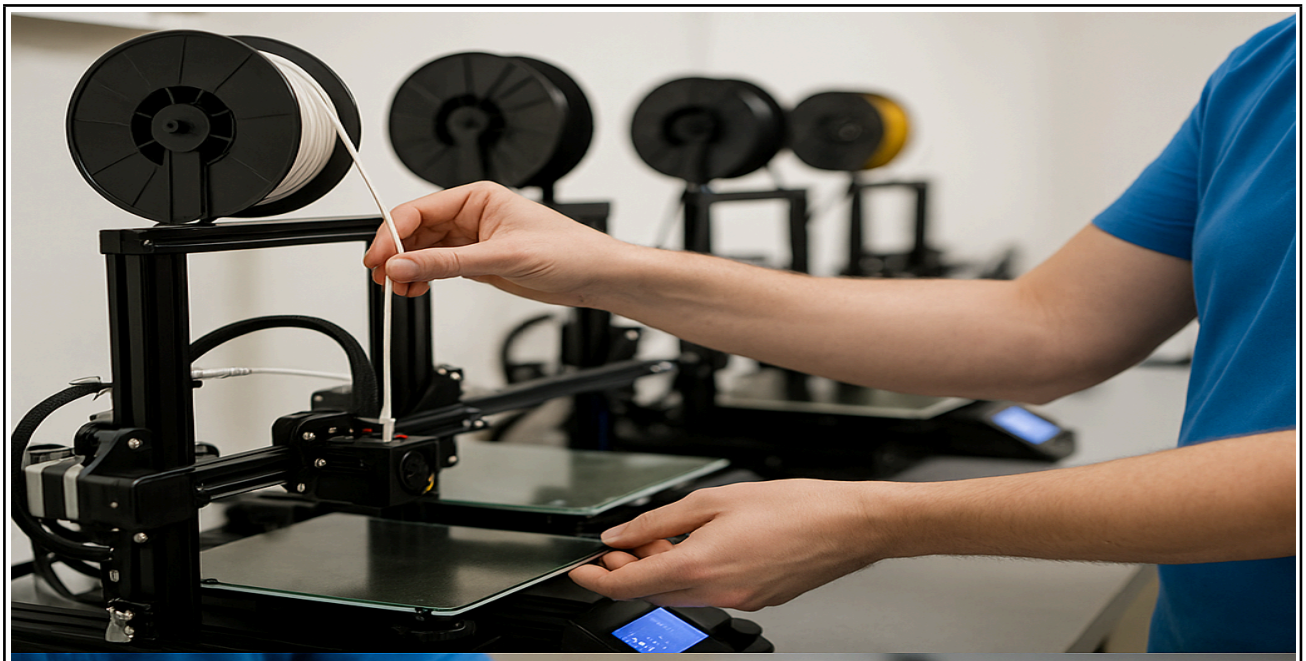
COMPETENCY-BASED CURRICULUM EXEMPLAR





SOURCE: *ChatGPT (2025). AI-generated instructional images for Additive Manufacturing Level II.*

Sector:

MANUFACTURING

Qualification:

ADDITIVE MANUFACTURING LEVEL II

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

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HOW TO USE THE COMPETENCY-BASED CURRICULUM (CBC) EXEMPLAR

Welcome to the CBC Exemplar on **ADDITIVE MANUFACTURING LEVEL II**, a qualification under the **MANUFACTURING** sector.

This essential training document was prepared collaboratively by the Curriculum and Training Aids Development Division (CTADD), trainers, content experts, industry experts and other stakeholders to provide complete guidance in the conduct of TVET programs in Additive Manufacturing Level II. This serves as a basis for the groundwork and actual implementation of a training program as well as a reference for program registration under the UTPRAS. And it contains the minimum specifications for a training program which TVIs must adhere to prior to integrating additional contents.

Sourced from the stipulations in and analysis of the related/corresponding Competency Standards, this CBC Exemplar sets out the specifications for a course or subject (module) which describe all the training experiences that a trainee or learner undergoes that leads to an appropriate certification. It generally includes the following components, namely:

COMPONENT	DESCRIPTION
Learning Outcomes (LOs)	Clear statements of what a learner can be expected to know, understand and/or do as a result of a learning experience. *(IRR of RA No. 10968)*
Contents	Specific knowledge, skills and attitude that are to be addressed within this learning outcome.
Conditions	Specify the conditions under which the learning and assessment will take place. This can include a list of tools and equipment, access to learning resources and equipment manuals, and type of facility. This should specify the scope or range of the equipment and facilities to be assessed.
Methodologies	Instructional strategies utilized to facilitate the transfer of knowledge to the learners allowing them to perform the given tasks or work activities according to defined standards.
Assessment Methods	Techniques used in gathering different types of evidence to evaluate a candidate for a particular qualification.

In addition, the nominal duration of the program indicates the contact hours between the learner and the trainer, regardless of the modality, either face-to-face or online synchronous activities. The Supervised Industry Learning (SIL), or training under a workplace environment, is also included.

The TVIs are required to conduct an assessment per module based on the assessment criteria specified in the CBC Exemplar. Learners have to complete all the requirements (in a form of formative assessments or performance tasks, among others) of a competency prior to the issuance of a Certificate of Achievement. This essential document allows a learner to

proceed to the remaining modules of the succeeding competency/ies. Concurrently, a summative institutional assessment must be administered to learners for them to proceed in taking up the corresponding National Competency Assessment.

With the rise of dynamic and emerging technologies brought about by area-based/demand-based requirements in the regional and provincial levels, the users of this CBC Exemplar may constantly review and update this depending on the needs of their industry counterparts to ensure the delivery of quality TVET programs.

COURSE DESIGN

COURSE TITLE : **ADDITIVE MANUFACTURING LEVEL II**

TRAINING DURATION : 37 hours Basic Competencies
42 hours Common Competencies
30 hours Core Competencies

TOTAL : 109 hours

COURSE DESCRIPTION :

This course provides comprehensive training in the complete additive manufacturing workflow. Participants will gain essential skills, starting with preparing materials, which includes checking the inventory of feedstocks, such as thermoplastic filaments and photosensitive resins, against job orders. The training continues with setting up the equipment, where students learn to prepare the build environment, configure the machine interface, and properly load materials. Participants will then operate the additive manufacturing equipment, initiating print jobs, monitoring the process for common failures such as warping or layer shifting, and safely removing the finished part from the build plate. Following printing, the course covers preliminary post-processing, focusing on the safe removal of print supports and performing appropriate wash and cure procedures. Finally, participants will learn to perform basic maintenance, assess the 3D printer for wear and tear, and properly clean equipment and tools after operation to ensure functionality and extend service life.

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Upon completion of the course, learners are expected to demonstrate the aforementioned competencies for employment. 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 have the following:
    - Graduate of K-12 or Old Curriculum; **OR**
      At least 6 months industry experience in Additive Manufacturing thru Certificate of Employment (COE); **AND**
    - Knowledge in basic computer operation

COURSE STRUCTURE:

BASIC COMPETENCIES
(37 hours)

Units of Competency	Module Title	Learning Outcomes	Nominal Duration
1. Participate in workplace communication	1.1 Participating in workplace communication	1.1.1 Obtain and convey workplace information 1.1.2 Perform duties following workplace instructions 1.1.3 Complete relevant work related documents	2 hours
2. Work in a team environment	2.1 Working in a team environment	2.1.1 Describe team role and scope 2.1.2 Identify one's role and responsibility within team 2.1.3 Work as a team member	2 hours
3. Work in a team environment	3.1 Working in a team environment	3.1.1 Identify routine problems 3.1.2 Look for solutions to routine problems 3.1.3 Recommend solutions to problems	2 hours
4. Develop Career and Life Decisions	4.1 Developing Career and Life Decisions	4.1.1 Manage one's emotion 4.1.2 Develop reflective practice 4.1.3 Boost self-confidence and develop self-regulation	1 hour
5. Contribute to workplace innovation	5.1 Contributing to workplace innovation	5.1.1 Identify opportunities to do things better 5.1.2 Discuss and develop ideas with others 5.1.3 Integrate ideas for change in the workplace	1 hour
6. Present relevant information	6.1 Presenting relevant information	6.1.1 Gather data/ information 6.1.2 Assess gathered data/ information 6.1.3 Record and present information	1 hour
7. Practice Occupational Safety and Health Policies And Procedures	7.1 Practicing Occupational Safety and Health Policies And Procedures	7.1.1 Identify OSH compliance requirements 7.1.2 Prepare OSH requirements for compliance 7.1.3 Perform tasks in accordance with relevant OSH policies and procedures	1 hour

Units of Competency	Module Title	Learning Outcomes	Nominal Duration
8. Exercise Efficient and Effective Sustainable Practices in the Workplace	8.1 Exercising Efficient and Effective Sustainable Practices in the Workplace	8.1.1 Identify the efficiency and effectiveness of resource utilization 8.1.2 Determine causes of inefficiency and/or ineffectiveness of resource utilization 8.1.3 Convey inefficient and ineffective environmental practices	3 hrs
9. Practice Entrepreneurial Skills in the Workplace	9.1 Practicing Entrepreneurial Skills in the Workplace	9.1.1 Apply entrepreneurial workplace best practices 9.1.2 Communicate entrepreneurial workplace best practices 9.1.3 Implement cost effective operations	4 hrs.

