, cutting grooves, drilling, cutting threads and the operations involve driven tools.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Prepare for basic program writing	1.1 Safe work practices observed as per work place requirement. 1.2 <i>Drawings</i> are interpreted to write program as per drawing specifications. 1.3 Process / job / adjustment sheets are filled up with relevant machine tool, <i>cutting tool</i> and raw material data.
2. Prepare basic CNC lathe machine program	2.1 Coordinates calculated for simple tool path or basic machining functions based on part or product to be produced. 2.2 Identify code format in accordance with lathe operation 2.3 <i>Program is</i> written according to CNC <i>lathe operations</i> .
3. Edit basic CNC lathe machine programs	3.1 Program is simulated by simulation software in accordance with drawing specifications 3.2 Program is edited (if necessary) according to the requirement of the operation.

Range of Variables

Variable	Range (May include but not limited to):
1. Drawings	Reading and interpretation 1.1 Dimensions and symbols 1.2 Tolerances
2. Cutting Tools	2.1 External and internal cutting tools 2.2 Grooving tools 2.3 Drilling tools 2.4 Threading tools 2.5 Parting - off tool

3. Programming	3.1 Absolute programming 3.2 Incremental programming 3.3 Canned cycle program 3.4 Linear programming.
4. Lathe Operations	4.1 Facing (transversal) 4.2 Straight turning (longitudinal/plain) 4.3 Contour turning (circular, taper) 4.4 Recess, shoulders, grooves, fillets and chamfers, 4.5 Thread cutting 4.6 Parting-off

Evidence Guide	
1 Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Determined job requirements 1.2 Wrote basic CNC lathe machine program 1.3 Edited basic CNC lathe machine programs
2. Underpinning knowledge	2.1 CNC Word Address & Code <ul style="list-style-type: none"> ➤ G Code Programming ➤ M Code Programming 2.2 CNC machine axis's 2.3 Cutting speed, feed rate 2.4 Lathe operation processes
3. Underpinning skills	3.1 Computation of feed and cutting speed 3.2 Application of G - codes and M - codes 3.3 Application of absolute & incremental coordinate system 3.4 Performing Canned cycle programming format.
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Tidiness and timeliness 4.4 Respect of peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1 Work place 5.2 Tools and equipment appropriate to workplace 5.3 Materials relevant to the proposed activity/task 5.4 Computer equipment, printer/plotter, software and facilities appropriate to processes or activities 5.5 Sample part/model 5.6 Measuring instruments 5.7 Drawings, sketches or blueprint

6. Method of assessment	Competency must be assessed through: 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.
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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

UNIT CODE & TITLE	TRAMACH 3024A1 Perform CNC Lathe Machine Operations
NOMINAL HOURS	70
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to perform CNC lathe machine operations. It includes facing, straight and contour turning, cutting grooves, drilling, boring, and external V-thread cutting,
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1 Prepare for CNC Operation	<p>1.1 Safe work practices observed and personal proactive equipment (PPE) worn as required for the work performed.</p> <p>1.2 Tool and Materials for CNC operation are selected conforming to the job requirement</p> <p>1.3 Performed routine maintenance to prepare the machine for required operation</p> <p>1.4 Drawings are interpreted to produce component to specifications.</p>
2 Set- up machine ,cutting tools and work piece	<p>2.1 Machine Zero Point Is set according to the required job position (offset setting)</p> <p>2.2 Cutting tools and <i>driven</i> tools are set according to required sequence of operations.</p> <p>2.3 Work holding and clamping devices are tightened according to standard operating procedures.</p> <p>2.4 Work piece is mounted on clamping device using tools and instruments in accordance with workplace procedures 3.1</p>
3 Input/write program	<p>Program Is inputted/written to the machine using appropriate devices.</p> <p>3.2 Program is checked to determine the correctness of work parameters.</p> <p>3.3 Work piece zero point is set to the required position.</p>
4 Simulate the program	<p>4.1 Program simulation is performed to check the desired tool path movement.</p> <p>4.2 Where necessary, program is edited for the desired tool path movement.</p>
5 Perform CNC operation in Auto mode	<p>5.1 The door is closed in order to safe operation</p> <p>5.2 Program is reset to ensure start position from the first program block.</p> <p>5.3 CNC Lathe operations are performed to produce component as programmed.</p> <p>5.4 Corrective measures/adjustments are performed if necessary.</p>

6 Check and measure work piece	6.1 Work piece is checked and measured in conformance to specification using appropriate methods, measuring tools and equipment. 6.2 Defective work pieces are marked, recorded and reported for proper action. 6.3 Waste materials are disposed of in accordance with environmental requirements. 6.4 Cleaning of machine and equipment is performed in accordance with standard procedures 6.5 Tools and equipment are stored safely in appropriate location according to standard work place procedures
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Range of Variables

