TRAINING REGULATIONS

5-AXIS CNC MACHINE OPERATION NC III

METALS AND ENGINEERING SECTOR

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
East Service Road, South Luzon Expressway (SLEX), Fort Bonifacio, Taguig City, Metro Manila

Technical Education and Skills Development Act of 1994
(Republic Act No. 7796)

Section 22, "Establishment and Administration of the National Trade Skills Standards" of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skill standards. The Authority shall develop and implement a certification and accreditation program in which private industry group and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority.

The Training Regulations (TR) serves as basis for:

1. Development of curriculum and assessment tools
2. Registration and delivery of training programs; and
3. Establishment of competency assessment and certification arrangements.

Each TR has four sections:

Section 1 **Definition of Qualification** - describes the qualification and defines the competencies that comprise the qualification.

Section 2 **The Competency Standards** format was revised to include the Required Knowledge and Required Skills per element. These fields explicitly state the required knowledge and skills for competent performance of a unit of competency in an informed and effective manner. These also emphasize the application of knowledge and skills to situations where understanding is converted into a workplace outcome.

Section 3 **Training Arrangements** – contain the information and requirements which serve as bases for training providers in designing and delivering competency-based curriculum for the qualification. The revisions to Section 3 entail identifying the Learning Activities leading to achievement of the identified Learning Outcome.

Section 4 **Assessment and Certification Arrangements** - describe the policies governing assessment and certification procedures for the qualification.

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5-AXIS CNC MACHINE OPERATION NC III

SECTION 1 5- AXIS CNC MACHINE OPERATION NC III QUALIFICATION

The **5-Axis CNC Machine Operation NC III** Qualification consists of competencies that a person must achieve to write advance CNC program, set up machine, work piece and cutting tools and perform 5-axis CNC machine operations and conduct final inspection on work piece.

CODE NO.	BASIC COMPETENCIES
400311319	Lead workplace communication
400311320	Lead small teams
400311321	Apply critical thinking and problem-solving techniques in the workplace
400311322	Work in a diverse environment
400311323	Propose methods of applying learning and innovation in the organization
400311324	Use information systematically
400311325	Evaluate occupational safety and health work practices
400311326	Evaluate environmental work practices
400311327	Facilitate entrepreneurial skills for micro-small-medium enterprises (MSMEs)

CODE NO.	COMMON COMPETENCIES
MEE722201	Apply safety practices
MEE722202	Interpret working drawings and sketches
MEE722203	Select/ cut workshop materials
MEE722204	Perform shop computations (Basic)
MEE722205	Measure workpiece (Basic)
MEE722206	Perform routine housekeeping
MEE722207	Perform shop computations (Intermediate)
MEE722208	Measure workpiece using angular measuring instruments
MEE722210	Measure workpiece using gages and surface texture comparator
MEE722211	Perform preventive and corrective maintenance
ICT311201	Operate a personal computer

CODE NO.	CORE COMPETENCIES
MEE 821321	Write 5-axis CNC machine program
MEE 821322	Set-up 5-axis CNC machine, cutting tools and workpiece
MEE 821323	Perform 5-axis CNC machine operations
MEE 821324	Perform post 5-axis CNC machine operations

A person who has achieved this Qualification is competent to be:

- 5-Axis CNC Machine Programmer
- 5-Axis CNC Machine Operator
- CNC Lathe Machine Operator
- CNC Milling Machine Operator

SECTION 2 COMPETENCY STANDARDS

This section gives the details and contents of the units of competency required in **5-AXIS CNC MACHINE OPERATION NC III.** These units of competency are categorized into basic, common and core competencies.

BASIC COMPETENCIES

UNIT OF COMPETENCY : LEAD WORKPLACE COMMUNICATION

UNIT CODE : 400311319

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to lead in the effective dissemination and discussion of ideas, information, and issues in the workplace. This includes preparation of written communication materials.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Communicate information about workplace processes	1.1 Relevant ***communication method*** is selected based on workplace procedures 1.2 Multiple operations involving several topics/areas are communicated following enterprise requirements 1.3 Questioning is applied to gain extra information 1.4 Relevant sources of information are identified in accordance with workplace/ client requirements 1.5 Information is selected and organized following enterprise procedures 1.6 Verbal and written reporting is undertaken when required 1.7 Communication and negotiation skills are applied and maintained in all relevant situations	1.1. Organization requirements for written and electronic communication methods 1.2. Effective verbal communication methods 1.3. Business writing 1.4. Workplace etiquette	1.1 Organizing information 1.2 Conveying intended meaning 1.3 Participating in a variety of workplace discussions 1.4 Complying with organization requirements for the use of written and electronic communication methods 1.5 Effective business writing 1.6 Effective clarifying and probing skills 1.7 Effective questioning techniques (clarifying and probing)

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Lead workplace discussions	2.1 Response to workplace issues are sought following enterprise procedures 2.2 Response to workplace issues are provided immediately 2.3 Constructive contributions are made to ***workplace discussions*** on such issues as production, quality and safety 2.4 Goals/ objectives and action plans undertaken in the workplace are communicated promptly	2.1 Organization requirements for written and electronic communication methods 2.2 Effective verbal communication methods 2.3 Workplace etiquette	2.1 Organizing information 2.2 Conveying intended meaning 2.3 Participating in variety of workplace discussions 2.4 Complying with organization requirements for the use of written and electronic communication methods 2.5 Effective clarifying and probing skills
3. Identify and communicate issues arising in the workplace	3.1 Issues and problems are identified as they arise 3.2 Information regarding problems and issues are organized coherently to ensure clear and effective communication 3.3 Dialogue is initiated with appropriate personnel 3.4 Communication problems and issues are raised as they arise 3.5 Identify barriers in communication to be addressed appropriately	3.1 Organization requirements for written and electronic communication methods 3.2 Effective verbal communication methods 3.3 Workplace etiquette 3.4 Communication problems and issues 3.5 Barriers in communication	3.1 Organizing information 3.2 Conveying intended meaning 3.3 Participating in a variety of workplace discussions 3.4 Complying with organization requirements for the use of written and electronic communication methods 3.5 Effective clarifying and probing skills 3.6 Identifying issues 3.7 Negotiation and communication skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. Methods of communication	May include: 1.1. Non-verbal gestures 1.2. Verbal 1.3. Face-to-face 1.4. Two-way radio 1.5. Speaking to groups 1.6. Using telephone 1.7. Written 1.8. Internet
2. Workplace discussions	May include: 2.1. Coordination meetings 2.2. Toolbox discussion 2.3. Peer-to-peer discussion

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Dealt with a range of communication/information at one time 1.2 Demonstrated leadership skills in workplace communication 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 written form 1.7 Used appropriate sources of information 1.8 Asked appropriate questions 1.9 Provided accurate information
2. Resource Implications	**The following resources should be provided:** 2.1 Variety of Information 2.2 Communication tools 2.3 Simulated workplace
3. Methods of Assessment	**Competency in this unit may be assessed through:** Case problem 3.1. Third-party report 3.2. Portfolio 3.3. Interview 3.4. Demonstration/Role-playing
4. Context for Assessment	4.1. Competency may be assessed in the workplace or in a simulated workplace environment

UNIT OF COMPETENCY : **LEAD SMALL TEAMS**

UNIT CODE : **400311320**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes to lead small teams including setting, maintaining and monitoring team and individual performance standards.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Provide team leadership	1.1 ***Work requirements*** are identified and presented to team members based on company policies and procedures 1.2 Reasons for instructions and requirements are communicated to team members based on company policies and procedures 1.3 ***Team members' and leaders' concerns*** are recognized, discussed and dealt with based on company practices	1.1 Facilitation of Team work 1.2 Company policies and procedures relating to work performance 1.3 Performance standards and expectations 1.4 Monitoring individual's and team's performance vis a vis client's and group's expectations	1.1 Communication skills required for leading teams 1.2 Group facilitation skills 1.3 Negotiating skills 1.4 Setting performance expectation
2. Assign responsibilities	2.1. Responsibilities are allocated having regard to the skills, knowledge and aptitude required to undertake the assigned task based on company policies. 2.2. Duties are allocated having regard to individual preference, domestic and personal considerations, whenever possible	2.1 Work plan and procedures 2.2 Work requirements and targets 2.3 Individual and group expectations and assignments 2.4 Ways to improve group leadership and membership	2.1 Communication skills 2.2 Management skills 2.3 Negotiating skills 2.4 Evaluation skills 2.5 Identifying team member's strengths and rooms for improvement
3. Set performance	3.1 Performance expectations are	3.1 One's roles and responsibilities in the team	3.1 Communication skills 3.2 Accurate empathy

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
expectations for team members	established based on client needs 3.2 Performance expectations are based on individual team members knowledge, skills and aptitude 3.3 Performance expectations are discussed and disseminated to individual team members	3.2 Feedback giving and receiving 3.3 Performance expectation	3.3 Congruence 3.4 Unconditional positive regard 3.5 Handling of Feedback
4. Supervise team performance	4.1 Performance is monitored based on defined performance criteria and/or assignment instruction 4.2 Team members are provided with ***feedback***, positive support and advice on strategies to overcome any deficiencies based on company practices 4.3 ***Performance issues*** which cannot be rectified or addressed within the team are referred to appropriate personnel according to employer policy 4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on client/customer needs and satisfaction 4.5 Team operations are monitored to ensure that employer/client	4.1 Performance Coaching 4.2 Performance management 4.3 Performance Issues	4.1 Communication skills required for leading teams 4.2 Coaching skill

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	needs and requirements are met 4.6 Follow-up communication is provided on all issues affecting the team 4.7 All relevant documentation is completed in accordance with company procedures		

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work requirements	May include: 1.1. Client Profile 1.2. Assignment instructions
2. Team member's concerns	May include: 2.1. Roster/shift details
3. Monitor performance	May include: 3.1. Formal process 3.2. Informal process
4. Feedback	May include: 4.1. Formal process 4.2. Informal process
5. Performance issues	May include: 5.1. Work output 5.2. Work quality 5.3. Team participation 5.4. Compliance with workplace protocols 5.5. Safety 5.6. Customer service

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Maintained or improved individuals and/or team performance given a variety of possible scenario 1.2. Assessed and monitored team and individual performance against set criteria 1.3. Represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf 1.4. Allocated duties and responsibilities, having regard to individual's knowledge, skills and aptitude and the needs of the tasks to be performed 1.5. Set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members
2. Resource Implications	**The following resources should be provided:** 2.1. Access to relevant workplace or appropriately simulated environment where assessment can take place 2.2. Materials relevant to the proposed activity or task
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1. Written Examination 3.2. Oral Questioning 3.3. Portfolio
4. Context for Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : APPLY CRITICAL THINKING AND PROBLEM-SOLVING TECHNIQUES IN THE WORKPLACE

UNIT CODE : 400311321

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to solve problems in the workplace including the application of problem solving techniques and to determine and resolve the root cause/s of specific problems in the workplace.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Examine specific workplace challenges	1.1 Variances are examined from normal operating **parameters;** and product quality. 1.2 Extent, cause and nature of the specific problem are defined through observation, investigation and ***analytical techniques***. 1.3 ***Problems*** are clearly stated and specified.	1.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations. 1.2 Competence to include the ability to apply and explain, enough for the identification of fundamental causes of specific workplace challenges. 1.3 Relevant equipment and operational processes. 1.4 Enterprise goals, targets and measures. 1.5 Enterprise quality OHS and environmental requirement. 1.6 Enterprise information systems and data collation 1.7 Industry codes and standards.	1.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 1.2 Identifying extent and causes of specific challenges in the workplace.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Analyze the causes of specific workplace challenges.	2.1 Possible causes of specific problems are identified based on experience and the use of problem solving tools / analytical techniques. 2.2 Possible cause statements are developed based on findings. 2.3 Fundamental causes are identified per results of investigation conducted.	2.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations. 2.2 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations. 2.3 Relevant equipment and operational processes. 2.4 Enterprise goals, targets and measures. 2.5 Enterprise quality OSH and environmental requirement. 2.6 Enterprise information systems and data collation. 2.7 Industry codes and standards.	2.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 2.2 Identifying extent and causes of specific challenges in the workplace. 2.3 Providing clear-cut findings on the nature of each identified workplace challenges.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Formulate resolutions to specific workplace challenges	3.1 All possible options are considered for resolution of the problem. 3.2 Strengths and weaknesses of possible options are considered. 3.3 Corrective actions are determined to resolve the problem and possible future causes. 3.4 **Action *plans*** are developed identifying measurable objectives, resource needs and timelines in accordance with safety and operating procedures	3.1 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations 3.2 Relevant equipment and operational processes 3.3 Enterprise goals, targets and measures 3.4 Enterprise quality OSH and environmental requirement 3.5 Principles of decision making strategies and techniques 3.6 Enterprise information systems and data collation 3.7 Industry codes and standards	3.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 3.2 Identifying extent and causes of specific challenges in the workplace. 3.3 Providing clear-cut findings on the nature of each identified workplace challenges. 3.4 Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Implement action plans and communicate results	4.1 Action plans are implemented and evaluated. 4.2 Results of plan implementation and recommendations are prepared. 4.2 Recommendations are presented to appropriate personnel. 4.3 Recommendations are followed-up, if required.	4.1 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations 4.2. Relevant equipment and operational processes 4.3 Enterprise goals, targets and measures 4.4 Enterprise quality, OSH and environmental requirement 4.5 Principles of decision making strategies and techniques 4.6 Enterprise information systems and data collation 4.7 Industry codes and standards	4.1 Using range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace. 4.2 Identifying extent and causes of specific challenges in the workplace. 4.3 Providing clear-cut findings on the nature of each identified workplace challenges. 4.4 Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Parameters	May include: 1.1 Processes 1.2 Procedures 1.3 Systems
2. Analytical techniques	May include: 2.1. Brainstorming 2.2. Intuitions/Logic 2.3. Cause and effect diagrams 2.4. Pareto analysis 2.5. SWOT analysis 2.6. Gant chart, Pert CPM and graphs 2.7. Scattergrams
3. Problem	May include: 3.1. Routine, non – routine and complex workplace and quality problems 3.2. Equipment selection, availability and failure 3.3. Teamwork and work allocation problem 3.4. Safety and emergency situations and incidents 3.5. Risk assessment and management
4. Action plans	May include: 4.1. Priority requirements 4.2. Measurable objectives 4.3. Resource requirements 4.4. Timelines 4.5. Co-ordination and feedback requirements 4.6. Safety requirements 4.7. Risk assessment 4.8. Environmental requirements

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Examined specific workplace challenges. 1.2. Analyzed the causes of specific workplace challenges. 1.3. Formulated resolutions to specific workplace challenges. 1.4. Implemented action plans and communicated results on specific workplace challenges.
2. Resource Implications	2.1. Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios / case studies / what ifs will be required as well as bank of questions which will be used to probe the reason behind the observable action.
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1. Observation 3.2. Case Formulation 3.3. Life Narrative Inquiry 3.4. Standardized test The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components. These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened.
4. Context for Assessment	In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units.