COMMON COMPETENCIES
(42 hours)

Units of Competency	Module Title	Learning Outcomes	Nominal Duration
1. Interpret drawing and sketches	1.1 Interpreting drawing and sketches	1.1.1 Interpret technical drawing 1.1.2 Interpret details from freehand sketch	10 hrs.
2. Perform basic workshop measurements and computations	2.1 Performing basic workshop measurements and computations	2.1.1 Select and use measuring tools 2.1.2 Clean and store measuring tools 2.1.3 Perform four fundamental operations. 2.1.4 Perform conversion of units	16 hrs.
3. Contribute to quality Management (QMS)	3.1 Contributing to quality Management (QMS)	3.1.1 Apply quality management system (QMS) 3.1.2 Apply quality standards to work 3.1.3 Protect company property and customer interests	8 hrs.
4. Use Hand Tools	4.1 Using Hand Tools	4.1.1 Identify and use of Personal Protective Equipment (PPE) 4.1.2 Select and use of tools and equipment 4.1.3 Perform simple maintenance of tools and equipment	8 hrs.

CORE COMPETENCIES
(30 hours)

Units of Competency	Module Title	Learning Outcomes	Nominal Duration
1. Prepare additive manufacturing materials	1.1. Preparing additive manufacturing materials	1.1.1. Check inventory of additive manufacturing materials 1.1.2. Collect additive manufacturing materials from inventory	3 Hours
2. Set-up additive manufacturing equipment	2.1. Setting-up additive manufacturing equipment	2.1.1. Prepare build environment 2.1.2. Load additive manufacturing material	5 Hours
3. Operate additive Manufacturing Equipment	3.1. Operating additive Manufacturing Equipment	3.1.1. Perform 3D printing job 3.1.2. Monitor printing process 3.1.3. Remove printed part	6 Hours
4. Perform preliminary post-processing of 3D printed output	4.1. Performing preliminary post-processing of 3D printed output	4.1.1. Remove print supports 4.1.2. Perform wash and cure procedure as appropriate	8 Hours
5. Perform basic maintenance on 3D printers	5.1. Performing basic maintenance on 3D printers	5.1.1. Assess the machine for maintenance 5.1.2. Maintain the equipment and tools used after the operation	8 Hours

RESOURCES

Recommended list of tools, equipment and materials for the training of 25 trainees for Additive Manufacturing Level II

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**
25 pcs	Caliper (Vernier / Digital) (1:1 ratio for individual inspection)
25 pcs	Steel Ruler
3 sets	Cleaning Brushes (1 set per printer)
As required	Rotary Tool with Attachments (Shared for post-processing)
10 pcs	Paint Brushes / Applicators
25 pcs	Cutting Tools / Side Cutters (Flush Cutters) (1:1 for post-processing)

TOOLS	
QTY.	**DESCRIPTION**
25 sets	Sanding Blocks and Files (1:1 for post-processing)
10 sets	Screwdrivers Set
3 units	Multimeter (1 per printer for maintenance)
3 pcs	Spatula / Scrapers (Stainless Steel) (Stainless Steel) (1 per printer)

EQUIPMENT	
QTY.	**DESCRIPTION**
2 units	Fused Filament Fabrication (FFF) 3D Printer ● For 1.75mm filaments ● Build Volume: Minimum of 220mmx220mmx250mm ● Maximum Printing Temperature: Minimum of 250C max printing temperature
1 unit	Vat Photopolymerization (VPP) 3D Printer ● Printing Resolution: atleast 8k resolution
25 unit	Slicing / CAD Workstations (Desktop or Laptop) (1:1 ratio)
1 units	Wash and Cure Station (Optional if VPP Printers) (1 per printer)
1 unit	Filament Dryer / Conditioning Unit (optional if FFF Printer)
4 benches	Post-processing Workbench
2 units	Ventilation /Exhaust Fan
2 sets	Storage Racks
1 unit	Inventory Management Logbook (Digital/Analog)
1 unit	Projector / Smart TV
2 units	Fire Extinguisher
1 set	First Aid Kit

MATERIALS & CONSUMABLES	
QTY.	**DESCRIPTION (Calculated for 3 Printers @ 8hrs/day)**
4 rolls	3D Printing Filament
2 liters	UV Resin (Standard)
3 gallon	Isopropyl Alcohol (IPA)

MATERIALS & CONSUMABLES	
QTY.	**DESCRIPTION (Calculated for 3 Printers @ 8hrs/day)**
As required	Acetone (for smoothing/cleaning)
2 boxes	Nitrile Gloves (100 pcs/box)
5 boxes	Face Masks (N95 or Surgical - 50 pcs/box)
25 pcs	Safety Goggles
25 pcs	Aprons / Lab Coats
50 sheets	Sandpaper Assorted Grits
15 pcs	Adhesive (Super Glue / Epoxy)
10 rolls	Paper Towels / Wipes
As required	Maintenance Lubricants
4 pcs	Waste Disposal Containers(Hazardous/Non-Hazardous)
10 pcs	Storage Containers (for individual projects)

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
QTY.	**DESCRIPTION**
25 pairs	Safety Shoes (Trainee-provided or Institutional)
3 pairs	Heat-resistant Gloves (1 pair per FFF printer)
As necessary	Ear Protection (if needed)

SOFTWARE REQUIREMENTS	
SOFTWARE	**SPECIFICATION / USE**
3D Modeling Software	Autodesk Fusion 360 / TinkerCAD / SolidWorks (educational version)
Slicing Software	Ultimaker Cura / PrusaSlicer / ChiTuBox / (Software Compatible with provided 3D printers)
Inventory Management	MS Excel, Google Sheets, or equivalent inventory app
Reporting / Documentation Tools	Word, Excel, 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 Room / Theory Area	5.0 × 8.0	40	40
Additive Manufacturing Laboratory / Workshop	10.0 × 10.0	100	100
Tool / Equipment Storage Room	2.0 × 3.0	6	6
Instructor's Room / Office	3.0 × 3.0	9	9
Learning Resource Area (Library / Computer Access)	4.0 × 4.0	16	16
Receiving / Finishing Area	3.0 × 5.0	15	15
Utility / Janitorial Room	2.0 × 2.0	4	4
Restroom (Male)	2.0 × 3.0	6	6
Restroom (Female)	2.0 × 3.0	6	6
Circulation / Hallways (approx. 15%)	—	40	40
		Total workshop area:	**242 sq. m.**

COURSE DELIVERY

- Institutional-based
- Enterprise-based
- Flexible Learning Delivery
- Distance Learning

ASSESSMENT METHODS:

- Written test
- Demonstration
- Interview/Questioning
- Observation

QUALIFICATION OF INSTRUCTORS/TRAINERS:

- Graduate of bachelor's degree; **OR**
- Have at least one (1) year of experience as a trainer for additive manufacturing; **AND**
- Holder of Trainers Methodology 1 or In-company Training 1; **AND**
- At least Holder of additive manufacturing Level II certificate

MODULES OF INSTRUCTION

BASIC COMPETENCIES

ADDITIVE MANUFACTURING LEVEL II

UNIT OF COMPETENCY	:	**PARTICIPATE IN WORKPLACE COMMUNICATION**
MODULE TITLE	:	**PARTICIPATING IN WORKPLACE COMMUNICATION**
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes required to obtain, interpret and convey information in response to workplace requirements.
NOMINAL DURATION	:	6 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Obtain and convey workplace information

LO2. Perform duties following workplace instructions

LO3. Complete relevant work-related document

LO1. OBTAIN AND CONVEY WORKPLACE INFORMATION

ASSESSMENT CRITERIA:

1. Specific and relevant information is accessed from appropriate sources.
2. Effective questioning, active listening and speaking skills are used to gather and convey information.
3. Appropriate medium is used to transfer information and ideas.
4. Appropriate non-verbal communication is used.
5. Appropriate lines of communication with supervisors and colleagues are identified and followed.
6. Defined workplace procedures for the location and storage of information are used.
7. Personal interaction is carried out clearly and concisely.

