Model Curriculum

QP Name: Installer - Additive Manufacturing (3D Printing)

QP Code: IAS/Q5602

QP Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

Instrumentation Automation Surveillance & Communication Sector Skill Council
201-202 STBP NSIC Complex (Gate No. 02), Okhla Industrial Area, New Delhi-110020

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Training Parameters

Sector	Instrumentation Automation Surveillance and Communication
Sub-Sector	Instrumentation and Automation
Occupation	Installation and Commissioning
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	10th Pass or ITI (2 Years) after 8th Pass in the relevant sector/trade/stream
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	21/01/2020
Next Review Date	21/01/2025
NSQC Approval Date	
Version	1.0
Model Curriculum Creation Date	21/01/2020
Model Curriculum Valid Up to Date	21/01/2025
Model Curriculum Version	1.0
Minimum Duration of the Course	252 Hours, 0 Minutes
Maximum Duration of the Course	252 Hours, 0 Minutes

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Identify the role, responsibilities and scope of work of an Installer – Additive Manufacturing (3D Printing)
- Carry out the process of installing a 3D printer
- Perform maintenance support and provide technical support for 3D printer
- Design and optimise the operations of 3D printer
- Work effectively in a team
- Follow the safety procedures

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Introduction to 3D Printing and role of an Installer *Bridge Module*	15:00	10:00	-	02:00	27:00
IAS/N5606 - Install a 3D Printer **NOS Version No. 1.0** **NSQF Level 4**	**25:00**	**55:00**	**-**	**04:00**	**84:00**
Installation of 3D Printer	25:00	55:00	-	04:00	84:00
IAS/N5607 - Maintain and provide technical support for 3D Printer **NOS Version No. 1.0** **NSQF Level 4**	**25:00**	**45:00**	**-**	**06:00**	**76:00**
Maintenance and Technical Support of 3D Printer	25:00	45:00	-	06:00	76:00
IAS/N5608 - Operate and optimise 3D printing for additive manufacturing **NOS Version No. 1.0** **NSQF Level 4**	**15:00**	**30:00**	**-**	**08:00**	**53:00**
Operate and Optimise 3D Printing for Additive Manufacturing	15:00	30:00	-	08:00	53:00

IAS/N9001 - Work effectively with teams **NOS Version No. 1.0** **NSQF Level 4**	**06:00**	**06:00**	-	-	**12:00**
Soft Skills and Work Ethics	06:00	06:00	-	-	12:00
IAS/N9002 - Health and safety in workplace **NOS Version No. 1.0** **NSQF Level 4**	**10:00**	**10:00**	-	-	**20:00**
Basic Health and Safety Practices	10:00	10:00	-	-	20:00
Total Duration	**96:00**	**156:00**	-	**20:00**	**272:00**

Module Details

Introduction to 3D Printing and Role of an Installer

Terminal Outcomes:

- Identify the role, responsibilities of an Installer – Additive Manufacturing (3D Printing)

Duration: *15:00*	Duration: *10:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Describe the role and responsibilities of an installer - List the workflow—Design, Model, Print—and procedures - List the tools, equipment and accessories to be used for additive manufacturing (3D printing) - Identify different types of hardware and software used for additive manufacturing (3D printing) - List the basics of communication with the customer as well as ways of providing operational and technical support - Identify 3D printing technologies along with various advantages and disadvantages - Select the 3D printer manufacturer from the list of approved manufacturers provided by the organisation - Identify the accessories and technical support needed to perform printing - List the different types of methods to make adjustments, calibration and performance improvement	- Illustrate the use of tools and equipment and accessories used for additive manufacturing (3D printing) - Demonstrate using various 3D printing technologies
Classroom Aids:	
Laptop, white board, marker, projector	
Tools, Equipment and Other Requirements	
3D Printer with input material	

Installation of 3D Printer

Terminal Outcomes:

