NATIONAL SKILLS QUALIFICATION

LEVEL 3

TITLE: COMPUTER AIDED DESIGN (CAD) & COMPUTER AIDED MANUFACTURING (CAM)

YEAR: 2024

NATIONAL SKILLS QUALIFICATION

NSQ LEVEL 3: COMPUTER AIDED DESIGN (CAD)/COMPUTER AIDED MANUFACTURING (CAM)

GENERAL INFORMATION

QUALIFICATION PURPOSE

This Qualification is designed to acquaint learners with knowledge and skills on how to use computer aided design (CAD) to create engineering drawings, parts and interface with computer aided manufacturing (CAM) processes.

QUALIFICATION OBJECTIVES

The learner should be able to: -

i. Work effectively within IT teams
ii. Convey technical information and collaborate with diverse stakeholders.
iii. Construct simple Geometric Shapes using CAD
iv. Create basic 3D models and advanced 2D drawings using CAD software
v. Apply the concepts of Computer-Aided Manufacturing (CAM) and CNC programming, emphasizing G-code
vi. Design, Prepare, and Print 3D models using 3D printing technologies.

Mandatory Units

Unit No	Reference Number	NOS Title	Credit Value	Guided Learning Hours	Remark
1	ICT/CDM/001/L3	Occupational Health and safety	1	10	Mandatory
2	ICT/CDM/002/L3	Teamwork	1	10	Mandatory
3	ICT/CDM/003/L3	Communication	1	10	Mandatory
4	ICT/CDM/004/L3	Fundamentals of CAD	3	30	Mandatory
5	ICT/CDM/005/L3	Basic 2D Drawing and Drafting	3	30	Mandatory
6	ICT/CDM/006/L3	Advanced 2D Drawing Techniques	3	30	Mandatory
7	ICT/CDM/007/L3	3D Modelling	3	30	Mandatory
8	ICT/CDM/008/L3	Fundamentals of CAM and CNC Programming G-Code Basics	3	30	Mandatory
9	ICT/CDM/009/L3	3D Printing	3	30	Mandatory
TOTAL			**21**	**210**	

NATIONAL SKILLS QUALIFICATION

LEVEL 3: COMPUTER AIDED DESIGN (CAD)/COMPUTER AIDED MANUFACTURING (CAM)

Unit 1: OCUPATIONAL HEALTH AND SAFETY

Unit Reference Number: ICT/CDM/001/L3
NSQ Level: 3

Credit Value: 1

Guided Learning Hours: 10

Unit Purpose:

This unit equips IT learners with the knowledge and skills to implement and maintain safe working practices in IT environments, ensuring personal and team safety while adhering to industry regulations and standards

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.

UNIT 001: Occupational Health and Safety

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand Workplace Health and Safety Regulations	1.1	Explain key OHS legislation and regulations relevant to the IT sector.									
	1.2	Identify the roles and responsibilities of individuals and organizations in maintaining a safe work environment									
	1.3	Describe the process for reporting health and safety risks and incidents.									
LO 2: Know Workplace Hazards and Implement Control Measures	2.1	Identify common hazards in IT work environments, including electrical, ergonomic, and data-related risks									
	2.2	Assess the severity and likelihood of potential hazards in specific IT tasks.									
	2.3	Implement appropriate control measures, such as safe cabling practices, ergonomic workstation setup, and electrical safety protocols.									
LO 3: Know Emergency Procedures and First Aid in the Workplace	3.1	Demonstrate the correct procedure for responding to workplace emergencies, such as electrical fires or equipment malfunctions.									
	3.2	Perform basic first aid techniques, including treating minor injuries and using first aid equipment									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	3.3	Communicate effectively with emergency services and other relevant personnel during a workplace incident.									
Learner's Signature							Date				
Assessor's Signature							Date				
IQA's Signature							Date				
EQA's Signature							Date				

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LEVEL 3: COMPUTER AIDED DESIGN (CAD)/COMPUTER AIDED MANUFACTURING (CAM)

Unit 002: Teamwork

Unit Reference Number: ICT/CDM/001/L3

NSQ Level: 3

Credit Value: 1

Guided Learning Hours: 10

Unit Purpose:

This unit is designed to equip learners' knowledge and skills in effective IT teamwork, fostering collaboration, problem-solving, and shared goal achievement.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.