.

CONTENTS:

- Sources of information
- Modes and media of communication
- Strategies on how to give and receive information
- Choosing appropriate forms of communication
- Workplace behaviors and attitudes and the effect on communication
- Lines of communication in the workplace
- Information storage
- Effective verbal and nonverbal communication

CONDITIONS: The students/ trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Participate in Workplace Communication)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Oral Interview
- Written test
- Demonstration

LO2. PERFORM DUTIES FOLLOWING WORKPLACE INSTRUCTIONS

ASSESSMENT CRITERIA:

1. Written notices and instructions are read and interpret in accordance with organizational guidelines.
2. Routine written instructions are followed based on established procedures.
3. Feedback is given to workplace supervisor-based instructions/ information received.
4. Workplace interactions are conducted in a courteous manner.
5. When necessary, clarifications about routine workplace procedures and matters concerning conditions of employment are sought and asked from appropriate sources.
6. Meeting's outcomes are interpreted and implemented.

CONTENTS:

- Strategies to understand written instructions
- Written notices and instructions
- Work related forms/ documents
- Workplace interactions, procedures, and duties
- Interpreting and implementing instructions following a meeting
- Seeking clarification
- Giving feedback on instructions and task to supervisor
- Conditions of employment and rights and responsibilities

CONDITIONS:

The students/trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Participate in Workplace Communication)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

L03. COMPLETE RELEVANT WORK-RELATED DOCUMENTS

ASSESSMENT CRITERIA:

1. Ranges of forms relating to conditions of employment are completed accurately and legibly.
2. Workplace data is recorded on standard workplace forms and documents.
3. Basic mathematical processes are used for routine calculations.
4. Errors in recording information on forms/ documents are identified and rectified.
5. Reporting requirements to superior are completed according to enterprise guidelines.

CONTENTS:

- Workplace documents and forms
- Business letters
- Writing and filling out workplace documents and forms

CONDITIONS:

The students/trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Participate in Workplace Communication)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

UNIT OF COMPETENCY	:	**WORK IN A TEAM ENVIRONMENT**
MODULE TITLE	:	**WORKING IN A TEAM ENVIRONMENT**
MODULE DESCRIPTOR	:	This module covers the knowledge, skills, and attitudes required to relate in a work-based environment.
NOMINAL DURATION	:	3 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Describe team role and scope

LO2. Identify one's role and responsibility within team

LO3. Work as a team member

LO1. DESCRIBE TEAM ROLE AND SCOPE

ASSESSMENT CRITERIA:

1. The role and objective of the team is identified from available sources of information.
2. Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources.

CONTENTS:

- Setting team goal and scope
- Stages of group development
- Cooperating with others

CONDITIONS:

The students/ trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Working in a Team Environment)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

LO2. IDENTIFY ONE'S ROLE AND RESPONSIBILITY WITHIN TEAM

ASSESSMENT CRITERIA:

1. Individual roles and responsibilities within the team environment are identified.
2. Roles and objectives of the team are identified from available sources of information.
3. Team parameters, reporting relationships and responsibilities are identified based on team discussions and appropriate external sources.

CONTENTS:

- Team roles & responsibilities within a team
- Teams in work environment
- Roles and responsibility of team members
- Fundamental rights at work including gender sensitivity
- Individual action plan

CONDITIONS:

The students/trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Working in a Team Environment)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

LO3. WORK AS A TEAM MEMBER

ASSESSMENT CRITERIA:

1. Effective and appropriate forms of communications are used and interactions are undertaken with team members based on company practices.
2. Effective and appropriate contributions are made to complement team activities and objectives, based on workplace context.
3. Protocols in reporting are observed based on standard company practices.
4. Contribute to the development of team work plans based on an understanding of the team's role and objectives.

CONTENTS:

- Individual work vs. teamwork
- Communication channels
- Team planning and decision-making

CONDITIONS:

The students/trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Working in a Team Environment)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

UNIT OF COMPETENCY	:	**SOLVE/ADDRESS GENERAL WORKPLACE PROBLEMS**
MODULE TITLE	:	**SOLVING/ADDRESSING GENERAL WORKPLACE PROBLEMS**
MODULE DESCRIPTOR	:	This module covers the knowledge, skills and attitudes required to apply problem-solving techniques to determine the origin of problems and plan for their resolution. It also includes addressing procedural problems through documentation and referral.
NOMINAL DURATION	:	3 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

LO1. Identify routine problems

LO2. Look for solutions to routine problems

LO3. Recommend solutions to problems

LO1. IDENTIFY ROUTINE PROBLEMS

ASSESSMENT CRITERIA:

1. Routine problems or procedural problem areas are identified.
2. Problems to be investigated are defined and determined.
3. Current conditions of the problem are identified and documented.

CONTENTS:

- Routine or procedural problems
- Definition of "documentation"
- Document a routine or procedural problem

CONDITIONS:

The students/ trainees must be provided with the following:

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Solving and Addressing General Workplace Problems)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

LO2. LOOK FOR SOLUTIONS TO ROUTINE PROBLEMS

ASSESSMENT CRITERIA:

1. Potential solutions to problem are identified.
2. Recommendations about possible solutions are developed, documented, ranked and presented to appropriate person for decision.

CONTENTS:

- Root cause analysis
- Finding solutions that address the root cause
- Analyzing Potential Solutions
- Determining who makes the final decision
- Develop and present recommendations

CONDITIONS:

The students/ trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Solving and Addressing General Workplace Problems)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

LO3. RECOMMEND SOLUTIONS TO PROBLEMS

ASSESSMENT CRITERIA:

1. Implementation of solutions is planned.
2. Evaluation of implemented solutions is planned.
3. Recommended solutions are documented and submitted to appropriate person for confirmation.

CONTENTS:

- Action plans (NC I Recap)
- Planning to Implement Your Solution
- Constructing a plan of action
- Steps in evaluating implemented solutions
- Benefits of documenting results/solutions
- Importance of documenting problems and solutions in writing
- Common forms of documentation

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Solving and Addressing General Workplace Problems)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

UNIT OF COMPETENCY : **DEVELOP CAREER AND LIFE DECISIONS**

MODULE TITLE : **DEVELOPING CAREER AND LIFE DECISIONS**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes in managing one's emotions, developing reflective practice, and boosting self-confidence and developing self-regulation.

NOMINAL DURATION : 3 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

LO1. Manage one's emotion

LO2. Develop reflective practice

LO3. Boost self-confidence and develop self-regulation

LO1. MANAGE ONE'S EMOTION

ASSESSMENT CRITERIA:

1. Self-management strategies are identified.
2. Skills to work independently and to show initiative, to be conscientious and persevering in the face of setbacks and frustrations are developed.
3. Techniques for effectively handling negative emotions and unpleasant situations in the workplace are determined.

CONTENTS:

- Self-management strategies that assist in regulating behavior and achieving personal and learning goals
- Identifying specific emotions
- Connection between emotions, thoughts, feelings and behaviors
- Building coping skills
- Building flexible thinking skills
- Self-management strategies

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Developing Career and Life Decisions)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

LO2. DEVELOP REFLECTIVE PRACTICE

ASSESSMENT CRITERIA:

1. Personal strengths and achievements are contemplated based on self-assessment strategies and teacher feedback.
2. Progress when seeking and responding to feedback from teachers are monitored to assist them in consolidating strengths, addressing weaknesses and fulfilling their potential.
3. Outcomes of personal and academic challenges are predicted by reflecting on previous problem solving and decision-making strategies and feedback from peers and teachers.