UNIT OF COMPETENCY : WORK IN A DIVERSE ENVIRONMENT

UNIT CODE : 400311322

UNIT DESCRIPTOR : This unit covers the outcomes required to work effectively in a workplace characterized by diversity in terms of religions, beliefs, races, ethnicities and other differences.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Develop an individual's cultural awareness and sensitivity	1.1 Individual differences with clients, customers and fellow workers are recognized and respected in accordance with enterprise policies and core values. 1.2 Differences are responded to in a sensitive and considerate manner 1.3 **Diversity** is accommodated using appropriate verbal and non-verbal communication.	1.1 Understanding cultural diversity in the workplace 1.2Norms of behavior for interacting and dialogue with specific groups (e. g., Muslims and other non-Christians, non-Catholics, tribes/ethnic groups, foreigners) 1.3Different methods of verbal and non-verbal communication in a multicultural setting	1.1 Applying cross-cultural communication skills (i.e. different business customs, beliefs, communication strategies) 1.2 Showing affective skills – establishing rapport and empathy, understanding, etc. 1.3 Demonstrating openness and flexibility in communication 1.4 Recognizing diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Work effectively in an environment that acknowledges and values cultural diversity	2.1 Knowledge, skills and experiences of others are recognized and documented in relation to team objectives. 2.2 Fellow workers are encouraged to utilize and share their specific qualities, skills or backgrounds with other team members and clients to enhance work outcomes. 2.3 Relations with customers and clients are maintained to show that diversity is valued by the business.	2.1 Value of diversity in the economy and society in terms of Workforce development 2.2 Importance of inclusiveness in a diverse environment 2.3 Shared vision and understanding of and commitment to team, departmental, and organizational goals and objectives 2.4 Strategies for customer service excellence	2.1 Demonstrating cross-cultural communication skills and active listening 2.2 Recognizing diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices 2.3 Demonstrating collaboration skills 2.4 Exhibiting customer service excellence

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Identify common issues in a multicultural and diverse environment	3.1 **Diversity-related conflicts** within the workplace are effectively addressed and resolved. 3.2 Discriminatory behaviors towards customers/stakeholders are minimized and addressed accordingly. 3.3 Change management policies are in place within the organization.	3.1 Value, and leverage of cultural diversity 3.2 Inclusivity and conflict resolution 3.3 Workplace harassment 3.4 Change management and ways to overcome resistance to change 3.5 Advanced strategies for customer service excellence	3.1 Addressing diversity-related conflicts in the workplace 3.2 Eliminating discriminatory behavior towards customers and co-workers 3.3 Utilizing change management policies in the workplace

RANGE OF VARIABLES

VARIABLE	RANGE
1. Diversity	This refers to diversity in both the workplace and the community and may include divergence in: 1.1 Religion 1.2 Ethnicity, race or nationality 1.3 Culture 1.4 Gender, age or personality 1.5 Educational background
2. Diversity-related conflicts	May include conflicts that result from: 2.1 Discriminatory behaviors 2.2 Differences of cultural practices 2.3 Differences of belief and value systems 2.4 Gender-based violence 2.5 Workplace bullying 2.6 Corporate jealousy 2.7 Language barriers 2.8 Individuals being differently-abled persons 2.9 Ageism (negative attitude and behavior towards old people)

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate**: 1.1 Adjusted language and behavior as required by interactions with diversity 1.2 Identified and respected individual differences in colleagues, clients and customers 1.3 Applied relevant regulations, standards and codes of practice
2. Resource Implications	**The following resources should be provided:** 2.1 Access to workplace and resources 2.2 Manuals and policies on Workplace Diversity
3. Methods of Assessment	**Competency in this unit may be assessed through**: 3.1 Demonstration or simulation with oral questioning 3.2 Group discussions and interactive activities 3.3 Case studies/problems involving workplace diversity issues 3.4 Third-party report 3.5 Written examination 3.6 Role Plays
4. Context for Assessment	Competency assessment may occur in workplace or any appropriately simulated environment

UNIT OF COMPETENCY : **PROPOSE METHODS OF APPLYING LEARNING AND INNOVATION IN THE ORGANIZATION**

UNIT CODE : **400311323**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to assess general obstacles in the application of learning and innovation in the organization and to propose practical methods of such in addressing organizational challenges.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Assess work procedures, processes and systems in terms of innovative practices	1.1. R***easons*** for innovation are incorporated to work procedures. 1.2. ***Models of innovation*** are researched. 1.3. G***aps or barriers*** to innovation in one's work area are analyzed. 1.4. Staff who can support and foster innovation in the work procedure are identified.	1.1 Seven habits of highly effective people. 1.2 Character strengths that foster innovation and learning (Christopher Peterson and Martin Seligman, 2004) 1.3 Five minds of the future concepts (Gardner, 2007). 1.4 Adaptation concepts in neuroscience (Merzenich, 2013). 1.5 Transtheoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).	1.1 Demonstrating collaboration and networking skills. 1.2 Applying basic research and evaluation skills 1.3 Generating insights on how to improve organizational procedures, processes and systems through innovation.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Generate practical action plans for improving work procedures, processes	2.1 Ideas for innovative work procedure to foster innovation using individual and group techniques are conceptualized 2.2 Range of ideas with other team members and colleagues are evaluated and discussed 2.3 Work procedures and processes subject to change are selected based on ***workplace requirements*** (feasible and innovative). 2.4 Practical action plans are proposed to facilitate simple changes in the work procedures, processes and systems. 2.5 ***Critical inquiry*** is applied and used to facilitate discourse on adjustments in the simple work procedures, processes and systems.	2.1 Seven habits of highly effective people. 2.2 Character strengths that foster innovation and learning (Christopher Peterson and Martin Seligman, 2004) 2.3 Five minds of the future concepts (Gardner, 2007). 2.4 Adaptation concepts in neuroscience (Merzenich, 2013). 2.5 Transtheoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).	2.1 Assessing readiness for change on simple work procedures, processes and systems. 2.2 Generating insights on how to improve organizational procedures, processes and systems through innovation. 2.3 Facilitating action plans on how to apply innovative procedures in the organization.

ELEMENTS	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Evaluate the effectiveness of the proposed action plans	3.1 Work structure is analyzed to identify the impact of the new work procedures 3.2 Co-workers/key personnel is consulted to know who will be involved with or affected by the work procedure 3.3 Work instruction operational plan of the new work procedure is developed and evaluated. 3.4 Feedback and suggestion are recorded. 3.5 Operational plan is updated. 3.6 Results and impact on the developed work instructions are reviewed 3.7 Results of the new work procedure are evaluated 3.8 Adjustments are recommended based on results gathered	3.1 Five minds of the future concepts (Gardner, 2007). 3.2 Adaptation concepts in neuroscience (Merzenich, 2013). 3.3 Transtheoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).	3.1 Generating insights on how to improve organizational procedures, processes and systems through innovation. 3.2 Facilitating action plans on how to apply innovative procedures in the organization. 3.3 Communicating results of the evaluation of the proposed and implemented changes in the workplace procedures and systems. 3.4 Developing action plans for continuous improvement on the basic systems, processes and procedures in the organization.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Reasons	May include: 1.1 Strengths and weaknesses of the current systems, processes and procedures. 1.2 Opportunities and threats of the current systems, processes and procedures.
2. Models of innovation	May include: 2.1 Seven habits of highly effective people. 2.2 Five minds of the future concepts (Gardner, 2007). 2.3 Neuroplasticity and adaptation strategies.
3. Gaps or barriers	May include: 3.1 Machine 3.2 Manpower 3.3 Methods 3.4 Money
4.	May include: 4.1 Preparation. 4.2 Discussion. 4.3 Clarification of goals. 4.4 Negotiate towards a Win-Win outcome. 4.5 Agreement. 4.6 Implementation of a course of action. 4.7 Effective verbal communication. See our pages: Verbal Communication and Effective Speaking. 4.8 Listening. 4.9 Reducing misunderstandings is a key part of effective negotiation. 4.10 Rapport Building. 4.11 Problem Solving. 4.12 Decision Making. 4.13 Assertiveness. 4.14 Dealing with Difficult Situations.

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Established the reasons why innovative systems are required 1.2 Established the goals of a new innovative system 1.3 Analyzed current organizational systems to identify gaps and barriers to innovation. 1.4 Assessed work procedures, processes and systems in terms of innovative practices. 1.5 Generate practical action plans for improving work procedures, and processes. 1.6 Reviewed the trial innovative work system and adjusted reflect evaluation feedback, knowledge management systems and future planning. 1.7 Evaluated the effectiveness of the proposed action plans.
2. Resource Implications	**The following resources should be provided:** 2.1 Pens, papers and writing implements. 2.2 Cartolina. 2.3 Manila papers.
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Psychological and behavioral Interviews. 3.2 Performance Evaluation. 3.3 Life Narrative Inquiry. 3.4 Review of portfolios of evidence and third-party workplace reports of on-the-job performance. 3.5 Sensitivity analysis. 3.6 Organizational analysis. 3.7 Standardized assessment of character strengths and virtues applied.
4. Context for Assessment	4.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions.

UNIT OF COMPETENCY : USE INFORMATION SYSTEMATICALLY

UNIT CODE : 400311324

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to use technical information systems, apply information technology (IT) systems and edit, format & check information.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Use technical information	1.1. ***Information*** are collated and organized into a suitable form for reference and use 1.2. Stored information are classified so that it can be quickly identified and retrieved when needed 1.3. Guidance are advised and offered to people who need to find and use information	1.1. Application in collating information 1.2. Procedures for inputting, maintaining and archiving information 1.3. Guidance to people who need to find and use information 1.4. Organize information 1.5. classify stored information for identification and retrieval 1.6. Operate the technical information system by using agreed procedures	1.1. Collating information 1.2. Operating appropriate and valid procedures for inputting, maintaining and archiving information 1.3. Advising and offering guidance to people who need to find and use information 1.4. Organizing information into a suitable form for reference and use 1.5. Classifying stored information for identification and retrieval 1.6. Operating the technical information system by using agreed procedures

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Apply information technology (IT)	2.1. ***Technical information*** system is operated using agreed procedures 2.2. Appropriate and valid procedures are operated for inputting, maintaining and archiving information 2.3. ***Software required*** are utilized to execute the project activities 2.4. Information and data obtained are handled, edited, formatted and checked from a range of internal and external ***sources*** 2.5. Information are extracted, entered, and processed to produce the outputs required by ***customers*** 2.6. Own skills and understanding are shared to help others 2.7. Specified ***security measures*** are implemented to protect the confidentiality and integrity of project data held in IT systems	2.1. Attributes and limitations of available software tools 2.2. Procedures and work instructions for the use of IT 2.3. Operational requirements for IT systems 2.4. Sources and flow paths of data 2.5. Security systems and measures that can be used 2.6. Extract data and format reports 2.7. Methods of entering and processing information 2.8. WWW enabled applications	2.1. Identifying attributes and limitations of available software tools 2.2. Using procedures and work instructions for the use of IT 2.3. Describing operational requirements for IT systems 2.4. Identifying sources and flow paths of data 2.5. Determining security systems and measures that can be used 2.6. Extracting data and format reports 2.7. Describing methods of entering and processing information 2.8. Using WWW applications

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Edit, format and check information	3.1 Basic editing techniques are used 3.2 Accuracy of documents are checked 3.3 Editing and formatting tools and techniques are used for more complex documents 3.4 Proof reading techniques is used to check that documents look professional	3.1 Basic file-handling techniques 3.2 Techniques in checking documents 3.3 Techniques in editing and formatting 3.4 Proof reading techniques	3.1 Using basic file-handling techniques is used for the software 3.2 Using different techniques in checking documents 3.3 Applying editing and formatting techniques 3.4 Applying proof reading techniques

RANGE OF VARIABLES

VARIABLE	RANGE
1. Information	May include: 1.1. Property 1.2. Organizational 1.3. Technical reference
2. Technical information	May include: 2.1. paper based 2.2. electronic
3. Software	May include: 3.1. spreadsheets 3.2. databases 3.3. word processing 3.4. presentation
4. Sources	May include: 4.1. other IT systems 4.2. manually created 4.3. within own organization 4.4. outside own organization 4.5. geographically remote
5. Customers	May include: 5.1. colleagues 5.2. company and project management 5.3. clients
6. Security measures	May include: 6.1. access rights to input; 6.2. passwords; 6.3. access rights to outputs; 6.4. data consistency and back-up; 6.5. recovery plans

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Used technical information systems and information technology 1.2. Applied information technology (IT) systems 1.3. Edited, formatted and checked information
2. Resource Implications	**The following resources should be provided:** 2.1. Computers 2.2. Software and IT system
3. Methods of Assessment	**Competency in this unit should be assessed through:** 3.1. Direct Observation 3.2. Oral interview and written test
4. Context for Assessment	4.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY : **EVALUATE OCCUPATIONAL SAFETY AND HEALTH WORK PRACTICES**

UNIT CODE : **400311325**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to interpret-Occupational Safety and Health practices, set OSH work targets, and evaluate effectiveness of Occupational Safety and Health work instructions

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret Occupational Safety and Health practices	1.1 ***OSH work practices issues*** are identified relevant to work requirements 1.2 OSH work standards and procedures are determined based on applicability to nature of work 1.3 Gaps in work practices are identified related to relevant OSH work standards	1.1. OSH work practices issues 1.2. OSH work standards 1.3. General OSH principles and legislations 1.4. Company/ workplace policies/ guidelines 1.5. Standards and safety requirements of work process and procedures	1.1. Communication skills 1.2. Interpersonal skills 1.3. Critical thinking skills 1.4. Observation skills
2. Set OSH work targets	2.1 Relevant work information are gathered necessary to determine OSH work targets 2.2 ***OSH Indicators*** based on gathered information are agreed upon to measure effectiveness of workplace OSH policies and procedures 2.3 Agreed OSH indicators are endorsed for approval from appropriate personnel 2.4 ***OSH work instructions*** are received in accordance with workplace policies and procedures*	2.1. OSH work targets 2.2. OSH Indicators 2.3. OSH work instructions 2.4. Safety and health requirements of tasks 2.5. Workplace guidelines on providing feedback on OSH and security concerns 2.6. OSH regulations Hazard control procedures 2.7. OSH trainings relevant to work	2.1. Communication skills 2.2. Collaborating skills 2.3. Critical thinking skills 2.4. Observation skills

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Evaluate effectiveness of Occupational Safety and Health work instructions	3.1 OSH Practices are observed based on workplace standards 3.2 Observed OSH practices are measured against approved ***OSH metrics*** 3.3 Findings regarding effectiveness are assessed and gaps identified are implemented based on OSH work standards	3.1. OSH Practices 3.2. OSH metrics 3.3. OSH Evaluation Techniques 3.4. OSH work standards	3.1. Critical thinking skills 3.2. Evaluating skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. OSH Work Practices Issues	May include: 1.1 Workers' experience/observance on presence of work hazards 1.2 Unsafe/unhealthy administrative arrangements (prolonged work hours, no break-time, constant overtime, scheduling of tasks) 1.3 Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/ guidelines
2. OSH Indicators	May include: 2.1 Increased of incidents of accidents, injuries 2.2 Increased occurrence of sickness or health complaints/symptoms 2.3 Common complaints of workers' related to OSH 2.4 High absenteeism for work-related reasons
3. OSH Work Instructions	May include: 3.1 Preventive and control measures**,** and targets 3.2 Eliminate the hazard (i.e., get rid of the dangerous machine 3.3 Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off) 3.4 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one) 3.5 Use administrative controls to reduce the risk (i.e. give trainings on how to use equipment safely; OSH-related topics, issue warning signages, rotation/shifting work schedule) 3.6 Use engineering controls to reduce the risk (i.e. use safety guards to machine) 3.7 Use personal protective equipment 3.8 Safety, Health and Work Environment Evaluation 3.9 Periodic and/or special medical examinations of workers
4. OSH metrics	May include: 4.1 Statistics on incidence of accidence and injuries 4.2 Morbidity (Type and Number of Sickness) 4.3 Mortality (Cause and Number of Deaths) 4.4 Accident Rate

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Identify OSH work practices issues relevant to work requirements 1.2. Identify gaps in work practices related to relevant OSH work standards 1.3. Agree upon OSH Indicators based on gathered information to measure effectiveness of workplace OSH policies and procedures 1.4. Receive OSH work instructions in accordance with workplace policies and procedures 1.5. Compare Observed OSH practices with against approved OSH work instructions 1.6. Assess findings regarding effectiveness based on OSH work standards
2. Resource Implications	**The following resources should be provided:** 2.1 Facilities, materials, tools and equipment necessary for the activity
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Observation/Demonstration with oral questioning 3.2 Third party report 3.3 Written exam
4. Context for Assessment	4.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : EVALUATE ENVIRONMENTAL WORK PRACTICES

UNIT CODE : 400311326

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitude to interpret environmental Issues, establish targets to evaluate environmental practices and evaluate effectiveness of environmental practices

