

COMPETENCY STANDARDS

ADDITIVE MANUFACTURING LEVEL III



MANUFACTURING SECTOR

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY
East Service Road, South Luzon Expressway (SLEX), 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 groups 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 Authority.

The Competency Standards (CS) serve as basis for the:

1. Institutional Competency assessment and training certification;
2. Registration and delivery of training programs; and
3. Development of curriculum and assessment instruments.

Each CS has 2 sections:

Section 1 **Definition of Competency Standards** - refers to the group of competencies that describes the different functions of the qualification.

Section 2 **The Competency Standards** - gives the specifications of competencies required for effective work performance.

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COMPETENCY STANDARDS FOR ADDITIVE MANUFACTURING LEVEL III

SECTION 1 COMPETENCY STANDARDS DESCRIPTION

The **ADDITIVE MANUFACTURING LEVEL III** consists of competencies that a person must achieve in strip preparing design files, managing additive manufacturing inventory, monitoring additive manufacturing process, performing post-processing, maintaining documentation, conducting quality inspection, and performing machine maintenance.

The Units of Competency comprising this Qualification include the following:

UNIT CODE	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)

UNIT CODE	COMMON COMPETENCIES
ADM311201	Interpret Drawings and sketches
MEE721210	Perform Basic Workshop measurements and computation
AFF321203	Contribute to Quality Management System (QMS)
MEE721205	Use Hand Tools
ADM311202	Perform Preventive and Corrective Maintenance

UNIT CODE	CORE COMPETENCIES
ADM311301	Finalize design files for production
ADM311302	Monitor additive manufacturing inventory
ADM311303	Monitor additive manufacturing process
ADM311304	Perform post-processing of 3D printed outputs
ADM311305	Perform documentation for equipment and material
ADM311306	Conduct preliminary print out inspection

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

- **Additive Manufacturing Production Lead Technician**

SECTION 2 COMPETENCY STANDARDS

This section details the contents of the basic, common and core units of competency required in **ADDITIVE MANUFACTURING LEVEL III**.

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 <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Communicate information about workplace	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	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 <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	maintained in all relevant situations		
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 VARIABLE

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

<p>1. Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 2.1 Variety of Information 2.2 Communication tools 2.3 Simulated workplace
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 3.1 Case problem 3.2 Third-party report 3.3 Portfolio 3.4 Interview 3.5 Demonstration/Role-playing
<p>4. Context of Assessment</p>	<p>4.1 Competency may be assessed in the workplace or in a simulated workplace environment</p>

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 <i>Italicized terms</i> 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 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 Negotiating skills 2.3 Evaluation skills 2.4 Identifying team member's strengths and rooms for improvement
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs 3.2 Performance expectations are based on individual team member's knowledge, skills and aptitude	3.1 One's roles and responsibilities in the team 3.2 Feedback giving and receiving 3.3 Performance expectation	3.1 Communication skills 3.2 Accurate empathy 3.3 Congruence 3.4 Unconditional positive regard 3.5 Handling of Feedback

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	3.3 Performance expectations are discussed and disseminated to individual team members		
4. Supervise team performance	<p>4.1 Performance is monitored based on defined performance criteria and/or assignment instruction</p> <p>4.2 Team members are provided with feedback, positive support and advice on strategies to overcome any deficiencies based on company practices</p> <p>4.3 Performance issues which cannot be rectified or addressed within the team are referred to appropriate personnel according to employer policy</p> <p>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</p> <p>4.5 Team operations are monitored to ensure that employer/client needs and requirements are met</p> <p>4.6 Follow-up communication is provided on all issues affecting the team</p> <p>4.7 All relevant documentation is completed in accordance with company procedures</p>	<p>4.1 Performance coaching</p> <p>4.2 Performance management</p> <p>4.3 Performance issues</p>	<p>4.1 Communication skills required for leading teams</p> <p>4.2 Coaching skill</p>

RANGE OF VARIABLE

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 of Assessment	4.1 Competency may be assessed in the workplace or in a simulated workplace environment

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.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> 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 nonstandard 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 a 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.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> 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 nonstandard 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 2.6 OSH and environmental requirements. 2.7 Enterprise information systems and data collation. 2.8 Industry codes and standards.	2.1 Using a 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.
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	3.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize	3.1 Using a range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>and possible future causes.</p> <p>3.4 Action plans are developed identifying measurable objectives, resource needs and timelines in accordance with safety and operating procedures</p>	<p>nonstandard situations.</p> <p>3.2 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations</p> <p>3.3 Relevant equipment and operational processes.</p> <p>3.4 Enterprise goals, targets and measures.</p> <p>3.5 Enterprise quality OSH and environmental requirements.</p> <p>3.6 Enterprise information systems and data collation.</p> <p>3.7 Industry codes and standards.</p>	<p>challenges in the workplace.</p> <p>3.2 Identifying extent and causes of specific challenges in the workplace.</p> <p>3.3 Providing clear-cut findings on the nature of each identified workplace challenges.</p> <p>3.4 Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges.</p>
4. Implement action plans and communicate results	<p>4.1 Action plans are implemented and evaluated.</p> <p>4.2 Results of plan implementation and recommendations are prepared.</p> <p>4.3 Recommendations are presented to appropriate personnel.</p> <p>4.4 Recommendations are followed-up, if required.</p>	<p>4.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize nonstandard situations.</p> <p>4.2 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective</p>	<p>4.1 Using a range of analytical techniques (e.g., planning, attention, simultaneous and successive processing of information) in examining specific challenges in the workplace.</p> <p>4.2 Identifying extent and causes of specific challenges in the workplace.</p> <p>4.3 Providing clear-cut findings on</p>

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		action and provision of recommendations. 4.3 Relevant equipment and operational processes. 4.4 Enterprise goals, targets and measures. 4.5 Enterprise quality OSH and environmental requirements. 4.6 Enterprise information systems and data collation. 4.7 Industry codes and standards.	the nature of each identified workplace challenges. 4.4 Devising, communicating, implementing and evaluating strategies and techniques in addressing specific workplace challenges.