CONTENTS:

- Self-assessment of strengths, weaknesses, likes and dislikes
- Overcoming limitations and limitations
- Strategies to improve my attitude in the workplace

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Developing Career and Life Decisions)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

LO3. BOOST SELF-CONFIDENCE AND DEVELOP SELF-REGULATION

ASSESSMENT CRITERIA:

1. Efforts for continuous self-improvement are demonstrated.
2. Counter-productive tendencies at work are eliminated.
3. Positive outlook in life are maintained.
4. Opportunities related to chosen field are discovered.

CONTENTS:

- Components of self-regulation
- Counterproductive work behaviors
- Self-help concepts
- Habits of highly effective people

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Developing Career and Life Decisions)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios.

UNIT OF COMPETENCY : **CONTRIBUTE TO WORKPLACE INNOVATION**

MODULE TITLE : **CONTRIBUTING TO WORKPLACE INNOVATION**

MODULE DESCRIPTOR : This module covers the knowledge, skills and attitudes required to make a pro-active and positive contribution to workplace innovation.

NOMINAL DURATION : 3 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

LO1. Identify opportunities to do things better.

LO2. Discuss and develop ideas with others

LO3. Integrate ideas for change in the workplace

LO1. IDENTIFY OPPORTUNITIES TO DO THINGS BETTER

ASSESSMENT CRITERIA:

1. Opportunities for improvement are identified proactively in own area of work.
2. Information are gathered and reviewed which may be relevant to ideas and which might assist in gaining support for idea.
3. Innovation and creativity are initiated with own scope of work

CONTENTS:

- The Empathy Map as a tool for identifying opportunities for improvement
- Brainstorming as a process to gather information for innovative ideas

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Contributing to Workplace Innovation)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO2. DISCUSS AND DEVELOP IDEAS WITH OTHERS

ASSESSMENT CRITERIA:

1. People who could provide input to ideas for improvements are identified.
2. Ways of approaching people to begin sharing ideas are selected.
3. Meeting is set with relevant people.
4. Ideas for follow up are review and selected based on feedback.
5. Critical inquiry method is used to discuss and develop ideas with others.

CONTENTS:

- Innovation strategy
- Getting inputs to sharpen innovative ideas
- Using feedback to further develop ideas

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Contributing to Workplace Innovation)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO3. INTEGRATE IDEAS FOR CHANGE IN THE WORKPLACE

ASSESSMENT CRITERIA:

1. Critical inquiry method is used to integrate different ideas for change of key people.
2. Summarizing, analyzing and generalizing skills are used to extract salient points in the pool of ideas.
3. Reporting skills are used to communicate results.
4. Current Issues and concerns on the systems, processes and procedures, as well as the need for simple innovative practices are identified.

CONTENTS:

- Critical Inquiry Method
- Summarizing and Reporting Skills
- Communicating Ideas for Change

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Contributing to Workplace Innovation)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

UNIT OF COMPETENCY : **PRESENT RELEVANT INFORMATION**

MODULE TITLE : **PRESENTING RELEVANT INFORMATION**

MODULE DESCRIPTOR : This Module covers the knowledge, skills and attitudes required to carry out gathering and assessment of relevant data and presenting data/information according to acceptable practices.

NOMINAL DURATION : 8 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

LO1. Gather data/ information

LO2. Assess gathered data/ information

LO3. Record and present information

LO1. GATHER DATA/ INFORMATION

ASSESSMENT CRITERIA:

1. Evidence, facts and information are collected according to specified needs.
2. Evaluation, terms of reference and conditions are reviewed to determine whether data/information falls within project scope.
3. Protocols and ethics in gathering and handling data/information is observed according to acceptable practices.

CONTENTS:

- Collecting data and information
- Confidentiality

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Contributing to Workplace Innovation)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO2. ASSESS GATHERED DATA / INFORMATION

ASSESSMENT CRITERIA:

1. Validity of data/ information is assessed based on needs.
2. Data analysis techniques are applied to assess data/ information.
3. Trends and anomalies are identified based on established process.
4. Data analysis techniques and procedures are documented.
5. Recommendations are solicited on areas of possible improvement.

CONTENTS:

- Steps in analyzing quantitative data
- Techniques on analyzing qualitative data

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Contributing to Workplace Innovation)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO3. RECORD AND PRESENT INFORMATION

ASSESSMENT CRITERIA:

1. Studied data/information are recorded as per organizational procedures.
2. Recommendations are analyzed for action to ensure they are compatible with the project's scope and terms of reference.
3. Interim and final reports are analyzed and outcomes are compared to the criteria established at the outset.
4. Findings are presented to stakeholders according to established practices.

CONTENTS:

- Presenting data
- Citing sources

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Contributing to Workplace Innovation)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

UNIT OF COMPETENCY : **PRACTICE OCCUPATIONAL HEALTH AND SAFETY PROCEDURES**

MODULE TITLE : **PRACTICING OCCUPATIONAL HEALTH AND SAFETY PROCEDURES**

MODULE DESCRIPTOR : This module covers the knowledge, skills and attitudes required to identify OSH compliance requirements, prepare OSH requirements for compliance, and perform tasks in accordance with relevant OSH policies and procedures.

NOMINAL DURATION : 4 hours

SUMMARY OF LEARNING OUTCOMES:

Upon completion of this module, the trainee/student must be able to:

LO1. Identify OSH compliance requirements

LO2. Prepare OSH requirements for compliance

LO3. Perform tasks in accordance with relevant OSH policies and procedures

LO1. IDENTIFY OSH COMPLIANCE REQUIREMENTS

ASSESSMENT CRITERIA:

1. Relevant OSH requirements, regulations, policies and procedures are identified in accordance with workplace policies and procedures.
2. OSH activity non-conformities are conveyed to appropriate personnel.
3. OSH preventive and control requirements are identified in accordance with OSH work policies and procedures.

CONTENTS:

- Occupational Safety and Health (OSH)
- Hazards and risks in the workplace
- General OSH Principles
- Key Elements of an Occupational Safety and Health Program
- OSH requirements, regulations, policies and procedures - DOLES's Republic Act 11058 (Declaration Policy) and DOLE Dept Order No. 198 s. 2018 – Implementing Rules and Regulation of RA 11058
- OSH Preventive and Control Requirements, including Implementing Rules and regulations on RA 11036 or the Mental Health Act
- Work Safety Tips for Employees
- S.A.M Principles or the Think Safe Steps- Spot the Hazard, Assess the Risk, Make the Changes
- Hierarchy of Controls

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Practicing Occupational Safety and Health Policies and Procedures)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO2. PREPARE OSH REQUIREMENTS FOR COMPLIANCE

ASSESSMENT CRITERIA:

1. OSH work activity material, tools and equipment requirements are identified in accordance with workplace policies and procedures.
2. Required OSH materials, tools and equipment are acquired in accordance with workplace policies and procedures.
3. Required OSH materials, tools and equipment are arranged/ placed in accordance with OSH work standards.

CONTENTS:

- Risks assessments
- Safe Handling Procedures of Tools, Equipment and Materials

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Practicing Occupational Safety and Health Policies and Procedures)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO3. PERFORM TASKS IN ACCORDANCE WITH RELEVANT OSH POLICIES AND PROCEDURES

ASSESSMENT CRITERIA:

1. Relevant OSH work procedures are identified in accordance with workplace policies and procedures.
2. Work activities are executed in accordance with OSH work standards.
3. Non-compliance work activities are reported to appropriate personnel.