- Install a 3D printer

Duration: *25:00*	**Duration**: *55:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Identify the process of verification of shipping details - List the types of damage/defects on the 3D printer after unpacking the same - Identify the printer manual, accessories and tools required for the purpose of installation - Comply with the printing quality standards such as resolution, smooth edges etc. - List the type of errors and solution pertaining to format, calibration, resolution, speed etc. - List the required installation documents to be prepared and get sign-off from the customer	- Demonstrate how to verify shipping details with respect to model, specification etc. along with any kind of damage or deficiency - Illustrate how to report the damages/ defects to the person concerned as per SOP - Test the power-on routine of the printer - Demonstrate the step by step process of installation of printer and resolve errors, if any - Illustrate steps to verify successful installation of printer - Demonstrate taking test prints to check for print quality is as expected and take corrective action wherever required

Classroom Aids:
Laptop, white board, marker, projector

Tools, Equipment and Other Requirements
3D Printer with input material, tools

Maintenance and Technical Support for 3D Printer

Terminal Outcomes:

- Perform maintenance support and provide technical support for 3D printer

Duration: *25:00*	**Duration**: *45:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Identify ways to perform periodic preventive maintenance as per instruction manual - List necessary precautions to be taken while performing periodic maintenance - State the standard operating procedures (SOPs) for printer settings, print jobs, filament material etc. - Identify causes of error and their corresponding corrective action - List ways to keep the customer informed regarding resolution of the issue such as timeframe, material procurement etc.	- Demonstrate the use and process of performing preventive maintenance - Perform troubleshooting or contact technical support personnel in case of unresolved issues - Perform regular upgradation of hardware and software as per company policy - Perform periodic configuration and calibration as per company policy
Classroom Aids:	
Laptop, white board, marker, projector	
Tools, Equipment and Other Requirements	
3D Printer with input material, tools	

Operate and Optimise 3D Printing for Additive Manufacturing

Terminal Outcomes:

- Plan and optimize the operations of 3D printer

Duration: *15:00*	**Duration**: *30:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Identify the design, 3D model and the material before printing - List the correct format into which the file to be printed is to be imported - List the appropriate environment condition for performing 3D printing - Identify the post printing activities, such as optimisation and cleaning - List the different ways to optimize printing - Identify the proper cleaning procedure as per standards	- Check the design file, 3D model and the material before printing as per specifications - Perform connection of 3D printer with CAD design software and import the file to be printed - Illustrate the way to verify availability of required input material and required environment condition - Perform loading of required material and execute the printing process - Perform unloading of the printed model as per standard operating procedures - Perform shutdown process as per standard operating procedures - Implement post printing activities including optimisation and cleaning
Classroom Aids:	
Laptop, white board, marker, projector	
Tools, Equipment and Other Requirements	
3D Printer with input material, tools, Auto CAD or similar software	

Soft Skills and Work Ethics

Terminal Outcomes:

- Work effectively at the workplace

Duration: *06:00*	Duration: *06:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the importance of working towards team objectives and goals - Identify the code of conduct towards team members w.r.t. their culture, preferences, roles and responsibilities - Identify the importance of effective communication and interpersonal skills - Identify the common reasons for interpersonal conflicts and ways of managing them effectively - Identify the importance of standard operating procedures of the company w.r.t. privacy, confidentiality and security - Identify the issues with process flow improvements, quality of output, product defects received from previous process, repairs and maintenance of tools and machinery and handle them - Identify the need for implementing standards, guidelines and practices pertaining to gender sensitivity, including work ethics and workplace etiquettes - Identify the need for implementing standards, guidelines and practices pertaining to sensitivity towards Persons with Disabilities (PwD) - Explain the specific ways to help persons with disability overcome the challenges - List organisational guidelines for dress code, time schedules, language and other soft skill aspects	- Apply team building skills and assist colleagues to maximise effectiveness and efficiency in carrying out tasks - Apply appropriate communication skills and etiquettes while interacting with others - Demonstrate use of inclusive language irrespective of disability and the gender of the person - Demonstrate active listening skills while communicating - Illustrate how to interact with supervisor to receive instructions and report problems that need escalation - Demonstrate ideal workplace ethics while interacting with colleagues - Demonstrate working effectively with colleagues by assisting them whenever required - Illustrate appropriate behaviour towards all genders and differently abled people
Classroom Aids:	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	
Sample of escalation matrix, organisation structure.	