RANGE OF VARIABLE

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 Gantt 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

<p>1. Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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
<p>2. Resource Implications</p>	<p>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 a bank of questions which will be used to probe the reason behind the observable action.</p>
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 3.1 Observation 3.2 Case Formulation 3.3 Life Narrative Inquiry 3.4 Standardized Test <p>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.</p> <p>These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened.</p>
<p>4. Context of Assessment</p>	<p>In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units.</p>

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 <i>Italicized terms</i> 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 nonverbal communication.	1.1 Understanding cultural diversity in the workplace 1.2 Norms of behavior for interacting and dialogue with specific groups (e. g., Muslims and other nonChristians, nonCatholics, tribes/ethnic groups, foreigners) 1.3 Different methods of verbal and nonverbal 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
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	2.1 Value of diversity in the economy and society in terms of Workforce development 2.2 Importance of inclusiveness in a diverse environment	2.1 Demonstrating cross-cultural communication skills and active listening 2.2 Recognizing diverse groups in the workplace and community as

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>share their specific qualities, skills or backgrounds with other team members and clients to enhance work outcomes.</p> <p>2.3 Relations with customers and clients are maintained to show that diversity is valued by the business.</p>	<p>2.3 Shared vision and understanding of and commitment to team, departmental, and organizational goals and objectives</p> <p>2.4 Strategies for customer service excellence</p>	<p>defined by divergent culture, religion, traditions and practices</p> <p>2.3 Demonstrating collaboration skills</p> <p>2.4 Exhibiting customer service excellence</p>
<p>3. Identify common issues in a multicultural and diverse environment</p>	<p>3.1 <i>Diversity-related conflicts</i> within the workplace are effectively addressed and resolved.</p> <p>3.2 Discriminatory behaviors towards customers / stakeholders are minimized and addressed accordingly.</p> <p>3.3 Change management policies are in place within the organization.</p>	<p>3.1 Value, and leverage of cultural diversity</p> <p>3.2 Inclusivity and conflict resolution</p> <p>3.3 Workplace harassment</p> <p>3.4 Change management and ways to overcome resistance to change</p> <p>3.5 Advanced strategies for customer service excellence</p>	<p>3.1 Addressing diversity-related conflicts in the workplace</p> <p>3.2 Eliminating discriminatory behavior towards customers and coworkers</p> <p>3.3 Utilizing change management policies in the workplace</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Diversity	This refers to diversity in both the workplace and the community and may include divergence in: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> 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. Reasons for innovation are incorporated to work procedures. 1.2. Models of innovation are researched. 1.3. Gaps 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.
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	2.1 Seven habits of highly effective people. 2.2 Character strengths that foster innovation and learning (Christopher Peterson and Martin Seligman, 2004)	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

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>subject to change are selected based on workplace requirements (feasible and innovative).</p> <p>2.4 Practical action plans are proposed to facilitate simple changes in the work procedures, processes and systems.</p> <p>2.5 Critical inquiry is applied and used to facilitate discourse on adjustments in the simple work procedures, processes and systems.</p>	<p>2.3 Five minds of the future concepts (Gardner, 2007).</p> <p>2.4 Adaptation concepts in neuroscience (Merzenich, 2013).</p> <p>2.5 Transtheoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).</p>	<p>systems through innovation.</p> <p>2.3 Facilitating action plans on how to apply innovative procedures in the organization.</p>
<p>3. Evaluate the effectiveness of the proposed action plans</p>	<p>3.1 Work structure is analyzed to identify the impact of the new work procedures</p> <p>3.2 Co-workers/key personnel is consulted to know who will be involved with or affected by the work procedure</p> <p>3.3 Work instruction operational plan of the new work procedure is developed and evaluated.</p> <p>3.4 Feedback and suggestion are recorded.</p> <p>3.5 Operational plan is updated.</p> <p>3.6 Results and impact on the developed work instructions are reviewed</p> <p>3.7 Results of the new work procedure are evaluated</p> <p>3.8 Adjustments are recommended based on results gathered</p>	<p>3.1 Five minds of the future concepts (Gardner, 2007).</p> <p>3.2 Adaptation concepts in neuroscience (Merzenich, 2013).</p> <p>3.3 Transtheoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992).</p>	<p>3.1 Generating insights on how to improve organizational procedures, processes and systems through innovation.</p> <p>3.2 Facilitating action plans on how to apply innovative procedures in the organization.</p> <p>3.3 Communicating results of the evaluation of the proposed and implemented changes in the workplace procedures and systems.</p> <p>3.4 Developing action plans for continuous improvement on the basic systems, processes and procedures in the organization.</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Diversity	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. Critical Inquiry	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

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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 it to reflect evaluation feedback, knowledge management systems and future planning. 1.7 Evaluated the effectiveness of the proposed action plans.
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 2.1 Pens, papers and writing implements. 2.2 Cartolina. 2.3 Manila papers.
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 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.
<p>4. Context for Assessment</p>	<ul style="list-style-type: none"> 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 <i>Italicized terms</i> 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 <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Apply information technology (IT)	<p>2.1. Technical information system is operated using agreed procedures</p> <p>2.2. Appropriate and valid procedures are operated for inputting, maintaining and archiving information</p> <p>2.3. Software required are utilized to execute the project activities</p> <p>2.4. Information and data obtained are handled, edited, formatted and checked from a range of internal and external sources</p> <p>2.5. Information are extracted, entered, and processed to produce the outputs required by customers</p> <p>2.6. Own skills and understanding are shared to help others</p> <p>2.7. Specified security measures are implemented to protect the confidentiality and integrity of project data held in IT systems</p>	<p>2.1. Attributes and limitations of available software tools</p> <p>2.2. Procedures and work instructions for the use of IT</p> <p>2.3. Operational requirements for IT systems</p> <p>2.4. Sources and flow paths of data</p> <p>2.5. Security systems and measures that can be used</p> <p>2.6. Extract data and format reports</p> <p>2.7. Methods of entering and processing information</p> <p>2.8. WWW enabled applications</p>	<p>2.1. Identifying attributes and limitations of available software tools</p> <p>2.2. Using procedures and work instructions for the use of IT</p> <p>2.3. Describing operational requirements for IT systems</p> <p>2.4. Identifying sources and flow paths of data</p> <p>2.5. Determining security systems and measures that can be used</p> <p>2.6. Extracting data and format reports</p> <p>2.7. Describing methods of entering and processing information</p> <p>2.8. Using WWW applications</p>

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> 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 <i>Italicized terms</i> 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 is 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	2.1 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 <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	2.4 OSH work instructions are received in accordance with workplace policies and procedures*		
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 3.4 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 4.1 Statistics on incidence of accident and injuries 4.2 Morbidity (Type and Number of Sickness) 4.3 Mortality (Cause and Number of Deaths) 4.4 Accident Rate

EVIDENCE GUIDE

<p>1. Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 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
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 2.1 Facilities, materials, tools and equipment necessary for the activity
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 3.1 Observation/Demonstration with oral questioning 3.2 Third party report 3.3 Written exam
<p>4. Context for Assessment</p>	<ul style="list-style-type: none"> 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

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> 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 is 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 2.4 Trainings and Seminars	2.1 Investigative Skills 2.2 Critical thinking 2.3 Problem Solving 2.4 Observation Skills

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> 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 3.2 Keeping Skills 3.3 Critical thinking 3.4 Problem Solving 3.5 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

<p>1. Critical aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 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
<p>2. Resource Implications</p>	<p>The following resources should be provided:</p> <ol style="list-style-type: none"> 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
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ol style="list-style-type: none"> 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
<p>4. Context for Assessment</p>	<p>4.1 Competency may be assessed in actual workplace or at the designated TESDA center.</p>

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 <i>Italicized terms</i> 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 the 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

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
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.)
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 through appropriate internal controls . 3.3 Unnecessary or lower-priority expenses and purchases are avoided.	3.1 Cash flow management 3.2 Basic financial management 3.3 Basic financial accounting 3.4 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., online 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 : INTERPRET DRAWINGS AND SKETCHES

UNIT CODE : ADM313201

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

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Interpret technical drawing	1.1 Dimensions identified as appropriate. 1.2 Instructions identified and followed as required. 1.3 Material requirements identified as required. 1.4 Symbols recognized as appropriate in the drawing/ sketch . 1.5 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 Identifying dimension 1.2 Identifying instruction 1.3 Identifying material 1.4 Recognizing symbols in the drawing 1.5 Identifying tolerance, limits and fits
2. Interpret details from freehand sketch	2.1. Dimensions identified as appropriate. 2.2. Instructions identified and followed as required. 2.3. Material requirements identified as required. 2.4. Symbols recognized as appropriate in the drawing	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. Identifying dimensions 2.2. Identifying instruction 2.3. Identifying material requirements 2.4. Recognizing symbols

RANGE OF VARIABLES

VARIABLE	RANGE
1. Drawing/sketch	May include: 1.1 Perspective 1.2 Orthographic
2. Tolerance	May include: 2.1 Fit tolerance 2.2 Dimensional tolerance

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Drawings 1.2 Sketches
2. Resource Implications	The following resources should be provided: 2.1 Drawings or plans 2.2 Sketches 2.3 Measuring tools
3. Method of Assessment	Competency in this unit must be assessed through: 3.1 Direct observation 3.2 Written or oral short answer questions 3.3 Demonstration
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : **PERFORM BASIC WORKSHOP MEASUREMENTS AND COMPUTATION**

UNIT CODE : **MEE721210**

UNIT DESCRIPTOR : This unit covers the competencies required to perform proper measurement and simple calculations using the four fundamental operations.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Select and use measuring tools	1.1 Measuring tools are selected according to the requirement. 1.2 Measuring tools are used according to the requirement 1.3 The 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	1.1 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.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Perform four fundamental operations.	3.1 Simple computations are performed using four fundamental operations. 3.2 Correct formulas are applied to isolate the variable required. 3.3 Simple transposition of variables in the formulae is carried out. 3.4 Unknown variables are solved correctly.	3.1 Linear measurement 3.2 Geometrical measurement 3.3 Ratio and proportion 3.4 Area	3.1 Performing Calculation
4. Perform conversion of units	4.1 Familiarity to English system of measurement is required 4.2 Understanding the metric system is necessary. 4.3 Units are converted to the required figure using the given formula	4.1 English Systems of Measurement 4.2 Metric System of Measurement 4.3 Conversion of units from English to metric and/or vice versa	4.1 Performing Calculation

RANGE OF VARIABLES

VARIABLE	RANGE
1. Measuring tools	It includes: 1.1 Ruler 1.2 Vernier caliper 1.3 Micrometer screw gauge 1.4 Vernier height gauge 1.5 Depth gauge 1.6 Measuring tape
2. Simple computations	It includes: 2.1 Addition 2.2 Subtraction 2.3 Multiplication 2.4 Division

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Correctly identified appropriate farm tools and equipment 1.2 Operated farm equipment according to manual specification 1.3 Performed preventive maintenance
2. Resource Implications	The following resources should be provided: 2.1 Tools and equipment
3. Method of Assessment	Competency in this unit must be assessed through: 3.1 Direct observation 3.2 Practical demonstration 3.3 Third Party Report
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : CONTRIBUTE TO QUALITY MANAGEMENT SYSTEM (QMS)

UNIT CODE : AFF321203

UNIT DESCRIPTOR : This unit involves competence required to contribute to quality management system towards work

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Apply quality management system (QMS)	1.1 Appropriate quality systems and procedures are applied throughout the production/fabrication process. 1.2 Documented information are properly controlled 1.3 QMS are properly implemented and maintained	1.1 Awareness on applicable quality management system / standards	1.1 Conforming to QMS
2. Apply quality standards to work	2.1 Inspections are conducted throughout the production processes to ensure quality standards are maintained. 2.2 Appropriate quality standards are applied throughout the production/fabrication processes. 2.3 All activities are coordinated throughout the workplace to ensure efficient quality work outcomes. 2.4 Records of work quality are maintained according to the company requirements.	2.1 Awareness on applicable quality management system / standards	2.1 Conforming to QMS

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Protect company property and customer interests	3.1 Possible damage to <i>company property</i> is avoided by adherence to company quality procedures. 3.2 Quality of work is reviewed to ensure customer requirements and company standards 3.3 Customer feedback system is established.	3.1 Awareness on applicable quality management system / standards	3.1 Conforming to QMS

RANGE OF VARIABLES

VARIABLE	RANGE
1. Quality system and Procedures	May include: 1.1 Work instructions 1.2 Procedures manual 1.3 Safe work procedures 1.4 Equipment maintenance schedules 1.5 Product technical procedures adopted or specifically prepared standards 1.6 Company/industry rules
2. Company property	May include: 2.1 Production and/or fabrication equipment 2.2 Hand and power tools 2.3 OH&S paraphernalia 2.4 Facilities

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Contributed to QMS towards work 1.2 Applied quality standards to work 1.3 Protected company property and customer interests
2. Resource Implications	The following resources should be provided: 2.1 Quality manuals / procedures 2.2 Applicable Codes, Standards and Specifications 2.3 Company / Industry rules
3. Method of Assessment	Competency in this unit must be assessed through: 3.1 Demonstration 3.2 Written or oral short answer questions
4. Context of Assessment	4.1 Competency may be assessed in the workplace or in a simulated workplace environment or at the designated TESDA Accredited Assessment Center.

UNIT OF COMPETENCY : USE HAND TOOLS

UNIT CODE : MEE721205

UNIT DESCRIPTOR : This unit covers the competencies required to use hand tools.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Identify and use of Personal Protective Equipment (PPE)	1.1 Personal protective equipment (PPE) is used in accordance with Rule 1080 of Occupational Safety and Health Standards 1.2 Proper Care and Maintenance of PPEs are performed in accordance with OSHS 1.3 Storage and Disposal of PPE are followed according to OSHS	1.1 OSH rule 1080 work standard 1.2 Company/ workplace policies/ guidelines 1.3 Standards and safety requirements of work process and procedures	1.1 OSH rule 1080 work standard 1.2 Company/ workplace policies/ guidelines 1.3 Standards and safety requirements of work process and procedures
2. Select and use of tools and equipment	2.1 Hand tools selected are appropriate to the requirements of the task . 2.2 Tools and equipment are inspected according to manufacturer's recommendation 2.3 Tools and equipment are used as per operation manual instructions.	2.1 Tools and equipment Instruction manual 2.2 Adherence to work requirements	2.1 Communication skills 2.2 Handling of tools and equipment

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Perform simple maintenance of tools and equipment	3.1 Tools and equipment are cleaned and lubricated (<i>routine maintenance</i>) according to manufacturer's recommendation. 3.2 Unsafe or defective tools are identified and marked for repair/ decommission according to procedure. 3.3 Minor tools and equipment repair are performed according to manufacturer's instructions or worksite procedure.	3.1 Proper cleaning and oiling. 3.2 Equipment inspection and maintenance. 3.3 Simple repairs of hand tools	3.1 Cleaning and lubricating. 3.2 Conducting simple check –up and remedies 3.3 Performing minor repairs

RANGE OF VARIABLES

VARIABLE	RANGE
1. Personal protective Equipment (PPE)	May include: 1.1 Safety goggles 1.2 Safety Shoes 1.3 Apron
2. Hand Tools	May include: 2.1 Chipping Hammer 2.2 Steel brush 2.3 Pliers/Tongs 2.4 Files-bastard cut 2.5 Portable disc grinder 2.6 Try Square 2.7 Steel Rule 2.8 Files-half round 2.9 Adjustable wrench 2.10 C- Clamps
3. Task	May include: 3.1 Testing / Inspection 3.2 Adjusting 3.3 Dismantling 3.4 Assembling
4. Routine Maintenance	May include: 4.1 Cleaning 4.2 Lubricating 4.3 Adjusting 4.4 Simple tool repair

EVIDENCE GUIDE

1. Critical Aspects of Competency	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Selected and used hand tools appropriate to the job</p> <p>1.2 Performed routine maintenance and storage of hand tools</p>
2. Resource Implications	<p>The following resources should be provided:</p> <p>2.1 Tools, equipment and facilities appropriate to the process or activity</p> <p>2.2 Materials relevant to the proposed activity</p>
3. Method of Assessment	<p>Competency in this unit must be assessed through:</p> <p>3.1 Demonstration</p> <p>3.2 Written or oral short answer questions</p> <p>3.3 Practical exercises</p>
4. Context of Assessment	<p>4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center.</p>

UNIT OF COMPETENCY : **PERFORM PREVENTIVE AND CORRECTIVE MAINTENANCE**

UNIT CODE : **ADM311202**

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to ensure optimal machine reliability by executing a preventive maintenance program and facilitating the resolution of major issues through diagnostics and coordination.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Perform inspection of machine	1.1 Machine parts are inspected according to worksite procedures. 1.2 Status/Report recorded on proforma or reported orally according to worksite procedure.	1.1 Equipment inspection 1.2 Parts and functions of machine tools 1.3 Location of main switches of the machine 1.4 Checklist of safe working conditions	1.1 Inspecting and changing drive pulleys and belts 1.2 Replacing and adjusting machine parts
2. Undertake unit cleaning and lubrication in accordance with maintenance standards.	2.1 Units lubricated as per manufacturer's recommendation using appropriate 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 Procedures in cleaning and disposal of waste materials	2.1 Following preventive maintenance checklists for additive manufacturing machines. 2.2 Maintaining machine components. 2.3 Performing safety checks

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
3. Perform minor machine repair and adjustments	3.1 Minor machine repairs performed according to manufacturer's instructions or worksite procedures. 3.2 Machine moving parts adjusted to manufacturer's specifications.	3.1 Proper cleaning and oiling 3.2 Equipment inspection and maintenance.	3.1 Cleaning and lubricating. 3.2 Conducting simple check –up and remedies 3.3 Performing minor repairs
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 Simple repairs of hand tools 4.2 Proper cleaning and oiling 4.3 Cleaning work area 4.4 Disposing metal scraps, chips and waste materials	4.1 Inspecting and repairing hand tools

RANGE OF VARIABLES

VARIABLE	RANGE
1. Machine parts	May include: 1.1 V-belt 1.2 Bearing 1.3 Gears 1.4 Clutch 1.5 Drive pulley
2. Units	May include: 2.1 3D printer (FDM) 2.2 3D printer (SLA) 2.3 Washing Station 2.4 Curing Station 2.5 Ultrasonic cleaner 2.6 Post Processing station
3. Tools and materials	May include: 2.1 Lubricants 2.2 Oil can 2.3 Grease gun 2.4 Oil 2.5 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 performed minor machine repairs and adjustments
2. Resource Implications	The following resources should be provided: 2.1 Tools, equipment and facilities appropriate to the process or activity 2.2 Materials relevant to the proposed activity
3. Method of Assessment	Competency in this unit must be assessed through: 3.1 Demonstration 3.2 Written or oral short answer questions 3.3 Practical exercises
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center.

CORE COMPETENCIES

UNIT OF COMPETENCY : FINALIZE DESIGN FILES FOR PRODUCTION

UNIT CODE : ADM311301

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to manage the end-to-end print preparation process, from 3D model validation and error correction to slicer optimization, ensuring the generation of G-code that balances quality, cost, and speed.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Validate 3D model files*	1.1 3D model files are validated for consistency based on the job order . 1.2 Errors in 3D models are repaired for printability in accordance with the additive manufacturing process. 1.3 Adjustments are discussed and agreed upon with the supervisor to ensure compliance with production requirements.	SCIENCE 1.1 Material limitations TECHNOLOGY 1.1 CAD/3D modeling software 1.2 Slicing software ENGINEERING 1.1 Design for additive manufacturing (DfAM) principles 1.2 Error detection (non-manifold edges, thin walls). MATHEMATICS 1.1 Dimension verification 1.2 Scaling 1.3 Tolerances verification COMMUNICATION 1.1 Computer-Aided Design (CAD) interpretation 1.2 Design specifications clarification	1.1 Interpreting Computer-Aided Design(CAD) and Standard Tessellation Language (STL) files. 1.2 Using 3D model analysis tools to detect errors (non-manifold, thin walls, holes, etc.). 1.3 Using mesh repair tools to correct identified model errors. 1.4 Applying scaling and dimension adjustments based on job order. 1.5 Verifying model tolerances against machine and project specifications.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
			1.6 Using slicing software. 1.7 Ensuring that files meet machine and project specifications.
2. Prepare print jobs	2.1 <i>Print job parameters</i> are configured based on the job order requirements. 2.2 Print simulation or preview is analyzed to ensure build accuracy and stability. 2.3 Adjustments are applied to improve quality and process efficiency.	SCIENCE 2.1 Material behavior under printing conditions TECHNOLOGY 2.1 Functions and impact of key slicer parameters (e.g., layer height, print speed, infill density/pattern, temperature, retraction). 2.2 Principles of support structure generation (e.g., types: tree, line, grid) and their effect on surface finish and post-processing. 2.3 Principles of build plate adhesion (e.g., brim, raft, skirt) and when to use them. ENGINEERING 2.1 Application of DfAM principles for part orientation (impact on strength, print time, and support needs). 2.2 Strategies for process efficiency and quality optimization. MATHEMATICS 2.1 Formulas for print time and material consumption estimation.	2.1 Orienting 3D models on the build plate for optimal print quality, strength, and speed. 2.2 Generating and customizing support structures (e.g., adding/removing supports, changing density). 2.3 Adjusting key slicer parameters (layer height, infill, speed, temp) to meet job order requirements for quality and speed. 2.4 Applying build plate adhesion settings (brim, raft, etc.) as required by material and geometry. 2.5 Using print simulation/preview tools to analyze the print path and

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		ENVIRONMENT 2.1 Nesting/layout optimization strategies to maximize build plate usage and minimize waste.	2.6 Identify potential failures (e.g., collisions, missed layers, excessive travel). 2.7 Balancing trade-offs between print quality, speed, and material cost.
3. Save Production Files	3.1 Approved print files are saved in the designated directory or storage device following standard naming conventions. 3.2 Documentation of print job settings and file versions is completed and filed for reference.	TECHNOLOGY 3.1 File management systems (local, network, cloud). 3.2 Printer-specific file formats (e.g., G-code, .makerbot, .form). 3.3 Data transfer methods (USB, Wi-Fi, LAN) and digital storage devices. COMMUNICATION 3.1 Documentation standards and file naming conventions. 3.2 Principles of file version control. ENVIRONMENT 3.1 Digital file storage and data management best practices.	3.1 Saving optimized print files (G-code) in the correct format. 3.2 Transferring data to appropriate storage devices or machines. 3.3 Verifying file integrity after saving or transferring. 3.4 Documenting all final print job settings and file versions. 3.5 Applying standard naming and archiving protocols for traceability.

RANGE OF VARIABLES

VARIABLE	RANGE
1. 3D model files	May include: <ul style="list-style-type: none"> 1.1 Standard Tessellation Language File (STL), 1.2 Wavefront Object File (OBJ) 1.3 3D Manufacturing File (3MF) 1.4 Retrieval via Universal Serial Bus (USB), Local Area Network (LAN), cloud, Laboratory Information Management System (LIMS), and job management system.
2. Job order	May include: <ul style="list-style-type: none"> 2.1 Design Files 2.2 Materials 2.3 Quantity 2.4 Print Time 2.5 Preliminary Post-Processing 2.6 Cost Estimate
3. Errors	May include: <ul style="list-style-type: none"> 3.1 Models that are too large 3.2 Wrong model scale 3.3 Missing details
4. Print job parameters	May include: <ul style="list-style-type: none"> 4.1 Layer height/thickness 4.2 Line width 4.3 Flow rate 4.4 Print Speed 4.5 Printing temperature 4.6 Fan speed 4.7 Bed temperature 4.8 Chamber temperature 4.9 Vat temperature 4.10 Exposure Time 4.11 Support generation 4.12 Bed adhesion 4.13 Part orientation 4.14 Infill density 4.15 Infill configuration 4.16 Wall thickness 4.17 Top/Bottom thickness 4.18 Pin hole locations

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Validated 3D model files based on the job order. 1.2 Prepared print files based on the job order. 1.3 Saved print files for production
2. Resource Implications	The following resources should be provided: 2.1 Tools, materials, and equipment appropriate for the unit of competency. 2.2 Workplace environment appropriate for the unit of competency.
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration with Questioning 3.2 Observation with Questioning 3.3 Written Examination
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : MONITOR ADDITIVE MANUFACTURING INVENTORY

UNIT CODE : ADM311302

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to maintain the full lifecycle of additive manufacturing materials, from inventory control and procurement coordination to hands-on preparation and conditioning, ensuring a continuous supply of materials for operations.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Assess inventory levels*	1.1 Material stock levels are tracked and documented in accordance with inventory control procedures. 1.2 Reports are initiated when stock reaches the threshold and in accordance with established procurement procedures and organizational policies.	SCIENCE 1.1 Material shelf-life 1.2 Storage conditions 1.3 Degradation factors. TECHNOLOGY 1.1 Digital inventory management systems. MATHEMATICS 1.1 Usage rates tracking 1.2 Material estimation COMMUNICATION 1.1 Inventory reports 1.2 Restocking procedures 1.3 Restocking protocols ENVIRONMENT 1.1 Safe material storage 1.2 Proper disposal practices for hazardous materials.	1.1 Tracking material usage for continuous operations. 1.2 Maintaining logs of available stock and consumed materials. 1.3 Reporting low stock levels of materials. 1.4 Coordinating with the procurement team.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Perform material handling	<p>2.1. Materials are prepared according to the <i>additive manufacturing process equipment</i></p> <p>2.2. Material traceability is logged based on the <i>job order</i>.</p>	<p>SCIENCE</p> <p>2.1 Pre-treatment requirements (drying)</p> <p>2.2 Cross-contamination risks and prevention methods.</p> <p>2.3 Principles of material traceability (lot numbers, batch tracking) for quality control.</p> <p>TECHNOLOGY</p> <p>2.1 Operation of conditioning (dryers)</p> <p>2.2 Loading and unloading procedures for different AM equipment (FFF, SLA, MSLA).</p> <p>COMMUNICATION</p> <p>2.1 Understanding traceability logs and job order documentation.</p> <p>ENVIRONMENT</p> <p>2.1 Safe handling protocols</p> <p>2.2 Personal Protective Equipment (PPE) requirements (e.g., nitrile gloves, safety glasses, respirators) for each material type based on MSDS.</p>	<p>2.1. Operating material conditioning equipment (e.g., setting time and temperature on a filament dryer).</p> <p>2.2. Preparing materials for use (e.g., drying filaments to specified moisture levels, mixing/filtering resins).</p> <p>2.3. Using correct PPE based on material MSDS.</p> <p>2.4. Loading materials into AM equipment (FFF, SLA, MSLA) safely and without contamination.</p> <p>2.5. Logging material traceability information (batch/lot numbers) against job orders.</p> <p>2.6. Inspecting materials for defects or contamination before use.</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Threshold	May include: 1.1 Minimum stock quantity 1.2 Safety stock level 1.3 Reorder point quantity
2. Additive manufacturing process equipment	May include: 2.1 Fused Filament Fabrication(FFF) printer 2.2 Stereolithography (SLA) printer 2.3 Masked Stereolithography (MSLA)
3. Job order	May include: 3.1 Job order number 3.2 Client or project details 3.3 Production schedule or timeline

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Assessed the inventory of additive manufacturing materials 1.2 Performed proper material handling
2. Resource Implications	The following resources should be provided: 2.1 Tools, materials, and equipment appropriate for the unit of competency 2.2 Workplace environment appropriate for the unit of competency
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Interview 3.2 Demonstration with Questioning 3.3 Observation with Questioning 3.4 Written Examination
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : MONITOR ADDITIVE MANUFACTURING PROCESS

UNIT CODE : ADM311303

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to ensure print success and quality through real-time process monitoring and mid-print intervention, adjusting critical parameters to correct deviations and mitigate defects without compromising part integrity.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Validate 3D printing parameters *	1.1 Print job parameters are monitored according to the additive manufacturing process equipment. 1.2 Deviations from control limits are identified and documented based on the job order.	SCIENCE 1.1 Material responses to variations in parameters. TECHNOLOGY 1.1 Slicing software ENGINEERING 1.1 Machine-specific process controls MATHEMATICS 1.1 Analyze real-time data trends for deviation detection.	1.1 Assessing material behavior during the 3D printing process 1.2 Validating digital models for printing 1.3 Using slicing software to set printing parameters.
2. Implement corrective actions during printing*	2.1 Process adjustments are implemented in real time according to the additive manufacturing process equipment. 2.2 Failures while printing results to paused or aborted operation as necessary	SCIENCE 2.1 Root cause analysis 2.2 Parameter corrections ENGINEERING 2.1 Adjustment of printing settings COMMUNICATION 2.1 Report creation for corrective action	2.1 Adjusting of printing parameters in real-time 2.2 Minimizing material waste 2.3 Ensuring job continuity

RANGE OF VARIABLES

VARIABLE	RANGE
1. Print job parameters	May include: 1.1 Layer height/thickness 1.2 Line width 1.3 Print Speed 1.4 Printing temperature 1.5 Fan speed 1.6 Bed temperature 1.7 Chamber temperature 1.8 Vat temperature 1.9 Support generation 1.10 Bed adhesion 1.11 Part orientation 1.12 Infill density 1.13 Infill configuration 1.14 Wall thickness 1.15 Top/Bottom thickness 1.16 Pin hole locations
2. Deviations	May include: 2.1 Warping 2.2 Inconsistent surface finish 2.3 Under Extrusion 2.4 Over Extrusion 2.5 Layer Shifting
3. Process adjustments	May include: 3.1 Printing temperatures 3.2 Bed temperature 3.3 Chamber temperature 3.4 VAT temperature 3.5 Flow rate 3.6 Exposure time 3.7 Printing speed 3.8 Fan speed 3.9 Z-offset
4. Failures while printing	May include: 4.1 Layer Adhesion Issues 4.2 Under/Over extrusion 4.3 Layer delamination 4.4 Tangled filament 4.5 Stringing 4.6 Offset printing 4.7 Warping 4.8 Insufficient support

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Validated process parameters to the additive manufacturing process equipment. 1.2 Implemented corrective actions as necessary while printing 1.3 Evaluated Print Output and Record Process Data
2. Resource Implications	The following resources should be provided: 2.1 Tools, materials, and equipment appropriate for the unit of competency 2.2 Workplace environment appropriate for the unit of competency
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration with Questioning 3.2 Observation with Questioning 3.3 Written Examination
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM POST-PROCESSING OF 3D PRINTED OUTPUTS

UNIT CODE : ADM311304

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to deliver finished parts by applying various post-processing techniques, while ensuring the operational readiness of all associated equipment through regular maintenance.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Prepare for post-processing activities	1.1 Work instructions and job specifications are interpreted according to workplace procedures. 1.2 Tools, equipment, and materials are identified and prepared according to job requirements. 1.3 Personal protective equipment (PPE) is selected and used in accordance with occupational health and safety (OHS) requirements. 1.4 3D printed parts are inspected for defects and printing irregularities prior to post-processing.	SCIENCE 1.1 Properties of post-processing chemicals (e.g., Alcohol, Acetone) and their interactions with print materials. TECHNOLOGY 1.1 Post-processing requirements for different AM materials (e.g., FFF vs. SLA/MSLA). ENGINEERING 1.1 Interpretation of technical drawings and job specifications for surface finish and tolerance requirements. 1.2 Part inspection criteria and common 3D printing defects (e.g., layer shifts, uncured resin). ENVIRONMENT 1.1 Environmental and waste management procedures	1.1 Interpreting job orders and technical drawings for post-processing requirements. 1.2 Performing pre-processing inspection to identify and document part defects. 1.3 Selecting appropriate PPE based on the specific material and process (e.g., handling resins, sanding, using solvents). 1.4 Preparing and staging the correct tools, equipment, and materials for the job.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Operate post-processing equipment	2.1 Post-processing operations are executed according to the additive manufacturing processes. 2.2 Post-processing operations are completed based on the job order. 2.3 Post-processing corrections of defects are to be implemented as appropriate.	TECHNOLOGY 2.1 3D printed parts post-processing 2.2 Use of post-processing equipment ENGINEERING 2.1 Effects of post-processing on dimensional accuracy 2.2 Effects of post-processing on part performance ENVIRONMENT 2.1 Safe material handling 2.2 Proper disposal of chemicals and abrasives	3.1 Applying post-processing methods. 3.2 Finishing techniques for AM materials. 3.3 Using equipment for thermal or chemical post-processing.
3. Maintain post-processing equipment	3.1 Post-processing equipment is cleaned and maintained. 3.2 Post-processing consumables and Personal Protective Equipment (PPE) are checked and replenished.	SCIENCE 3.1 Chemical/thermal effects of cleaning agents on post-processing equipment TECHNOLOGY 3.1 Maintenance requirements of post-processing systems COMMUNICATION 3.1 Maintenance activities logs 3.2 Material consumables logs ENVIRONMENT 3.1 Sustainable cleaning practices	3.1 Maintaining curing chambers, polishing stations, or blasting-maintenance for each machine 3.2 Reporting wear, malfunctions, or hazards in post-processing tools.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
4. Finalize and document post-processing	4.1 Dispose of waste materials according to environmental standards. 4.2 Complete required documentation and production reports.	SCIENCE 4.1 Proper storage and handling requirements for finished parts. ENGINEERING 4.1 Final quality assurance (QA) inspection criteria. COMMUNICATION 4.1 Production reporting and documentation procedures. ENVIRONMENT 4.1 Waste segregation and disposal procedures (e.g., hazardous vs. non-hazardous, cured resin vs. liquid-contaminated materials, solvent disposal).	4.1 Performing final QA inspection of post-processed parts against job order specifications. 4.2 Segregating and disposing of waste materials (chemical and solid) according to environmental and safety standards. 4.3 Cleaning and storing all tools and equipment properly. 4.4 Completing all required documentation (e.g., inspection reports, job order forms, material usage logs).

RANGE OF VARIABLES

VARIABLE	RANGE
1. Personal Protective Equipment (PPE)	May include: 1.1 Nitrile gloves 1.2 Safety gloves 1.3 Face mask (At least an N95) 1.4 Apron 1.5 UV Glasses 1.6 Safety goggles
2. Post-processing operations	May include: 2.1 Sanding 2.2 Vapor smoothing 2.3 Washing 2.4 UV curing 2.5 Polishing 2.6 Painting
3. Post-processing corrections	May include: 3.1 Sanding 3.2 Plastic welding 3.3 Joining 3.4 Thermal 3.5 Gap filling 3.6 Cutting 3.7 Coating
4. Post-processing equipment	May include: 4.1 Vapor Smoothing Machine 4.2 Wash Module 4.3 Cure Module 4.4 Rotary tool 4.5 Side Cutter 4.6 Pliers 4.7 UV Flashlight 4.8 Polisher 4.9 Soldering iron 4.10 Sander
5. Consumables	May include: 5.1 Isopropyl Alcohol (At least 90%) 5.2 Sandpaper 5.3 Acetone 5.4 Super glue 5.5 Polishing compound 5.6 Body filler 5.7 Polishing wheel 5.8 Tissue
6. Documentation	May Include: 6.1 Inspection reports 6.2 Material usage logs 6.3 Job order forms

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Operated post-processing equipment 1.2 Maintained post-processing equipment 1.3 Completed documentation and housekeeping
2. Resource Implications	The following resources should be provided: 2.1 Tools, materials, and equipment appropriate for the unit of competency 2.2 Workplace environment appropriate for the unit of competency
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration with Questioning 3.2 Observation with Questioning
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : PERFORM DOCUMENTATION FOR EQUIPMENT AND MATERIAL

UNIT CODE : ADM311305

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to manage the complete production documentation from maintaining auditable logs for full traceability to analyzing and reporting key trends and quality metrics to drive informed decision-making.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Prepare documentation requirements	1.1 Documentation requirements are identified based on company procedures and job instructions. 1.2 Relevant forms, logs, or digital systems are prepared for recording. 1.3 Tools and data needed for documentation are made available and verified for accuracy.	TECHNOLOGY 1.1 Digital logbooks 1.2 Manufacturing execution systems (MES). 1.3 Knowledge in which tool to use in data documentation ENGINEERING 1.1 Principles of traceability in manufacturing. COMMUNICATION 1.1 Company documentation procedures and standards. 1.2 Types of production records (e.g., equipment logs, material usage, maintenance checklists, job order forms).	1.1 Identifying all required documentation for a specific job order. 1.2 Preparing (or accessing) relevant digital or physical forms (logbooks, checklists, MES interface) for data entry. 1.3 Verifying that all necessary data fields are available.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
2. Document production logs*	2.1 Production processes are documented based on the job order. 2.2 The equipment and materials used are recorded according to the additive manufacturing equipment.	TECHNOLOGY 2.1 Digital logbooks 2.2 Manufacturing execution systems (MES). MATHEMATICS 2.1 Calculation of production data COMMUNICATION 2.1 Record-keeping of daily operations, parameters, and material usage.	2.1 Recording of production activities. 2.2 Using logging systems. 2.3 Maintaining accurate production records.
3. Generate job reports *	3.1 Data from production logs is compiled into reports based on the job order. 3.2 Quality reports are submitted according to the additive manufacturing process equipment. 3.3 Usage of materials is logged based on actual consumption.	TECHNOLOGY 3.1 Reporting software 3.2 Data visualization tools ENGINEERING 3.1 Quality metrics and standards (ISO/ASTM for additive manufacturing) MATHEMATICS 3.1 Statistical data analyzation 3.2 Deviation inspection COMMUNICATION 3.1 Prepare detailed reports	3.1 Compiling print results, parameter records, and inspection data into reports. 3.2 Analyzing production outcomes 3.3 Reporting standards for internal and external quality assurance. 3.4 Presenting findings for decision-making.
4. Maintain and store documentation	4.1 Completed documentation is checked for completeness and legibility. 4.2 Records are secured and maintained in accordance with organizational traceability procedures.	TECHNOLOGY 4.1 Reporting software 4.2 Cloud storage	4.1 Recording and verifying data 4.2 Using forms and logbooks 4.3 Filing and record management 4.4 Communicating and writing reports 4.5 Using digital documentation tools

RANGE OF VARIABLES

VARIABLE	RANGE
1. Documentation requirements	May include: 1.1 Equipment logbook 1.2 Material usage form 1.3 Maintenance checklist 1.4 Calibration report, 1.5 Job order form 1.6 Digital tracking systems
2. Equipment	May include: 2.1 3D printers 2.1.1 Fused Filament Fabrication (FFF) 2.1.2 Stereolithography Apparatus (SLA) 2.1.2 Masked Stereolithography (MSLA) 2.2 Post-processing equipment 2.2.1 Wash Module 2.2.2 Cure Module 2.2.3 Oven
3. Materials	May include: 3.1 Filaments 3.2 Photopolymer resins
4. Data	May include: 4.1 Type of Material 4.2 Color 4.3 Brand 4.4 Print success/Print failure 4.5 Printing parameters 4.5.1 Layer height/thickness 4.5.2 Line width 4.5.3 Print Speed 4.5.4 Printing temperature 4.5.5 Fan speed 4.5.6 Bed temperature 4.5.7 Chamber temperature 4.5.8 Vat temperature 4.5.9 Support generation 4.5.10 Bed adhesion 4.5.11 Part orientation 4.5.12 Infill density 4.5.13 Infill configuration 4.5.14 Wall thickness 4.5.15 Top/Bottom thickness 4.5.16 Pin hole locations 4.6 Observations/Remarks

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Documented and maintained updated production logs 1.2 Produced job and quality reports related to the production process 1.3 Maintained and stored documentation
2. Resource Implications	The following resources should be provided: 2.1 Tools, materials, and equipment appropriate for the unit of competency 2.2 Workplace environment appropriate for the unit of competency
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration with Questioning 3.2 Observation with Questioning 3.3 Written Examination
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center

UNIT OF COMPETENCY : CONDUCT PRELIMINARY PRINT OUT INSPECTION

UNIT CODE : ADM311306

UNIT DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to perform end-to-end quality assurance inspections, executing both dimensional analysis (using and visual/functional testing to verify full compliance with all design, aesthetic, and performance specifications.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
1. Prepare for inspection	1.1 Work instructions and print specifications are obtained and interpreted correctly. 1.2 Inspection tools and equipment are selected and checked for functionality. 1.3 The inspection area is organized in accordance with workplace housekeeping standards.	SCIENCE 1.1 Interpretation of work instructions and specifications 1.2 Types of inspection documentation in Additive manufacturing 1.3 Principles of metrology (precision, accuracy, resolution, tolerance). 1.4 Principles of equipment calibration. TECHNOLOGY 1.1 Types and functions of inspection tools (calipers, micrometers, height/depth gauges). 1.2 Handling procedures for precision instruments. ENGINEERING 1.1 Principles of metrology (precision, accuracy, resolution, tolerance).	1.1 Interpreting technical drawings and job orders to determine dimensional and visual specifications. 1.2 Selecting the appropriate inspection tools based on the required measurements and tolerances. 1.3 Performing functionality checks and zero-calibration on inspection tools. 1.4 Preparing and organizing the inspection workstation and all necessary documentation.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
		1.2 Principles of equipment calibration. COMMUNICATION 1.1 Interpretation of technical drawings, job orders, and quality specifications. 1.2 Understanding inspection documentation (e.g., checklists, report forms).	
2. Perform visual inspection of printed parts *	2.1 Printed parts are visually checked for defects in accordance with the additive manufacturing process 2.2 Findings in the visual inspection are to be included in the job report . 2.3 Tag and segregate defective prints properly.	SCIENCE 2.1 Material shrinkage 2.2 Warping 2.3 Distortions 2.4 Kinds of AM Materials 2.5 Polymer compatibility and disposal ENGINEERING 2.1 Product inspection TECHNOLOGY 2.1 Slicing software COMMUNICATION 2.1 Report filing 2.2 Routing sheet	2.1 Identifying non-conformities 2.2 Comparing output to 3d model 2.3 Documenting inspection results 2.4 Preparing reports 2.5 Material Segregation
3. Perform preliminary dimensional measurement	3.1 Printed parts are measured using inspection tools as necessary based on the job order. 3.2 Dimensions and deviations from tolerances are recorded in accordance with standard operating procedures.	TECHNOLOGY 3.1 Use of measuring tools ENGINEERING 3.1 Measurement system 3.2 Principles of precision and accuracy COMMUNICATION 3.1 Report filing	3.1 Conducting dimensional measurement 3.2 Handling of measuring instruments 3.3 Reading technical drawings and specifications 3.4 Using of measuring instruments 3.5 Preparing reports
4. Record and report inspection results	4.1 Inspection results are recorded accurately in designated forms or digital systems. 4.2 Non-conformance reports are prepared when	TECHNOLOGY 4.1 Data entry using digital forms, spreadsheets, or MES. 4.2 Principles of data integrity and traceability.	4.1 Recording all visual and dimensional inspection findings in designated forms or digital systems accurately 4.2 Preparing and completing Non-

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables	REQUIRED KNOWLEDGE	REQUIRED SKILLS
	<p>deviations or defects are detected.</p> <p>4.3 Inspection records are filed and maintained in accordance with documentation standards.</p>	<p>ENGINEERING</p> <p>4.1 Components of a Non-Conformance Report (NCR).</p> <p>COMMUNICATION</p> <p>4.1 Technical report writing and data presentation.</p> <p>4.2 Procedures for report submission, filing, and routing.</p>	<p>Conformance Reports (NCRs) for rejected parts, detailing the defects found.</p> <p>4.3 Compiling all data into a final job report or quality log.</p> <p>4.4 Filing and maintaining inspection records according to documentation standards.</p> <p>4.5 Communicating inspection results (pass/fail/deviations) to relevant personnel.</p>

RANGE OF VARIABLES

VARIABLE	RANGE
1. Inspection tools	May include: 1.1 Micrometer screw gauge 1.2 Vernier Caliper 1.3 Measuring tape 1.4 Ruler 1.5 Vernier height gauge 1.6 Depth gauge
2. Defects	May include: 2.1 Warping 2.2 Delamination 2.3 Elephant's foot 2.4 Insufficient layers 2.5 Sagging 2.6 Over/under extrusion 2.7 Bubbles 2.8 Decoloration 2.9 Layer Shift 2.10 Missing features
3. Job report ***	May include: 3.1 Part identification 3.2 Surface quality 3.3 Part details 3.4 Part features
4. Dimensions	May include: 4.1 Length 4.2 Width 4.3 Height 4.4 Bore Diameter 4.5 Wall thickness

EVIDENCE GUIDE

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 1.1 Perform visual inspection of printed parts 1.2 Performed preliminary dimensional measurement 1.3 Recorded and reported inspection results
2. Resource Implications	The following resources should be provided: 2.1 Tools, materials, and equipment appropriate for the unit of competency 2.2 Workplace environment appropriate for the unit of competency
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Demonstration with Questioning 3.2 Observation with Questioning 3.3 Written Examination
4. Context of Assessment	4.1 Competency may be assessed in the actual workplace or at the designated TESDA Accredited Assessment Center

Glossary of Terms

Term	Definition
1. 3D Printing	A manufacturing process that creates physical objects layer by layer from a digital model. It is often used interchangeably with Additive Manufacturing (AM).
2. Additive Manufacturing (AM)	A manufacturing process that builds parts layer by layer directly from digital designs, which allows for complex shapes and reduces material waste compared to other methods.
3. Calibration	The process of adjusting machines and tools to maintain accuracy and reliability, ensuring consistent results in AM production.
4. Dimensional Accuracy	How closely a printed part's measurements match its intended design. It's a key factor for part quality and usability.
5. Functional Testing	The process of evaluating a printed part to confirm it performs its intended function, ensuring the final product meets its requirements.
6. Infill	The internal lattice or grid structure within a 3D-printed object that influences its strength, weight, and material usage.
7. Inventory Management	The process of tracking and controlling AM materials and supplies to ensure continuous production and minimize waste.
8. Layer Height	The thickness of each layer deposited during the 3D printing process. A smaller layer height improves resolution but increases print time.
9. Machine Maintenance	The upkeep and servicing of AM equipment, including cleaning, calibration, and part replacement to keep performance consistent.
10. Post-processing	Secondary steps performed after a part is printed, such as cleaning, curing, sanding, or polishing. These steps improve a part's mechanical properties and surface finish.
11. Preventive Maintenance	Scheduled care for equipment to prevent unexpected breakdowns. It extends the machine's lifespan and reduces unplanned downtime.
12. Quality Inspection	The process of checking printed parts for dimensional, functional, and visual accuracy to ensure they meet required standards.
13. Slicing Software	A program that converts 3D models into G-code for printing, allowing you to define settings like speed, infill, supports, and layer thickness.
14. Support Structures	Temporary elements that are printed to hold up overhangs or complex parts of a design. They are removed during post-processing.
15. Tolerance	The acceptable amount of deviation from the specified dimensions of a printed part. Proper tolerance ensures parts fit and can be assembled correctly.
16. Traceability	The ability to track materials, processes, and parameters throughout the production process to support quality assurance and compliance.
17. Warping	A common defect where a printed part lifts or distorts due to uneven cooling, which negatively affects its dimensional accuracy and adhesion to the build plate.

GLOSSARY OF TERMS (Acronyms)

Acronym	Abbreviation
.3MF	3D Manufacturing Format
.gcode	Geometric Code
.obj	Object File
.stl	Standard Tessellation Language
AM	Additive Manufacturing
CAD	Computer-Aided Design
DfAM	Design for Additive Manufacturing
FDM	Fused Deposition Modeling
FFF	Fused Filament Fabrication
MSLA	Masked Stereolithography
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
QMS	Quality Management System
SLA	Stereolithography
TESDA	Technical Education and Skills Development Authority

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