CONTENTS:

- Working safely
- Safe practices and procedures when on the job: safety for electricity, fire, lifting and ladder use
- Compliance to OSH standards and practices

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Practicing Occupational Safety and Health Policies and Procedures)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

UNIT OF COMPETENCY : **EXERCISE EFFICIENT AND EFFECTIVE SUSTAINABLE PRACTICES IN THE WORKPLACE**

MODULE TITLE : **EXERCISING EFFICIENT AND EFFECTIVE SUSTAINABLE PRACTICES IN THE WORKPLACE**

MODULE DESCRIPTOR : This module covers knowledge, skills and attitude to identify the efficiency and effectiveness of resource utilization, determine causes of inefficiency and/or ineffectiveness of resource utilization and convey inefficient and ineffective environmental practices.

NOMINAL DURATION : 3 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Identify the efficiency and effectiveness of resource utilization

LO2. Determine causes of inefficiency and/or ineffectiveness of resource utilization

LO3. Convey inefficient and ineffective environmental practices

LO1. IDENTIFY THE EFFICIENCY AND EFFECTIVENESS OF RESOURCE UTILIZATION

ASSESSMENT CRITERIA:

1. Required resource utilization in the workplace is measured using appropriate techniques.
2. Data are recorded in accordance with workplace protocol.
3. Recorded data are compared to determine the efficiency and effectiveness of resource utilization according to established environmental work procedures.

CONTENTS:

- Sustainable Development
- Resource use in the home and workplace
- Sustainability Policies and Practices in the Workplace

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Exercising Efficient and Effective Sustainable Practices in the Workplace)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO2. DETERMINE CAUSES OF INEFFICIENCY AND/OR INEFFECTIVENESS OF RESOURCE UTILIZATION

ASSESSMENT CRITERIA:

1. Potential causes of inefficiency and/or ineffectiveness are listed.
2. Causes of inefficiency and/or ineffectiveness are identified through deductive reasoning.
3. Identified causes of inefficiency and/or ineffectiveness are validated thru established environmental procedures.

CONTENTS:

- Resource Conservation and Waste Reduction Techniques
- Inefficiencies and Challenges Faced in Reducing Resource Use and Waste

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Exercising Efficient and Effective Sustainable Practices in the Workplace)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case studies and scenarios

LO3. CONVEY INEFFICIENT AND INEFFECTIVE ENVIRONMENTAL PRACTICES

ASSESSMENT CRITERIA:

1. Efficiency and effectiveness of resource utilization are reported to appropriate personnel.
2. Concerns related resource utilization are discussed with appropriate personnel.
3. Feedback on information/ concerns raised are clarified with appropriate personnel.

CONTENTS:

- Complying to workplace procedures and practices related to environmental sustainability
- Reporting non-compliance

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Exercising Efficient and Effective Sustainable Practices in the Workplace)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test

UNIT OF COMPETENCY : **PRACTICE ENTREPRENEURIAL SKILLS IN THE WORKPLACE**

MODULE TITLE : **PRACTICING ENTREPRENEURIAL SKILLS IN THE WORKPLACE**

MODULE DESCRIPTOR : This module covers the outcomes required to apply entrepreneurial workplace best practices and implement cost-effective operations.

NOMINAL DURATION : 4 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Apply entrepreneurial workplace best practices

LO2. Communicate entrepreneurial workplace best practices

LO3. Implement cost-effective operations

LO1. APPLY ENTREPRENEURIAL WORKPLACE BEST PRACTICES

ASSESSMENT CRITERIA:

1. Good practices relating to workplace operations are observed and selected following workplace policy.
2. Quality procedures and practices are complied with according to workplace requirements.
3. Cost-conscious habits in resource utilization are applied based on industry standards.

CONTENTS:

- Workplace best practices, policies and criteria
- Resource utilization
- Ways in fostering entrepreneurial attitudes:
  - Patient
  - Honesty
  - Quality-consciousness
  - Safety-consciousness
  - Resourcefulness

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Practicing Entrepreneurial Skills in the Workplace)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO2. COMMUNICATE ENTREPRENEURIAL WORKPLACE BEST PRACTICES

ASSESSMENT CRITERIA:

1. Observed good practices relating to workplace operations are communicated to appropriate person.
2. Observed quality procedures and practices are communicated to appropriate person.
3. Cost-conscious habits in resource utilization are communicated based on industry standards.

CONTENTS:

- Workplace best practices, policies and criteria
- Resource utilization (best possible use of resources)
- Ways in fostering entrepreneurial attitudes:
  - Patient
  - Honesty
  - Quality-consciousness
  - Safety-consciousness
  - Resourcefulness

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Practicing Entrepreneurial Skills in the Workplace)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO3. IMPLEMENT COST-EFFECTIVE OPERATIONS

ASSESSMENT CRITERIA:

1. Preservation and optimization of workplace resources is implemented in accordance with enterprise policy.
2. Judicious use of workplace tools, equipment and materials are observed according to manual and work requirements.
3. Constructive contributions to office operations are made according to enterprise requirements.
4. Ability to work within one's allotted time and finances is sustained.

CONTENTS:

- Workplace Resource Optimization
- 5S (Sort, Set in Order, Shine, Standardize, Sustain) Procedures and Concepts
- Cost-Effectiveness Criteria
- Workplace Productivity
- Entrepreneurial Mindset Impact on Productivity
- Ways in fostering entrepreneurial attitudes:
  - Quality-consciousness
  - Safety-consciousness

CONDITIONS:

The students/trainees must be provided with the following

- Notebook
- Writing materials
- Learning Material (CBLM 21st Century Skills - Practicing Entrepreneurial Skills in the Workplace)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenario

MODULES OF INSTRUCTION

COMMON COMPETENCIES

ADDITIVE MANUFACTURING LEVEL II

UNIT OF COMPETENCY : **INTERPRET DRAWINGS AND SKETCHES**

MODULE TITLE : **INTERPRETING DRAWINGS AND SKETCHES**

MODULE DESCRIPTOR : This module covers the competencies required to read and interpret drawings and sketches.

NOMINAL DURATION : 10 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Interpret technical drawing

LO2. Interpret details from freehand sketch

LO1. INTERPRET TECHNICAL DRAWING

ASSESSMENT CRITERIA:

1. Dimensions identified as appropriate.
2. Instructions identified and followed as required.
3. Material requirements identified as required.
4. Symbols recognized as appropriate in the drawing/ sketch.
5. Tolerance, limits and fits identified in the drawing

CONTENTS:

- Purpose of Technical Drawings in Additive Manufacturing
- Basic Elements of Technical Drawings
- Dimensions and Measurement Interpretation
- Symbols and Conventions in Drawings
- Material Identification and Specifications
- Tolerances, Limits, and Fits

CONDITIONS:

The students/trainees must be provided with the following

- Ruler
- Compass
- Protractor
- Pencil
- Eraser
- Sharpener
- Digital Caliper
- Divider
- Computer or Laptop
- Projector or Smart TV
- Printer/Plotter
- Drawing Board
- Storage Cabinet
- Sample Technical Drawing
- Interpretation Worksheet
- Bond Paper
- Drawing Paper
- Ballpen
- Reference Sheet
- Material Data Sheet
- Tolerance Chart
- Masking Tape

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO2. INTERPRET DETAILS FROM FREEHAND SKETCH

ASSESSMENT CRITERIA:

1. Dimensions identified as appropriate.
2. Instructions identified and followed as required.
3. Material requirements identified as required.
4. Symbols recognized as appropriate in the drawing

CONTENTS:

- Elements of a Freehand sketch
- Interpretation of dimensions from sketches
- Common Sketch Symbols and Notations

CONDITIONS:

The students/trainees must be provided with the following

- Computer or Laptop with internet connection to access drawing/3d drawing application) or
- Free 3d drawing software
- Projector or Smart TV
- Printer/Plotter
- Drawing Board
- Storage Cabinet
- Ruler
- Compass
- Protractor
- Pencil
- Eraser
- Sharpener – Manual or mechanical type
- Digital Caliper
- Divider – 6-inch steel divider (shared)
- Sample Technical Drawing
- Interpretation Worksheet
- Bond Paper – A4, 80 gsm
- Drawing Paper – A3, 100 gsm, plain white
- Ballpen – Blue/Black ink, 0.5 mm tip
- Reference Sheet
- Material Data Sheet
- Tolerance Chart
- Masking Tape

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

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

MODULE TITLE : **PERFORMING BASIC WORKSHOP MEASUREMENTS AND COMPUTATIONS**

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

NOMINAL DURATION : 16 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Select and use measuring tools

LO2. Clean and store measuring tools

LO3. Perform four fundamental operations

LO4. Perform conversion of units

LO1. SELECT AND USE MEASURING TOOLS

ASSESSMENT CRITERIA:

1. Measuring tools are selected according to the requirement.
2. Measuring tools are used according to the requirement
3. The measuring technique used is correct and appropriate to the device used

CONTENTS:

- Types and Functions of Measuring Tools
- Measurement Units and Conversions
- Measuring Techniques
- Interpretation of Measurement Results
- Identifying appropriate measuring instruments to be used
- Use accurate measurements for the tasks given.
- Reading skills required to interpret work instruction
- Communication skills

CONDITIONS:

The students/trainees must be provided with the following

- Measuring tools
- Manual on measurement procedures

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO2. CLEAN AND STORE MEASURING TOOLS

ASSESSMENT CRITERIA:

1. Cleaning of devices undertaken according to standard operating procedures.
2. Care of devices undertaken according to manufacturer's specifications.
3. Storage of devices undertaken according to standard operating procedures.

CONTENTS:

- Types and functions of cleaning devices
- Using appropriate devices to avoid damage.
- Proper procedure in cleaning up the workplace before and after using
- Identifying the proper storage of the devices to be kept that met the
- manufacturer's specifications and standard to avoid damage in mismatching.
- Reading skills required to interpret work instruction
- Communication skills

CONDITIONS:

The students/trainees must be provided with the following

- Cleaning devices
- Manual of operation in cleaning devices
- Proper storage system

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO3. PERFORM FOUR FUNDAMENTAL OPERATIONS

ASSESSMENT CRITERIA:

1. Simple computations are performed using four fundamental operations.
2. Correct formulas are applied to isolate the variable required.
3. Simple transposition of variables in the formulae is carried out.
4. Unknown variables are solved correctly.

CONTENTS:

- Four fundamentals of mathematical operations
- Using of correct formulas
- Calculating simple transposition of variables to perform in the given tasks.

CONDITIONS:

The students/trainees must be provided with the following

- Manual for mathematical calculations
- Sample computations
- Writing materials

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO4. PERFORM CONVERSION OF UNITS

ASSESSMENT CRITERIA:

1. Familiarity to English system of measurement is required
2. Understanding the metric system is necessary.
3. Units are converted to the required figure using the given formula

CONTENTS:

- Familiarity and Understanding with the English system
- Conversions within the metric system and english system

CONDITIONS:

The students/trainees must be provided with the following

- Measuring and calculation tools
- Equipment for measurement tools
- Computer or workstation
- Software or digital application for measurement/conversion
- Workbench or stable measurement surface
- Display device (monitor/projector) for instructions
- Supplies (Paper, pens/pencils, log sheets or record sheets, instruction sheets, labels or tags, tape or markers, etc.)

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

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

MODULE TITLE : **CONTRIBUTE TO QUALITY MANAGEMENT SYSTEM (QMS)**

MODULE DESCRIPTOR : This module involves competence required to contribute to quality management system towards work

NOMINAL DURATION : 8 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Apply quality management system (QMS)

LO2. Apply quality standards to work

LO3. Protect company property and customer interests

LO1. APPLY QUALITY MANAGEMENT SYSTEM (QMS)

ASSESSMENT CRITERIA:

1. Appropriate quality systems and procedures are applied throughout the production/fabrication process.
2. Documented information are properly controlled
3. QMS are properly implemented and maintained

CONTENTS:

- Principle of quality management system
- Quality systems and procedures:
- Production process
- Fabrication process
- Implementation manual for quality management system
- Document and record control
- Filing systems
- Data storage

CONDITIONS:

The students/trainees must be provided with the following

- Computer or workstation
- Printer/scanner/copier (for documentation)
- Filing cabinets or storage system
- Software for document control or QMS management
- Projector/monitor (for training, presentations, or audits)
- Production/fabrication machinery (for practical QMS implementation)
- Checklist templates
- Inspection gauges
- Audit forms
- Pens/pencils
- Calculator
- Paper (for logs, reports, forms)
- Record sheets/checklists
- Labels or tags
- Binders or folders
- Clipboards
- Markers/highlighters
- Sticky notes or index tabs
- Envelopes or storage sleeves

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO2. APPLY QUALITY STANDARDS TO WORK

ASSESSMENT CRITERIA:

1. Inspections are conducted throughout the production processes to ensure quality standards are maintained.
2. Appropriate quality standards are applied throughout the production/fabrication processes.
3. All activities are coordinated throughout the workplace to ensure efficient quality work outcomes.
4. Records of work quality are maintained according to the
5. company requirements.

CONTENTS:

- Quality control system
- Quality standards for production/fabrication
- Records control
- Inspection procedures

CONDITIONS:

The students/trainees must be provided with the following

- Production/fabrication machines,
- Computers/workstations, printers/scanners, projectors, measurement devices, storage cabinets
- Inspection gauges, calipers, micrometers, rulers, measuring tape, thermometers, checklists, pens/pencils, calculators
- Paper, forms, log sheets, labels, clipboards, markers, binders, folders, sticky notes

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO3. PROTECT COMPANY PROPERTY AND CUSTOMER INTERESTS

ASSESSMENT CRITERIA:

1. Possible damage to company property is avoided by adherence to company quality procedures.
2. Quality of work is reviewed to ensure customer requirements and company standards
3. Customer feedback system is established.

CONTENTS:

- Company quality procedures
- Safety procedures
- Hazard awareness
- Quality checks
- Feedback systemComplaint handling

CONDITIONS:

The students/trainees must be provided with the following

- Computer/workstation, printers/scanners, projectors, storage cabinets
- Checklist templates, inspection gauges, measuring tools (caliper, ruler, tape), pens/pencils,
- calculator
- Paper, log sheets, forms, labels, clipboards, markers, binders, folders
- Sample workpieces, SOPs, inspection records, templates, feedback forms, customer survey documents

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

UNIT OF COMPETENCY : **USE HAND TOOLS**

MODULE TITLE : **USING OF HAND TOOLS**

MODULE DESCRIPTOR : This module covers the competencies required to use hand tools.

NOMINAL DURATION : 8 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Identify and use of Personal Protective Equipment (PPE)

LO2. Select and use of tools and equipment

LO3. Perform simple maintenance of tools and equipment

LO1. IDENTIFY AND USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

ASSESSMENT CRITERIA:

1. Personal protective equipment (PPE) is used in accordance with Rule 1080 of Occupational Safety and Health Standards
2. Proper Care and Maintenance of PPEs are performed in accordance with OSHS
3. Storage and Disposal of PPE are followed according to OSHS

CONTENTS:

- Types and functions of Personal protective equipment
- Occupational Safety and health standards
- PPEs care and maintenance
- Storage and disposal of PPEs

CONDITIONS:

The students/trainees must be provided with the following

- PPE items (helmets, gloves, goggles, masks, aprons, boots), lockers or storage racks, washing or cleaning stations
- PPE manuals or guidelines, OSHS reference documents
- PPE inspection checklist, cleaning tools (brush, cloth), measuring tape (for fitting), pens/pencils

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO2. SELECT AND USE OF TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

1. Hand tools selected are appropriate to the requirements of the task.
2. Tools and equipment are inspected according to manufacturer's recommendation
3. Tools and equipment are used as per operation manual Instructions.

CONTENTS:

- Types and functions of hand tools and equipment used
- Selecting appropriate hand tools
- Operation of hand tools and equipment
- Safety requirements of hand tools
- Inspection procedures for selected hand tools and equipment
- Operation manual instructions

CONDITIONS:

The students/trainees must be provided with the following

- Hand tools
- Equipment
- Manual of operation for inspection
- Operator's manual

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

LO3. PERFORM SIMPLE MAINTENANCE OF TOOLS AND EQUIPMENT

ASSESSMENT CRITERIA:

1. Tools and equipment are cleaned and lubricated (routine maintenance) according to manufacturer's recommendation.
2. Unsafe or defective tools are identified and marked for repair/ decommission according to procedure.
3. Minor tools and equipment repair are performed according to manufacturer's instruction or worksite procedure.

CONTENTS:

- Functions of tools and equipment
- Types and functions of cleaning materials
- Safety requirements of tools and equipment
- Common defects of tools and equipment
- SOP in repairing tools and equipment
- Preventive maintenance procedures

CONDITIONS:

The students/trainees must be provided with the following

- Hand tools and equipment
- Cleaning materials
- Safety manuals
- Repair kits
- Manual of Preventive maintenance

METHODOLOGIES:

- Group discussion (virtual or face-to-face)
- Interaction (virtual or face-to-face)
- Lecture (online-offline / face-to-face)
- Reportorial (online / distance learning)

ASSESSMENT METHODS:

- Observation
- Oral interview
- Written test
- Case Scenarios

MODULES OF INSTRUCTION

CORE COMPETENCIES

ADDITIVE MANUFACTURING LEVEL II

UNIT OF COMPETENCY : **PREPARE ADDITIVE MANUFACTURING MATERIALS**

MODULE TITLE : **PREPARING ADDITIVE MANUFACTURING MATERIALS**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required to handle the inventory of additive manufacturing materials and prepare the necessary tools to support additive manufacturing production and maintenance activities.

NOMINAL DURATION : 3 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Check inventory of additive manufacturing materials

LO2. Load additive manufacturing material

LO1. PREPARE BUILD ENVIRONMENT

ASSESSMENT CRITERIA:

1. Additive manufacturing feedstock is requested based on job order.
2. Types of feedstock (filament vs. resin) are identified correctly.

CONTENTS:

- Types of Additive Manufacturing feedstock:
  - Thermoplastic Filament.
  - Photosensitive Resin.
- Condition of additive manufacturing materials.
- Content of Job Order: Materials, Quantity, Design Files, Print Settings, Deadline, Post-Processing Requirements, Cost Estimate.
- Conditions on material selection

CONDITIONS:

Students/trainees must be provided with the following:

- Job order forms (physical or digital).
- Inventory lists/database access.
- Samples of different feedstock (PLA, ABS, Resin, etc.).
- Workstation with computer (if digital inventory).

METHODOLOGIES:

- Discussion (Types of materials and Job Orders).
- Hands-On (Performing the request for materials).

ASSESSMENT METHODS:

- Written Test (Identification of materials).
- Direct Observation (Simulation of the requesting process).

LO2. COLLECT ADDITIVE MANUFACTURING MATERIALS FROM INVENTORY

ASSESSMENT CRITERIA:

1. Quantity and quality of material are checked based on the job order.
2. Feedstock is logged based on inventory records.
3. Additive manufacturing materials are transferred to designated workshops safely.

CONTENTS:

- Material science:
  - Types of plastic filaments
  - Types of photopolymer resins
- Conditions of Materials (Mechanical Properties).
- Types of Inventory Records.
- Procedure for using the inventory management system (Logging/Retrieval).
- Quantity of Material (Amount, Weight, Measurement).
- Material waste management.
- Proper handling of sensitive materials.
- Proper use of PPEs.

CONDITIONS:

Students/trainees must be provided with the following:

- Inventory Logbooks or Management System.
- Personal Protective Equipment (PPE).
- Carts or containers for material transfer.
- Retrieval forms.

METHODOLOGIES:

- Discuss (Inventory process, forms, and OSH).
- Hands-on (Collection and transfer of materials).

ASSESSMENT METHODS:

- Direct Observation
- Practical Demonstration (of logging and retrieving materials)
- Oral Assessment / Interviews (on handling procedures)

UNIT OF COMPETENCY : **SET-UP ADDITIVE MANUFACTURING EQUIPMENT**

MODULE TITLE : **SETTING-UP ADDITIVE MANUFACTURING EQUIPMENT**

MODULE DESCRIPTOR : This unit module the skills, knowledge, and attitudes required to set up (additive manufacturing) equipment in preparation for production. It includes preparing the build environment, configuring the machine interface, loading additive manufacturing materials, and verifying process readiness in accordance with job order specifications and additive manufacturing process requirements.

NOMINAL DURATION : 3 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Prepare build environment

LO2. Load additive manufacturing material

LO1. PREPARE BUILD ENVIRONMENT

ASSESSMENT CRITERIA:

1. Build plate is prepared in accordance with the additive manufacturing process requirement.
2. Basic machine calibrations are made on the 3D printer components as necessary.
3. Machine environment is checked in accordance with process requirements.
4. Print file is made ready (uploaded/oriented) in accordance with the process.

CONTENTS:

- Principles of thermal expansion and material adhesion.
- Types of build plates (Heated, Magnetic, Glass) and Adhesives (PEI, Glue).
- Mechanics of motion systems.
- Calibration tools
- Physics/Thermodynamics for nozzle/bed temperatures.
- Effects of humidity on material composition.
- Print file types (.gcode, .3MF) and 3D coordinate systems (X, Y, Z).
- Operating machine interface for environmental conditions.
- Procedures for ensuring plate cleanliness.

CONDITIONS:

Students/trainees must be provided with the following:

- 3D Printer (FDM/SLA).
- Build plates and Adhesives.
- Cleaning agents (Isopropyl Alcohol).
- Calibration tools (Feeler gauge, paper, multimeter).
- Computer with slicing software/files.

METHODOLOGIES:

- Lecture (Build plates, adhesion science, file formats).
- Demonstration (Cleaning, leveling, uploading files).
- Hands-on Practice (Bed leveling for old version of 3D printers, interface navigation).

ASSESSMENT METHODS:

- Practical Demonstration (Bed leveling and file setup).
- Written Test (Calibration principles and).

LO2. LOAD ADDITIVE MANUFACTURING MATERIAL

ASSESSMENT CRITERIA:

1. Machine setup is verified based on types of material.
2. The additive manufacturing feedstock is loaded into the designated equipment based on the job order.

CONTENTS:

- Material science:
  - Composition of plastic filaments
  - Composition of photopolymer resins.
- Identifying machine components (Nozzle type, Vat type).
- Verifying material batch numbers and quantities.
- Proper material handling and loading procedures.
- OSH procedures for safe material handling.
- Proper storage of materials to prevent degradation (e.g., moisture).

CONDITIONS:

Students/trainees must be provided with the following:

- Filament spools and Resin bottles.
- 3D Printer (compatible with materials).
- PPE (Gloves, Safety Glasses).
- Job Order specifications.

METHODOLOGIES:

- Discussion (Material-Machine compatibility).
- Demonstration (Verifying nozzle/vat, safe loading).
- Hands-on Practice (Loading feedstock).

ASSESSMENT METHODS:

- Direct Observation (Safe loading techniques).
- Oral Questioning (Safety protocols).

UNIT OF COMPETENCY : **OPERATE ADDITIVE MANUFACTURING EQUIPMENT**

MODULE TITLE : **OPERATING ADDITIVE MANUFACTURING EQUIPMENT**

MODULE DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to perform 3D printing operations, monitor ongoing processes, and safely remove printed parts in accordance with additive manufacturing standards and procedures.

NOMINAL DURATION : 8 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Perform 3D printing job

LO2. Monitor printing process

LO3. Remove printed part

LO1. PERFORM 3D PRINTING JOB

ASSESSMENT CRITERIA:

1. File compatibility is checked in accordance with the additive manufacturing process.
2. Printing job is initiated from the machine interface in accordance with the additive manufacturing process.

CONTENTS:

- Additive Manufacturing processes (FFF, SLA, MSLA).
- File formats (.ufp, .gcode, .ctb).
- Principles of machine operation.
- Parameters affecting print quality.

CONDITIONS:

Students/trainees must be provided with the following:

- 3D Printer.
- Printable files.
- Machine Interface.

METHODOLOGIES:

- Lecture/Discussion (Machine principles).
- Demonstration (Initiating print).
- Hands-on Practice (Starting a job).

ASSESSMENT METHODS:

- Direct Observation
- Practical Demonstration
- Written Tests

LO2. MONITOR PRINTING PROCESS

ASSESSMENT CRITERIA:

1. The printing process is monitored for common failures.
2. Print failures or machine errors are addressed immediately.

CONTENTS:

- Thermal and chemical processes in fusion.
- Types of common failures (Warping, Layer shifting).
- Types of machine errors (Thermal runaway, Axis misalignment).
- Defects during build.
- Print time and material usage estimation.
- Documenting job progress and status reports.
- Methods of monitoring
  - Virtual
  - Actual
- Safe execution during long jobs.
- Safety measures during unattended printing.