ELEMENTS	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret environmental practices, policies and procedures	1.1 ***Environmental work practices*** issues are identified relevant to work requirements 1.2 Environmental Standards and Procedures nature of work are determined based on Applicability to nature of work 1.3 Gaps in work practices related to Environmental Standards and Procedures are identified	1.1 Environmental Issues 1.2 Environmental Work Procedures 1.3 Environmental Laws 1.4 Environmental Hazardous and Non-Hazardous Materials 1.5 Environmental required license, registration or certification	1.1. Analyzing Environmental Issues and Concerns 1.2. Critical thinking 1.3. Problem Solving 1.4. Observation Skills
2. Establish targets to evaluate environmental practices	2.1. Relevant information are gathered necessary to determine environmental work targets 2.2. ***Environmental Indicators*** based on gathered information are set to measure environmental work targets 2.3. Indicators are verified with appropriate personnel	2.1. Environmental Indicators 2.2. Relevant Environment Personnel or expert 2.3. Relevant Environmental Trainings and Seminars	2.1. Investigative Skills 2.2. Critical thinking 2.3. Problem Solving 2.4. Observation Skills

ELEMENTS	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Evaluate effectiveness of environmental practices	3.1. Work environmental practices are recorded based on workplace standards 3.2. Recorded work environmental practices are compared against planned indicators 3.3. Findings regarding effectiveness are assessed and gaps identified are implemented based on environment work standards and procedures 3.4. Results of environmental assessment are conveyed to appropriate personnel	3.1 Environmental Practices 3.2 Environmental Standards and Procedures	3.1 Documentation and Record Keeping Skills 3.2 Critical thinking 3.3 Problem Solving 3.4 Observation Skills

RANGE OF VARIABLES

VARIABLE	RANGE
1. Environmental Practices Issues	May include: 1.1 Water Quality 1.2 National and Local Government Issues 1.3 Safety 1.4 Endangered Species 1.5 Noise 1.6 Air Quality 1.7 Historic 1.8 Waste 1.9 Cultural
2. Environmental Indicators	May include: 2.1 Noise level 2.2 Lighting (Lumens) 2.3 Air Quality - Toxicity 2.4 Thermal Comfort 2.5 Vibration 2.6 Radiation 2.7 Quantity of the Resources 2.8 Volume

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1. Identified environmental issues relevant to work requirements 1.2. Identified gaps in work practices related to Environmental Standards and Procedures 1.3. Gathered relevant information necessary to determine environmental work targets 1.4. Set environmental indicators based on gathered information to measure environmental work targets 1.5. Recorded work environmental practices are recorded based on workplace standards 1.6. Conveyed results of environmental assessment to appropriate personnel
2. Resource Implications	**The following resources should be provided:** 2.1 Workplace/Assessment location 2.2 Legislation, policies, procedures, protocols and local ordinances relating to environmental protection 2.3 Case studies/scenarios relating to environmental Protection
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Written/ Oral Examination 3.2 Interview/Third Party Reports 3.3 Portfolio (citations/awards from GOs and NGOs, Certificate of training – local and abroad) 3.4 Simulations and role-plays
4. Context for Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA center.

UNIT OF COMPETENCY : **FACILITATE ENTREPRENEURIAL SKILLS FOR MICRO-SMALL-MEDIUM ENTERPRISES (MSMEs)**

UNIT CODE : **400311327**

UNIT DESCRIPTOR : This unit covers the outcomes required to build, operate and grow a micro/small-scale enterprise.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Develop and maintain micro-small-medium enterprise (MSMEs) skills in the organization	1.1 Appropriate ***business strategies*** are determined and set for the enterprise based on current and emerging business environment. 1.2 ***Business operations*** are monitored and controlled following established procedures. 1.3 Quality assurance measures are implemented consistently. 1.4 Good relations are maintained with staff/workers. 1.5 Policies and procedures on occupational safety and health and environmental concerns are constantly observed.	1.1 Business models and strategies 1.2 Types and categories of businesses 1.3 Business operation 1.4 Basic Bookkeeping 1.5 Business internal controls 1.6 Basic quality control and assurance concepts 1.7 Government and regulatory processes	1.1 Basic bookkeeping/ accounting skills 1.2 Communication skills 1.3 Building relations with customer and employees 1.4 Building competitive advantage of the enterprise
2. Establish and maintain client-base/market	2.1 Good customer relations are maintained 2.2 New customers and markets are identified, explored and reached out to. 2.3 Promotions/Incentives are offered to loyal customers 2.4 Additional products and services are evaluated and tried where feasible. 2.5 ***Promotional/advertising initiatives*** are carried out where necessary and feasible.	2.1 Public relations concepts 2.2 Basic product promotion strategies 2.3 Basic market and feasibility studies 2.4 Basic business ethics	2.1 Building customer relations 2.2 Individual marketing skills 2.3 Using basic advertising (posters/ tarpaulins, flyers, social media, etc.)

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Apply budgeting and financial management skills	3.1 Enterprise is built up and sustained through judicious control of cash flows. 3.2 Profitability of enterprise is ensured though appropriate ***internal controls***. 3.3 Unnecessary or lower-priority expenses and purchases are avoided.	3.1 Cash flow management 3.1 Basic financial management 3.2 Basic financial accounting 3.3 Business internal controls	3.1 Setting business priorities and strategies 3.2 Interpreting basic financial statements 3.3 Preparing business plans

RANGE OF VARIABLES

VARIABLE	RANGE
1. Business strategies	May include: 1.1. Developing/Maintaining niche market 1.2. Use of organic/healthy ingredients 1.3. Environment-friendly and sustainable practices 1.4. Offering both affordable and high-quality products and services 1.5. Promotion and marketing strategies (e. g., on-line marketing)
2. Business operations	May include: 2.1 Purchasing 2.2 Accounting/Administrative work 2.3 Production/Operations/Sales
3. Internal controls	May include: 3.1 Accounting systems 3.2 Financial statements/reports 3.3 Cash management
4. Promotional/Advertising initiatives	May include: 4.1 Use of tarpaulins, brochures, and/or flyers 4.2 Sales, discounts and easy payment terms 4.3 Use of social media/Internet 4.4 “Service with a smile” 4.5 Extra attention to regular customers

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Demonstrated basic entrepreneurial skills 1.2 Demonstrated ability to conceptualize and plan a micro/small enterprise 1.3 Demonstrated ability to manage/operate a micro/small-scale business
2. Resource Implications	**The following resources should be provided:** 2.1 Simulated or actual workplace 2.2 Tools, materials and supplies needed to demonstrate the required tasks 2.3 References and manuals
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Written examination 3.2 Demonstration/observation with oral questioning 3.3 Portfolio assessment with interview 3.4 Case problems
4. Context of Assessment	4.1 Competency may be assessed in workplace or in a simulated workplace setting 4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group

COMMON COMPETENCIES

UNIT OF COMPETENCY : APPLY SAFETY PRACTICES

UNIT CODE : MEE722201

UNIT DESCRIPTOR : This unit covers the competencies required to apply safety practices in the workplace.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify hazards	1.1 ***Hazards*** are identified correctly in accordance with OHS principles 1.2 Safety signs and symbols are identified and adhered to	1.1 Shop safety signs, symbols and alarms 1.2 Safety precautionary measures	1.1 Identifying hazard 1.2 Identifying safety sign and symbol
2. Use protective clothing and devices	2.1 Appropriate ***protective clothing and devices*** correctly selected and used in accordance with OHS requirements or industry/company policy	2.1 Shop safety signs, symbols and alarms 2.2 Safety precautionary measures 2.3 Housekeeping 2.4 Machine tools 2.5 First aid	2.1 Selecting appropriate protective clothing and devices
3. Perform safe handling of tools, equipment and materials	3.1 Safety procedures for pre-use check and operation of tools and equipment followed in accordance with industry/ company policies 3.2 Tools, equipment and materials handled safely in accordance with OHS requirements and industry/ company policies	3.1 Shop safety signs, symbols and alarms 3.2 Safety precautionary measures 3.3 Housekeeping 3.4 Machine tools 3.5 Engineering materials	3.1 Checking tools and equipment 3.2 Operating tools and equipment 3.3 Handling tools and equipment

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Perform first aid	4.1 Surroundings are checked for any possible risk or harm 4.2 Call for help someone if seriously injured. 4.3 First aid treatment of ***injuries*** are carried out according to recommended procedures	4.1 Shop safety signs, symbols and alarms 4.2 Safety precautionary measures 4.3 Housekeeping 4.4 Machine tools 4.5 First aid 4.6 Engineering materials	4.1 Determining first aid treatment according to recommended procedures 4.2 Performing first aid according to recommended procedures
5. Use fire extinguisher	5.1 Check for your own safety before starting to extinguish a fire. 5.2 Fire extinguisher is selected correctly according to the ***type of fire***. 5.3 Fire extinguisher are operated correctly according recommended procedures	5.1 Shop safety signs, symbols and alarms 5.2 Safety precautionary measures 5.3 Housekeeping 5.4 Machine tools 5.5 First aid 5.6 Engineering materials 5.7 Fire extinguishers	5.1 Selecting fire extinguisher according to the type of fire 5.2 Operating fire extinguisher according to the type of fire

RANGE OF VARIABLES

VARIABLE	RANGE
1. Hazards	May include: 1.1 Cluttered tools and materials 1.2 Slippery floors (caused by oil, grease or any liquid) 1.3 Exposed electrical wires 1.4 Sharp edges 1.5 Machine without guards or with exposed moving parts 1.6 Uncollected chips or other wastes etc.
2. Protective clothing and devices	May include: 2.1 Safety glasses/goggles 2.2 Safety shoes 2.3 Overalls 2.4 Cap
3. Injuries	May include: 3.1 Burns/scalds 3.2 Fractures 3.3 Cuts and abrasions 3.4 Poisoning 3.5 Foreign bodies in the eye 3.6 Concussion 3.7 Shock
4. Type of fires	May include: 4.1 common combustibles (wood, cloth, paper, rubber and plastic) 4.2 Flammable liquids (gasoline, oil, solvents, paints, etc.) 4.3 Energized electrical equipment (wiring, fuse boxes, circuit breakers, appliances, etc. 4.4 Combustible metals (magnesium, sodium, etc.)

EVIDENCE GUIDE

1. Critical Aspects of competency	**Assessment requires evidence that the candidate:** Assessment requires evidence that the candidate: 1.1 identified hazardous area 1.2 used protective clothing and devices 1.3 handled tools, equipment and materials properly 1.4 performed first aid 1.5 used fire extinguisher
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to processes or activity 2.2 Materials relevant to the proposed activity
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Demonstration 3.2 Written or oral short answer questions 3.3 Practical exercises
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : INTERPRET WORKING DRAWINGS AND SKETCHES

UNIT CODE : MEE722202

UNIT DESCRIPTOR : This unit covers the competencies required to read and interpret drawings and sketches.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret technical drawing	1.1 Components, assemblies or objects recognized as required. 1.2 Dimensions identified as appropriate. 1.3 Instructions identified and followed as required. 1.4 Material requirements identified as required. 1.5 Symbols recognized as appropriate in the ***drawing*****.** 1.6 ***Tolerance***, limits and fits identified in the drawing.	1.1 Alphabet of lines 1.2 Projections 1.3 Drawing symbols 1.4 Dimensioning techniques 1.5 Tolerance, limits and fits 1.6 Engineering materials 1.7 Drawing tools and supplies	1.1 Recognizing components, assemblies and objects. 1.2 Identifying dimension 1.3 Identifying instruction 1.4 Identifying material 1.5 Recognizing symbols in the drawing 1.6 Identifying tolerance, limits and fits
2. Prepare freehand sketch of parts	2.1 Sketch drawn correctly and appropriately. 2.2 Sketch depicted objects or part appropriately. 2.3 Dimensions indicated in sketch are clear and correct. 2.4 Instructions included in sketch are clear and correct. 2.5 Base line or datum points indicated as required.	2.1 Alphabet of lines 2.2 Projections 2.3 Drawing symbols 2.4 Dimensioning techniques 2.5 Tolerance, limits and fits 2.6 Engineering materials 2.7 Drawing tools and supplies	2.1 Depicting sketch 2.2 Dimensioning sketch 2.3 Including instruction in the sketch 2.4 Indicating base line/ datum

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Interpret details from freehand sketch	3.1 Components, assemblies or objects recognized as required. 3.2 Dimensions identified as appropriate. 3.3 Instructions identified and followed as required. 3.4 Material requirements identified as required. 3.5 Symbols recognized as appropriate in the drawing.	3.1 Alphabet of lines 3.2 Projections 3.3 Drawing symbols 3.4 Dimensioning techniques 3.5 Tolerance, limits and fits 3.6 Engineering materials 3.7 Drawing tools and supplies	3.1 Recognizing components, assemblies and objects. 3.2 Identifying dimensions 3.3 Identifying instruction 3.4 Identifying material requirements 3.5 Recognizing symbols

RANGE OF VARIABLES

VARIABLE	RANGE
1. Drawing	1.1 Drawing technique may include 1.1.1 Perspective 1.1.2 Exploded view 1.1.3 Hidden view technique 1.2 Projections 1.2.1 First angle projections 1.2.2 Third angle projections
2. Tolerance	May include: 2.1 General tolerance 2.2 Angular tolerance 2.3 Geometric tolerance

EVIDENCE GUIDE

1. Critical aspect of competency	**Assessment requires evidence that the candidate:** 1.1 Interpreted technical drawing 1.2 Prepared sketches 1.3 Interpreted sketches
2. Resource implications	**The following resources should be provided:** 2.1 Drafting room/facilities and drafting instruments and supplies appropriate to the activity 2.2 Measuring tools 2.3 Drawings, sketches or blueprint 2.4 Specimen parts/components
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Written or oral short answer questions 3.3 Demonstration 3.4 Project/work sample 3.5 Portfolio
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : SELECT/ CUT WORKSHOP MATERIALS

UNIT CODE : MEE722203

UNIT DESCRIPTOR : This unit covers the skills and knowledge required to select and cut workshop materials.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Determine requirement	1.1 ***Plans/ drawings*** are interpreted to produce component to specification 1.2 Sequence of operation is determined to produce component to specification	1.1 Shop safety practices 1.1.1 Safe working habits 1.1.2 Safe handling of tools, equipment and materials 1.2 Blueprint reading 1.2.1 Standard drawing scales, symbols and abbreviations 1.2.2 Assembly and details of drawing 1.2.3 Dimensions 1.3 Measurement 1.3.1 Linear measuring tools	1.1 Interpreting plans and drawings 1.2 Determining sequence of operation
2. Select and measure materials	2.1 Materials are selected according to the requirement of the operation 2.2 Materials are measured to required level of accuracy using measuring tool 2.3 Measuring tools are used according to manufacturer's specification	2.1 Shop safety practices 2.1.1 Safe working habits 2.1.2 Safe handling of tools, equipment and materials 2.2 Blueprint reading 2.2.1 Standard drawing scales, symbols and abbreviations 2.2.2 Assembly and details of drawing	2.1 Selecting materials 2.2 Measuring materials 2.3 Using measuring tools

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		2.3 Dimensions 2.3.1 Measurement 2.3.2 Linear measuring tools 2.4 Materials and related science 2.4.1 Classification and mechanical properties of engineering materials	
3. Cut materials	3.1 Materials are cut according to plans/drawing instruction 3.2 ***Cutting tools/equipment*** are used based on manufacturers specification, appropriate techniques or the *safety procedure*	3.1 Shop safety practices 3.1.1 Safe working habits 3.1.2 Safe handling of tools, equipment and materials 3.2 Blueprint reading 3.2.1 Standard drawing scales, symbols and abbreviations 3.2.2 Assembly and details of drawing 3.2.3 Dimensions 3.3 Measurement 3.3.1 Linear measuring tools 3.4 Materials and related science 3.4.1 Classification and mechanical properties of engineering materials	3.1 Cutting of material 3.2 Using of cutting tools and equipment

RANGE OF VARIABLES

VARIABLE	RANGE
1. Plan/drawings	May include: 1.1 Dimensions 1.2 Tolerance
2. Materials	May include: 2.1 Ferrous 2.2 Non-ferrous
3. Measuring tools	May include: 3.1 Steel rule 3.2 Pull-push rule
4. Cutting tools/equipment	May include: 4.1 Hacksaw 4.2 Power hacksaw
5. Safety procedure	Safety involves the handling of: 5.1 Equipment 5.2 Tools 5.3 Materials

EVIDENCE GUIDE

1. Critical Aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Interpreted plans/drawings 1.2 Selected natural according to the requirement 1.3 Performed cutting operation 1.4 Cutting tools/equipment used safely
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate processes of an activity 2.2 Materials relevant to the proposal activity 2.3 Drawings/plans
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Oral short answer question 3.3 Practical exercises
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM SHOP COMPUTATIONS (BASIC)

UNIT CODE : MEE722204

UNIT DESCRIPTOR : This unit covers the competencies required to perform basic calculations using the four fundamental operation.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Perform four fundamental operations.	1.1 Simple calculations performed using *four* ***fundamental operations.*** 1.2 Simple calculations performed involving fractions and mixed numbers using four fundamental operations	1.1 English and metric system of measurement	1.2 Performing calculation using four fundamental operation
2. Perform basic calculations involving fractions and decimals	2.1 Simple calculations are performed involving fractions and decimals using the four fundamental operations. 2.2 Decimal are converted into fraction (and vice versa) accurately	2.1 English and metric system of measurement	2.1 Identifying die material requirements 2.2 Determining production volume 2.3 Identifying design parameters
3. Perform basic calculations involving percentages.	3.1 Simple calculations are performed to obtain percentages from information expressed in either fractional or decimal format	3.1 English and metric system of measurement	3.1 Performing calculation
4. Perform basic calculation involving ration and proportion	4.1 Simple calculations are performed involving ratios and proportion using whole numbers, fractions and decimal fractions.	4.1 English and metric system of measurement	4.1 Performing calculation
5. Perform calculations on algebraic expressions	5.1 Simple calculations are performed on ***algebraic expressions*** using the four fundamental operations. 5.2 Simple transposition of formulae is carried out to isolate the variable required, involving the four fundamental operations.	5.1 English and metric system of measurement	5.1 Performing calculation

RANGE OF VARIABLES

VARIABLE	RANGE
1. Four fundamental operations	May include: 1.1 Addition 1.2 Subtraction 1.3 Multiplication 1.4 Division
2. Algebraic expressions	Calculation using formula for determining: 2.1 tap drill size 2.2 feed 2.3 speed

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Using four fundamental operations 1.2 Involving fractions and mixed numbers 1.3 Involving fractions and decimals 1.4 Involving percentages 1.5 Involving ratio and proportion 1.6 On algebraic expressions 1.7 of simple formulae
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to processes or activity 2.2 Materials relevant to the proposed activity
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Written or oral short answer questions 3.2 Practical exercises
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : MEASURE WORKPIECE (BASIC)

UNIT CODE : MEE722205

UNIT DESCRIPTOR : This unit covers the competencies required to measure workpieces using measuring instruments such as steel rules, Vernier calipers, micrometers, etc.….