Variable	Range (May include but not limited to):
1. PPE	1.1 Hand Gloves. 1.2 Goggles . 1.3 Safety Shoes. 1.4 Apron
2. Materials	2.1 Mild Steel, Carbon Steel, Stainless Steel, Gum metal, Bright Steel 2.2 Aluminum, Brass 2.3 Plastic bar/rod
3. Routine Maintenance	3.1 Checking and adjust Machine guards, 3.2 Checking and use coolant and lubricant 3.3 Checking & adjusting Air And Hydraulic Pressure 3.4 Checking and adjust chips extraction devices. 3.5 Checking machine performance
4. Cutting Tools	4.1 Side cutting Tool 4.2 Boring tools 4.3 Grooving tools 4.4 Drilling tools 4.5 Tapping tools 4.6 Threading tools 4.7 Parting-off tools
5. Tool set-up	5.1 Scratch method 5.2 Tool-setting device method
6. Work holding and clamping device	6.1 Three jaw chuck 6.2 Collect chuck 6.3 Live center 6.4 Bar feeder 6.5 Part catcher

7. Instruments	7.1 Tool pre - setting device (<i>optional</i>) 7.2 Dial indicator 7.3 Dial test indicator 7.4 Gauges (go-no go, pitch, plug, radius, etc.) 7.5 Coordinate measuring machine (CMM) (<i>optional</i>) 7.6 Bevel protractor 7.7 Profile projector 7.8 Surface-texture tester 7.9 Surface-finish comparator 7.10 Steel rule
8. Program	8.1 Canned cycle programing 8.2 Absolute programing 8.3 Incremental programing
9. Appropriate input Devices	9.1 Machine Key board 9.2 Computer/Laptop 9.3 Flash drive
10. CNC Lathe Operations	10.1 Facing 10.2 straight turning 10.3 Contour turning (circular, taper) 10.4 Recess, shoulders, grooves, fillets and chamfers, drilling, boring 10.5 External V-thread cutting 10.6 Parting-off
11. Corrective measures/adjustments	11.1 Replacement of cutting tools 11.2 Adjustment of tool offset 11.3 Adjustment of cutting speed and feed rate
12. Measuring Tools	12.1 Vernier caliper (Digital or read out) 12.2 Micrometer (Digital or read out) 12.3 Gages (thread, drill, surface comparator / roughness tester, radius, screw pitch, taper)

Evidence Guide	
1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Used safety rules and procedure 1.2 Performed machine set-up with multiple axis 1.3 Performed cutting tools and driven tools setting 1.4 Wrote / inputted programs 1.5 Performed work piece set-up 1.6 Simulated the program 1.7 Turned work piece 1.8 Checked and measured work piece
2. Underpinning knowledge and attitude	<ul style="list-style-type: none"> 2.1 Emergency stop 2.2 Machine axis 2.3 G-Code programing 2.4 M-code programing 2.5 Coordinate <ul style="list-style-type: none"> ➤ Absolute position ➤ Relative position ➤ Machine position 2.6 Mode <ul style="list-style-type: none"> ➤ Edit (Program) mode ➤ JOG (Handle) mode ➤ MDI mode ➤ DNC mode ➤ Single block mode ➤ Auto mode 2.7 Feed rate over write 2.8 Spindle speed over write 2.9 Rapid travels 2.10 Tool offset and tool geometry 2.11 Zero return 2.12 Memory lock key 2.13 Cycle start and cycle stop 2.14 Low lubrication indicator
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Selection of cutting tools 3.2 Computation of feed, cutting speed and machine rpm 3.3 Application of G - codes and M - codes 3.4 Setting machine with multiple axis 3.5 Writing /inputting programs 3.6 Setting work piece 3.7 Simulating the program 3.8 Applying techniques to turn work piece 3.9 Using measuring tools and equipment to check and measure work piece
4. Required Attitude	<ul style="list-style-type: none"> 4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn

	<p>4.4 Tidiness and timeliness</p> <p>4.5 Respect of peers and seniors in workplace</p>
5. Resource implications	<p>The following resources must be provided:</p> <p>5.1 Work place</p> <p>5.2 Tools and equipment appropriate to work</p> <p>5.3 CNC Lathe</p> <p>5.4 Materials relevant to the proposed activity/task</p> <p>5.5 Computer with data transfer device</p> <p>5.6 Measuring instruments</p> <p>5.7 Drawings and sketches</p>
6. Method of assessment	<p>Competency must be assessed through:</p> <p>6.1 Written test.</p> <p>6.2 Demonstration</p> <p>6.3 Oral Questioning/Interview</p>
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>
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National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