Basic Health and Safety Practices

Terminal Outcomes:

- Apply health and safety practices at the workplace

Duration: *10:00*	Duration: *10:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the importance of health and safety guidelines - List the components of a basic first-aid kit, safety tools and equipment - Identify the practices for maintaining safe and secure workplace - List the precautions for handling different types of cables and electrical equipment - List the daily safety instructions and the other recommended safety procedures for work—before starting work, while working, after finishing work - Describe the safety drills and health related activities scheduled in the organisation - Identify the types of fire and use correct fire extinguishers - Identify the general safety procedures and standard safety procedures for handling tools, equipment and hazardous materials - Identify the importance of good postures for lifting heavy objects - Explain the importance of efficient utilisation of material and water - Identify common practices of conserving electricity - List the common sources of pollution and ways to minimise it - Describe the concept of waste management and methods of waste disposal - List the different categories of waste for the purpose of segregation	- Apply methods of accident prevention in the work environment - Demonstrate using proper techniques for disposal of hazardous chemicals, tools and materials by following prescribed environmental norms or as per company policy - Report any abnormal situation/behaviour of any equipment/system to relevant authorities - Apply emergency rescue techniques during fire hazard - Apply first aid and bandage to victims - Illustrate the steps to free a person from electrocution, and artificial respiration and the CPR Process - Demonstrate correct use of fire extinguishers at the time of emergency - Illustrate the administration of basic first-aid at the time of emergency - Use defined emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of escape and so on - Use protective equipment suitable to tasks and work conditions - Demonstrate correct posture while sitting, standing, and handling heavy materials - Comply with the procedures for minimising waste and processes specified for disposal of hazardous waste
Classroom Aids:	
White board/ black board marker / chalk, duster, computer or Laptop attached to LCD projector	

Tools, Equipment and Other Requirements
Personal Protection Equipment: safety glasses, head protection, rubber gloves, safety footwear, warning signs and tapes, fire extinguisher and first aid kit

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	*Specialization*	*Years*	*Specialization*	
12th pass	Additive Manufacturing (3D Printing)	3	Additive Manufacturing (3D Printing)	2-3	Additive Manufacturing (3D Printing)	**NA**

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Installer and Operator-Additive Manufacturing (3D Printing)" mapped to QP: "IAS/Q5602". Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q2601". Minimum accepted score is 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
12th pass	Additive Manufacturing (3D Printing)	3	Additive Manufacturing (3D Printing)	2-3	Additive Manufacturing (3D Printing)	NA

Assessor Certification	
Domain Certification	Platform Certification
Certified for Job Role: "Installer and Operator-Additive Manufacturing (3D Printing)" mapped to QP: "IAS/Q5602". Minimum accepted score is 80%	Recommended that the Assessor is certified for the Job Role: "Assessor", mapped to the Qualification Pack: "MEP/Q2701". Minimum accepted score is 80%

Assessment Strategy

1. Assessment System Overview:

    - Batches assigned to the assessment agencies for conducting the assessment on SDSM/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:

    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training
    - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m
    - If the batch size is more than 30, then there should be 2 Assessors
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP)
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly
    - Check the availability of the Lab Equipment for the particular Job Role

3. Assessment Quality Assurance levels / Framework:

    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - Assessor must be ToA certified & trainer must be ToT Certified
    - Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Center photographs with signboards and scheme specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - Hard copies of the documents are stored
    - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
    - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives