

# COMPETENCY-BASED CURRICULUM EXEMPLAR



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Sector:

**MANUFACTURING**

Qualification:

**ADDITIVE MANUFACTURING LEVEL IV**



**TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY**  
East Service Road, South Superhighway, Taguig, Metro Manila

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## COURSE DESIGN

COURSE TITLE : **ADDITIVE MANUFACTURING LEVEL IV**

NOMINAL DURATION : **47 hours** Basic Competencies

**16 hours** Common Competencies

**136 hours** Core Competencies

**\*80 hours** *Supervised Industry Learning (SIL)*

**TOTAL : 265 hours**

### COURSE DESCRIPTION :

This comprehensive course provides the required knowledge, skills, and attitudes to manage the end-to-end workflow in an additive manufacturing production environment. Participants will learn to plan production workflows, schedule tasks, and coordinate staff. The curriculum covers the technical validation of 3D model files and the oversight of live print jobs, including troubleshooting common failures. Key management competencies include validating the quality of 3D printed parts against client specifications, overseeing the status and inventory of equipment and materials, and determining corrective maintenance procedures for equipment malfunctions. Finally, the course emphasizes leadership, focusing on enforcing workplace safety regulations and managing teams effectively.

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

### TRAINEE ENTRY REQUIREMENTS:

Trainees or students wishing to gain entry into this program must possess the following requirements:

- Must be a Bachelor's degree holder (with units related to engineering); **OR**
- Must be a graduate of diploma program in engineering related field; **OR**
- At least 3 years supervisory position industry experience thru Certificate of Employment (COE); **AND**
- Must be a graduate of Additive Manufacturing Level III.

**COURSE STRUCTURE:**

**BASIC COMPETENCIES  
(47 hours)**

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
1. Utilize specialized communication skills	1.1 Utilizing specialized communication skills	1.1.1 Meet common and specific communication needs of clients and colleagues 1.1.2 Contribute to the development of communication strategies 1.1.3 Deliver a technical presentation 1.1.4 Represent the organization 1.1.5 Facilitate group discussion 1.1.6 Conduct interview	6 hrs.
2. Develop and lead teams	2.1 Developing and lead teams	2.1.1 Foster individual growth 2.1.2 Foster individual and team growth 2.1.3 Monitor and evaluate workplace learning 2.1.4 Develop team commitment and cooperation 2.1.5 Facilitate accomplishment of team goals	8 hrs.
3. Perform higher-order thinking processes and apply techniques in the workplace	3.1 Performing higher-order thinking processes and apply techniques in the workplace	3.1.1 Evaluate effectiveness and efficiency of the workplace systems, processes and procedures. 3.1.2 Foster the habit of critical inquiry and curiosity in the workplace	4 hrs.

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
		3.1.3 Develop practical action plans for improving workplace conditions.	
4. Contribute to the practice of social justice in the workplace	4.1 Contributing to the practice of social justice in the workplace	4.1.1 Update self on local, national and global trends/ issues in the workplace 4.1.2 Relate local and global trends to workplace context 4.1.3 Engage and take actions on workplace issues and concerns	3 hrs.
5. Manage innovative work instructions	5.1 Managing innovative work instructions	5.1.1 Review and analyze existing workplace practices 5.1.2 Examine opportunities for continuous improvement and innovation of practices in the workplace 5.1.3 Implement innovative ways in the conduct of usual workplace practices	3 hrs.
6. Manage and evaluate usage of information	6.1 Managing innovative work instructions	6.1.1 Review information needs and sources 6.1.2 Collect and analyze information 6.1.3 Use management information systems	8 hrs.
7. Lead in improvement of Occupational Safety and Health (OSH) programs, policies and procedures	7.1 Leading in improvement of Occupational Safety and Health (OSH) programs, policies and procedures	7.1.1 Assess Occupational Safety and Health (OSH) practices and programs 7.1.2 Recommend OSH program improvement initiatives	8 hrs.

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
		7.1.3 Implement recommended improvements on Occupational Safety and Health (OSH) Programs, Procedures and Policies	
8. Lead towards improvement of environment work programs, policies and procedures	8.1 Leading towards improvement of environment work programs, policies and procedures	8.1.1 Assess environmental work practices and programs 8.1.2 Recommend environmental program improvements initiatives 8.1.3 Implement recommended improvements on environmental programs, policies and procedures	3 hrs.
9. Sustain entrepreneurial skills	9.1 Sustaining entrepreneurial skills	9.1.1 Enhance one's business skills 9.1.2 Manage entrepreneurial practices 9.1.3 Expand markets and clientele	4 hrs.

**COMMON COMPETENCIES  
(2 hours)**

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
1. Apply quality standards	1.1 Applying quality standards	1.1.1 Inspect quality of received products 1.1.2 Assess own work 1.1.3 Engage in quality improvement	9 Hours

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
2. Provide and build quality customer relations	2.1 Providing and building quality customer relations	2.1.1 Maintain a professional image 2.1.2 Update knowledge of products and services 2.1.3 Assess needs of new and existing customers 2.1.4 Build relations with customers	7 Hours

**CORE COMPETENCIES  
(120 hours)**

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
1. Plan the production workflow	1.1. Planning the production flow	1.1.1. Schedule tasks based on project timeline and resource availability.* 1.1.2. Coordinate with production staff .*	16 hrs.
2. Approve file and setups	2.1. Approving file and setups	2.1.1. Validate 3D model files for printability 2.1.2. Approve printing parameters prior to job execution*	16 hrs.
3. Oversee printing and troubleshooting workflow	3.1. Overseeing printing and troubleshooting workflow	3.1.1. Supervise ongoing print jobs to ensure adherence to specifications 3.1.2. Resolve common print failures	16 hrs.

<b>Units of Competency</b>	<b>Module Title</b>	<b>Learning Outcomes</b>	<b>Nominal Duration</b>
4. Validate quality of 3d printed parts	4.1. Validating quality of 3D printed parts	4.1.1. Conduct required inspections of printed parts. 4.1.2. Verify compliance of outputs against client requirements*.	24 hrs.
5. Lead safety and team management	5.1. Leading safety and team management	5.1.1. Enforce compliance on workplace safety regulations. 5.1.2. Lead team members in efficient and safe work practices.	16 hrs.
6. Oversee the status of equipment and materials	6.1. Overseeing the status of equipment and materials	6.1.1. Monitor status of additive manufacturing materials.* 6.1.2. Ensure regular checks and upkeep of equipment readiness.*	16 hrs.
7. Determine the appropriate corrective maintenance procedures	7.1. Determining the appropriate corrective maintenance procedures	7.1.1. Analyze root causes of equipment malfunctions.* 7.1.2. Conduct corrective maintenance with a technician*	32 hrs.

## COURSE DELIVERY

- Institutional-based
- Enterprise-based
- Flexible Learning Delivery
- Supervised Industry Learning (SIL)
- Distance Learning

## ASSESSMENT METHODS:

- Written test
- Demonstration
- Interview/Questioning
- Observation

## RESOURCES

Recommended list of tools, equipment and materials for the training of 25 trainees for ADDITIVE MANUFACTURING LEVEL IV

Up-to-date tools, materials, and equipment of equivalent functions can be used as alternatives. This also applies in consideration of community practices and their availability in the local market.

TOOLS	
QTY.	DESCRIPTION
3 units	Table with minimum of: 39.4 inches (L) x 23.7 inches (W) x 28.4 inches (H)
9 units	Vernier Caliper (150mm/6 inch. Shared (approx. 1 caliper per 2-3 students) for Quality Control.)
9 units	Micrometer Set (0-50mm)
3 units	Hex / Allen Key Set (Metric)
3 units	Screwdriver Set
3 units	Pliers Set (Needlenose, Cutters)
3 units	Tweezers
3 units	Nozzle cleaning kit
3 units	Wire brushes
3 pcs	Spatula or scraper (1 per machine)
9 units	Feeler Gauge Set (For bed leveling and gap analysis.)

<b>TOOLS</b>	
<b>QTY.</b>	<b>DESCRIPTION</b>
3 units	Digital Multimeter
2 units	Digital Microscope (USB)
3 units	Fabrication Table minimum of: 39.4 inches (L) x 23.7 inches (W) x 28.4 inches (H)

<b>EQUIPMENT</b>	
<b>QTY.</b>	<b>DESCRIPTION</b>
25 units	PC/Laptop (High-performance PC/Laptop (Min: 16GB RAM, Dedicated GPU) for CAD and Slicing.)
2 units	FDM Printer <ul style="list-style-type: none"> <li>• For 1.75mm filaments</li> <li>• Build Volume: Minimum of 220mmx220mmx250mm</li> <li>• Maximum Printing Temperature: Minimum of 250C max printing temperature</li> </ul>
1 unit	Vat Photopolymerization (SLA/DLP) Printer <ul style="list-style-type: none"> <li>• Printing Resolution: atleast 8k resolution</li> </ul>
1 unit	Wash and Cure Station
1 unit	Filament Dryer / Dehydrator (for 1 spool)
1 set	Material Storage Solution (Original) (Dark cabinets, sealed bins, etc.)

<b>MATERIALS &amp; CONSUMABLES</b>	
<b>QTY.</b>	<b>DESCRIPTION</b>
25 sets	Sample Parts / Job Orders / Templates / Case Studies
2 packs	Microfiber cloths (100 cloths total)
15 spools	AM Filaments
5 L	AM Resins
20 L	Isopropyl Alcohol (IPA) (99%+)
10 units	Spare Nozzles (various sizes)
5 units	Spare FEP Films (for SLA)
2 units	Resin tanks (consumable spare parts)

<b>PERSONAL PROTECTIVE EQUIPMENT (PPE)</b>	
<b>QTY.</b>	<b>DESCRIPTION</b>
25 units	Safety Shoes (Provided by student due to hygiene concerns)
25 units	Safety Glasses (Impact resistant. Individual issue for every student.)
25 units	Lab Coat or Apron
25 units	Face Mask (N95)
3pairs	Heat-resistant Gloves
5 boxes	Nitrile Gloves (Box of 100)
10 sets	Ear Protection (if needed)

<b>SOFTWARE REQUIREMENTS</b>	
<b>SOFTWARE</b>	<b>SPECIFICATION / USE</b>
3D Modeling Software	Autodesk Fusion 360 / TinkerCAD / SolidWorks (educational version)
Slicing Software	Ultimaker Cura / PrusaSlicer / ChiTuBox / Bambu Studio / Orca Slicer (Software Compatible with provided 3D printers)
Inventory Management	Spreadsheet, Google Sheets, or equivalent inventory app
Reporting / Documentation Tools	Word, Spreadsheet, PDF Creator
MES / Digital Logbook (optional)	Locally developed or free-access software for record-keeping

## TRAINING FACILITIES

Based on a class intake of 25 learners/trainees

Space Requirement	Size in Meters	Area in Sq. Meters	Total Area in Sq. Meters
Lecture / Computer Room	5 x 8	40	40
Advanced AM Laboratory / Production Floor	8 x 10	80.0	80.0
Maintenance & Repair Workshop	2.5 x 4.0	10.0	10.0
Material Storage Room	2 x 4	8.0	8.0
Instructor's Office	2.5 x 2.4	6	6
Receiving / Finishing Area (area for post-processing. Requires dedicated ventilation.)	3 x 4	12	12
Utility / Janitorial Room	1.5 x 1.5	2.25	2.25
Restroom (Male)	2 x 2	4	4
Restroom (Female)	2 x 2.5	5	5
<b>Circulation / Hallways (≈ 15%)</b>	—	50	50
<b>Total Workshop Area</b>			<b><u>217.25 sq.m</u></b>

### QUALIFICATION OF INSTRUCTORS/TRAINERS:

- Must be a Bachelor's degree holder; **OR**
- Must be a graduate of diploma program in engineering related field; **OR**
- At least 3 years supervisory position industry experience thru Certificate of Employment (COE); **AND**
- Holder of Trainers Methodology 1 or Incompany Training 1; and
- Must be a graduate of Additive Manufacturing Level IV.

# **MODULES OF INSTRUCTION**

## **BASIC COMPETENCIES**

<b>UNIT OF COMPETENCY</b>	:	UTILIZE SPECIALIZED COMMUNICATION SKILLS
<b>MODULE TITLE</b>	:	UTILIZING SPECIALIZED COMMUNICATION SKILLS
<b>MODULE DESCRIPTOR</b>	:	This module covers the knowledge, skills and attitudes required to use specialized communication skills, meet specific needs of internal and external clients, conduct interviews, facilitate discussion with groups, and contribute to the development of communication strategies.
<b>NOMINAL DURATION</b>	:	6 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/ trainees will be able to:

- LO1. Meet common and specific communication needs of clients and colleagues
- LO2. Contribute to the development of communication strategies
- LO3. Deliver a technical presentation
- LO4. Represent the organization
- LO5. Facilitate group discussion
- LO6. Conduct interview

## **LO1. MEET COMMON AND SPECIFIC COMMUNICATION NEEDS OF CLIENTS AND COLLEAGUES**

### **ASSESSMENT CRITERIA:**

1. Specific communication needs of clients and colleagues are identified and met;
2. Different approaches are used to meet communication needs of clients and colleagues; and
3. Conflict is addressed promptly in a manner which does not compromise the organization.

### **CONTENTS:**

- Definition of common and specific communication
- Communication techniques/approaches
- Communication skills
- Communication barriers
- Conflict management
- Communication processes
- Group Leadership Styles
- Feedback system

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- Equipment
  - Multimedia projector
  - Printer with scanner
- CBLM Module on Utilizing Specialized Communication Skills
- Supplies/Materials:
  - USB flash drive
  - Memo
  - Bond paper
  - Writing materials

### **METHODOLOGIES:**

- Lecture
- Blended learning
- Group discussion
- Role play

### **ASSESSMENT METHODS:**

- Demonstration
- Interview
- Written test

## **LO2. CONTRIBUTE TO THE DEVELOPMENT OF COMMUNICATION STRATEGIES**

### **ASSESSMENT CRITERIA:**

1. Strategies for internal and external dissemination of information are developed, promoted, implemented and reviewed as required.
2. Channels of communication are established and reviewed regularly.
3. Coaching in effective communication is provided.
4. Work related network and relationship are maintained.
5. Negotiation and conflict resolution strategies are used where required.
6. Communication with clients and colleagues is performed appropriate to individual needs and organizational objectives.

### **CONTENTS:**

- Channels of communication
- Negotiation skills
- Implementation process
- Review process
- Communication techniques
- Information dissemination strategies
- Communication channels
- Conflict negotiation

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- Equipment
  - Multimedia projector
  - Printer with scanner
- CBLM Module on Utilizing Specialized Communication Skills
- Supplies/Materials:
  - USB flash drive
  - Memo
  - Bond paper
  - Writing materials

### **METHODOLOGIES:**

- Group discussion
- Lecture
- Blended learning
- Role play

### **ASSESSMENT METHODS:**

- Written Test
- Role play
- Oral interview

### **LO3. DELIVER A TECHNICAL PRESENTATION**

#### **ASSESSMENT CRITERIA:**

1. Presentation is delivered clearly, sequential and delivered within allotted time.
2. Utilize appropriate media to enhance presentation.
3. Differences in views/opinions are respected.
4. Questions during fore are responded in a manner consistent with organizational standard.

#### **CONTENTS:**

- Organizations' ethical standards
- Delivering technical presentation
- Different media in delivering presentation
- Proper questioning

#### **CONDITIONS:**

The students/ trainees must be provided with the following:

- Equipment
  - Multimedia projector
  - Printer with scanner
- CBLM Module on Utilizing Specialized Communication Skills
- Supplies/Materials:
  - USB flash drive
  - Memo
  - Bond paper
  - Writing materials

#### **METHODOLOGIES:**

- Group Discussion
- Lecture
- Blended learning
- Role playing

#### **ASSESSMENT METHODS:**

- Written test
- Role play
- Oral interview

## **LO4. REPRESENT THE ORGANIZATION**

### **ASSESSMENT CRITERIA:**

1. When participating in internal or external forums, presentation is relevant, appropriately researched and presented in a manner to promote the organization
2. Presentation is clear and sequential and delivered within a predetermined time.
3. Utilize appropriate media to enhance presentation.
4. Differences in views are respected.
5. Written communication is consistent with organizational standards.
6. Inquiries are responded in a manner consistent with organizational standard.
7. Consolidate ideas and suggestions.
8. Generalize and summarize all ideas and suggestions.

### **CONTENTS:**

- Presentation Skills and Techniques
- Appropriate research method
- Ranges of Communication techniques
- Effective presentation techniques
- Expression of ideas and queries
- Effective writing
- Work ethics

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- Equipment
  - Multimedia projector
  - Printer with scanner
- CBLM Module on Utilizing Specialized Communication Skills
- Supplies/Materials:
  - USB flash drive
  - Memo
  - Bond paper
  - Writing materials

### **METHODOLOGIES**

- Discussion
- Blended Learning
- Role play

### **ASSESSMENT METHODS:**

- Role play
- Interview
- Written test
- Observation/oral questioning

## **LO5. FACILITATE GROUP DISCUSSION**

### **ASSESSMENT CRITERIA:**

1. Mechanisms which enhance effective group interaction is defined and implemented.
2. Strategies which encourage all group members to participate are used routinely.
3. Objectives and agenda for meetings and discussions are routinely set and followed.
4. Relevant information is provided to group to facilitate outcomes.
5. Evaluation of group communication strategies is undertaken to promote participation of all parties.
6. Specific communication needs of individuals are identified and addressed.

### **CONTENTS:**

- Effective group interaction
- Group dynamics
- Establish good rapport
- Conduct meeting
- Group discussion
- Individual differences

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- Equipment
  - Multimedia projector
  - Printer with scanner
- CBLM Module on Utilizing Specialized Communication Skills
- Supplies/Materials:
  - USB flash drive
  - Memo
  - Bond paper
  - Writing materials

### **METHODOLOGIES**

- Group discussion
- Simulation
- Lecture
- Blended learning

### **ASSESSMENT METHODS**

- Interview
- Written examination
- Role play

## **LO6. CONDUCT INTERVIEW**

### **ASSESSMENT CRITERIA:**

1. A range of appropriate communication strategies are employed in interview Situations.
2. Records of interviews are made and maintained in accordance with organizational procedures.
3. Effective questioning, listening and nonverbal communication techniques are used to ensure that required message is communicated.

### **CONTENTS:**

- Purpose of the interview
- Preparation interview
- Conduct interview
- Effective questioning/ listening techniques
- Types of interview
- Interview situations

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- Equipment
  - Multimedia projector
  - Printer with scanner
- CBLM Module on Utilizing Specialized Communication Skills
- Supplies/Materials:
  - USB flash drive
  - Memo
  - Bond paper
  - Writing materials

### **METHODOLOGIES:**

- Discussion
- Blended learning
- Observation

### **ASSESSMENT METHODS:**

- Demonstration
- Case study
- Oral interview

<b>UNIT OF COMPETENCY</b>	:	DEVELOP AND LEAD TEAMS
<b>MODULE TITLE</b>	:	DEVELOPING AND LEADING TEAMS
<b>MODULE DESCRIPTOR</b>	:	This unit covers the skills, knowledge and attitudes required to determine individual and team development needs.
<b>NOMINAL DURATION</b>	:	8 hours

### **SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/trainees we be able to:

- LO1. Foster Individual growth
- LO2. Foster individual and team growth
- LO3. Monitor and evaluate workplace learning
- LO4. Develop team commitment and cooperation
- LO5. Facilitate accomplishment of team goals

## **LO1. FOSTER INDIVIDUAL GROWTH**

### **ASSESSMENT CRITERIA:**

1. Learning and development needs of team members are systematically identified in line with organizational requirements.
2. Development plan to meet individual needs is collaboratively developed and implemented.
3. Individuals are encouraged to self-evaluate performance and identify areas for improvement.
4. Feedback on performance of team members is collected from relevant sources and compared with established team learning process.

### **CONTENTS:**

- Organizational Requirements
- Coaching and Mentoring
- Employee Development Plan
- Feedbacking on Performance

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Module on Developing and Leading Teams
- Equipment:
  - Projector
- Work plans and schedules MIS
- Quality assurance documents

### **METHODOLOGIES:**

- Lecture
- Blended learning
- Group discussion
- Role play

### **ASSESSMENT METHODS:**

- Interview
- Role play
- Written test

## **LO2. FOSTER INDIVIDUAL AND TEAM GROWTH**

### **ASSESSMENT CRITERIA:**

1. Learning and development program goals and objectives are identified to match the specific knowledge and skills requirements of competency standards.
2. Learning delivery methods are appropriate to the learning goals, the learning style of participants and availability of equipment and resources.
3. Workplace learning opportunities and coaching/ mentoring assistance are provided to facilitate individual and team achievement of competencies.
4. Resources and timelines required for learning activities are identified and approved in accordance with organizational requirements.

### **CONTENTS:**

- Learning and Development Programs
- Learning and Development Strategies

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Module on Developing and Leading Teams
- Equipment:
  - Projector
- Work plans and schedules MIS
- Quality assurance documents

### **METHODOLOGIES:**

- Lecture
- Blended learning
- Group discussion
- Role-Play

### **ASSESSMENT METHODS:**

- Interview
- Written Test
- Role Play
- Demonstration with oral questioning

### **LO3. MONITOR AND EVALUATE WORKPLACE LEARNING**

#### **ASSESSMENT CRITERIA:**

1. Feedback from individuals or teams is used to identify and implement improvements in future learning arrangements.
2. Outcomes and performance of individuals/teams are assessed and recorded to determine the effectiveness of development programs and the extent of additional support.
3. Modifications to learning plans are negotiated to improve the efficiency and effectiveness of learning.
4. Records and reports of competency are maintained within organizational requirements.

#### **CONTENTS:**

- Levels of LEarning Evaluation
- Methods of Evaluation
- Performance Reporting
- Gathering Information

#### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Module on Developing and Leading Teams
- Equipment:
  - Projector
- Work plans and schedules MIS
- Quality assurance documents

#### **METHODOLOGIES:**

- Lecture
- Blended learning
- Group discussion

#### **ASSESSMENT METHODS:**

- Role play
- Interviews
- Written test

## **LO4. DEVELOP TEAM COMMITMENT AND COOPERATION**

### **ASSESSMENT CRITERIA:**

1. Open communication processes to obtain and share information is used by team.
2. Decisions are reached by the team in accordance with its agreed roles and responsibilities.
3. Mutual concern and camaraderie are developed in the team.
4. Career planning for each member is monitored.

### **CONTENTS:**

- Team commitment and cooperation
- Team Dynamics
- Development of Career Plans

### **CONDITION:**

The students/ trainees must be provided with the following:

- CBLM Module on Developing and Leading Teams
- Equipment:
  - Projector
- Work plans and schedules MIS
- Quality assurance documents

### **METHODOLOGIES:**

- Lecture
- Blended learning
- Group discussion
- Role play

### **ASSESSMENT METHODS**

- Interview
- Written test
- Role play

## **LO5. FACILITATE ACCOMPLISHMENT OF TEAM GOALS**

### **ASSESSMENT CRITERIA:**

1. Team members actively participated in team activities and communication processes.
2. Team members developed individual and joint responsibility for their actions.
3. Collaborative efforts are sustained to attain organizational goals.

### **CONTENTS:**

- Building a Team
- Team management
- Teamwork and collaboration
- Principles of Organizational development
- Collaboration principles and procedures
- Organizational leadership

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Module on Developing and Leading Teams
- Equipment:
  - Projector
- Work plans and schedules MIS
- Quality assurance documents

### **METHODOLOGIES:**

- Lecture
- Blended Learning
- Group discussion

### **ASSESSMENT METHODS:**

- Interview
- Written test
- Oral Interview

<b>UNIT OF COMPETENCY</b>	:	PERFORM HIGHER-ORDER THINKING PROCESSES AND APPLY TECHNIQUES IN THE WORKPLACE
<b>MODULE TITLE</b>	:	PERFORMING HIGHER –ORDER THINKING PROCESSES AND APPLY TECHNIQUES IN THE WORKPLACE
<b>MODULE DESCRIPTOR</b>	:	This unit covers the knowledge, skills and attitudes required to use fundamental critical thinking skills in the workplace.
<b>NOMINAL DURATION</b>	:	4 hours

### **SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the students/ trainees must be able to.

- LO1. Evaluate effectiveness and efficiency of the workplace systems, processes and procedures
- LO2. Foster the habit of critical inquiry and curiosity in the workplace
- LO3. Develop practical action plans for improving workplace conditions

## **LO1. EVALUATE EFFECTIVENESS AND EFFICIENCY OF THE WORKPLACE SYSTEM, PROCESS AND PROCEDURES**

### **ASSESSMENT CRITERIA:**

1. Effectiveness and efficiency of workplace standards and procedures are examined.
2. Usage of inquiry and dialogue to communicate evaluation measures and result are implemented.
3. Evaluation reports are prepared and communicated to team members.

### **CONTENTS:**

- Effectiveness vs. efficiency
- Workplace effectiveness and efficiency
- Effective communication
- Evaluation reporting and dissemination

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Performing Higher-Order Thinking Process and Applying Techniques in the Workplace
- Equipment:
  - Projector

### **METHODOLOGIES**

- Discussion
- Blended learning
- Role playing

### **ASSESSMENT METHODS**

- Role play
- Written test
- Observation

## **LO2. FOSTER THE HABIT OF CRITICAL INQUIRY AND CURIOSITY IN THE WORKPLACE**

### **ASSESSMENT CRITERIA:**

1. Issues and situations are reflected on and are elaborated in the Range of Variables wondered about.
2. Issues and problems in the workplace particularly in the policies, procedures and protocols are discussed and evaluated between and among teams.
3. Evaluation of efficiency and effectiveness of workplace policies, procedures and protocols are documented, communicated and agreed upon between and among teams.
4. Growth mind-set and positive relationship and communication is applied in the context of curiosity and critical inquiry in the workplace.

### **CONTENTS:**

- Asking Questions
- Objectivity
- Open-mindedness
- Observation
- Analysis
- Skepticism
- Creativity

### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Performing Higher-Order Thinking Process and Applying Techniques in the Workplace
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector

### **METHODOLOGIES**

- Lecture
- Group Discussion
- Blended Learning
- Role play

### **METHODS OF ASSESSMENT;**

- Oral Interview
- Written Test
- Role play

### **LO3. DEVELOP PRACTICAL ACTION PLANS FOR IMPROVING WORKPLACE CONDITIONS**

#### **ASSESSMENT CRITERIA:**

1. Evaluation of efficiency and effectiveness of workplace policies, procedures and protocols are documented. Italicized terms are elaborated in the Range of Variables communicated to stakeholders.
2. Practical action plans in improving workplace conditions are formulated, presented and negotiated with stakeholders.
3. Proposed changes and directions are inquired, processed and negotiate between and among teams, and stakeholders as well of the organization.
4. Commitment to continuous improvement and change is highlighted.
5. Passion and dedication for changing and adapting to the demands of the 21<sup>st</sup> century workplace is considered.

#### **CONTENTS:**

- Leadership vs. management
- Management Styles
- The decision

#### **CONDITIONS:**

The students/ trainees must be provided with the following:

- CBLM Performing Higher-Order Thinking Process and Applying Techniques in the Workplace
- Materials
  - Bondpater
  - Writing materials
- Equipment:
  - Projector

#### **METHODOLOGIES:**

- Group discussion
- Role play
- Blended learning

#### **ASSESSMENT METHODS**

- Interview
- Written test
- Role play

<b>UNIT OF COMPETENCY</b>	:	CONTRIBUTE TO THE PRACTICE OF SOCIAL JUSTICE IN THE WORKPLACE
<b>MODULE TITLE</b>	:	CONTRIBUTING TO THE PRACTICE OF SOCIAL JUSTICE IN THE WORKPLACE
<b>MODULE DESCRIPTOR</b>	:	This unit covers ways and means to assume active roles in resolving local and global challenges and to become proactive contributors to a more peaceful and sustainable world.
<b>NOMINAL DURATION</b>	:	3 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/trainees will be able to:

- LO1. Update self on local, national and global trends/ issues in the workplace
- LO2. Relate local and global trends to workplace context
- LO3. Engage and take actions on workplace issues and concerns

## **LO1. UPDATE SELF ON LOCAL, NATIONAL AND GLOBAL TRENDS/ ISSUES IN THE WORKPLACE**

### **ASSESSMENT CRITERIA:**

1. Media are regularly scanned/ monitored for trends and issues relevant to human rights, gender equality, promotion of culture of peace and non-violence, global citizenship and appreciation of cultural diversity.
2. Knowledge and understanding of local, national and global issues and their interconnectedness and interdependency are acquired
3. Notable issues and trends are critically examined and discussed with peers, colleagues, or family members.

### **CONTENTS:**

- Social Justice
- Social Justice Principles in the Workplace
- Promoting Diversity and Inclusion
- Diversity and Inclusion in the Workplace
- Fostering Employee Well-being

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Contributing to the Practice of Social Justice in the Workplace
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Reporting
- Film showing
- Focus Group Discussions

### **ASSESSMENT METHODS:**

- Written examination
- Case problems / studies

## **LO2. RELATE LOCAL AND GLOBAL TRENDS TO WORKPLACE CONTEXT**

### **ASSESSMENT CRITERIA:**

1. Local events are reflected on for implications in one's own situation and in the external global environment.
2. Sense of belonging to a common humanity, sharing values and responsibilities are developed.
3. Attitudes of empathy, solidarity and respect for differences and diversity are strengthened

### **CONTENTS:**

- Local Trends and Issues
- Philippine Local Trends and Issues Discussion
- Diversity, Equity, and Inclusion

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Contributing to the Practice of Social Justice in the Workplace
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector
- Case Studies

### **METHODOLOGIES:**

- Lecture
- Group Discussions
- Brainstorming
- Case Studies

### **ASSESSMENT METHODS:**

- Written examination
- Case problems / studies

### **LO3. ENGAGE AND TAKE ACTIONS ON WORKPLACE ISSUES AND CONCERNS**

#### **ASSESSMENT CRITERIA:**

1. Effective and responsible actions at local, national and global levels are identified.
2. Motivation and willingness to take necessary actions are developed.
3. Attitude of “thinking globally and acting locally” is practiced.

#### **CONTENTS:**

- Workplace Issues and Concerns
- Promoting Employee Engagement and Peaceful Workplace Environment
- Monitoring and Evaluating Progress

#### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Contributing to the Practice of Social Justice in the Workplace
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector
- Case Studies

#### **METHODOLOGIES:**

- Lecture
- Group Discussions
- Brainstorming
- Case Studies

#### **ASSESSMENT METHODS:**

- Written examination
- Case problems / studies

<b>UNIT OF COMPETENCY</b>	:	MANAGE INNOVATIVE WORK INSTRUCTIONS
<b>MODULE TITLE</b>	:	MANAGING INNOVATIVE WORK INSTRUCTIONS
<b>MODULE DESCRIPTOR</b>	:	This unit covers the knowledge, skills and attitudes required to sustain and develop a workplace environment in which improvement, innovation and learning are promoted and reinforced.
<b>NOMINAL DURATION</b>	:	3 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/trainees will be able to:

LO1. Review and analyze existing workplace practices

LO2. Examine opportunities for continuous improvement and innovation of practices in the workplace

LO3. Implement innovative ways in the conduct of usual workplace practices

## **LO1. REVIEW AND ANALYZE EXISTING WORKPLACE PRACTICES**

### **ASSESSMENT CRITERIA:**

1. Current instructions and strategies to perform tasks in the workplace are reviewed.
2. Climate for innovation at the organizational level is defined.
3. Innovation drivers in the workplace are identified.

### **CONTENTS:**

- Principles of Management
- Types of Innovations and its Characteristics
- Dimensions of Innovation and Innovation Climate
- Review to KM and Innovation Tools
- Theories of Innovation Adoption and Real-World Case Analyses

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing Innovative Work Instructions
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Group Discussions
- Interview
- Brainstorming

### **ASSESSMENT METHOD:**

- Written examination
- Demonstrating with oral questioning
- Interview

## **LO2. EXAMINE OPPORTUNITIES FOR CONTINUOUS IMPROVEMENTS AND INNOVATION OF PRACTICES IN THE WORKPLACE**

### **ASSESSMENT CRITERIA:**

1. Effectiveness of innovative practices in the workplace is determined.
2. Innovative behaviors of leaders or managers in the organization are assessed.
3. Driving principles of innovation are discussed.

### **CONTENTS:**

- Principles of Innovation and Categories
- Innovation Process Simulation
- Determinants of Innovative Behavior
- Needs Analysis

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing Innovative Work Instructions
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Group Discussions
- Interview
- Brainstorming

### **ASSESSMENT METHOD:**

- Written examination
- Demonstrating with oral questioning
- Interview

### **LO3. IMPLEMENT INNOVATIVE WAYS IN THE CONDUCT OF USUAL WORKPLACE PRACTICES**

#### **ASSESSMENT CRITERIA:**

1. Innovative behaviors in the workplace are performed.
2. Innovative climate in the workplace is maintained.
3. Adoption or modification of new ideas relevant to the organizational needs is achieved.

#### **CONTENTS:**

- Theory of Organizational Change
- Self-Reflection
- Implementing Innovative Change in the Workplace

#### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing Innovative Work Instructions
- Materials
  - Bondpaper
  - Writing materials
- Equipment:
  - Projector

#### **METHODOLOGIES:**

- Group Discussions
- Interview
- Brainstorming

#### **ASSESSMENT METHOD:**

- Written examination
- Demonstrating with oral questioning
- Interview

<b>UNIT OF COMPETENCY</b>	:	MANAGE AND EVALUATE USAGE OF INFORMATION
<b>MODULE TITLE</b>	:	MANAGING AND EVALUATING USAGE OF INFORMATION
<b>MODULE DESCRIPTOR</b>	:	This unit of competency covers the knowledge, skills and attitudes required to support.
<b>NOMINAL DURATION</b>	:	8 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/trainees will be able to:

- LO1. Review information needs and sources
- LO2. Collect and analyze information
- LO3. Use management information systems
- LO4. Report and disseminate analyzed information

## **LO1. REVIEW INFORMATION NEEDS AND SOURCES**

### **ASSESSMENT CRITERIA:**

1. The information needs of individuals/teams are determined and the sources are identified.
2. Information held by the organization is reviewed to determine suitability and accessibility.
3. Plans are prepared to obtain information that is not available or accessible within the organization.

### **CONTENTS:**

- Brief introduction and overview to the different kinds of information
- Definition and characteristics of factual information
- Definition and characteristics of analytical information
- Definition and characteristics of subjective information

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing and Evaluating the Usage of Information
- Materials
  - Bondpaper
  - Writing materials
  - Legal and policy Materials
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming

### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

## **LO2. COLLECT AND ANALYZE INFORMATION**

### **ASSESSMENT CRITERIA:**

1. Collection of information is interpreted timely and relevant to the needs of individuals/teams.
2. Information is collected in formal suitable for analysis, interpretation and dissemination.
3. Information is analyzed to identify relevant trends and developments in terms of the needs for which is acquired.

### **CONTENTS:**

- Information Collection, Collation
- Relevant Trends and Developments
- Collection of Information
- Analyzing Information

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing and Evaluating the Usage of Information
- Materials
  - Bondpaper
  - Writing materials
  - Legal and policy Materials
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming

### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

### **LO3. USE MANAGEMENT INFORMATION SYSTEM**

#### **ASSESSMENT CRITERIA:**

1. Management information systems are used to store and retrieve data for decision making.
2. Technology available in the work area/ organization is used manage information.
3. Recommendations for improving the information system are submitted to designated persons/ groups.

#### **CONTENTS:**

- Management Information Systems
- Available Technologies in Information Management
- Advanced Strategies for Customer Service Excellence in Management Information Systems
- Use of Available Technology in Information Management

#### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing and Evaluating the Usage of Information
- Materials
  - Bondpaper
  - Writing materials
  - Legal and policy Materials
- Equipment:
  - Projector

#### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming

#### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

## **LO4. REPORT AND DISSEMINATE ANALYZED INFORMATION**

### **ASSESSMENT CRITERIA:**

1. The results of information gathering, analysis and synthesis are reported within specified time frames and to the standard defined by the organization.
2. The results of information gathering, analysis and synthesis are reported so they can be inputs to policy development and organization decision making.
3. Information which is gathered is disseminated to appropriate personnel within the specified timeframe.

### **CONTENTS:**

- Reporting Procedures in an Organization
- Analysis and Display Techniques
- Reporting Procedures in an Organization
- Using Management Information Systems to Store and Retrieve Data

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Managing and Evaluating the Usage of Information
- Materials
  - Bondpaper
  - Writing materials
  - Legal and policy Materials
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming

### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

<b>UNIT OF COMPETENCY</b>	:	LEAD IN IMPROVEMENT OF OCCUPATIONAL SAFETY AND HEALTH (OSH) PROGRAMS, POLICIES AND PROCEDURES
<b>MODULE TITLE</b>	:	LEADING IN IMPROVEMENT OF OCCUPATIONAL SAFETY AND HEALTH (OSH) PROGRAMS, POLICIES AND PROCEDURES
<b>MODULE DESCRIPTOR</b>	:	This module covers the knowledge, skills and attitude required to enforce compliance of city ordinances and market policies, supervise installation of market design and plan and documentation.
<b>NOMINAL DURATION</b>	:	8 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/ trainees will be able to:

- LO1. Assess Occupational Safety and Health (OSH) practices and programs
- LO2. Recommend OSH program improvement initiatives
- LO3. Implement recommended improvements on Occupational Safety and Health (OSH) Programs, Procedures and Policies

## **LO1. ASSESS OCCUPATIONAL SAFETY AND HEALTH (OHS) PRACTICES AND PROGRAMS**

### **ASSESSMENT CRITERIA:**

1. OSH practices and programs are reviewed based on workplace policies and procedures.
2. Appropriate personnel or OSH reference guides are consulted for proper guidance based on workplace policies and procedures.
3. Current practices and programs are evaluated based on acceptable level of OSH work standards.

### **CONTENTS:**

- Auditing the Effectiveness of Workplace Occupational Safety and Health Programs, Policies, and Procedures
- Tools to Assess the Effectiveness of Workplace Occupational Safety and Health Programs, Policies, and Procedures
- Case Studies in Evaluating the Current OSH Programs Effectiveness

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Leading in the Improvement of Occupational Safety and Health Programs, Policies and Procedures
- Assessment tool for OSH Auditing
- Audit Report History
- OSH Program , Policies, and Procedures
- Equipment Safety Operating Instructions
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming
- Case studies

### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

## **LO2. RECOMMEND OSH PROGRAM IMPROVEMENT INITIATIVES**

### **ASSESSMENT CRITERIA:**

1. OSH work improvement initiatives are identified that are relevant with the workplace scenario.
2. OSH program improvement plans are organized based on workplace policies and procedures.
3. OSH program improvement plans are presented based on workplace policies and procedures

### **CONTENTS:**

- Work-place relevant OSH Work Improvement Initiatives
- Organizing OSH Program Improvements based on Workplace Policies and Procedures
- Presentation of OSH Program Improvement Plans based on the Company's Policies and Procedures

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Leading in the Improvement of Occupational Safety and Health Programs, Policies and Procedures
- Assessment tool for OSH Auditing
- Audit Report History
- OSH Program , Policies, and Procedures
- Equipment Safety Operating Instructions
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming
- Case studies

### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

### **LO3. IMPLEMENT RECOMMENDED IMPROVEMENTS ON OCCUPATIONAL SAFETY (OHS) PROGRAMS, PROCEDURES AND POLICIES**

#### **ASSESSMENT CRITERIA:**

1. Approved improvements on OSH work improvement initiatives are communicated based on workplace policies and procedures.
2. Concern personnel are guided in accordance with workplace policies and procedures.
3. Implementation of approved OSH initiatives are monitored based on workplace policies and procedures.
4. Implementation of approved OSH initiatives are evaluated based on workplace policies and procedures.

#### **CONTENTS:**

- Communication on Approved OSH Work Improvement Initiatives
- Guide for Concerned Personnel on OSH Work Improvement
- Monitor and Evaluate the Effectiveness of the Approved OSH Initiatives

#### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Leading in the Improvement of Occupational Safety and Health Programs, Policies and Procedures
- Assessment tool for OSH Auditing
- Audit Report History
- OSH Program , Policies, and Procedures
- Equipment Safety Operating Instructions
- Equipment:
  - Projector

#### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Brainstorming
- Case studies

#### **ASSESSMENT METHODS:**

- Interview
- Written examination
- Demonstration with oral questioning
- Portfolio

<b>UNIT OF COMPETENCY</b>	:	LEAD TOWARDS IMPROVEMENT OF ENVIRONMENT WORK PROGRAMS, POLICIES AND PROCEDURES
<b>MODULE TITLE</b>	:	LEADING TOWARDS IMPROVEMENT OF ENVIRONMENT WORK PROGRAMS, POLICIES AND PROCEDURES
<b>MODULE DESCRIPTOR</b>	:	This unit covers the knowledge, skills and attitudes required to enforce compliance of city ordinances and market policies, supervise installation of market design and plan and documentation.
<b>NOMINAL DURATION</b>	:	3 hours

#### SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module the students/ trainees will be able to:

- LO1. Assess environmental work practices and programs
- LO2. Recommend environmental program improvements initiatives
- LO3. Implement recommended improvements on environmental programs, policies and procedures

## **LO1. ASSESS ENVIRONMENTAL WORK PRACTICES AND PROGRAMS**

### **ASSESSMENT CRITERIA:**

1. Environmental practices and programs are reviewed based on workplace policies.
2. Appropriate personnel or environmental reference guides are consulted form proper guidance based on workplace policies.
3. Current practices and programs are evaluated based on acceptable level of environmental work standards, workplace policies and procedures.

### **CONTENTS:**

- Green Economy
- Environmental Practices
- Environmental Reference Guides
- Environmental Impact Assessment

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Leading Towards Improvement of Environmental Work Programs, Policies, and Procedures
- Writing Materials
- Legislations, policies, procedures, protocols, and local ordinances related to environmental protection
- Case studies / scenarios relating to environmental protection
- Equipment:
  - Projector

### **METHODOLOGIES:**

- Lecture
- Discussion
- Brainstorming
- Demonstration
- Blended Learning

### **ASSESSMENT METHODS:**

- Written examination
- 
- Demonstration with oral questioning

## **LO2. RECOMMEND ENVIRONMENTAL PROGRAM IMPROVEMENTS INITIATIVES**

### **ASSESSMENT CRITERIA:**

1. Environment practices opportunities are identified that are relevant with the workplace scenario.
2. Environmental program improvement plans are organized based on workplace policies and procedures.
3. Environmental program improvement plans are presented based on workplace policies and procedures.

### **CONTENTS:**

- Environmental Standards
- Mitigation Requirements

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Leading Towards Improvement of Environmental Work Programs, Policies, and Procedures
- Writing Materials
- Legislations, policies, procedures, protocols, and local ordinances related to environmental protection
- Case studies / scenarios relating to environmental protection
- Equipment:
  - o Projector

### **METHODOLOGIES:**

- Lecture
- Discussion
- Brainstorming
- Demonstration
- Blended Learning

### **ASSESSMENT METHODS:**

- Written examination
- Demonstration with oral questioning

### **LO3. IMPLEMENT RECOMMENDED IMPROVEMENTS ENVIRONMENTAL PROGRAMS, POLICIES AND PROCEDURES**

#### **ASSESSMENT CRITERIA:**

1. Approved improvements on environmental work program initiatives are promoted based on workplace policies and procedures with the workplace scenarios.
2. Implementation of the approved environmental initiatives are monitored in accordance with workplace policies and procedures.
3. Implementation of approved environmental initiatives are evaluated based on workplace policies and procedures.

#### **CONTENTS:**

- Environmental Work Program Initiatives
- Environmental Monitoring Techniques
- Environmental Communication Strategies

#### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Leading Towards Improvement of Environmental Work Programs, Policies, and Procedures
- Writing Materials
- Legislations, policies, procedures, protocols, and local ordinances related to environmental protection
- Case studies / scenarios relating to environmental protection
- Equipment:
  - o Projector

#### **METHODOLOGIES:**

- Lecture
- Discussion
- Brainstorming
- Demonstration
- Blended Learning

#### **ASSESSMENT METHODS:**

- Written examination
- Demonstration with oral questioning

<b>UNIT OF COMPETENCY</b>	:	SUSTAIN ENTREPRENEURIAL SKILLS
<b>MODULE TITLE</b>	:	SUSTAINING ENTREPRENEURIAL SKILLS
<b>MODULE DESCRIPTOR</b>	:	This unit covers the outcomes required to update and continue one's professional development along entrepreneurship, including applying such growth in skills toward expanding the enterprise and developing its workforce.
<b>NOMINAL DURATION</b>	:	4 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/ trainees will be able to:

- LO1. Enhance one's business
- LO2. Manage entrepreneurial practices
- LO3. Expand markets and clientele

## **LO1. ENHANCE ONE'S BUSINESS SKILLS**

### **ASSESSMENT CRITERIA:**

1. Entrepreneurial skills development needs are identified and responded to promptly.
2. Market trends are monitored, anticipated and taken advantage of where feasible
3. New technologies, products and processes are included/utilized where advantageous to the enterprise.
4. Constant dialog/linkages with other entrepreneurs/peers and stakeholders are maintained.
5. Circulation and participation in business fora, meetings, conventions and exhibits are maintained.

### **CONTENTS:**

- Determining Needs for Entrepreneurial Skills Development
- Responding to Needs for Entrepreneurial Skills Development

### **CONDITIONS:**

The students/trainees must be provided with the following:

- CBLM on Sustaining Entrepreneurial Skills
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

### **METHODOLOGIES:**

- Lecture
- Discussion
- Brainstorming
- Demonstration

### **ASSESSMENT METHODS:**

- Written examination
- Demonstration with oral questioning
- Portfolio

## **LO2. MANAGE ENTREPRENEURIAL PRACTICES**

### **ASSESSMENT CRITERIA:**

1. Ideas and comments for improvements are sought from workers and clients.
2. Staff/workers are encouraged and supported in their skills development and enhancement.
3. A culture of continuous improvement is fostered within the enterprise.
4. Innovations on the existing lines of products and services are encouraged.

### **CONTENTS:**

- Fostering a Culture of Continuous Improvement
- Public relations concepts
- Basic business ethics

### **CONDITION:**

The students/trainees must be provided with the following:

- CBLM on Sustaining Entrepreneurial Skills
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

### **METHODOLOGIES:**

- Lecture
- Discussion
- Brainstorming
- Demonstration

### **ASSESSMENT METHODS:**

- Written examination
- Demonstration with oral questioning
- Portfolio

### **LO3. EXPAND MARKETS AND CLIENTELE**

#### **ASSESSMENT CRITERIA:**

1. Enterprise is built up and sustained through judicious control of cash flows.
2. Profitability of enterprise is ensured through appropriate internal controls.
3. Unnecessary or lower-priority expenses and purchases are avoided.
4. New markets and clients are identified based on current market trends.

#### **CONTENTS:**

- Expanding a Business
  - ❖ Basic cost benefit analysis
  - ❖ Basic financial management
  - ❖ Basic financial accounting
  - ❖ Business internal controls

#### **CONDITION:**

The students/trainees must be provided with the following:

- CBLM on Sustaining Entrepreneurial Skills
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

#### **METHODOLOGIES:**

- Lecture
- Discussion
- Brainstorming
- Demonstration

#### **ASSESSMENT METHODS:**

- Written examination
- Demonstration with oral questioning
- Portfolio

# **MODULES OF INSTRUCTION**

## **COMMON COMPETENCIES**

### **ADDITIVE MANUFACTURING LEVEL IV**

<b>UNIT OF COMPETENCY</b>	:	APPLY QUALITY STANDARDS
<b>MODULE TITLE</b>	:	APPLYING QUALITY STANDARDS
<b>MODULE DESCRIPTOR</b>	:	This module covers the knowledge, skill, attitudes and values needed to apply quality standards in the workplace. The unit also includes the application of relevant safety procedures and regulations, organization procedures and customer requirements.
<b>NOMINAL DURATION</b>	:	9 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/ trainees will be able to:

- LO1. Inspect quality of received products
- LO2. Assess own work
- LO3. Engage in quality improvement

## **LO1. INSPECT QUALITY OF RECEIVED PRODUCTS**

### **ASSESSMENT CRITERIA:**

1. Work instruction is obtained and work is carried out in accordance with standard operating procedures.
2. Received products are checked against workplace standards and specifications.
3. Faulty materials related to work are identified and isolated.
4. Faults and any identified causes are recorded and/or reported to the supervisor concerned in accordance with workplace procedures.
5. Faulty materials are replaced in accordance with workplace procedures.

### **CONTENTS:**

- Reading skills required to interpret work instruction
- Workplace standards and specifications
- Procedures in obtaining and carrying out work instructions
- Quality checking procedures
- Fault identification and reporting
- Safety and environmental aspects of production process
- Carry out work in accordance with policies and procedures

### **CONDITIONS:**

The students/trainees must be provided with the following:

- Work instructions
- Manuals (operation manual of the company/ manufacturer's Instruction/ service manual)
- Company/ workplace standards and specifications
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Demonstration

### **ASSESSMENT METHODS:**

- Hands-on
- Direct Observation

- Practical Demonstration
- Oral questioning

## LO2. ASSESS OWN WORK

### ASSESSMENT CRITERIA:

1. Documentation relative to quality within the company is identified and used in accordance with established procedures.
2. Completed work is checked against workplace standards relevant to the task undertaken.
3. Errors are identified and isolated in accordance with established procedures.
4. Information on the quality and other indicators or work performance are recorded in accordance with workplace procedures.
5. In case of deviations from specific quality standards, causes are documented and reported in accordance with the workplace's standard operating procedures.

### CONTENTS:

- Communication skills needed to interpret and apply defined work procedures
- Identifying errors (deviation from customer and or organization requirements)
- Types of errors
- Types of quality standards
- Documentation and reporting procedures

### CONDITION:

The students/trainees must be provided with the following:

- Organization work procedures
- Manufacturer's Instruction manual
- Customer requirements
- Other forms
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

### METHODOLOGIES:

- Lecture
- Group Discussion
- Demonstration
- Self-paced instruction

### ASSESSMENT METHODS:

- Hands-on
- Direct observation
- Demonstration with oral questioning

### **LO3. ENGAGE IN QUALITY IMPROVEMENT**

#### **ASSESSMENT CRITERIA:**

1. Process improvement procedures are participated relative to the workplace.
2. Work is carried out in accordance with process improvement procedures.
3. Performance of operation or quality of product to ensure customer satisfaction is monitored in accordance with established procedures.

#### **CONTENTS:**

- Relevant production processes, materials and products
- Safety and environmental aspects of production processes
- Quality improvement processes
- Monitoring procedures for customer satisfaction

#### **CONDITION:**

The students/trainees must be provided with the following:

- Organization work procedures
- Manufacturer's instruction manual
- Customer requirements
- Other forms
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

#### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Self-paced instruction
- Demonstration

#### **ASSESSMENT METHODS:**

- Hands-on
- Demonstration with oral questioning
- Direct observation

<b>UNIT OF COMPETENCY</b>	:	<b>PROVIDE AND BUILD QUALITY CUSTOMER RELATIONS</b>
<b>MODULE TITLE</b>	:	<b>PROVIDING AND BUILDING QUALITY CUSTOMER RELATIONS</b>
<b>MODULE DESCRIPTOR</b>	:	This module covers the knowledge, skills and attitudes in providing effective and efficient service to customers. It includes personal presentation, knowledge of updated product information, addressing customer needs and building customer relations.
<b>NOMINAL DURATION</b>	:	7 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module the students/ trainees will be able to:

- LO1. Maintain a professional image
- LO2. Update knowledge of products and services
- LO3. Assess needs of new existing customers
- LO4. Build relations with customers

## **LO1. MAINTAIN A PROFESSIONAL IMAGE**

### **ASSESSMENT CRITERIA:**

1. Personal presence is maintained according to employer standards or venue requirements.
2. Interpersonal skills are used to ensure that customer needs are accurately identified.
3. Visible work area is kept tidy and uncluttered.
4. Equipment and other resources are stored according to assignment requirements.

### **CONTENTS:**

- Personal Presence and Professional Appearance
- Interpersonal Skills and Communication (Verbal & Non-Verbal, Body Language, Eye Contact)
- Teamwork, Attentiveness, and Professional Attitude
- Housekeeping and Work Area Organization
- Safe Work Practices and Personal Hygiene
- Time Management and Working Calmly

### **CONDITIONS:**

The students/trainees must be provided with the following:

- Employer standards / SOP manual
- Workplace housekeeping guidelines
- Role-play scenarios / case studies
- Assessment checklists
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

### **METHODOLOGIES:**

- Lecture–Discussion
- Demonstration
- Role Playing
- Simulation / Practical Exercises

### **ASSESSMENT METHODS:**

- Direct Observation with Checklist
- Practical Demonstration
- Role Play Assessment

- Oral Questioning

## **LO2. UPDATE KNOWLEDGE OF PRODUCTS AND SERVICES**

### **ASSESSMENT CRITERIA:**

1. Products to be marketed are identified, familiarized with and fully understood in accordance with established procedures.
2. Information on programs is accessed in accordance with established procedures.
3. Additional information on products, services and programs are identified in accordance with established procedures.

### **CONTENTS:**

- Customer's nature, motivation, expectations, and needs
- Customer needs and expectations related to the product and programs
- Marketing and promotional strategies
- Company standards on how to interact with customers
- Organization's vision, mission
- Organization profile
- Organization procedures and processes in providing quality customer service
- Work values and ethics:
  - Quality consciousness
  - Proactive
  - Patience
- Information on products, services and programs

### **CONDITION:**

The students/trainees must be provided with the following:

- Tools, materials and supplies needed to demonstrate the required tasks (e.g., sample report forms)
- References and manuals
- Sample brochures on products, services and programs
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

### **METHODOLOGIES:**

- Lecture
- Group Discussion
- Demonstration
- Self-paced instruction
- Film viewing

### **ASSESSMENT METHODS:**

- Demonstration
- Oral questioning
- Written test

### **LO3. ASSESS NEEDS OF NEW AND EXISTING CUSTOMERS**

#### **ASSESSMENT CRITERIA:**

1. Active listening is used to gather information from customers in accordance with established procedures.
2. Orientation on products, programs and policies are conducted in accordance with established procedures.
3. Provide customers with courteous and professional treatment throughout the interaction using interactive communication.
4. Inquiries, concerns and comments are responded to promptly and accurately in accordance with organization's policies.
5. Identified related or applicable needs of clients based on the products being offered.

#### **CONTENTS:**

- Methods of assessing needs of new and existing client's and use of
- Instruments:
  - Interviewing
  - Observation
  - Focus Group Discussion
  - Needs Survey
- Procedures in conducting product and service orientation of clients
- Procedures in assessing needs of new and existing client's
- Procedure in innovating products and services
- Guidelines on recording and reporting clients' needs
- Work values and ethics:
  - Quality consciousness
  - Proactive
  - Clients focus
  - Patience
  - Vigilance
  - Sincerity
  - Integrity
- Commitment

#### **CONDITION:**

The students/trainees must be provided with the following:

- Tools, materials and supplies needed to demonstrate the required tasks
- References and manuals
- Audio / Video recorder
- Instruments used in assessing needs
- Writing Materials
- Equipment:
  - Projector
  - Computer
  - Printer

#### METHODOLOGIES:

- Lecture
- Group Discussion
- Self-paced instruction
- Demonstration
- Film viewing

#### ASSESSMENT METHODS:

- Demonstration
- Oral questioning
- Written test

## **LO4. BUILD RELATION WITH CUSTOMERS**

### **ASSESSMENT CRITERIA:**

1. Customer expectations on quality, efficiency, punctuality and appearance are met in accordance with established procedures.
2. Possible causes of customer dissatisfaction are identified, addressed and recorded according to employer policy.
3. Customers are fully informed of any relevant concerns in a timely manner and according to agreed reporting procedures.

### **CONTENTS:**

- Customer expectations
- Service quality
- Customer dissatisfaction
- Handling complaint
- Interpersonal skills and professional attitude
- Time management
- Work ethics
- Safety, hygiene and workplace conduct

### **CONDITION:**

The students/trainees must be provided with the following:

- Writing Materials
- Customer service procedures / SOP manual
- Employer policy guidelines
- Role-play scenarios / case studies
- Reporting forms and templates
- Assessment checklists
- Training videos
- Equipment:
  - Projector
  - Computer
  - Printer

### **METHODOLOGIES:**

- Lecture
- Simulation exercise
- Role-playing
- Demonstration

### **ASSESSMENT METHODS:**

- Role play
- Practical demonstration
- Oral questioning

- Direct observation

# **MODULES OF INSTRUCTION**

## **CORE COMPETENCIES**

### **ADDITIVE MANUFACTURING LEVEL IV**

UNIT OF COMPETENCY : **PLAN THE PRODUCTION WORKFLOW**

MODULE TITLE : **PLANNING THE PRODUCTION WORKFLOW**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required to maintain quality control, facilitate additive manufacturing coordination, resolve advanced printing problems, and promote continuous improvement within an additive manufacturing production environment.

NOMINAL DURATION : 16 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/students must be able to:

- LO1. Schedule tasks based on project timeline and resource availability.
- LO2. Coordinate with production staff.

■

## LO1. SCHEDULE TASKS BASED ON PROJECT TIMELINE AND RESOURCE AVAILABILITY.

### ASSESSMENT CRITERIA:

1. Tasks are distributed according to the job order
2. Resources are allocated efficiently based on project schedules.

### CONTENTS:

- Uses of project management software/tools according to company policies:
  - Resource management
  - Workflow planning
  - Scheduling
- Principle of ratio and proportion for the following:
  - Lead time estimation
  - Material estimation
    - Filaments
    - Photosensitive resin
  - Manpower allocation
    - Operator
    - Technician
- Contents of job order:
  - Assigned personnel
  - Type of Material
  - Material Quantity
  - Machine
  - Cost-Estimation Form (CEF)
    - Material costing
    - Machine usage costing
    - Labor costing
  - Routing Sheet
  - Job order form
  - Reference Image

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
<ul style="list-style-type: none"> <li>● Software:               <ul style="list-style-type: none"> <li>○ PMIS</li> <li>○ Spreadsheet software</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● PC/Laptop with internet access</li> </ul>	<ul style="list-style-type: none"> <li>● <i>Pen and Paper</i></li> </ul>
		<ul style="list-style-type: none"> <li>● <i>Job order form</i></li> </ul>
		<ul style="list-style-type: none"> <li>● <i>Cost-Estimation Forms (CEF)</i></li> </ul>
		<ul style="list-style-type: none"> <li>● <i>Routing Sheets</i></li> </ul>

**METHODOLOGIES:**

- Discussion: Project management tools and Job Order contents.
- Hands-on: Using PMIS to allocate resources and schedule tasks.

**ASSESSMENT METHODS:**

- Practical Demonstration (Using project management tools).
- Oral Questioning.

## LO2. COORDINATE WITH PRODUCTION STAFF

### ASSESSMENT CRITERIA:

1. Communication with the operator and technician is maintained based on workflow requirements.
2. Coordination with the production team is conducted in accordance with project timelines.

### CONTENTS:

- Utilizing Digital Tools for Technical Communication
  - Production Tracking and Management Systems
  - The Integrated Production Lifecycle: From Design to Finish
  - Workflow requirements
- Job Order
  - Workflow duration
  - Project Deadline
  - Materials
  - Machine
  - Operator
  - Technician
- Involved personnel for additive manufacturing workflow
  - Supervisor
  - Technician
  - Operator
- Digital communication tools
- Maintaining the additive manufacturing workflow

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Digital communication tools		Workflow Status Report templates
Production tracking and management systems		Shift Handover logs

### METHODOLOGIES:

- Discussion (Production tracking systems, Production lifecycle)
- Hands-on (Documenting and reporting production status, Facilitating cross-department coordination)

**ASSESSMENT METHODS:**

- Practical Demonstration / Simulation (Documenting and reporting, Facilitating coordination)
- Oral Questioning / Discussion

UNIT OF COMPETENCY : **APPROVE FILE AND SETUPS**

MODULE TITLE : **APPROVING FILE AND SETUPS**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required for maintaining standardized and quality-controlled 3D printing parameters. It includes the review of CAD models and slicing parameters before the printing process.

NOMINAL DURATION : 16 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/students must be able to:

LO1. Validate 3D model files for printability

LO2. Approve printing parameters prior to job execution

■

## LO1. VALIDATE 3D MODEL FILES FOR PRINTABILITY

### ASSESSMENT CRITERIA:

1. Files are checked for errors and compliance with the additive manufacturing process requirements
2. Printability is validated based on design specifications.

### CONTENTS:

- File types used for slicing 3D models
  - Standard tessellation language (.stl)
  - 3D Manufacturing Format (.3mf)
  - Standard for the Exchange of Product model data (.stp)
- Introduction to Computer-Aided Design (CAD) for 3D Printing
- Mastering Slicing Software to Prepare Files for Printing
- Errors encountered while validating 3D models
  - Failed mesh
  - Corrupted file
- Validation of model specification compliance
- Material Constraints in Additive Manufacturing
- Applying DfAM Principles for Optimal 3D Prints
- 3D printing specification requirements
  - Material
  - Print texture
  - Tolerance
  - External model dimension
  - Color

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
<ul style="list-style-type: none"><li>● CAD software</li></ul>	<ul style="list-style-type: none"><li>● PC</li></ul>	<ul style="list-style-type: none"><li>● Sample 3D model files with and without errors<ul style="list-style-type: none"><li>○ .stl</li><li>○ .3mf</li><li>○ .stp</li></ul></li></ul>
<ul style="list-style-type: none"><li>● Slicing software</li></ul>		
<ul style="list-style-type: none"><li>● Mesh Repair Software</li></ul>		

**METHODOLOGIES:**

- Discussion (Preparing validated files, Identifying design flaws)
- Hands-On (Validating 3D model files, Optimizing models for accuracy and efficiency)

**ASSESSMENT METHODS:**

- Practical Demonstration (Validating and optimizing 3D files)
- Oral Questioning / Discussion

## **LO2. APPROVE PRINTING PARAMETERS PRIOR TO JOB EXECUTION**

### **ASSESSMENT CRITERIA:**

1. The setup for additive manufacturing is reviewed based on the job order.
2. Slicing parameters are confirmed according to the additive manufacturing process requirements

### **CONTENTS:**

- Communication based on the job order
  - Workflow duration
  - Project Deadline
  - Material selection
  - Machine selection
  - Dimensional requirements
- Effects of slicing settings and machine settings on the print quality.
- Validation of Slicer Settings:
  - Top/Bottom Layers
  - Support Interface Density
  - Build Plate Adhesion Type (Raft vs. Brim vs. Skirt)
  - Prime Tower / Ooze Shield
  - Printing speed
  - Printing temperature
  - Flow Rate / Extrusion Multiplier
  - Infill Density
  - Infill Pattern
  - Print orientation
  - Wall thickness
  - Support pattern
  - Support density
  - Exposure time
  - VAT temperature
  - Layer height
  - Line width
  - Print build volume
  - Fan speed
  - Bed temperature
  - Chamber temperature
  - Vat temperature
  - Exposure time

**CONDITIONS:**

The students/ trainees must be provided with the following:

<b>TOOLS</b>	<b>EQUIPMENT</b>	<b>MATERIALS</b>
Slicing software	3D printer	Sample Job Orders
		Material Technical Data Sheets (TDS)
		Slicer Profile Checklists

**METHODOLOGIES:**

- Discussion (Contents of job order, Set up parameters of 3D printers)
- Hands-On (Confirming optimal slicing settings)

**ASSESSMENT METHODS:**

- Practical Demonstration (Confirming slicing settings)

UNIT OF COMPETENCY : **OVERSEE PRINTING AND TROUBLESHOOTING WORKFLOW**

MODULE TITLE : **OVERSEEING PRINTING AND TROUBLESHOOTING WORKFLOW MODULE**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes necessary for monitoring the 3D printing workflow and supervising machine repair and maintenance. It also involves implementing corrective actions for any issues that may arise.

NOMINAL DURATION : 16 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the trainees/students must be able to:

- LO1. Supervise ongoing print jobs to ensure adherence to specifications
- LO2. Resolve common print failures

■

## **LO1. SUPERVISE ONGOING PRINT JOBS TO ENSURE ADHERENCE TO SPECIFICATIONS**

### **ASSESSMENT CRITERIA:**

1. Printing operations are monitored in accordance with job order requirements.
2. Deviations from specifications are identified based on the requirements of the additive manufacturing process.

### **CONTENTS:**

- Contents of job order requirements
  - Workflow duration
  - Project deadline
  - Dimensional requirements
  - Material selection
  - Machine selection
- Key factors of 3D print functionalities
  - Tolerance
  - Changes in actual dimensions
  - Model dimensions
  - Material selection
  - Surface finish
- Real-time data analysis for anticipating issues

### **CONDITIONS:**

The students/ trainees must be provided with the following:

<b>TOOLS</b>	<b>EQUIPMENT</b>	<b>MATERIALS</b>
Monitoring software	3D printer	Print files
Vernier Caliper		Job order form

### **METHODOLOGIES:**

- Demonstration (Monitoring a live print job)
- Simulation (Using software to monitor a virtual print)

### **ASSESSMENT METHODS:**

- Practical Demonstration / Simulation (Monitoring print jobs, identifying deviations)
- Oral Questioning / Discussion

## LO2. RESOLVE COMMON PRINT FAILURES

### ASSESSMENT CRITERIA:

1. Print failures are diagnosed in accordance with the job order requirements.
2. Troubleshooting steps are applied according to the additive manufacturing process requirements.
3. Corrective actions are guided based on equipment and material conditions.

### CONTENTS:

- Cause of failure diagnosis
  - Layer shifting
  - Warping
  - Under-extrusion
  - Over extrusion
  - Heat creep
  - Clogging
  - Print adhesion
  - Material condition
- Varying troubleshooting steps (based on part, repair/replacement, and technology)
- Creating a troubleshooting activity report
- Machine corrective actions
  - Part repair
  - Part replacements
- Machine restoration mentoring
- Machine repair/maintenance manual

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Hex/Allen key set		Equipment maintenance manuals
Screwdriver set		Intentional Failures (Sample prints with defects).
Pliers		Glue stick
Tweezers		Isopropyl alcohol (IPA)
Nozzle cleaning kit		Microfiber cloths/ Tissue
Wire brushes		Troubleshooting Report template
Spatula or scraper		

**METHODOLOGIES:**

- Hands-On: Using diagnostic flowcharts; Machine repair.
- Case Study: Analyzing print failures.

**ASSESSMENT METHODS:**

- Practical Demonstration (Troubleshooting).
- Case Study Analysis.

UNIT OF COMPETENCY : **VALIDATE QUALITY OF 3D PRINTED PARTS**

MODULE TITLE : **VALIDATING QUALITY OF 3D PRINTED PARTS**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required to manage the end-to-end quality assurance process for additive manufacturing parts, from hands-on dimensional and functional inspection to data analysis, reporting, and driving corrective actions to guarantee full compliance with client specifications.

NOMINAL DURATION : 24 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the trainees/students must be able to:

- LO1. Conduct required inspections of printed parts.
- LO2. Verify compliance of outputs against client requirements.

■

## LO1. CONDUCT REQUIRED INSPECTIONS OF PRINTED PARTS.

### ASSESSMENT CRITERIA:

1. Parts are measured against dimensional tolerances in the job order.
2. Functional checks are conducted based on additive manufacturing process requirements.

### CONTENTS:

- Introduction to Precision Measurement Tools
- Fundamentals of Quality Control Inspection
- The Mathematics of Quality Assurance
- Job order contents
  - Materials
  - Design files
  - Quantity
  - Print Time
  - Post-Processing
  - Cost Estimate
- Material Science in Additive Manufacturing
- Applying Industry Standards for Product Testing
- Types of tolerance and fit

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Micrometer		Sample 3D printed parts and corresponding 3D models/job orders
Vernier Caliper		3D printed parts for fit tests
Feeler Gauges		Job order form

### METHODOLOGIES:

- Demonstration: Calibration and use of CMM and Scanners.
- Lab Activity: Dimensional inspection.
- Workshop: Destructive testing (stress tests).

### ASSESSMENT METHODS:

- Practical Demonstration (Using measurement tools, conducting functional checks)

## LO2. VERIFY COMPLIANCE OF OUTPUTS AGAINST CLIENT REQUIREMENTS.

### ASSESSMENT CRITERIA:

1. Outputs are checked according to client requirements.
2. Client specifications are validated against the job order.

### CONTENTS:

- Fundamentals of Tolerance Inspection in Quality Control
  - Tolerance
  - Dimensional accuracy
  - Conformity to the supplied 3D model
  - 3D print finish
- Effective Communication: How to Accurately Interpret Client Needs
- Translating Requirements into Actionable Quality Checks
- Principles of Inspection Data Documentation
- Print quality assurance

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Micrometer		Sample job orders with client specifications
Vernier Caliper		Sample 3D printed outputs
		Quality compliance report templates
		Job order form

### METHODOLOGIES:

- Hands-On: Validating parts against job order.
- Role Play: Simulating client consultation.

### ASSESSMENT METHODS:

- Practical Demonstration (Validating parts and preparing reports)

UNIT OF COMPETENCY : **LEAD SAFETY AND TEAM MANAGEMENT**

MODULE TITLE : **LEADING SAFETY AND TEAM MANAGEMENT**

MODULE DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to lead teams to achieve peak productivity and full regulatory compliance by enforcing safety protocols, providing hands-on mentorship, and fostering a culture of accountability and continuous improvement.

NOMINAL DURATION : 16 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainees/students must be able to:

- LO1. Enforce compliance on workplace safety regulations.
- LO2. Lead team members in efficient and safe work practices.

■

## LO1. ENFORCE COMPLIANCE ON WORKPLACE SAFETY REGULATIONS.

### ASSESSMENT CRITERIA:

1. Safety procedures are implemented according to company regulations.
2. Compliance with workplace safety standards is monitored continuously.

### CONTENTS:

- Machine & Equipment Safety Protocols
  - Safe Operation of Workplace Equipment
  - Proactive Hazard Identification
  - Use of Material Safety Data Sheets (MSDS)
  - Environmental, Health, and Safety (EHS) standards
  - Proper material handling and disposal protocols
- Understanding & Managing Risks
  - Wearing appropriate Personal Protective Equipment (PPE)
  - Maintaining distance from hot components
  - Working in well-ventilated spaces
- Effective Safety Instruction & Training
- Safety policies
  - Machine operation
  - Material handling
    - Engineering filaments
    - UV Sensitive Resin
    - Isoprophyl Alcohol
  - Waste disposal
- Installation of safety equipment
  - Printers with enclosure
  - Local exhaust ventilation
  - High-Efficiency Particulate Air (HEPA) filters

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
	Fire extinguisher	Material Safety Data Sheets (MSDS)
	Spill Containment Kit.	Company safety regulations and policies
		Workplace safety audit checklists
		Nitrile Gloves
		Heat-Resistant Gloves
		Safety Glasses or Goggles

		Respirator
		Lab Coat or Apron

**METHODOLOGIES:**

- Workshop: Analyzing MSDS.
- Demonstration: Performing a workplace safety audit.

**ASSESSMENT METHODS:**

- Practical Demonstration (Audit).
- Role-Play (Coaching).

## **LO2. LEAD TEAM MEMBERS IN EFFICIENT AND SAFE WORK PRACTICES.**

### **ASSESSMENT CRITERIA:**

1. Guidance is provided to ensure adherence to additive manufacturing process requirements.
2. Team members are coached based on workplace safety and efficiency standards.

### **CONTENTS:**

- Utilizing Training Tools for Additive Manufacturing
- Implementing Best Practices for Safe & Efficient Additive Manufacturing
- Optimizing material usage
- Utilizing and minimizing support structures
- Effective Team Training Strategies
- Integrating Sustainable Practices in Modern Manufacturing
- Techniques for Monitoring Team Performance
- Documenting Performance for Continuous Improvement
- Designing and Implementing Resource-Efficient Workflows

### **CONDITIONS:**

The students/ trainees must be provided with the following:

<b>TOOLS</b>	<b>EQUIPMENT</b>	<b>MATERIALS</b>
		Performance documentation templates
		Sample case studies on team productivity and conflict
		Incident Report Forms

### **METHODOLOGIES:**

- Lecture/Discussion (Efficient additive manufacturing workflows)
- Role-Play (Conducting an on-the-job coaching session)
- Case Study (Analyzing and resolving team conflict)

### **ASSESSMENT METHODS:**

- Role-Play / Simulation (Coaching session, conflict resolution)
- Case Study Analysis

UNIT OF COMPETENCY : **OVERSEE THE STATUS OF EQUIPMENT AND MATERIALS**

MODULE TITLE : **OVERSEEING THE STATUS OF EQUIPMENT AND MATERIALS**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required to oversee operational readiness. This includes ensuring material availability and equipment reliability by overseeing inventory control, conducting routine maintenance and calibration, and keeping detailed logs of all activities.

NOMINAL DURATION : 16 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the trainees/students must be able to:

LO1. Monitor status of additive manufacturing materials.

LO2. Ensure regular checks and upkeep of equipment readiness.

■

## LO1. MONITOR STATUS OF ADDITIVE MANUFACTURING MATERIALS.

### ASSESSMENT CRITERIA:

1. Material stock levels are checked regularly
2. Material replenishment is initiated in accordance with the threshold.
3. Materials storage conditions are maintained in accordance with additive manufacturing process standards.

### CONTENTS:

- Implementing Digital Inventory Systems for AM Materials
  - Filaments
  - Photosensitive Resin
  - Consumables (Isopropyl Alcohol, Sandpaper, Acetone, Super glue, Polishing compound, Body filler, Polishing wheel, Tissue)
- Calculating Material Consumption Rates
- Forecasting Material Requirements and Setting Reorder Points
- Inventory management concepts (FIFO, safety stock, reorder points)
- The Science of Material Integrity (Storage, Handling, Shelf Life)
- Sustainable Material Management
- Material Safety Data Sheets (MSDS) storage requirements

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Inventory systems <ul style="list-style-type: none"><li>● manual logbooks</li><li>● Spreadsheets</li><li>● software</li></ul>		Mock storeroom with AM materials <ul style="list-style-type: none"><li>● Filaments</li><li>● resins</li></ul>
Proper storage containers <ul style="list-style-type: none"><li>● sealed containers</li><li>● Desiccants</li><li>● Dark cabinets</li></ul>		Material requisition or purchase request forms
Hygrometer		Inventory Logbooks
Weighing Scale		

**METHODOLOGIES:**

- Lecture/Discussion (Inventory management concepts, material properties, MSDS)
- Demonstration (Conducting physical count, updating stock card, proper material storage)
- Practical Exercise (Inventory Simulation, completing requisition forms, organizing storage area)

**ASSESSMENT METHODS:**

- Practical Demonstration / Simulation (Performing stock check, organizing storage)
- Written Test (Completing forms, explaining concepts)
- Oral Questioning / Discussion

## **LO2. ENSURE REGULAR CHECKS AND UPKEEP OF EQUIPMENT READINESS.**

### **ASSESSMENT CRITERIA:**

1. Equipment readiness is verified according to maintenance schedules.
2. Preventive maintenance checklists are reviewed based on additive manufacturing process requirements.

### **CONTENTS:**

- Utilizing Machine Monitoring Systems
- Applying Diagnostic Tools for Equipment Troubleshooting
- Properly Logging and Documenting Equipment Readiness
  - Calibrated machine
  - Updated software/firmware
- Creating and Interpreting Documented Issue Reports
- Monitoring and Optimizing Equipment Energy Utilization
- Preventive vs. corrective maintenance
- Developing and Following Preventive Maintenance Schedules
- Maintenance schedules and Work instructions
- Understanding Core Equipment Functions

### **CONDITIONS:**

The students/ trainees must be provided with the following:

<b>TOOLS</b>	<b>EQUIPMENT</b>	<b>MATERIALS</b>
Basic maintenance tools (e.g., for cleaning, checking tension)	Additive manufacturing machines	Preventive maintenance schedules and checklists
Multimeter		Maintenance logs (digital or physical)

### **METHODOLOGIES:**

- Lecture/Discussion
- Demonstration Practical Exercise (Machine inspection using checklist, troubleshooting, completing maintenance log)

### **ASSESSMENT METHODS:**

- Practical Demonstration
- Documentation Review
- Oral Questioning / Discussion

UNIT OF COMPETENCY : **DETERMINE THE APPROPRIATE CORRECTIVE MAINTENANCE PROCEDURES**

MODULE TITLE : **DETERMINING THE APPROPRIATE CORRECTIVE MAINTENANCE PROCEDURES**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required to maintain the working condition of an additive manufacturing machine. It includes machine diagnostics, maintenance scheduling, and conducting corrective maintenance.

NOMINAL DURATION : 32 hours

**SUMMARY OF LEARNING OUTCOMES:**

Upon completion of this module, the trainees/students must be able to:

- LO1. Analyze root causes of equipment malfunctions.
- LO2. Conduct corrective maintenance with a technician

## LO1. ANALYZE ROOT CAUSES OF EQUIPMENT MALFUNCTIONS

### ASSESSMENT CRITERIA:

1. Malfunctions are analyzed based on additive manufacturing process requirements.
2. Root cause findings are documented according to maintenance procedures.

### CONTENTS:

- Understanding Thermal and Physical Factors in AM
- Navigating the Additive Manufacturing user interface
- How to Read and Interpret System Error Logs
- Fundamentals of Machine, Mechanical, and Electrical Systems
- Using Diagnostic Tools for Troubleshooting
- Effective Failure and Error Reporting

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Diagnostic tools	Malfunction scenarios (case studies)	Sample machine error logs
Digital Multimeter	3D Printers	Standard report templates

### METHODOLOGIES:

- Lecture/Discussion (Common 3D printer malfunctions)
- Demonstration (Using diagnostic tools to read error logs)
- Case Study (Trainees analyze malfunction scenarios)
- Practical Exercise (Documenting findings using a report template)

### ASSESSMENT METHODS:

- Case Study Analysis (Identifying root cause)
- Written Report (Documenting findings)
- Oral Questioning / Discussion

## LO2. CONDUCT CORRECTIVE MAINTENANCE WITH A TECHNICIAN

### ASSESSMENT CRITERIA:

1. Corrective maintenance is carried out following standard procedures.
2. Technical assistance is coordinated based on equipment requirements.

### CONTENTS:

- Software Update Procedures
- Methods of Corrective Maintenance
  - Cleaning the machine
  - Updating firmware
  - Lubricating parts
  - Replacing parts
  - Repairing parts
- Component Replacement Techniques
- Waste Management in Maintenance
- Defining Maintenance Needs of Equipment
  - 3D printer
  - Post-processing tools
  - Computer for slicing
- Vendor and Service Provider Liaison
- Communication and Collaboration

### CONDITIONS:

The students/ trainees must be provided with the following:

TOOLS	EQUIPMENT	MATERIALS
Soldering iron	Hotends	Contact information for technical support
Wire strippers	Nozzles	Service Manuals
3D printer maintenance tools set	Thermistors	
	Fans	

### METHODOLOGIES:

- Demonstration & Guided Practice (Basic repairs like replacing a nozzle, clearing a jam)
- Role-Playing (Making a service call to technical support)

**ASSESSMENT METHODS:**

- Practical Demonstration (Performing basic repairs)
- Role-Play (Coordinating technical assistance)
- Situational Assessment

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