UNIT 002: Teamwork

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Understand the Roles and Responsibilities within a Team	1.1	Identify the different roles and functions within an IT team (e.g., network engineers, system administrators, software developers).									
	1.2	Describe the key responsibilities and contributions of each team member.									
	1.3	Recognize the importance of each role in achieving the team's objectives.									
LO 2: Know Positive Working Relationships within a Team	2.1	Demonstrate techniques for effective interpersonal communication and conflict resolution in a team environment.									
	2.2	Show the ability to provide constructive feedback and actively listen to others' contributions									
	2.3	Promote inclusivity and collaboration among team members to ensure participation and engagement from all.									
LO 3: Contribute to Team Problem-Solving and	3.1	Participate in group discussions to identify and analyse IT-related problems.									
	3.2	Suggest innovative solutions and support team decision-making processes.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Decision-Making	3.3	Evaluate the effectiveness of team decisions and propose improvements where necessary.									
Learner's Signature							Date				
Assessor's Signature							Date				
IQA's Signature							Date				
EQA's Signature							Date				

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LEVEL 3: COMPUTER AIDED DESIGN (CAD)/COMPUTER AIDED MANUFACTURING (CAM)

Unit 003: Communication

Unit Reference Number: ICT/CDM/003/L3

NSQ Level: 3

Credit Value: 1

Guided Learning Hours: 10

Unit Purpose:

This unit is designed to equip learners with the knowledge and skills to effectively communicate technical information and collaborate with technical and non-technical stakeholders

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc.

UNIT 003: Communication

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Communicate Technical Information Clearly and Accurately	1.1	Explain IT concepts, procedures, and solutions in a manner appropriate to the audience, whether technical or non-technical.									
	1.2	Use industry-standard terminology correctly when describing technical processes									
	1.3	Adapt communication methods to suit the context, such as written reports, emails, or verbal presentations.									
LO 2: Utilize Digital Communication Tools Effectively	2.1	Demonstrate proficiency in using digital tools for communication, such as email, messaging platforms, and collaboration software (e.g., Slack, Teams).									
	2.2	Adhere to best practices for professional digital communication, including email etiquette and secure file sharing.									
	2.3	Use collaborative tools to share and receive feedback on documents, code, or project updates.									
LO 3: Listen and Respond	3.1	Demonstrate active listening skills during team discussions or client meetings.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
Appropriately in a Professional Context	3.2	Respond to questions, concerns, and feedback clearly and effectively.									
	3.3	Clarify misunderstandings and summarize discussions to ensure mutual understanding.									
Learner's Signature							Date				
Assessor's Signature							Date				
IQA's Signature							Date				
EQA's Signature							Date				

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LEVEL 3:

Unit 4: FUNDAMENTALS OF COMPUTER AIDED DESIGN

Unit Reference Number: ICT/CDM/004/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with the basic knowledge and skills required to create, modify, and manage computer aided designs.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Question and Answer (QA)
3. Witness Testimony (WT)
4. Assignment (ASS), etc

UNIT 04: FUNDAMENTALS COMPUTER AIDED DESIGN

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Know Computer Design and Drafting Process.	1.1	Explain advantages and disadvantages of computer in design process									
	1.2	Explain the evolution of CAD software.									
	1.3	Explain the Principles of Operation and system requirements of Auto CADD.									
LO 2: Understand the link between CAD and CAM	2.1	Explain Design to Manufacturing Workflow									
	2.2	Explain Data Integration									
	2.3	Explain Simulation and Optimisation									
	2.4	Explain Automation and Efficiency									
LO 3: Know popular CAD software.	3.1	Identify popular CAD software									
	3.2	Install CAD software.									
	3.3	Navigate CAD interface and basic work space.									
LO 4: Understand the principles, system requirements and	4.1	Explain principles of CAD software									
	4.2	Explain Operational Capabilities of CAD Software									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
functionalities of CAD software.	4.3	Explain System Requirements for CAD Software.									
	4.4	Identify different input methods in CAD									
LO 5: Know icons on CAD interface	5.1	Prepare the size of the drawing field (work space).									
	5.2	Use HELP Menu in solving CAD problems									
	5.3	Identify draw panel and modification panel.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

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LEVEL 3:

Unit 5: BASIC 2D DRAWING AND DRAFTING

Unit Reference Number: ICT/CDM/005/L3
NSQ Level: 3
Credit Value: 3
Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with the skills required for 2D drawing using CAD software.

Unit assessment requirements/ evidence requirements:
Assessment must be carried out in real workplace environment in which learning and human development is carried out. The **Work Product (WP)** assessment method is mandatory for this unit, in evaluating learners' competence, providing tangible evidence of their ability to create drawings using CAD software in a practical workplace environment.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Work Product (WP)
3. Question and Answer (QA)
4. Witness Testimony (WT)
5. Assignment (ASS), etc

UNIT 05: BASIC 2D DRAWING AND DRAFTING

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Know tools in draw panel.	1.1	Identify basic 2D shapes									
	1.2	Work with layers, line types, and dimensions.									
	1.3	Construct polygons and squares to given dimensions									
LO 2: Know tools in modify panel	2.1	Draw polar and rectangular arrays of any given 2D shape with array tool.									
	2.2	Use offset Command to produce multiple items.									
	2.3	Demonstrate how to Erase objects									
	2.4	Demonstrate how to Trim objects									
	2.5	Demonstrate how to fillet and chamfer angles									
LO 3: Know annotation tools	3.1	Write letters and numbers on drawings									
	3.2	Perform dimensioning of simple 2D shapes									
	3.3	Add tolerances to dimensions.									
	3.4	Create linear, angular and aligned dimensions.									
	3.5	Create hatch on any existing work									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 4: Know simple 2D editing tools	4.1	Use trim tool for editing simple 2D shapes									
	4.2	Use extend tool for editing simple 2D shapes									
	4.3	Use mirror and array tools for editing simple 2D shapes.									
LO 5: Understand plot, and print in CAD	5.1	Explain Plotting and Printing in CAD.									
	5.2	Set up plot environment.									
	5.3	Configure paper size and layout									
	5.4	Perform task involving Plot Styles and Line weights									
	5.5	Demonstrate how to Scale Drawings for Plotting									
	5.6	Create basic Layouts and Viewports									

Learner's Signature	Date
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EQA's Signature	Date

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Unit 6: ADVANCED 2D DRAWING TECHNIQUES

Unit Reference Number: ICT/CDM/006/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with knowledge and skills to create advanced 2D drawings using CAD software.

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. The **Work Product (WP)** assessment method is mandatory for this unit, in evaluating learners' competence, providing tangible evidence of their ability to create drawings using CAD software in a practical workplace environment.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Work Product (WP)
3. Question and Answer (QA)
4. Witness Testimony (WT)
5. Assignment (ASS), etc

UNIT 06: ADVANCED 2D DRAWING TECHNIQUES

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
LO 1: Know reusable elements in drawings.	1.1	Explain parametric constraints.									
	1.2	Create basic blocks									
	1.3	Demonstrate how to manage block attributes and parameters.									
	1.4	Use blocks in drawings									
	1.5	Perform editing and updating of blocks									
LO 2: Understand coordinate systems.	2.1	Explain Coordinate Systems in CAD									
	2.2	Explain World Coordinate System (WCS)									
	2.3	Explain User Coordinate System (UCS)									
	2.4	Use coordinate entry methods.									
	2.5	Perform task with Snap, grid, and object snap (OSNAP) tools.									

LO 3: Know drawing presentation and printing.	3.1	Explain drawing preparation for presentation									
	3.2	Use of Layouts and Viewports									
	3.3	Add Title Blocks and Borders to drawings.									
	3.4	Demonstrate Annotation for Presentation Drawings									
	3.5	Use Layers for Presentation Control									
	3.6	Set up Plot Styles and Plot Configurations.									
LO 4: Explore advanced editing techniques for complex drawings.	4.1	Explain advanced editing in CAD.									
	4.2	Perform task on advanced selection techniques.									
	4.3	Perform task on advanced modify commands.									
	4.4	Use Advance Fillet, Chamfer, and Blend Commands on existing drawings.									
	4.5	Use Splines, Polylines, and Curve Editing in 2D drawings.									

LO 5: Apply 2D drawing techniques to real-world scenarios	5.1	Draw a 2D floor plan showing the layout of rooms, furniture placement, and door openings in a house.									
	5.2	Draw a detailed 2D machine component showing exact measurements, tolerances, and materials.									
	5.3	Sketch a new smartphone design showing front, back, and side views with annotations for buttons and features.									
	5.4	Develop a 2D site plan for a park showing paths, playgrounds, and green spaces.									

Learner's Signature	Date
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LEVEL 4

Unit 7: 3D MODELLING

Unit Reference Number: ICT/CDM/007/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to provide learners with knowledge and skills to create basic 3D models using CAD software

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out. The **Work Product (WP)** assessment method is mandatory for this unit, in evaluating learners' competence, providing tangible evidence of their ability to create drawings using CAD software in a practical workplace environment.

Assessment methods to be used include:

1. 1. Direct Observation/oral questions (DO)
2. Work Product (WP)
3. Question and Answer (QA)
4. Witness Testimony (WT)
5. Assignment (ASS), etc

UNIT 07: 3D MODELING

LEARNING OBJECTIVE (LO) **The learner will:**		**PERFORMANCE CRITERIA** **The learner can:**	**Evidence Type**					**Evidence Ref. Page No.**			
LO 1: Understand the basic principles and concepts of 3D modelling.	1.1	Demonstrate how to move an object along the X, Y, Z-axis.									
	1.2	Use geometry types: Solid, Surface, and Mesh Modeling for modeling objects.									
	1.3	Use a cylinder as a base for modeling a column or a sphere.									
	1.4	Perform task involving Transformations: Move, Rotate, Scale.									
LO 2: Know 3D modelling tools in CAD	2.1	Use extrude tool to converts 2D shapes into 3D solids.									
	2.2	Create a 3D object by rotating a 2D shape around a specified axis.									
	2.3	Create a 3D object by sweeping a 2D profile along a specified path.									
	2.4	Use loft tool to create a 3D solid by blending multiple 2D shapes positioned on different planes.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	2.5	Modify the height of walls or create openings in solids using the press-pull tool.									
LO 3: Know 3D basic modelling tools.	3.1	Create basic 3D shapes with primitives.									
	3.2	Create 3D Shapes with extrusion tool.									
	3.3	Create circular objects with revolve tool.									
	3.4	Modify shapes with Boolean operations.									
	3.5	Create simple assemblies combining multiple shapes, to build more complex models									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

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Unit 8: FUNDAMENTALS OF COMPUTER AIDED MANUFACTURING (CAM) AND COMPUTER NUMERICAL CONTROL (CNC) PROGRAMMING G-CODE BASICS

Unit Reference Number: ICT/CDM/08/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with the basic concept of Computer-Aided Manufacturing (CAM) and CNC programming with a primary focus on G-code

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. Direct Observation/oral questions (DO)
2. Work Product (WP)
3. Question and Answer (QA)
4. Witness Testimony (WT)
5. Assignment (ASS), etc

UNIT 8: FUNDAMENTALS OF COMPUTER AIDED MANUFACTURING (CAM) AND COMPUTER NUMERICAL CONTROL (CNC) PROGRAMMING G-CODE BASICS

LEARNING OBJECTIVE (LO) **The learner will:**		**PERFORMANCE CRITERIA** **The learner can:**	**Evidence Type**					**Evidence Ref. Page No.**			
LO 1: Understand CAM in modern manufacturing.	1.1	Define CAM									
	1.2	Explain the role of CAM in the design-to-manufacturing process.									
	1.3	Differentiate between CAD and CAM									
	1.4	Explain Computer Integrated Manufacturing (CIM).									
	1.5	Explain manufacturing processes that benefit from CAM: • Milling • Turning • Laser cutting, etc.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	1.6	Explain real-world applications of CAM in industries: • Automotive, • Aerospace, • Consumer goods, etc.									
	1.7	Identify the common CAM software's (e.g., Mastercam, Fusion 360, Solid CAM).									
LO 2: Know CNC Milling Machines – Setup and Operation.	2.1	Apply safety protocols when working with CNC machines.									
	2.2	Explain milling process, tool types, and machine setup.									
	2.3	Demonstrate proper mounting of cutting tools, setting tool offsets, and zeroing the machine.									
	2.4	Carryout a step-by-step setup of a CNC milling machine,									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
		including tool loading and workpiece securing.									
	2.5	Perform basic milling operations by writing G & M codes to create slots and pockets.									
	2.6	Perform changing tools and recalibration of machine for different operations.									
LO 3: Know CNC Lathes and Turning Centres.	3.1	Set up a CNC lathe, including workpiece mounting, tool selection, and setting tool offsets.									
	3.2	Create basic cylindrical component from writing G & M codes, to perform turning, facing, and threading operations.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	3.3	Use threading tools to cut internal and external threads on the lathe.									
LO 4: Understand CNC Routers – Applications and Operations	4.1	Set up a CNC router for cutting a plywood sheet: • Securing the material • Calibrating the machine.									
	4.2	Use pre-programmed toolpaths to cut a simple shape or sign.									
	4.3	Test cutting different materials (wood, plastic, aluminum) to understand machine adjustments.									
LO 5: Know CNC Precision Cutting Techniques	5.1	Cut a simple metal shape using a plasma cutter.									
	5.2	Engrave a small design on acrylic or wood with a laser cutter.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	5.3	Adjust machine settings for different material thicknesses and types.									
LO 6: Know CNC Machine Maintenance and Troubleshooting.	6.1	Resolve common CNC machine errors: • Tool misalignment, • Programming errors									
	6.2	Perform calibration checks to ensure machine accuracy.									
	6.3	Perform basic maintenance on a CNC machine.									
	6.4	Diagnose a simulated machine error during operation.									
	6.5	Fix machine faults from diagnoses									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date