CONDITIONS:

Students/trainees must be provided with the following:

- Active 3D Printer.
- Monitoring Log/Job Sheet.
- Reference images of print failures.

METHODOLOGIES:

- Interactive Lecture
- Live Monitoring

ASSESSMENT METHODS:

- Direct Observation
- Oral Assessment / Interviews
- Written Tests

LO3. REMOVE PRINTED PART

ASSESSMENT CRITERIA:

1. The finished part is carefully detached from the build plate.
2. The work area is kept clean and free from leftover materials.

CONTENTS:

- Material behavior during and after printing (brittleness, flexibility)
- Effects of thermal contraction on part release
  - Allow the printed part to cool down completely before removal from the build plate.
- Types of hand tools for part removal
- Part adhesion methods and safe detachment techniques
- Build plate types
- Workplace safety standards during part removal
- Proper collection and disposal of leftover materials (supports, rafts, excess resin)

CONDITIONS:

Students/trainees must be provided with the following:

- Completed 3D print on build plate.
- Removal tools (Scraper, Spatula, Pliers).
- PPE (Cut-resistant gloves).
- Waste bins.

METHODOLOGIES:

- Demonstration: Show safe part removal from different build plate types
- Hands-on Practice:
  - Trainees detach finished parts and clean the work area
  - Proper segregation and disposal of waste materials

ASSESSMENT METHODS:

- Direct Observation
- Practical Demonstration (of part removal and cleanup)
- Structured Practical Exercises

UNIT OF COMPETENCY : **PERFORM PRELIMINARY POST-PROCESSING OF 3D PRINTED OUTPUT**

MODULE TITLE : **PERFORMING PRELIMINARY POST-PROCESSING OF 3D PRINTED OUTPUT**

MODULE DESCRIPTOR : This module covers the knowledge, skills, and attitudes required to remove print supports safely and to perform appropriate washing and curing procedures to ensure finished additive manufacturing parts meet quality and safety standards.

NOMINAL DURATION : 8 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Remove print supports

LO2. Perform wash and cure procedure as appropriate

LO1. REMOVE PRINT SUPPORTS

ASSESSMENT CRITERIA:

1. Printed supports removed in accordance with appropriate techniques.
2. Printed supports removed in accordance with appropriate tools.
3. Personal Protective Equipment (PPE) used correctly in accordance with workplace safety procedures.

CONTENTS:

- Support removal techniques (Manual, Thermal, Solvent).
- Manual tools (Cutters, Pliers, Rotary tools)
  - Measurement
- Automated tools.
  - Measurement and selecting rotary bit sizes.
- Measurement and selecting Technical guidelines for support removal.
- Proper disposal of waste support material.
- OSH standards for tool handling.

CONDITIONS:

Students/trainees must be provided with the following:

- Printed parts with supports.
- Support removal toolkit (Flush cutters, pliers, rotary tool).
- PPE (Safety glasses, gloves).
- Disposal containers.

METHODOLOGIES:

- Lecture/Discussion: Types of support structures and removal strategies
- Demonstration: Proper and safe use of various support removal tools
- Hands-on Practice: Trainees remove supports from various sample 3D prints

ASSESSMENT METHODS:

- Direct Observation
- Practical Demonstration (of using removal tools)
- Oral Assessment / Interviews (on safety and technique)

LO2. PERFORM WASH AND CURE PROCEDURE AS APPROPRIATE

ASSESSMENT CRITERIA:

1. 3D printed part washed using the correct cleaning agent.
2. 3D printed part cured using Ultraviolet (UV) light.

CONTENTS:

- UV skin absorption risks and solvent risks
- Solvent properties (IPA).
- UV polymerization/cross-linking.
- Wash station and Cure station operation.
- Calculating wash and curing times based on thickness and application.
- Interpreting HAZMAT labels.
- Preventing chemical exposure and VOC containment.

CONDITIONS:

Students/trainees must be provided with the following:

- Resin printed parts (uncured).
- Wash Station & Cure Station.
- Isopropyl Alcohol (IPA).
- Chemical-resistant PPE.

METHODOLOGIES:

- Lecture/Discussion: Safety protocols (PPE), chemical handling, and UV curing
- Demonstration: Operating the wash and cure stations
- Practical Exercise: Trainees, with PPE, will wash and cure a resin 3D printed part

ASSESSMENT METHODS:

- Direct Observation
- Practical Demonstration (of operating wash/cure stations)
- Written Tests (on chemical safety and curing times)

UNIT OF COMPETENCY : **PERFORM BASIC MAINTENANCE ON 3D PRINTERS**

MODULE TITLE : **PERFORMING BASIC MAINTENANCE ON 3D PRINTERS**

MODULE DESCRIPTOR : This unit covers the knowledge, skills, and attitudes required to perform basic maintenance on 3d printers and to clean equipment and tools after operation in order to ensure proper functionality, extend service life, and maintain safe working conditions in additive manufacturing processes.

NOMINAL DURATION : 8 hours

SUMMARY OF LEARNING OUTCOMES:

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

LO1. Assess the machine for maintenance

LO2. Maintain the equipment and tools used after the operation

LO1. ASSESS THE MACHINE FOR MAINTENANCE

ASSESSMENT CRITERIA:

1. Parts are recognized if they have degraded due to wear and tear.
2. Basic machine components are lubricated or replaced.
3. Test print output is produced based on specifications.

CONTENTS:

- Friction and wear mechanics.
- Wearable components ID (Belts, Nozzles).
- Tracking operation hours and component life extension.
- Lubrication points and replacement procedures.
- Diagnostic test files (Calibration cubes).
- Dimensional accuracy checks.

CONDITIONS:

Students/trainees must be provided with the following:

- 3D Printer.
- Lubricants (Grease/Oil).
- Replacement parts (Nozzles/Belts).
- Diagnostic files.
- Tools (Wrenches, Screwdrivers)..

METHODOLOGIES:

- Lecture & Discussion: Identifying wear on 3D printer parts (nozzles, belts, build plates)
- Hands-on Lab: Inspecting a printer and diagnosing print quality issues related to worn components

ASSESSMENT METHODS:

- Practical Demonstration.
- Observation.

LO2. MAINTAIN THE EQUIPMENT AND TOOLS USED AFTER THE OPERATION

ASSESSMENT CRITERIA:

1. Non-conformance is documented according to specifications.
2. Cleaning tools and consumables are used and stored appropriately.
3. All maintenance activities are documented in standard logs.

CONTENTS:

- Chemical agents for FDM and SLA cleaning.
- Tool care and handling procedures
- Maintenance Logs and Non-conformance reports.
- Writing clear activity logs.
- Cleaning for energy efficiency and waste reduction.
- Tracing maintenance history.
- Organizational Literacy (Operational traceability).
- Accessing maintenance manual

CONDITIONS:

Students/trainees must be provided with the following:

- Cleaning consumables (IPA, Cloths).
- Maintenance Logsheets (Physical or Digital).
- Dirty tools/machine for cleaning.

METHODOLOGIES:

- Hands-on
  - Logging maintenance/issues
  - Cleaning tools and machine
  - Finalizing logs

ASSESSMENT METHODS:

- Direct Observation (Cleaning procedures).
- Projects or Work-Based Assignments (e.g., complete a full maintenance cycle)
- Practical Demonstration

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What is Competency-Based Curriculum (CBC)?

- ❑ A competency-based curriculum is a framework or guide for the subsequent detailed development of competencies, associated methodologies, training and assessment resources.

- ❑ The CBC specifies the outcomes which are consistent with the requirements of the workplace as agreed through the industry or community consultations.

- ❑ CBC can be developed immediately when competency standards exist.

- ❑ When competency standards do not exist, curriculum developers need to clearly define the learning outcomes to be attained. The standard of performance required must be appropriate to industry and occupational needs through the industry/enterprise or specified client group consultations.

These materials are available in both printed and electronic copies.

For more information please contact:
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