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select and use measuring tools	1.1 ***Measuring tools*** are selected and used according to the level of accuracy required. 1.2 ***Measurements*** taken are accurate to the finest graduation of the selected measuring instrument. 1.3 Measuring technique used is correct and appropriate to the device used.	1.1 Types, purposes and accuracy of measuring instruments 1.2 Capability of measuring instruments 1.3 Part dimensions and tolerances 1.4 Techniques for measuring dimensions 1.5 Care and storage procedure of measuring tools	1.1 Selecting measuring tools 1.2 Obtaining accurate measurements 1.3 Determining measuring technique
2. Clean and store measuring tools	2.1 Cleaning of devices undertaken according to standard operating procedures. 2.2 Care of devices undertaken according to manufacturer's specifications. 2.3 Storage of devices undertaken according to standard operating procedures.	2.1 Types, purposes and accuracy of measuring instruments 2.2 Capability of measuring instruments 2.3 Part dimensions and tolerances 2.4 Techniques for measuring dimensions 2.5 Care and storage procedure of measuring tools	2.1 Determining proper care and storage of measuring tools.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Measuring tools	May include 1.1 Steel tape 1.2 Steel rule 1.3 Straight edge 1.4 Combination square 1.5 Steel square 1.6 Divider or trammel 1.7 Caliper 1.8 Protractor 1.9 Vernier caliper 1.10 Micrometer
2. Measurements	May include: 2.1 Length 2.2 Diameter 2.3 Depth 2.4 Flatness 2.5 Straightness 2.6 Squareness

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Selected and used measuring instruments 1.2 Cleaned and stored measuring instruments
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to the activity 2.2 Specimen component or part to the proposed activity
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Demonstration 3.3 Written or oral short answer questions 3.4 Portfolio
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM ROUTINE HOUSEKEEPING

UNIT CODE : MEE722206

UNIT DESCRIPTOR : This unit covers the competencies required to maintain an organized and clean work area.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Determine requirement	1.1 Work area maintained in a safe, uncluttered and organized manner according to ***workshop policy*** 1.2 All tasks carried out safely, effectively and efficiently with minimum inconvenience according to workshop policy 1.3 Workshop policies and procedures for tidying work areas and placing items in designated areas applied	1.1 Shop safety practices 1.2 Machine shop equipment 1.3 Shop policies regulations 1.4 5-S 1.5 Shop cleaning equipment	1.1 Maintaining work area, safe uncluttered and organized 1.2 Carrying out all task safely, effectively and efficiently 1.3 Designating workshop policies and procedures for work area
2 Clean work area	2.1 Shop policies and procedures applied for cleaning ***work area*** 2.2 Wastes promptly removed and disposed of according to shop policies and environmental requirements 2.3 Spills, wastes and other potential hazards reported to appropriate personnel and removed according to shop policies and environmental requirements 2.4 Signage promptly displayed in regard to unsafe areas 2.5 Consumable materials maintained and stored correctly after use 2.6 ***Tools and equipment*** (including guards) cleaned and used in Accordance with manufacturer's instructions	2.1 Shop safety practices 2.2 Machine shop equipment 2.3 Shop policies regulations 2.4 5-S 2.5 Shop cleaning equipment	2.1 Applying shop policies and procedures 2.2 Disposing of waste according to shop policy and environmental requirements 2.3 Cleaning of tools and equipment

RANGE OF VARIABLES

VARIABLE	RANGE
1. Workshop policy	Shop policy and procedure in regard to: 1.1 Housekeeping practices 1.2 Maintenance and storage of cleaning equipment 1.3 Use and storage of cleaning chemicals
2. Work area	May include: 2.2 Work benches 2.3 Walkways and aisles 2.4 Fixtures and other working surfaces
3. Tools and Equipment	May include: 3.1 Drill Press 3.2 Pedestal Grinder 3.3 Surface plate 3.4 Layout and marking tools 3.5 Cutting tools (hacksaw, chisel, files) 3.6 Inspection and measuring tools (templates, vernier caliper, micrometer, straight edge, gages, etc…)

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Organized and cleaned work area according shop policies and environmental requirements.
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to processes or activity 2.2 Materials and documentation relevant to the proposed activity 2.3 Shop policy and/or procedures manual on housekeeping, cleaning and occupational health and safety
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Demonstration or role play 3.3 Written or oral short answer questions 3.4 Identify colleagues/clients who can be approached for the collection of competency evidence, where appropriate
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM SHOP COMPUTATIONS (INTERMEDIATE)

UNIT CODE : MEE722207

UNIT DESCRIPTOR : This unit covers the competencies required to perform calculation involving triangles and tapers.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Perform calculations involving triangles	1.1 Problems involving right triangles are performed using the ***trigonometric functions***. 1.2 Problems involving non-right triangles are performed using sine and cosine rules.	1.1 English and 1.2 metric system of 1.3 measurements 1.4 Geometrical 1.5 shapes	1.1 Performing trigonometric function
2. Calculate taper	2.1 Convert the units of the conical taper so that all units are the same. 2.2 Visualize a cross section of the cone with the length being the height and the diameter being the base. 2.3 Taper of work calculated correctly using appropriate formula.	2.1 English and metric system of measurements 2.2 Geometrical shapes	2.1 Calculating taper of work

RANGE OF VARIABLES

VARIABLE	RANGE
1. Trigonometric functions	May include: 1.1 Sine 1.2 Cosine 1.3 Tangent 1.4 Cotangent 1.5 Secant 1.6 Cosecant

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Performed calculations involving right triangles, non-right triangles and involving tapers
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to processes or activity 2.2 Materials relevant to the proposed activity
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Written or oral short answer questions 3.2 Practical exercises
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : MEASURE WORKPIECE USING ANGULAR MEASURING INSTRUMENTS

UNIT CODE : MEE722208

UNIT DESCRIPTOR : This unit covers the competencies required to measure workpieces using angular measuring instruments.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select and use angular measuring tools	1.1 ***Angular measuring tools*** are selected and used according to the level of accuracy required. 1.2 ***Measurements*** taken are accurate to the finest graduation of the selected measuring instrument. 1.3 Measuring technique used is correct and appropriate to the device used.	1.1 Types, purposes and accuracy of angular measuring instruments 1.2 Capability of measuring tools 1.3 Techniques for measuring angles and tapers	1.1 Selecting angular measuring tools 1.2 Obtaining accurate measurements 1.3 Determining measuring techniques
2. Maintain angular measuring tools	2.3 Measuring tools are adjusted and maintained to the required accuracy utilizing manufacturer's or worksite procedures.	2.1 Types, purposes and accuracy of angular measuring instruments 2.2 Capability of measuring tools 2.3 Techniques for measuring angles and tapers	2.1 Maintaining and adjusting measuring tool accuracy
3. Clean and store measuring tools	3.1 Care and storage of devices undertaken to manufacturer's specifications or standard operating procedures.	3.3 Types, purposes and accuracy of angular measuring instruments 3.4 Capability of measuring tools 3.5 Techniques for measuring angles and tapers 3.6 Care and storage procedure of measuring tools	3.1 Storing and cleaning of measuring tools

RANGE OF VARIABLES

VARIABLE	RANGE
1. Angular measuring tools	May include: 1.1 Bevel protractor 1.2 Gage blocks 1.3 Sine bar
2. Measurements	May include: 2.1 Angle 2.2 Taper

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Selected and used angular measuring instruments 1.2 Maintained/adjusted instruments 1.3 Cleaned and stored measuring instruments
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to the activity 2.2 Specimen component or part to the proposed activity
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Demonstration 3.3 Written or oral short answer questions 3.4 Portfolio
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : MEASURE WORKPIECE USING GAGES AND SURFACE TEXTURE COMPARATOR

UNIT CODE : MEE722210

UNIT DESCRIPTOR : This unit covers the competencies required to measure workpieces using fixed and adjustable gages.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select and use fixed and adjustable gages	1.1 Appropriate ***gages*** are selected and used to undertake the required comparison or measurement using standard operating procedures. 1.2 Consistent and accurate ***measurements*** obtained conforms to drawing specification 1.3 Measuring technique used is correct and appropriate to the device used.	1.1 Types and application of fixed and adjustable gages 1.2 Gage limits and accuracy 1.3 Techniques for measuring components	1.1 Selecting appropriate gages and measuring instrument 1.2 Obtaining accurate measurements 1.3 Determining measuring techniques
2. Perform surface texture measurements	2.1 Surface texture are measured according worksite procedures. 2.2 Measurements taken are within the level of accuracy required.	2.1 Types and application of fixed and adjustable gages 2.2 Gage limits and accuracy 2.3 Techniques for measuring components	2.1 Identifying die material requirements 2.2 Determining production volume 2.3 Identifying design parameters
3. Clean and store measuring tools	3.1 Care and storage of devices undertaken to manufacturer's specifications or standard operating procedures.	3.1 Care and storage procedure of measuring tools	3.1 Cleaning and storing measuring tools

RANGE OF VARIABLES

VARIABLE	RANGE
1. Gages	May include: 1.1 Gage blocks 1.2 Telescoping gages 1.3 Center gages 1.4 Thread gages 1.5 Dial bore gages 1.6 Height gages 1.7 Radius gages 1.8 Go-no-go gages 1.9 Depth gages
2. Measurements	May include: 2.1 Linear dimensions 2.2 Diameters 2.3 Depths 2.4 Fits 2.5 Tapers 2.6 Threads 2.7 Radius 2.8 Squareness 2.9 Surface texture

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Selected and used fixed and adjustable gages 1.2 Performed surface texture measurements 1.3 Cleaned and stored measuring instruments
2. Resource implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to the activity 2.2 Specimen component or part to the proposed activity 2.3 Drawing
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Demonstration 3.3 Written or oral short answer questions 3.4 Portfolio
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM PREVENTIVE AND CORRECTIVE MAINTENANCE

UNIT CODE : MEE722211

UNIT DESCRIPTOR : This unit covers the knowledge and skills required in performing preventive and corrective maintenance such as inspection and repair of hand tools, cleaning and lubrication of machine parts and changing drive pulley and belts.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Perform inspection of machine	1.1 Machine ***inspected*** according to worksite procedures. 1.2 Status/Report recorded on proforma or reported orally according to worksite procedure.	1.1 Proper cleaning and oiling 1.2 Parts and function of machine tools 1.3 Cutting oil, coolant or compound 1.4 Pulleys and belts 1.5 Location of main switches of the machine 1.6 Checklist of safe working conditions	1.1 Inspecting machine 1.2 Recording status report
2. Perform surface texture measurements	2.1 ***Machines*** lubricated as per manufacturer's recommendation using ***tools and materials*** 2.2 Fluids and lubricants replaced and/or topped up according to prescribed schedule.	2.1 Proper cleaning and oiling 2.2 Kinds of oil 2.3 Parts and function of machine tools 2.4 Cutting oil, coolant or compound 2.5 Location of main switches of the machine	2.1 Lubricating machine 2.2 Replacing fluid and lubricants
3. Perform minor machine repair and adjustments	3.1 Minor machine repairs performed according to manufacturer's instruction or worksite procedures. 3.2 Machine moving parts adjusted to manufacturer's specifications.	3.1 Proper cleaning and oiling 3.2 Kinds of oil 3.3 Parts and function of machine tools 3.4 Cutting oil, coolant or compound 3.5 Pulleys and belts 3.6 Location of main switches of the machine 3.7 Handling and storage of tools 3.8 Checklist of safe working conditions	3.1 Performing minor machine repair 3.2 Adjusting machine moving parts

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Maintain hand tools	4.1 Tool cutting ground to recommended specifications 4.2 Hand tools lubricated and stored according to prescribed procedure	4.1 Proper cleaning and oiling 4.2 Kinds of oil 4.3 Handling and storage of tools 4.4 Procedures in cleaning and disposal of waste materials	4.1 Recommending cutting tool 4.2 Lubricating hand tools

RANGE OF VARIABLES

VARIABLE	RANGE
1. Inspected	Inspected machine parts include: 1.1 V-belt 1.2 Bearing 1.3 Gears 1.4 Clutch 1.5 Drive pulley
2. Machines	May include: 2.1 Lathe machine 2.2 Milling machine 2.3 Grinding machine
3. Tools and materials	May include: 3.1 Lubricants 3.2 Oil can 3.3 Grease gun 3.4 Oil 3.5 Coolant or compound

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Performed inspection of machine 1.2 Performed cleaning and lubricating of machine 1.3 Performed minor machine repairs and adjustments
2. Resource Implications	**The following resources should be provided:** 2.1 Tools, equipment and facilities appropriate to processes or activity 2.2 Materials relevant to the proposed activity
3. Method of Assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation of activities 3.2 Oral or written questioning
4. Context for Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : OPERATE A PERSONAL COMPUTER

UNIT CODE : ICT311201

UNIT DESCRIPTOR : This unit defines the competency required to operate a personal computer by: starting the PC, logging in, using and working with files, folders and programs, saving work, and closing down the PC.

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Start the computer	1.1 The ***peripheral devices*** are properly connected 1.2 Power is checked and the computer and peripheral devices are switched on 1.3 Proper logging in and logging off is successfully done 1.4 The operating system features and functions are accessed and 1.5 Navigated Hardware configuration and other system features are checked	1.1 Computer functions 1.2 Basic parts of a computer and various hardware components 1.3 Keyboard layout and functions	1.1 Connecting peripheral devices 1.2 Logging in and logging off properly
2. Arrange and customize desktop display/ Windows settings	2.1 The desktop screen or Windows elements are changed as needed 2.2 Desktop icons are added, renamed, moved, copied or deleted 2.3 The online help functions are accessed or used as needed 2.4 Desktop icons of application programs are selected, opened and closed 2.5 Properties of icons are displayed 2.6 Computer or desktop settings are saved and restored	2.1 Keyboard layout and functions 2.2 Computer functions 2.3 Basic parts of a computer and various hardware components 2.4 Storage devices and file concepts 2.5 Basic software operation and functionalities	2.1 Changing desktop screen or windows element 2.2 Adding, renaming, moving, copying and deleting desk top icon 2.3 Accessing online help function 2.4 Opening and closing desk top icons 2.5 Displaying properties of icons

ELEMENT	PERFORMANCE CRITERIA ***Italicized terms*** are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Work with files and folders (or directories	3.1 A file or folder is created, opened, moved, renamed or copied 3.2 Files are located, deleted and restored 3.3 Details and properties of files and folders are displayed or viewed 3.4 Various files are organized for easy lookup and use 3.5 Files and information are searched 3.6 Disks are checked, erased or formatted as necessary	3.1 Keyboard layout and functions 3.2 Computer functions 3.3 Basic parts of a computer and various hardware components 3.4 Storage devices and file concepts 3.5 Basic software operation and functionalities	3.1 Creating, opening, moving, renaming and copying a file and folder 3.2 Locating, deleting and restoring files 3.3 Displaying details and properties of files and folders 3.4 Organizing files 3.5 Searching file and information
4. Work with user application programs	4.1 Application programs are added, changed, removed or ran 4.2 User software or application program are installed, updated and upgraded 4.3 Information/data are moved between documents or files	4.1 Keyboard layout and functions 4.2 Computer functions 4.3 Basic parts of a computer and various hardware components 4.4 Storage devices and file concepts 4.5 Basic software operation and functionalities	4.1 Checking hardware configuration and other system featured 4.2 Installing, updating and upgrading user software or application program
5. Print information	5.1 Printer is added or installed and correct printer settings is ensured 5.2 Default printer is assigned accordingly 5.3 Information or document is printed on the installed printer 5.4 Progress of print jobs are viewed and deleted as required	5.1 Keyboard layout and functions 5.2 Computer functions 5.3 Basic parts of a computer and various hardware components 5.4 Storage devices and file concepts 5.5 Basic software operation and functionalities	5.1 Installing printer settings 5.2 Printing information or document

ELEMENT	PERFORMANCE CRITERIA *Italicized terms* are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
6. Shut down computer	6.1 All open application programs are closed 6.2 Computer and peripheral devices are properly shut down	6.1 Keyboard layout and functions 6.2 Computer functions 6.3 Basic parts of a computer and various hardware components 6.4 Storage devices and file concepts 6.5 Basic software operation and functionalities	6.1 Shutting down computer and peripheral devices

RANGE OF VARIABLES

VARIABLE	RANGE
1. Peripheral device	May include: 1.1 Mouse 1.2 Keyboard 1.3 Monitor or visual display unit 1.4 Printer 1.5 Scanner
2. Computer	May include: 2.1 Laptops/notebooks 2.2 Workstations 2.3 Servers 2.4 other personal computer devices
3. Application programs	May include: 3.1 User programs 3.2 Database programs 3.3 Word processors 3.4 Email programs 3.5 Internet browsers 3.6 System browsers 3.7 Spreadsheets
4. Operating system	May include: 4.1 Windows 4.2 NT 4.3 Mac OS 4.4 Linux 4.5 Solaris 4.6 Unix
5. System features	May include: 5.1 Memory size 5.2 Disk capacities 5.3 Video cards 5.4 Usbs 5.5 Modems 5.6 1394 and lan connectors 5.7 Sd and pc cards 5.8 Wireless and infrared connections.
6. Online help functions	May include: 6.1 An instruction manual, or a portion of the manual, integrated and accessible from within the program or software being used

VARIABLE	RANGE
7. Properties	May include: 7.1 File name 7.2 Type of file 7.3 File size 7.4 Date created and modified 7.5 Attributes (hidden, read-only).
8. Various files	May include: 8.1 Documents 8.2 Records 8.3 Pictures 8.4 Music 8.5 Video
9. Disks	May include: 9.1 Floppy disks 9.2 CDs 9.3 CD-RW (Compact discs-Read/Write) 9.4 DVD RW 9.5 zip disks 9.6 flash drives 9.7 memory sticks 9.8 hard drives
10. Printer settings	May include: 10.1 Page layout 10.2 Paper size 10.3 ink/cartridge type 10.4 Number of copies 10.5 Page orientation.

EVIDENCE GUIDE

1. Critical aspects of Competency	**Assessment requires evidence that the candidate:** 1.1 Ability to utilize software, navigate the desktop, using system features to perform tasks and save results of work.
2. Resource Implications	**The following resources should be provided:** 2.1 A personal computer 2.2 A printer 2.3 Mouse and keyboard 2.4 Basic systems software
3. Methods of Assessment	**Competency in this unit may be assessed through:** 3.1 Observation in a workplace or simulated environment 3.2 Third party reports 3.3 Exams and tests 3.4 Demonstration of required skills 3.5 Interviews
4. Context for Assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

CORE COMPETENCIES

UNIT OF COMPETENCY : WRITE 5-AXIS CNC MACHINE PROGRAM

UNIT CODE : MEE821321

UNIT DESCRIPTOR : This unit covers the knowledge and skills required to write 5-axis CNC program based on drawing specifications.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** *terms are elaborated* in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Determine job requirements	1.1 ***Drawings*** are interpreted to produce component according to specifications. 1.2 Sequence of ***CNC machining operations*** (tool pathing) are determined to produce component according to industry standard 1.3 ***Cutting tools*** are selected according to the requirements of the operations 1.4 ***Cutting speed and feed*** rate are calculated based on cutting tools and work piece specifications. 1.5 Process / operation sheets are filled up with relevant machine, ***work piece***, fixture, ***tools and measuring instruments*** to be used. 1.6 Safety practices are applied according to OSHS.	1.1 3D Drafting 1.2 3D Machining 1.3 Technical drawing 1.4 Application of limits, fits, tolerances and surface texture 1.5 Sequence of operation 1.6 Different types of cutting tools 1.7 Calculation of speed and feed rate 1.8 Procedure in filling up job sheets 1.9 Appropriate Fixtures 1.10 OSH Rule No. 1080 – Personal Protective Equipment & Devices 1.11 OSH Rule No. 1150 – Materials Handling & Storage 1.12 Air pollution 1.13 Noise pollution Quality control	1.1 Interpreting 3D drawing. 1.2 Determining of sequence of operation 1.3 Selecting cutting tools 1.4 Calculating cutting speed and feed. 1.5 Filling up job sheets 1.6 Applying safety procedures

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** *terms are elaborated* in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Write 5-axis CNC machine program	2.1 Sequence of programs are generated using manual programing (G-codes /M-codes) and automatic programming using ***software*** according to standard operating procedure 2.2 Conversational or ISO CNC programming operations are used based on machine capability. 2.3 Safety practices are applied according to OSHS.	2.1 Generation of manual and automatic programming. 2.2 Procedure in writing conversational or ISO CNC programming language 2.3 OSH Rule No. 1080 – Personal Protective Equipment & Devices 2.4 OSH Rule No. 1150 – Materials Handling & Storage 2.5 Air pollution 2.5 Noise pollution 2.7 Quality control	2.1 Generating manual and automatic program 2.2 Writing conversational or ISO CNC program 2.3 Applying safety procedures
3. Edit 5-axis CNC program	3.1 Program is simulated and edited if required according to standard operating procedures 3.2 Program is saved to the machine file according to standard operating procedures 3.3 Proven program is copied and saved to backup program files according to standard operating procedures. 3.4 Safety practices are applied according to OSHS	3.1 Procedure in simulation and editing of tool movement 3.2 Procedure in saving files to the machine 3.3 Procedure in copying saved proven program on separate folders or files 3.4 Occupational 3.5 safety and 3.6 health practice 3.7 OSH Rule No. 1070 – Occupational Health & Environmental Control 3.8 OSH Rule No. 1080 – Personal Protective Equipment & Devices Air pollution 3.9 Noise pollution	3.1 Simulating and editing tool movement 3.2 Saving program in machine files 3.3 Copying proven program 3.4 Applying safety procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. Drawing	May include: 1.1 Dimensions and symbols 1.2 Geometric dimensioning and tolerancing 1.3 Limits, fits, tolerances and surface texture
2. CNC machining operation	May include: 2.1 Point machining unit/C-axis point machining unit 2.1.1 Right hand counter boring (RGH CBOR) machining 2.1.2 Right hand back boring (RGH BCB) machining 2.1.3 Reaming 2.1.4 Tapping 2.1.5 Boring 2.1.6 Back boring 2.1.7 Circular milling 2.1.8 Counter bore-tapping 2.1.9 Boring of through hole 2.1.10 Boring of step through hole 2.1.11 Boring of non-through hole 2.2 Line machining unit/C-axis line machining unit 2.2.1 Central linear machining 2.2.2 Right-hand linear machining 2.2.3 Left-hand linear machining 2.2.4 Outside linear machining 2.2.5 Inside linear machining 2.2.6 Right-hand chamfering 2.2.7 Left-hand chamfering 2.2.8 Outside chamfering 2.2.9 Inside chamfering 2.2.10 Face milling 2.2.11 End milling-top 2.2.12 End milling-step 2.2.13 Pocket milling 2.2.14 Pocket milling-mountain 2.2.15 Pocket milling-valley 2.2.16 End milling-slot 2.2.17 3-D 2.3Turning unit 2.3.1 Bar-materials machining 2.3.2 Copy-machining 2.3.3 Corner-machining 2.3.4 Edge-machining

VARIABLE	RANGE
	2.3.5 Threading 2.3.6 Grooving 2.3.7 Turning drilling 2.3.8 Turning tapping 2.3.9 Mill-turning
3. Cutting tools	May include: 3.1 Center drill 3.2 Drill 3.3 End mill 3.4 Gun drill 3.5 T slot cutter 3.6 Dovetail cutter 3.7 Form cutter 3.8 Tap 3.9 Inserts 3.10 Face mill 3.11 Bits
4. Cutting speed and feed rate	May include: 4.1Revolution per minute (RPM) 4.2 Feed rate in inch per minute (IPM) 4.3 Feed rate in millimeter per minute (MPM)
5. Workpiece	May include: 5.1 Aluminum 5.2 Stainless steel 5.3 High carbon steel 5.4 Copper 5.5 Brass 5.6 HSS 5.7 Mild steel(CRS)
6. Tools and measuring instruments	May include: 6.1 Combination wrench 6.2 Allen wrench 6.3 Adjustable wrench 6.4 Dial indicator 6.5 Vernier caliper 6,6 Micrometer 6.7 Test indicator 6.8 Tool holders/ arbors
7. Software	May include: 7.1 NX program 7.2 Master cam 7.3 Solid works 7.4 Del cam (part maker) 7.5 Feature cam 7.6 Autodesk 7.7 Admac

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Determined job requirements 1.2 Wrote 5 axis CNC machine program 1.3 Edited 5 axis CNC program
2. Resource implications	**The following resources should be provided:** 2.1 Equipment, tools and facilities 2.2 Consumable materials 2.3 Machine manuals 2.4 Laptop/desktop computer 2.5 USB, Memory card
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Written-Examination 3.2 Direct observation 3.3 Demonstration with Oral Questioning
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : SET UP 5-AXIS CNC MACHINE, CUTTING TOOLS AND WORK PIECE

UNIT CODE : MEE 821322

UNIT DESCRIPTOR : This unit covers the knowledge and skills required to set-up 5-axis CNC machine, cutting tools and workpiece.

ELEMENT	PERFORMANCE CRITERIA ***Bold and Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Prepare machine	1.1 Power up machine according to manual operating procedure. 1.2 Oil and coolant level are checked according to manufacturers' specification 1.3 Air and hydraulic pressure are checked according to manufacturers' specification 1.4 Machine zero point is checked and set to required position according to standard operating procedure 1.5 ***Work holding and clamping devices*** are selected and mounted according to standard operating procedures. 1.6 Safety practices are applied according to OSHS	1.1 Machine set up 1.2 Types of oil and coolant 1.3 Units of air and hydraulic pressure 1.4 Machine datum reference point 1.5 Procedure in selection and mounting of work holding devices 1.6 OSH Rule No. 1070 – Occupational Health & Environmental Control 1.6 OSH Rule No. 1080 – Personal Protective Equipment & Devices 1.7 Air pollution 1.8 Noise pollution	1.1 Powering up of machine 1.2 Checking of oil and coolant types 1.3 Checking the air and hydraulic pressure 1.4 Determining datum reference 1.5 Selecting and mounting work holding devices. 1.6 Applying safety procedures

ELEMENT	PERFORMANCE CRITERIA ***Bold and Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Prepare cutting tools	2.1 ***Cutting tools*** are selected according to required sequence of operation 2.2 Cutting tools are mounted on the designated tool holders according to standard operating procedure 2.3 ***Cutting tools are set-up*** according to the required length 2.4 Cutting tools with holders are mounted on the machine magazine/carousel according to tool number location 2.5 Safety practices are applied according to OSHS	2.1 Different types of cutting tools 2.2 Different types of tool holders. 2.3 Procedure in mounting of cutting tools to holder 2.4 Procedure in setting of the required tool length 2.5 Procedure in mounting tools to the machine magazine rack. 2.6 OSH Rule No. 1070 – Occupational Health & Environmental Control 2.7 OSH Rule No. 1080 – Personal Protective Equipment & Devices 2.8 Air pollution 2.9 Noise pollution	2.1 Selecting of cutting tools 2.2 Mounting of cutting tools to holders. 2.3 Setting of tool set length 2.4 Mounting of tools to the magazine rack 2.5 Applying safety procedures
3. Prepare workpiece	3.1 ***Work piece*** is mounted on clamping device to required level of accuracy using measuring tools and instruments/equipment in accordance with worksite procedures 3.2 Machine coordinate system (MCS) values are set to required position according to standard operating procedures 3.3 Workpiece coordinate system	3.1 Procedure in mounting work piece. 3.2 Procedure in datum referencing 3.3 OSH Rule No. 1070 – Occupational Health & Environmental Control 3.4 OSH Rule No. 1080 – Personal Protective Equipment & Devices 3.5 Air pollution 3.6 Noise pollution	3.1 Mounting work piece 3.2 Setting and verifying datum reference 3.3 Applying safety procedures

	(WCS) values are set and verified to the required position according to standard operating procedures 3.4 Safety practices are applied according to OSHS		

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work holding/fixtures and clamping device	May include: 1.1 Chucks 1.2 Precision vise 1.3 Parallel bars 1.4 V-blocks 1.5 Angle plates
2. Cutting tools	May include: 2.1 Center drill 2.2 Drill 2.3 End mill 2.4 Gun drill 2.5 T slot cutter 2.6 Dovetail cutter 2.7 Form cutter 2.8 Tap 2.9 Inserts 2.10 Face mill 2.11 Bits
3.Cutting tool set up	May include: 3.1 Tool type 3.2 Input tool length 3.3 Input tool diameter 3.4 Tool presetter (optional)
4. Workpiece	May include: 4.1 Aluminum 4.2 Stainless steel 4.3 High carbon steel 4.4 Copper 4.5 Brass 4.6 High speed steel (HSS) 4.7 Mild steel(CRS)

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** Assessment requires evidence that the candidate: 1.1 Prepare machine 1.2 Prepare cutting tools 1.3 Prepare workpiece
2. Resource implications	**The following resources should be provided:** 2.1 Equipment, cutting tools and facilities 2.2 Consumable materials 2.3 Charts and tables 2.4 Work piece
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Written Examination 3.2 Direct observation 3.3 Demonstration with Oral Questioning
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : PERFORM 5-AXIS CNC MACHINE OPERATIONS

UNIT CODE : MEE 821323

UNIT DESCRIPTOR : This unit covers the knowledge and skills required to perform 5-AXIS CNC machining operations