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Unit 9: 3D PRINTING

Unit Reference Number: ICT/CDM/009/L3

NSQ Level: 3

Credit Value: 3

Guided Learning Hours: 30

Unit Purpose: This unit is designed to equip learners with the skills and knowledge required to design, prepare, and print 3D models using 3D printing technologies

Unit assessment requirements/ evidence requirements:

Assessment must be carried out in real workplace environment in which learning and human development is carried out.

Assessment methods to be used include:

1. 1. Direct Observation/oral questions (DO)
2. Work Product (WP)
3. Question and Answer (QA)
4. Witness Testimony (WT)
5. Assignment (ASS), etc

UNIT 9: 3D PRINTING

LEARNING OBJECTIVE (LO) **The learner will:**		**PERFORMANCE CRITERIA** **The learner can:**	**Evidence Type**					**Evidence Ref. Page No.**			
LO 1: Understand fundamental of 3D Printing	1.1	Identify 3D printing software									
	1.2	Create 3D CAD model for 3D printing									
	1.3	Prepare the model for transfer to the 3D printer									
	1.4	Verify the model prepared									
	1.5	Perform printing of the model									
LO 2: Develop CAD Skills for 3D Printing	2.1	Create 3D models using CAD software,									
	2.2	Demonstrate how to design parts that are optimised for additive manufacturing.									
	2.3	Perform task on the entire 3D printing process, from model creation, slicing, printer setup and operation.									
	2.4	Demonstrate how to adjust print settings									
LO 3: Understand Material Properties and Selection	3.1	Identify common 3D printing materials									
	3.2	Explain the impact of material choice on print quality, strength, flexibility, and end-use performance.									
	3.3	Carryout task based on material selection									
LO 4: Know Post-Processing Techniques	4.1	Explain sanding as a post-processing method.									
	4.2	Perform basic post-processing methods.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	4.3	Identify safety considerations and practices when handling 3D printed parts and post-processing materials.									
LO 5: Develop Problem-Solving Skills for 3D Printing Challenges	5.1	Identify common 3D printing issues.									
	5.2	Troubleshoot common 3D printing issues, such as warping, layer adhesion problems, and print failures.									
	5.3	Solve problems related to complex prints or challenging geometries.									
LO 6: Understand the Role of 3D Printing in Industry	6.1	Explain applications of 3D printing in various sectors.									
	6.2	Identify the future trends of 3D printing, including advancements in multi-material printing, bioprinting, and large-scale applications.									
	6.3	Explain industry sectors utilising 3D printing									
	6.4	Explain current challenges, including material limitations, print speed, quality control, and the need for post-processing.									
LO 7: Know Emerging Trends and the Future of 3D Printing	7.1	Explain cutting-edge developments like multi-material printing, large-scale 3D printing, and the use of AI and machine learning to optimise printing processes.									

LEARNING OBJECTIVE (LO) The learner will:		PERFORMANCE CRITERIA The learner can:	Evidence Type					Evidence Ref. Page No.			
	7.2	Explain the role of 3D printing in sustainable manufacturing.									
	7.3	Explain smart materials and 4D printing as an emerging trend.									

Learner's Signature	Date
Assessor's Signature	Date
IQA's Signature	Date
EQA's Signature	Date