UNIT CODE & TITLE	TRAMACH 3025A1 Apply CAD/CAM Program
NOMINAL HOURS	70
UNIT DESCRIPTOR	This unit covers the knowledge, skill and attitude required to apply CAD/CAM program for creating of CAD drawings and CNC programs based on drawing specifications.
ELEMENTS OF COMPETENCY	PERFORMANCE CRITERIA <i>Bold & Italic</i> terms are elaborated in the Range of Variables
1. Prepare for application CAD/CAM Program	<p>1.1 Safe work practices observed in accordance with work place requirement.</p> <p>1.2 Work piece, drawing, model or a concept of a new design are analyzed to produce CAD drawing and CAM program.</p> <p>1.3 CNC Parameters are selected according to the requirements of the operation.</p> <p>1.4 Tools and equipment are gathered to produce drawing as per requirement.</p> <p>1.5 All relevant materials, instructions manuals and operating procedures are obtained according to job requirements</p> <p>1.6 Basic parameters of CNC machine are set in accordance with instructions manual.</p>
2. Create / import CAD drawing	<p>2.1 Drawing reference point is established based on job requirement / work piece.</p> <p>2.2 Profile, shape, contour of the work piece are created / imported using CAD according to job requirements and drawing standards.</p> <p>2.3 Created / imported drawings are edited according to drawing standards.</p> <p>2.4 Created / edited drawing is saved according to job requirements.</p>

3. Create / edit CNC programs	<p>3.1 Tools are selected from the tool library and loaded based on job requirements.</p> <p>3.2 Coordinates are set for tool path or machining functions based on the CNC machine.</p> <p>3.3 Work piece Zero point is identified based on the CNC machine.</p> <p>3.4 Tool paths generated in accordance with the software used.</p> <p>3.5 Tool paths are simulated and determined the correctness of the tool movements and other work parameters.</p> <p>3.6 CNC program generated through post processor in accordance with selected CNC machine</p>
4. Load and run program at CNC machine	<p>4.1 Program is loaded using the appropriate devices.</p> <p>4.2 Dry run/simulation is performed in the machine in accordance with established procedures.</p> <p>4.3 Program is executed to produce part/ work piece.</p> <p>4.4 Problems encountered are documented, reported or referred to concerned personnel in accordance with worksite procedures.</p> <p>4.5 Cleaning of equipment is performed in accordance with standard procedures.</p>

Range of Variables	
Variable	Range (May include but not limited to):
1. CNC Parameters	<p>1.1 Coordinates of CNC machine</p> <p>1.2 Tools position</p>
2. Drawing standards	<p>2.1 ISO</p> <p>2.2 American (ANSI)</p> <p>2.3 And other existing standards</p>
3. Software	<p>3.1 Master CAM</p> <p>3.2 Edge CAM</p> <p>3.3 CATIA</p>
4. Machine control	<p>4.1 Fanuc</p> <p>4.2 Sinumerik</p>
5. Problems encountered	<p>5.1 Incorrect machine set-up</p> <p>5.2 Incorrect parameter setting</p> <p>5.3 Defective raw materials</p>
6. Concerned personnel	<p>6.1 Production supervisor</p> <p>6.2 CNC Programmer</p> <p>6.3 Designer</p> <p>6.4 Other operators</p> <p>6.5 Quality control inspector</p>

Evidence Guide	
1. Critical aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Observed computer hardware safety practice 1.2 Determined job requirements 1.3 Created / imported CAD drawing 1.4 Set CNC parameters 1.5 Created / edited CNC programs 1.6 Loaded and run program at CNC machine
2. Underpinning knowledge and attitude	<ul style="list-style-type: none"> 2.1 Methods of CNC Lathe machine operations 2.2 Determination of materials specifications 2.3 Fundamental common and specific G-codes and M-codes 2.4 Fundamentals of CAD/CAM software 2.5 Connection technique to CNC machines 2.6 Basic file management
3. Underpinning skills	<ul style="list-style-type: none"> 3.1 Drafting and designing work piece 3.2 Selection of cutting tools 3.3 Using CAD/CAM software 3.4 Generating codes 3.5 Application of G - codes and M - codes 3.6 Transferring program to CNC machines.
4. Required Attitude	<ul style="list-style-type: none"> 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 of peers and seniors in workplace
5. Resource implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 5.1 Work place 5.2 Computer equipment, software and facilities appropriate to processes or activities. 5.3 Data transferring devices 5.4 Tools and equipment appropriate to work requirement 5.5 Relevant manuals, codes, standards and reference material.
6. Method of assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 6.1 Written test. 6.2 Demonstration 6.3 Oral Questioning/Interview
7. Context for assessment	<p>For certification competency should be assessed individually in the actual work place or simulated environment after completion of the module.</p>

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