ELEMENT	PERFORMANCE CRITERIA ***Bold and Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Operate machine	1.1 Close machine guard according to safety standard operation procedures 1.2 Dry run is conducted in accordance with the desired tool path movement 1.3 Program is edited according to tool path movement if required. 1.4 Operate ***5 axis CNC machine*** to produce component to meet the desired dimensions, ***tolerance, fits, limits*** and surface finish according to job requirement. 1.5 Safety practices are applied according to OSHS.	1.1 Machine safety procedures 1.2 Procedures in conducting dry run 1.3 Procedures in editing program 1.4 Procedures in operating 5 axis CNC machine 1.5 OSH Rule No. 1070 – Occupational Health & Environmental Control 1.6 OSH Rule No. 1080 – Personal Protective Equipment & Devices 1.6 Air pollution 1.7 Noise pollution	1.1 Conducting dry run 1.2 Editing program 1.3 Operating of 5 axis CNC machine 1.4 Applying safety procedures
2. Monitor machine and tool movements	2.1 ***Program parameters*** are checked based on computed data 2.2 Air pressure level is maintained according to machine operating manual 2.3 Cooling system is maintained according to viscosity requirements 2.4 Cutting tool sharpness is maintained according to work procedures 2.5 Safety practices are applied according to OSHS.	2.1 Procedures in checking machine parameters 2.2 Procedures in checking air pressure 2.3 Procedures in maintaining cooling system 2.4 Procedures in maintaining tool sharpness 2.5 OSH Rule No. 1070 – Occupational Health & Environmental Control 2.6 OSH Rule No. 1080 – Personal Protective Equipment & Devices 2.7 Air pollution 2.8 Noise pollution	2.1 Checking machine parameters 2.2 Checking air pressure 2.3 Maintaining cooling system 2.4 Maintaining machine lubrication system 2.5 Maintaining tool life 2.6 Applying safety procedures

ELEMENT	PERFORMANCE CRITERIA ***Bold and Italicized*** terms are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Check and measure work piece	3.1 Machine guard is opened according to machine operating manual 3.2 Work piece is cleaned and de burred while on the fixture according to standard operating procedure 3.3 Work piece is inspected and measured according to drawing specification 3.4 Safety practices are applied according to OSHS	3.1 Procedures in opening machine guard 3.2 Procedures in cleaning and de burring work piece 3.3 Procedures in inspecting work piece 3.4 OSH Rule No. 1070 – Occupational Health & Environmental Control 3.5 OSH Rule No. 1080 – Personal Protective Equipment & Devices 3.6 Air pollution 3.7 Noise pollution	3.1 Opening of machine guard 3.2 Cleaning and de burring work piece 3.3 Checking and measuring work piece 3.4 Applying safety procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. 5 axis CNC machine	May include: 1.1 Table/table (5 axis milling) 1.2 Table/tool (5 axis turn-milling) 1.3 Tool/tool (5 axis rotating head milling)
2 Tolerance	May include: 2.1 Unilateral tolerance 2.2 Bilateral tolerance
3. Limits and fits	May include: 3.1 Clearance fit 3.2 Interference fit 3.3 Transition fit 3.4 Line fit
4. Program parameters	May include: 4.1 Revolution per minute 4.2 Feed rate 4.3 Speed

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Operated machine workpiece 1.2 Monitored machine and tool movements 1.3 Checked and measured work piece
2. Resource implications	The following resources should be provided: 2.1 Equipment, tools and facilities 2.2 Consumable materials 2.3 Charts and tables 2.4 Work piece
3. Method of assessment	**Competency in this unit may be assessed through:** 3.1 Direct observation 3.2 Demonstration with Oral Questioning
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM POST 5-AXIS CNC MACHINE OPERATIONS

UNIT CODE : MEE 821324

UNIT DESCRIPTOR : This unit covers the knowledge and skills required to perform post- 5-axis CNC machining operation.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** *terms are elaborated* in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Conduct post CNC operation	1.1 Work piece is unloaded from the fixture according to work instructions 1.2Work piece is cleaned and ***de burr***ed according to work instruction 1.3 Work piece is inspected and measured according to drawing specifications 1.4 Safety practices are applied according to OSHS	1.1 Procedures in unloading work piece 1.2 Procedures in deburring work piece 1.3 Procedures in inspecting and measuring work piece 1.4 OSH Rule No. 1070 – Occupational Health & Environmental Control 1.5 OSH Rule No. 1080 – Personal Protective Equipment & Devices 1.6 Air pollution 1.7 Noise pollution	1.1 Unloading of work piece 1.2 De burring of work piece 1.3 Inspecting and measuring work piece 1.4 Applying safety procedures
2. Submit work piece	2.1 Operator is sign out the operation sheet according to workplace procedures 2.2 Work piece and operation sheet are submitted to immediate supervisor according to work place procedures 2.3 Safety practices are applied according to OSHS	2.1 Procedures in signing out operation sheet 2.2 Submission of operation sheet and inspected work piece 2.2 OSH Rule No. 1070 – Occupational Health & Environmental Control 2.3 OSH Rule No. 1080 – Personal Protective Equipment & Devices 2.4 Air pollution 2.5 Noise pollution	2.1 Signing out operation sheet 2.2 Submitting report and work piece 2.3 Applying safety procedures

ELEMENT	PERFORMANCE CRITERIA *Italicized terms are elaborated* in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Shut-off machine and perform house keeping	3.1 Machine is shut-off according to manufacturer's operating manual 3.2 Tools are maintained and stored based on established procedures 3.3 ***Defective tools*** and machines are tagged and reported according to work place procedures 3.4 Good housekeeping is performed following 5S 3.5 Wastes are disposed according to waste management procedures and environmental regulations 3.6 Safety practices are applied following OSHS	3.1 Procedures in shutting off machine 3.2 Storage of tools and materials 3.3 Tagging of defective tools and machine 3.4 5S of good house keeping 3.5 Waste management 3.6 Environmental laws to post activities 3.7 OSH Rule No. 1070 – Occupational Health & Environmental Control 3.8 OSH Rule No. 1080 – Personal Protective Equipment & Devices 3.9 Air pollution 3.10 Noise pollution	3.1 Shutting off machine 3.2 Cleaning and storing ~~of~~ tools and materials 3.3 Tagging defective tools and machine 3.4 Performing good house keeping 3.5 Managing wastes 3.6 Applying safety procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. De burr	Tools may include: 1.1Bush burr 1.2 Air motor 1.3 Sand paper 1.4 File 1.5 Oil stone 1.6 Surface plate
2. Defective tools	May include: 2.1 Chipped off edges 2.2 Broken tools 2.3 Out of specifications 2.4 Dull tools

EVIDENCE GUIDE

1. Critical aspects of competency	**Assessment requires evidence that the candidate:** 1.1 Conducted post CNC operation 1.2 Submitted machined work piece 1.3 Shutt-off machine and performed house keeping
2. Resource implications	**The following resources should be provided:** 2.1 Equipment , tools and facilities 2.2 Consumable materials 2.3 Work piece
3. Method of assessment	**Competency in this unit may be assessed through**: 3.1 Direct observation 3.2 Demonstration with Oral Questioning
4. Context for assessment	4.1 Competency may be assessed in actual workplace or at the designated TESDA Accredited Assessment Center

SECTION 3 TRAINING ARRANGEMENTS

These standards are set to provide technical and vocational education and training (TVET) providers with information and other important requirements to consider when designing training programs for **5-AXIS CNC MACHINE OPERATION NC III.**

They include information on curriculum design; training delivery; trainee entry requirements; tools and equipment; training facilities; and trainer's qualification.

3.1 CURRICULUM DESIGN

TESDA shall provide the training on the development of competency-based curricula to enable training providers develop their own curricula with the components mentioned below.

Delivery of knowledge requirements for the basic, common and core units of competency specifically in the areas of mathematics, science/technology, communication/language and other academic subjects shall be contextualized. To this end, TVET providers shall develop a Contextual Learning Matrix (CLM) to accompany their curricula.

Course Title: 5-AXIS CNC MACHINE OPERATION NC III

Nominal Training Duration:

40	**Hours**	**Basic Competencies**
120	**Hours**	**Common Competencies**
272	**Hours**	**Core Competencies**
Total 432	**Hours**	

Course Description:

This course is designed to enhance the knowledge, skill and attitudes of 5-AXIS CNC MACHINE OPERATION NC III in accordance with industry standards. This covers competencies that a person must achieve in writing 5-axis CNC machine program, setting-up 5-axis CNC machine, workpiece and cutting tools and performing pre and post 5-axis CNC machine operations.

Upon completion of the course, the learners are expected to demonstrate the above-mentioned competencies to be employed. To obtain this, all units prescribed for this qualification must be achieve

BASIC COMPETENCIES
(40 HOURS)

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration

1. Lead workplace communication	1.1 Communicate information about workplace processes	• Read
		  ○ Effective verbal communication methods
		  ○ Sources of information
		• Practice organizing information
		• Identify organization requirements for written and electronic communication methods
		• Follow organization requirements for the use of written and electronic communication methods
		• Perform exercises on understanding and conveying intended meaning scenario
			• Lecture
			• Demonstration
			• Practical exercises
			• Role Play
				• Written Test
				• Observation
					2 Hours

	1.2 Lead workplace discussions	• Describe:
		  ○ Organizational policy on production, quality and safety
		  ○ Goals/ objectives and action plan setting
		• Read
		  ○ Effective verbal communication methods
		• Prepare/set action plans based on organizational goals and objectives
			• Group discussion
			• Lecture
			• Demonstration
				• Oral evaluation
				• Written Test
				• Observation
					2 Hours

	1.3 Identify and communicate issues arising in the workplace	• Describe: ○ Organizational policy in dealing with issues and problems • Read • Effective verbal communication methods	• Group discussion • Lecture	• Oral evaluation • Written Test	2 Hours

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
2. Lead small teams	2.1 Provide team leadership	• Discussion of Company policies and procedures • Read web pages on situational leadership • Role play on situational leadership	• **Group work** • **Role Play** • **Lecture/ Discussion** • **Individual Work**	• Role Play • Written Test	1 Hour
	2.2 Assign responsibilities	• Read web pages on performance management • Case study on allocating roles and responsibilities based on competencies of current staff	• Individual Work • Case Study	• Role Play • Written Test	1 Hour
	2.3 Set performance expectations for team members	• Role play to communicate performance expectations with staff • Discussion on performance issues	• Lecture/ Discussion • Role Play	• Role Play • Written Test	1 Hour
	2.4 Supervise team performance	• Discussion on performance monitoring • Role play on providing feedback on performance • Role play on performance coaching • Discussion on keeping the team informed of team performance • Case study on Team performance monitoring and feedback	• Lecture/ Discussion • Role Play • Case Study	• Role Play • Written Test	1 Hour
3. Apply critical thinking and problem-solving techniques in the workplace	3.1 Examine specific workplace strategies	• Show thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations • Show mastery of the current industry hardware and software products and services	• Group discussion • Lecture • Demonstration • Role playing	• Case Formulation • Life Narrative Inquiry (Interview) • Standardized test	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
		• Discuss process of identification of fundamental causes of specific workplace challenges • Show mastery of knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations - Relevant equipment and operational processes - Enterprise goals, targets and measures - Enterprise quality OHS and environmental requirement - Enterprise information systems and data collation - Industry codes and standards			
	3.2 Analyze the causes of specific workplace challenges	• Show thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations • Show mastery of the current industry hardware and software products and services • Discuss process of identification of fundamental causes of specific workplace challenges • Show mastery of knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations - Relevant equipment and operational processes	• Group discussion • Lecture • Demonstration • Role playing	• Case Formulation • Life Narrative Inquiry (Interview) • Standardized test	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
		- Enterprise goals, targets and measures - Enterprise quality OHS and environmental requirement - Enterprise information systems and data collation - Industry codes and standards • Identify extent and causes of specific challenges in the workplace • Use of range of analytical problem-solving techniques • Formulate clear-cut findings on the nature of each identified workplace challenges			
	3.3 Formulate resolutions to specific workplace challenges	• Show thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations • Show mastery of the current industry hardware and software products and services • Discuss process of identification of fundamental causes of specific workplace challenges • Show mastery of knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations - Relevant equipment and operational processes - Enterprise goals, targets and measures - Enterprise quality OHS and environmental requirement	• Group discussion • Lecture • Demonstration • Role playing	• Case Formulation • Life Narrative Inquiry (Interview) • Standardized test	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
		- Enterprise information systems and data collation - Industry codes and standards • Identify extent and causes of specific challenges in the workplace • Use of range of analytical problem-solving techniques • Formulate clear-cut findings on the nature of each identified workplace challenges • Discus strategies on devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges			
	3.4 Implement action plans and communicate results	• Identify extent and causes of specific challenges in the workplace • Use of range of analytical problem-solving techniques • Formulate clear-cut findings on the nature of each identified workplace challenges • Discus strategies on devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges	• Group discussion • Lecture • Demonstration • Role playing	• Case Formulation • Life Narrative Inquiry (Interview) • Standardized test	1 Hour
4. Work in a diverse environment	4.1 Develop an individual's cultural awareness and sensitivity	• Show understanding of cultural diversity in the workplace • Recognize norms of behavior for interacting and dialogue with specific groups (e. g., Muslims and other non-Christians, non-Catholics, tribes/ethnic groups, foreigners)	• Small Group Discussion • Interactive Lecture • Brainstorming • Demonstration • Role-playing	• Demonstration or simulation with oral questioning • Group discussions and interactive activities • Case studies/ problems involving	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
		• Demonstrate different methods of verbal and non-verbal communication in a multicultural setting • Apply cross-cultural communication skills (i.e. different business customs, beliefs, communication strategies) • Show affective skills – establishing rapport and empathy, understanding, etc. • Demonstrate openness and flexibility in communication • Recognize diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices		workplace diversity issues • Written examination • Role Playing	
	4.2 Work effectively in an environment that acknowledges and values cultural diversity	• Explain the value of diversity in the economy and society in terms of Workforce development • Discuss the importance of inclusiveness in a diverse environment • Discuss the importance of shared vision and understanding of and commitment to team, departmental, and organizational goals and objectives • Identify and exhibit strategies for customer service excellence • Demonstrate cross-cultural communication skills and active listening • Recognize diverse groups in the workplace and community as defined by divergent culture, religion, traditions and practices • Demonstrate collaboration skills	• Small Group Discussion • Interactive Lecture • Brainstorming • Demonstration • Role-playing	• Demonstration or simulation with oral questioning • Group discussions and interactive activities • Case studies/ problems involving workplace diversity issues • Written examination • Role Playing	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
	4.3 Identify common issues in a multicultural and diverse environment	• Explain the value, and leverage of cultural diversity • Discuss the inclusivity and conflict resolution • Describe the workplace harassment • Explain the change management and cite ways to overcome resistance to change • Demonstrate advanced strategies for customer service excellence • Address diversity-related conflicts in the workplace • Eliminate discriminatory behavior towards customers and co-workers • Utilize change management policies in the workplace	• Small Group Discussion • Interactive Lecture • Brainstorming • Demonstration • Role-playing	• Demonstration or simulation with oral questioning • Group discussions and interactive activities • Case studies/ problems involving workplace diversity issues • Written examination • Role Playing	1 Hour
5. Propose methods of applying learning and innovation in the organization	5.1 Assess work procedures, processes and systems in terms of innovative practices	• Show mastery of the following practical concepts (e.g., 7 habits of highly effective people, character strengths that foster learning and innovation, five minds of the future, adaptation concepts and transtheoretical model of behavior change) • Demonstrate collaboration and networking skills • Show basic skills in research • Generate practical insights on how to improve organizational procedures, processes and systems	• Interactive Lecture • Appreciative Inquiry • Demonstration • Group work	• Psychological and behavioral Interviews • Performance Evaluation • Life Narrative Inquiry • Review of portfolios of evidence and third-party workplace reports of on-the-job performance. • Standardized assessment of character strengths and virtues applied	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
	5.2 Generate practical action plans for improving work procedures, processes	• Show mastery of the following practical concepts (e.g., 7 habits of highly effective people, character strengths that foster learning and innovation, five minds of the future, adaptation concepts and transtheoretical model of behavior change) • Demonstrate collaboration and networking skills • Show basic skills in research • Generate practical insights on how to improve organizational procedures, processes and systems • Set up action plans on how to apply innovative procedures in the organization • Set up action plans on how to apply innovative procedures in the organization • Generate practical insights on how to improve organizational procedures, processes and systems	• Interactive Lecture • Appreciative Inquiry • Demonstration • Group work	• Psychological and behavioral Interviews • Performance Evaluation • Life Narrative Inquiry • Review of portfolios of evidence and third-party workplace reports of on-the-job performance. • Standardized assessment of character strengths and virtues applied	1 Hour
	5.3 Evaluate the effectiveness of the proposed action plans	• Show mastery of the following practical concepts (e.g., 7 habits of highly effective people, character strengths that foster learning and innovation, five minds of the future, adaptation concepts and transtheoretical model of behavior change) • Demonstrate collaboration and networking skills • Show basic skills in research • Generate practical insights on continuous improvement	• Interactive Lecture • Appreciative Inquiry • Demonstration • Group work	• Psychological and behavioral Interviews • Performance Evaluation • Life Narrative Inquiry • Review of portfolios of evidence and third-party workplace reports of on-the-job performance.	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
				• Standardized assessment of character strengths and virtues applied	
6. Use information systematically	6.1 Use technical information	• Lecture and discussion on: - Application in collating information - Procedures for inputting, maintaining and archiving information - Guidance to people who need to find and use information • Organizing information into a suitable form for reference and use • Classify stored information for identification and retrieval • Operate the technical information system by using agreed procedures	• Lecture • Group Discussion • Hands on • Demonstration	• Oral evaluation • Written Test • Observation • Presentation	4 Hours
	6.2 Apply information technology (IT)	• Lecture and discussion on: - Attributes and limitations of available software tool - Procedures and work instructions for the use of IT - Operational requirements for IT systems - Sources and flow paths of data - Security systems and measures that can be used - Methods of entering and processing information • Use procedures and work instructions for the use of IT • Extract data and format reports • Use WWW applications	• Lecture • Group Discussion • Self-paced handout/ module • Hands on • Demonstration	• Oral evaluation • Written Test • Observation • Presentation	2 Hours

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
	6.3 Edit, format and check information	• Lecture and discussion on: - Basic file-handling techniques - Techniques in checking documents - Techniques in editing and formatting - Proof reading techniques • Use different techniques in checking documents • Edit and format information applying different techniques • Proof read information applying different techniques	• Lecture • Group Discussion • Self-paced handout/ module • Hands on • Demonstration	• Oral evaluation • Written Test • Observation • Presentation	2 Hours
7. Evaluate Occupational Safety And Health Work Practices	7.1 Interpret Occupational Safety and Health practices	• Discuss the OSH standards, principles and legislations • Identify OSH work practices issues • Discuss standard safety requirements	• Lecture • Group Discussion	• Written Exam • Demonstration • Observation • Interviews / Questioning	1.5 Hours
	7.2 Set OSH work targets	• Discussion in actions plans that are necessary in achieving the OSH target	• Lecture • Group Discussion	• Written Exam • Demonstration • Observation • Interviews / Questioning	1 Hour
	7.3 Evaluate effectiveness of Occupational Safety and Health work instructions	• Practice evaluating safety data (Historical or Simulated)	• Lecture • Group Discussion	• Written Exam • Demonstration • Observation • Interviews / Questioning	1.5 Hours
8. Evaluate Environmental Work Practices	8.1 Interpret environmental practices, policies and procedures	• Discussion Environmental Issues regarding - Water Quality - National and Local Government Issues - Safety	• Lecture • Group Discussion • Demonstration	• Written Exam • Demonstration • Observation • Interviews / Questioning	1 Hour

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
		- Endangered Species - Noise - Air Quality - Historic - Waste - Cultural • Updating of existing occupation practices			
	8.2 Establish targets to evaluate environmental practices	• Discussion on - lower production costs and energy consumption - Environmentally Sound Processes - Resource Efficient - Recycling and Waste Management • Simple case study regarding energy efficiency	• Lecture • Group Discussion • Demonstration	• Written Exam • Demonstration • Observation • Interviews / Questioning	1 Hour
	8.3 Evaluate effectiveness of environmental practices	• Identifying effective environmental practices relevant to the industry/occupation - **Implementation of energy efficiency**	• Lecture • Group Discussion • Demonstration • Case Study	• Written Exam • Demonstration • Observation • Interviews / Questioning • Third Party Reports	1 Hour
9. Facilitate Entrepreneurial Skills For Micro-Small-Medium Enterprises (MSMEs)	9.1 Develop and maintain micro-small-medium enterprise (MSMEs) skills in the organization	• Discussions on business models and strategies • Discussion on Types and categories of businesses and business internal control • Discussion on Relevant National and local legislations affecting businesses • Prepare promotional materials • Practice basic bookkeeping	• Lecture/ Discussion • Case Study • Demonstration	• Written Test • Portfolio • Work Related Project	2 Hours

Unit of Competency	Learning Outcomes	Learning Activities	Methodology	Assessment Approach	Nominal Duration
	9.2 Establish and maintain client-base/market	• Role play on customer and employee relations • Discussion on Basic product promotion strategies • Preparation of Basic Feasibility study • Case studies on Basic Business ethics • Prepare basic advertising materials	• Role Play • Lecture Discussion • Case study	• Case problem • Written Test	2 Hours
	9.3 Apply budgeting and financial management skills	• Discussion on: - Basic cost-benefit analysis - Basic financial management - Basic financial accounting - Business internal controls	• Role Play • Lecture Discussion • Group work	• Written Test • Case problem	1 Hour

COMMON COMPETENCIES
(120 HOURS)

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
1. Apply safety practices	1.1 Identify hazards	• Identified hazards in accordance with safety standards • Identified safety signs and symbols in the workplace	• Lecture-Discussion • Demonstration • Interaction • Video presentation • Practical Exercises	• Written Examination • Observation • Oral Questioning	8 Hours
	1.2 Use protective clothing and devices	• Determine appropriate protective clothing and devices in accordance with safety standards. • Select appropriate protective clothing and devices in accordance with safety standards	• Lecture-Discussion • Demonstration • Interaction • Video presentation • Practical Exercises	• Written Examination • Observation • Oral Questioning	
	1.3 Perform safe handling of tools, equipment and materials	• explain the safety procedure of tools and equipment • Describe safety handling of tools, equipment and materials.	• Lecture-Discussion • Demonstration • Interaction • Video presentation • Practical Exercises	• Written Examination • Observation • Oral Questioning	
	1.4 Perform first aid	• Determine possible injuries in the work place. • Describe recommended first aid treatment according to injury	• Lecture-Discussion • Demonstration • Interaction • Video presentation • Practical Exercises •	• Written Examination • Observation • Oral Questioning	
	1.5 Use fire extinguisher	• Select fire extinguisher according to type of fire.	• Lecture-Discussion • Demonstration • Interaction • Video presentation • Practical Exercises	• Written Examination • Observation • Oral Questioning	

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
2. Interpret working drawings and sketches	2.1 Interpret technical drawing	• Determine components, assemblies according to drawing. • Explain critical dimension, tolerances, and instruction according to drawing.	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	16 Hours
	2.2 Prepare freehand sketch of parts	• Describe the sketch drawing of a part • Determine critical dimension, datum points on the sketch • Explain the instruction in the sketch	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	2.3 Interpret details from freehand sketch	• Determine components, assemblies on the sketch • Determine critical dimension, datum points on the sketch • Determine material requirements on the sketch • Explain standard symbols in the sketch	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
3. Select/cut workshop materials	3.1 Determine requirement	• Explain plans and drawing interpretation according to specification. • Know and obtain the sequence of operation according to specification	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	8 Hours
	3.2 Select and measure materials	• Determine materials according to requirements of operation • Determine measuring tools to be used according to specification	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	3.3 Cut materials	• Know how to cut material according to specification • Explain the cutting tool and equipment used according to plans and drawings	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
4. Perform shop computations (Basic)	4.1 Perform four fundamental operations	• Explain simple calculation performed using four fundamentals operations	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	22 Hours
	4.2 Perform basic calculations involving fractions and decimals	• Explain simple calculation performed involving fraction and decimal using four fundamentals operations • Know how to convert decimal to fraction and vice versa	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	4.3 Perform basic calculations involving percentages	• Know and obtain percentages from information using simple calculation	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	4.4 Perform basic calculation involving ration and proportion	• Describe simple calculation involving ratios and proportion using whole numbers, fractions and decimal fraction	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	4.5 Perform calculations on algebraic expressions	• Explain simple calculations on algebraic expressions using the four fundamental operations	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
5. Measure workpiece (basic)	5.1 Select and use measuring tools	• Determine Measuring tools to be used according to the level of accuracy required • Determine appropriate measuring technique	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	8 Hours

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
	5.2 Clean and store measuring tools	• Explain Care and storage of devices according to manufacturer's specifications	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
6. Perform routine housekeeping	6.1 Organize work area	• Determine workshop policy to work area	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	8 Hours
	6.2 Clean work area	• Describe work shop policies and procedure in specific work area • Describe signage's displayed in the work area • Know how to clean and used tools and equipment according to manufacturer's specification	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
7. Perform shop computations (Intermediate)	7.1 Perform calculations involving triangles	• Know how to calculate problems involving right triangle using trigonometric function. • Know how to calculate problems involving non-right triangle using sine and cosine rules. •	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	10 Hours
	7.2 Calculate taper	• Know how to calculate taper using appropriate formula	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
8. Measure workpiece using angular measuring instruments	8.1 Select and use angular measuring tools	• Determine angular measuring tools according to level of accuracy • Determine measuring techniques to the device.	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	8 Hours

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
	8.2 Maintain angular measuring tools	• Know how to adjust and maintained the measuring tools to the required accuracy according to workplace procedures	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	8.3 Clean and store measuring tools	• Explain Care and storage according to standard operating procedures	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
9. Measure workpiece using gages and surface texture comparator	9.1 Select and use fixed and adjustable gages	• Determine Appropriate gages required • Know and obtained accurate measurement according to drawing specification • Determine measuring technique of the device	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	9.2 Perform surface texture measurements	• Determine surface texture according to worksite procedure • Obtain measurements according to level of accuracy	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	8 Hours
	9.3 Clean and store measuring tools	• Explain care and storage according to standard operating procedures	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
10. Perform preventive and corrective maintenance	10.1 Perform inspection of machine	• Know how to inspect machines according to worksite procedure • Prepare statue reports according to worksite procedure	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	8 Hours

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
	10.2 Perform cleaning and lubricating of machine	• Know how to lubricate machines using appropriate tools • Know when to lubricate machines according prescribe schedule	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	10.3 Perform minor machine repair and adjustments	• Know how to perform minor machine repair according to worksite procedure • Know how to adjust machine moving parts according to manufacturer's specification	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	10.4 Maintain hand tools	• Know how to grind cutting tools according to recommended specification	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
11. Operate personal computer	11.1 Start the computer	• Obtained properly connected peripheral devices • Know how to proper logging in and logging off • Know how to check system features and hardware configuration	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	16
	11.2 Arrange and customize desktop display/ Windows settings	• Know how to add, rename, move, copy and delete desktop icon • Know how to access online help • Know how to select and desktop icons of application program	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	11.3 Work with files and folders (or directories	• Know how to create, open, move, rename and copy a file or folder • Know how to organize various files • Know how to search files and information	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
	11.4 Work with user application programs	• Know how to add, change remove and ran application program • Know how to install, update and upgrade software and application	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	11.5 Print information	• Know how to install printer program and ensure correct printer setting	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	
	11.6 Shut down computer	• Know how to properly shut down computer and peripheral devices	• Lecture-Discussion • Practical exercise • Interaction • Demonstration	• Written Examination • Oral Questioning	

CORE COMPETENCIES
(272 HOURS)

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	Assessment Methods	Nominal Duration
1. Write 5-axis CNC machine program	1.1 Determine job requirements	• Explain and interpret drawing symbols • Explain 5 axis machining operation • Identify and explain types of cutting tool • Calculation of feeds and speeds • Identify tools and measuring instruments	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	108 hours
	1.2 Write 5-axis CNC machine program	• Explain and identify types of software • Explain conversational programming • Explain ISO CNC programming	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	
	1.3 Edit 5-axis CNC program	• Explain editing of program • Perform simulation • Explain procedure in saving program to the machine • Explain of downloading of program to machine directory	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	• Assessment Methods	Nominal Duration
2. Set up 5-axis CNC machine, cutting tools and workpiece	2.1 Set-up machine	• Explain types of oil and coolant • Explain the standard working air and hydraulic pressure • Explain and perform setting of machine zero point • Identify types of work holding devices • Demonstrate how to power up machine.	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	24 hours
	2.2 Set-up cutting tools	• Identify and select types of cutting tools • Perform mounting of cutting tools to the holder • Perform and explain set-up of cutting tools to required reference length • Explain and perform designated tool assignment	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	
	2.3 Set-up workpiece	• Explain procedures in mounting work piece to fixture • Explain and identify types of measuring tools and equipments • Explain and perform datum references	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	• Assessment Methods	Nominal Duration
3. Perform 5-axis CNC machine operations	3.1 Machine workpiece	• Explain closing of machine guard before starting the machine • Explain the importance of machine dry run • Explain editing of tool path • Explain types of tolerancing ,kinds of fitting in CNC machining operation	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	100 hours
	3.2 Monitor machine and tool movements	• Monitoring of parameters • Explain the importance of maintaining the working air pressure level • Explain the importance of cooling system • Explain the importance of sharpness of tools	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	
	3.3 Check and measure work piece	• Perform open and closing of machine door • Perform procedure of de burring work piece • Explain and perform inspection and measurement	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	

Unit of Competency	Learning Outcomes	Learning Activities	Methodologies	• Assessment Methods	Nominal Duration
4. Perform post 5-axis CNC machine operations	4.1 Conduct post CNC operation	• Perform and explain loading and unloading of workpiece • Perform de burring operation • Perform and explain final inspection of workpiece	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	40 hours
	4.2 Documentation of machined workpiece	• Explain the importance of signing out the operation sheet • Explain the process and importance of accomplishing report • Submission of workpiece and report	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	
	4.3 CNC machine shutdown and house keeping	• Explain the procedure of shutting off of electrical pneumatic and hydraulic switches • Explain proper maintenance and storing of tools • Explain importance of tagging and reporting of defective tools • Explain and perform 5S • Explain and perform proper disposal of industrial wastes	• Lecture • Practical / Demonstration	• Written examination • Demonstration with oral questioning	

3.2 TRAINING DELIVERY

1. The delivery of training shall adhere to the design of the curriculum. Delivery shall be guided by the principles of competency-based TVET.

a. Course design is based on competency standards set by the industry or recognized industry sector; (Learning system is driven by competencies written to industry standards)

b. Training delivery is learner-centered and should accommodate individualized and self-paced learning strategies;

c. Training can be done on an actual workplace setting, simulation of a workplace and/or through adoption of modern technology.

d. Assessment is based in the collection of evidence of the performance of work to the industry required standards;

e. Assessment of competency takes the trainee's knowledge and attitude into account but requires evidence of actual performance of the competency as the primary source of evidence.

f. Training program allows for recognition of prior learning (RPL) or current competencies;

g. Training completion is based on satisfactory performance of all specified competencies.

2. The competency-based TVET system recognizes various types of delivery modes, both on-and off-the-job as long as the learning is driven by the competency standards specified by the industry. The following training modalities and their variations/components may be adopted singly or in combination with other modalities when designing and delivering training programs:

2.1 Institution- Based:

- Dual Training System (DTS)/Dualized Training Program (DTP) which contain both in-school and in-industry training or fieldwork components. Details can be referred to the Implementing Rules and Regulations of the DTS Law and the TESDA Guidelines on the DTP;

- Distance learning is a formal education process in which majority of the instruction occurs when the students and instructor are not in the same place. Distance learning may employ correspondence study, audio, video, computer technologies or other modern technology that can be used to facilitate learning and formal and non-formal training. Specific guidelines on this mode shall be issued by the TESDA Secretariat.

- The classroom-based or in-center instruction uses of learner-centered methods as well as laboratory or field-work components.

2.2 Enterprise-Based:

- Formal Apprenticeship – Training within employment involving a contract between an apprentice and an enterprise on an approved apprenticeable occupation.

- Informal Apprenticeship - is based on a training (and working) agreement between an apprentice and a master craftsperson wherein the agreement may be written or oral and the master craftsperson commits to training the apprentice in all the skills relevant to his or her trade over a significant period of time, usually between one and four years, while the apprentice commits to contributing productively to the work of the business. Training is integrated into the production process and apprentices learn by working alongside the experienced craftsperson.

- Enterprise-based Training- where training is implemented within the company in accordance with the requirements of the specific company. Specific guidelines on this mode shall be issued by the TESDA Secretariat.

2.3 Community-Based – Community-Based – short term programs conducted by non-government organizations (NGOs), LGUs, training centers and other TVET providers which are intended to address the specific needs of a community. Such programs can be conducted in informal settings such as barangay hall, basketball courts, etc. These programs can also be mobile training program (MTP).

3.3 TRAINEE ENTRY REQUIREMENTS

Trainees or students who wish to enter this training should possess the following requirements:

- Holder of any certificate of competency in Machining NC I or 1-Year industry experience in Machining
- Must have completed the 10-year basic education or an Alternative Learning System (ALS) Certificate of Completion with grade 10 equivalent holder
- Must have competence in CNC Lathe Machine and CNC Milling Machine Operation acquired through training or work experience or certification
- Can communicate orally and or in writing
- Can perform basic mathematical computation

3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS

Recommended list of tools, equipment and materials for the training of 20 trainees for 5-axis CNC machine operation NC III:

EQUIPMENT			
QTY	**Description**	**QTY**	**Description**
1 unit	5 axis CNC machine, Spindle speed 16,00 rpm, spindle motor output 26 kw, x and y axes travel 900 mm z axis 660 mm or 5 axis CNC training machine	1 unit	Overhead/LCD Projector
1 unit	Power Hack saw, 230 watts/ 220 volts, single phase	1 set	Table with drawer and chair
1 unit	Air Compressor, 5HP with dryer	1 unit	Precision vise
1 unit	Air Conditioner, 3 tons capacity		

SUPPLIES AND MATERIALS					
QTY	**Description**	**QTY**	**Description**	**QTY**	**Description**
25pcs	150 grit sandpaper	25 pcs	800 grit sandpaper	25pcs	250 grit sandpaper
20 pcs.	Aluminum dia 30mm x100mm	20 pcs.	Aluminum Plate 50mm x 50mm x 50mm	200 liters	Water base soluble coolant
5 pcs.	Right hand tool holder	5 pcs.	Paint brush 50mm width	5 kgs.	Rags
1 box	Right hand carbide insert	2 pcs.	Left hand tool holder	2 pcs.	Neutral tool holder
5 pcs.	#3 center drill	1 box	Left hand carbide inserts	1 box	Neutral carbide inserts
1 set	Drill bits, Dia.1/8" – Dia 1/2"	5 pcs.	#2 center drill	1 set	Drill bits, Dia. 1mm – Dia. 12mm
		1 pair	Magnetic v-block		

TRAINING MATERIALS			
QTY	**Description**	**QTY**	**Description**
	Manual		
	Reference books		
	Brochures		

TOOLS					
QTY	**Description**	**QTY**	**Description**	**QTY**	**DESCRIPTION**
1 set	Combination wrench Size 6mm to 21mm	2 sets	6” Needle file		
2 pcs.	Machine tap, M8 x 1.75 mm	1 pc	Granite surface plate 500mm x 500mm x 100mm		
1 set	Allen wrench, Size 4mm to 12mm	2 pcs	Adjustable wrench, 150mm		
5 pcs	Flat File, 2nd cut, 150 mm	1 pc.	Ball peen hammer, 500 grams		
4pairs	t-bolts and nuts (to fit machine table)	1 pc.	Rubber mallet 250g		
CUTTING TOOLS					
QTY	**Description**	**QTY**	**Description**		
2 pcs.	End mill, dia 10 mm	1 pc.	Face mill, dia 50mm		
2 pcs.	End mill, dia 20 mm	1 pc.	Plane mill cutter, dia 60mm		
1 pc.	Side milling cutter, dia 100mm	2 pcs.	Slitting cutter, dia 100mm		
2 pcs.	Ball end mill, dia 6m				
2 pcs.	Ball end mill, dia 10m				

MEASURING INSTRUMENTS					
QTY	**Description**	**QTY**	**Description**	**QTY**	**Description**
1 pc.	Vernier caliper (Digital) 300mm	2 pcs.	Outside Micrometer (Digital) 0- 25 mm 25-50 mm	1 pc.	Dial indicator with magnetic stand, lever-type, 0.01 least count
1 pc.	3-Point Inside Micrometer (Digital), 25-50 mm	1 set	Rectangular Gauge block, Steel, 0.0005 mm – 100mm	1 pc.	Vernier height gage with dial indicator
2 pcs.	Depth gage micrometer, 0- 25 mm	1 set	Steel Pin block, 0.1 mm – 10 mm	1 pc.	Surface gauge comparator, 0 .40-18.0 Ra(um)
1 pc	Digital Height Gage , 300mm	1 pc	Granite surface plate 500mm x 500mm	1 pc	Sine plate

3.5 TRAINING FACILITIES

Based on class intake of 20 students/trainees:

SPACE REQUIREMENT	SIZE IN METERS	AREA IN SQ. METERS	TOTAL AREA IN SQ. METERS
• Building (Permanent)	10.0m X 10.0m x	100 sqm	100 sqm
• CNC workshop	5 .0m X 5.0m	25 sqm	
• Quality Control room	3 .0m X 2.5m	7.5 sqm	
• Learning Resource Center	5 .0m X 5.0m	25 sqm	
• Tool Room and Storage	4 .0m X 3.0m	12 sqm	
• Dressing / Washroom	3 .0m X 2.5m	7.5 sqm	

NOTE:
Training center may enter into a memorandum of understanding (MOU) with an institution/company with appropriate equipment and facilities.

3.6 TRAINERS' QUALIFICATION

- Holder of National TVET Trainer Certificate Level I (NTTC Level I) in 5-Axis CNC Machine Operation NC III
- Must be 3D CAD/CAM literate
- Must have at least 2 years job/industry experience in CNC 5-axis machining

3.7 INSTITUTIONAL ASSESSMENT

Institutional Assessment is gathering of evidences to determine the achievements of the requirements of the qualification to enable the trainer make judgement whether the trainee is competent or not competent.

SECTION 4 ASSESSSMENT AND CERTIFICATION ARRANGEMENT

Competency Assessment is the process of collecting evidence and making judgments whether competency has been achieved. The purpose of assessment is to confirm that an individual can perform to the standards expected at the workplace as expressed in relevant competency standards.

The assessment process is based on evidence or information gathered to prove achievement of competencies. The process may be applied to an employable unit(s) of competency in partial fulfillment of the requirements of the national qualification.

4.1 NATIONAL ASSESSMENTAND CERTIFICATION ARRANGEMENTS

4.1.1 A National Certificate (NC) is issued when a candidate has demonstrated competence in all unit/s of competency of a qualification with a promulgated Training Regulations.

4.1.2 Individuals wanting to be certified will have to be assessed in accordance with the requirements identified in the evidence guide of the relevant unit/s of competency.

4.1.3 Recognition of Prior Learning (RPL). Candidates who have gained competencies through informal training, previous work or life experiences may apply for recognition in a particular qualification through competency assessment.

4.1.4 The industry shall determine assessment and certification requirements for each qualification with promulgated Training Regulations: It includes the following:

a. entry requirements for candidates
b. evidence gathering methods
c. qualification requirements of competency assessors
d. specific assessment and certification arrangements as identified by industry

4.1.5 The following are qualified to apply for **assessment and certification**:

a. Graduating students/trainees of NTR programs or graduates of formal, non-formal and informal institutions including enterprise-based training programs related to 5-Axis CNC Machine Operation NC III

b. Industry workers in CNC Machining.

4.2 COMPETENCY ASSESSMENT REQUISITE

4.2.1 Self-Assessment Guide. The self-assessment guide (SAG) is accomplished by the candidate prior to actual competency assessment. SAG is a pre-assessment tool to help the candidate and the assessor determine what evidence is available, where gaps exist, including readiness for assessment.

This document can:

a. Identify the candidate's skills and knowledge
b. Highlight gaps in candidate's skills and knowledge
c. Provide critical guidance to the assessor and candidate on the evidence that need to be presented
d. Assist the candidate to identify key areas in which practice is needed or additional information or skills that should be gained prior `

4.2.2 **Accredited Assessment Center.** Only Assessment Center accredited by TESDA is authorized to conduct competency assessment. Assessment centers undergo a quality assured procedure for accreditation before they are authorized by TESDA to manage the assessment for National Certification.

4.2.3 **Accredited Competency Assessor.** Only accredited competency assessor is authorized to conduct assessment of competence. Competency assessors undergo a quality assured system of accreditation procedure before they are authorized by TESDA to assess the competencies of candidates for National Certification.

ANNEX A

COMPETENCY MAP
METALS AND ENGINEERING SECTOR
5-AXIS CNC MACHINE OPERATION NC III

BASIC COMPETENCIES

Lead workplace communication	**Lead small teams**	**Apply critical thinking and problem-solving techniques in the workplace**	**Work in a diverse environment**	**Propose methods of applying learning and innovation in the organization**	**Use information systematically**	**Evaluate occupational safety and health work practices**	**Evaluate environmental work practices**	**Facilitate entrepreneurial skills for micro-small-medium enterprises (MSMEs)**
Receive and respond to workplace communication	Work with others	Solve/address routine problems	Enhance self-management skills	Support Innovation	Access and maintain information	Follow occupational safety and health policies and procedures	Apply environmental work standards	Adopt entrepreneurial mindset in the workplace
Participate in workplace communication	Work in Team Environment	Solve/address general workplace problems	Develop career and life decisions	Contribute to workplace innovation	Present relevant information	Practice occupational safety and health policies and procedures	Exercise efficient and effective sustainable practices in the workplace	Practice entrepreneurial skills in the workplace

Utilize specialize specialized communication skill	Develop and lead teams	Perform higher order thinking processes and apply techniques in the workplace	Contribute to the practice of social justice in the workplace	Manage innovative work instructions	Manage evaluate usage of information	Lead in improvement of Occupational Safety and Health Program, Policies and Procedures	Lead towards improvement of environmental work programs, policies and procedures	Sustain entrepreneurial skills
Manage and sustain effective communication strategies	Manage and sustain high performing teams	Evaluate higher order thinking skills and adjust problem solving techniques	Advocate strategic thinking for global citizenship	Incorporate innovation into work procedures	Develop systems in managing, and maintaining information	Manage Implementation of OSH programs in the workplace	Manage implementation of environmental program in the workplace	Develop and sustain a high-performing enterprise

COMMON COMPETENCIES

Apply safety practices	**Interpret working drawings and sketches**	**Select/ cut workshop materials**	**Perform shop computations (Basic)**
Measure workpiece (Basic)	**Perform routine housekeeping**	**Perform shop computations (Intermediate)**	**Measure workpiece using angular measuring instruments**
Perform shop computations (Advanced)	**Measure workpiece using gages and surface texture comparator**	**Perform preventive and corrective maintenance**	**Operate a personal computer**
Select and cut workshop materials	Prepare cost estimates	Apply Safety Practices	Interpret Drawings and Sketches
Perform Industry Calculations	Contribute to Quality System	Use Hand Tools	Prepare Weld Materials
Setup Welding Equipment	Fit up Weld Materials	Repair Welds	Perform shop computations (Intermediate)
Measure workpiece (Intermediate)	Perform preventive and corrective Maintenance		

CORE COMPETENCIES

Create drawing using CAD software	Apply CAD/CAM program	Write basic CNC lathe machine program	Set-up CNC lathe machine, workpiece and cutting tools
Perform basic CNC lathe machine operations	Write advanced CNC lathe machine program	Set-up multiple-axis CNC lathe machine, workpiece and cutting tools	Perform advanced CNC lathe machine operations
Write basic CNC milling machine program	Set-up CNC milling machine, workpiece and cutting tools	Perform basic CNC milling machine operations	Write advanced CNC milling machine program
Set-up multiple-axis CNC milling machine, workpiece and cutting tools	Perform advanced CNC milling machine operations	Weld Carbon Steel Plates Using FCAW	Weld Carbon Steel Pipes Using FCAW
Weld Alloy Steel Plates Using FCAW	Weld Alloy Steel Pipes Using FCAW	Perform Gas Welding in Carbon Steel Plates and Tubes	Perform Gas Welding in Alloy Steel Plates and Tubes
Weld Carbon Steel Plates Using GMAW	Weld Carbon Steel Pipes Using GMAW	Weld Alloy Steel Plates Using GMAW	Weld Alloy Steel Pipes Using GMAW
Weld Carbon Steel Plates Using GTAW	Weld Carbon Steel Pipes Using GTAW	Weld Alloy Steel Plates Using GTAW	Weld Alloy Steel Pipes Using GTAW
Perform bench work (Basic)	Turn workpiece	Mill workpiece	Grind workpiece
Shape workpiece	Repair workpiece	Perform bench work (Basic)	Perform bench work (Complex)
Turn workpiece (Basic)	Turn workpiece (Intermediate)	Mill workpiece (Basic)	Mill workpiece (Intermediate)

CORE COMPETENCIES				
	Grind workpiece (Basic)	Grind workpiece (Complex)	Turn workpiece (Advanced)	Mill workpiece (Advanced)
	Prepare basic engineering drafting	Perform basic engineering detail drafting	Perform Preventive Maintenance	Perform Planned and Unplanned (Emergency) Maintenance
	Fabricate Simple Items	Install Machinery	Perform press machine setting	Perform mechanical press operation
	Weld Plates Using SAW	Weld Pipes Using SAW	Weld Carbon Steel Plates Using SMAW	Weld Carbon Steel Plates and Pipes Using SMAW
	Weld Alloy Steel Plates Using SMAW	Weld Alloy Steel Pipes Using SMAW	Machine Die Components	Fit and Assemble Dies
	Test and Try Die	Machine mold components	Implement surface finishing	Fit and assemble mold
	Rectify mold flaws	**Write 5-axis CNC machine program**	**Set-up 5-axis CNC machine, cutting tools and workpiece**	**Perform 5-axis CNC machine operations**
	Perform post 5-axis CNC machine operations			

GLOSSARY OF TERMS

1. 5-axis CNC (Computerized Numerical Control) Machine	The automation of machine tools that are operated by precisely programmed commands encoded on a storage medium, as opposed to controlled manually via hand wheels or levers
2. Machine coordinate system	A point of reference in this system of coordinates is known as machine zero-point
3. Work piece coordinate system	A system of coordinates taking this point as reference is called the work piece coordinates system
4. Machine Zero	The position located at the farthest possible distance in a positive direction along the X-, Y-, and Z-axes. This position is permanently set for each particular CNC machine
5. Micrometer	A hand-held measuring device used to inspect the dimensions of parts. Thy typical micrometer is accurate within 0.001 in. or 0.02 mm
6. Mode	A machine state that determines the way it executes manual and automatic commands
7. Optional Stop	A code that pauses the program if the appropriate switch is selected on the machine. Optional Stop allows the operator to inspect the machine between operations
8. Override	A control that adjusts a programmed speed or feed rate by a certain percentage during operation
9. Part Program	A series of numerical instructions used by a CNC machine to perform the necessary sequence of operations to machine a specific work piece
10. Part Programmer	The person responsible for the creation of a part program. The part programmer translates the work piece design into program instructions for the CNC machine
11. Proving Out	Running a program one block at a time in order to check for accuracy and proper tool set-up
12. Cycle Start	The control used to begin a program or continue a program that has been previously stopped
13. Cycle Stop	The control used to pause a program. Cycle Stop pauses tool feed but does not stop spindle movement

14.	Dry Running	Performing a trial run of the part program without any parts or cutting fluids to check the program
15.	Edit Mode	The mode that allows an operator an operator to make changes to a part program and store those changes
16.	Emergency Stop	The control that automatically shuts down all machine functions
17.	Feed rate Override	An override that allows the operator to adjust the feed rate of the tool during operation. The override functions as a percentage of the programmed value
18.	Handle Mode	The mode that allows for the manual operation of tool movement via the hand wheel. Some machines may have a combined handle/jog mode
19.	Rapid Feed Rate Override	An override that allows the operator to reduce the rate of rapid tool movement during operation. A rapid override may be 25% of the original rate or less
20.	Rapid Mode	The mode that allows for the manual movement of machine components at high rates of travel
21.	Tolerance	The unwanted but acceptable deviation from a desired dimension
22.	Tool Offset	A stored value that compensates for variations in tool length. Each tool requires an offset, which is measured from the turret or spindle position
23.	Zero return	The control that automatically locates the turret or spindle in the machine zero position

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