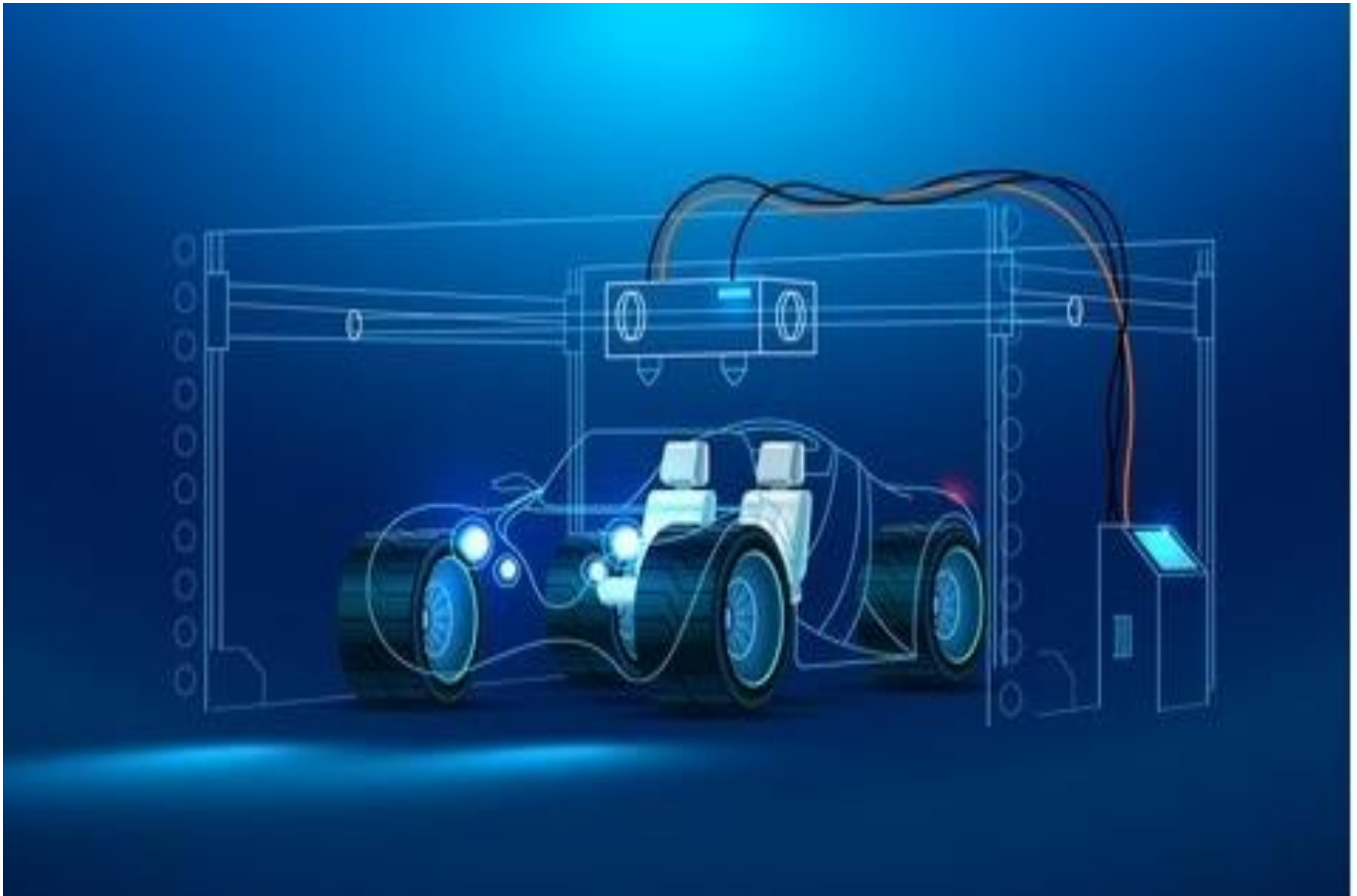


Qualification Pack



Automotive Additive Manufacturing Operator

QP Code: ASC/Q6410

Version: 1.0

NSQF Level: 3

Automotive Skills Development Council || 153, GF, Okhla Industrial Area, Phase 3
New Delhi 110020

Qualification Pack

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ASC/Q6410: Automotive Additive Manufacturing Operator

Brief Job Description

The individual in this job is responsible for operating and maintaining 3D printing machine for manufacturing of automotive parts

Personal Attributes

The person should be organised, team-oriented and have the ability to work independently for long hours in adverse conditions. They should be result-oriented, keen observers and have an eye for detail and quality

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ASC/N9803: Organize work and resources \(Manufacturing\)](#)
2. [ASC/N9802: Interact effectively with colleagues, customers and others](#)
3. [ASC/N6427: Operate and maintain 3D printing machine for product generation](#)

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Production Engineering
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2144.0801

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Minimum Educational Qualification & Experience	8th Class Pass with 1 year of relevant experience OR 8th Class Pass + ITI OR 10th Class pass
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	30/12/2021
Next Review Date	30/12/2024
NSQC Approval Date	30/12/2021
Version	1.0
Reference code on NQR	2021/AUT/ASDC/04779
NQR Version	1.0

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ASC/N9803: Organize work and resources (Manufacturing)

Description

This NOS unit is about implementing safety, planning work, adopting sustainable practices for optimising use of resources

Scope

The scope covers the following :

- Maintain safe and secure working environment
- Health and hygiene
- Perform work as per quality standards
- Effective waste management practices
- Material/energy conservation practices

Elements and Performance Criteria

Maintain safe and secure working environment

To be competent, the user/individual on the job must be able to:

- PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace
- PC2. follow safe working practices while dealing with hazards to ensure safety of self and others
- PC3. carry out routine check of the machine for identifying potential hazards
- PC4. use appropriate protective clothing/equipment for specific tasks and work
- PC5. follow safety hazards and preventive techniques during fire drill
- PC6. report any identified breaches in health, safety and security policies and procedures to the designated person

Health and hygiene

To be competent, the user/individual on the job must be able to:

- PC7. ensure workstation and equipment are regularly clean and sanitized
- PC8. clean hands with soap, alcohol-based sanitizer regularly
- PC9. avoid contact with ill people and self-isolate in a similar situation
- PC10. wear and dispose PPEs regularly and appropriately
- PC11. report advanced hygiene and sanitation issues to appropriate authority
- PC12. follow stress and anxiety management techniques

Perform work as per quality standards

To be competent, the user/individual on the job must be able to:

- PC13. ensure that work is accomplished as per the requirements within the specified timeline
- PC14. ensure team goals are given preference over individual goals

Effective waste management practices

To be competent, the user/individual on the job must be able to:

- PC15. follow the fundamentals of 5S for waste management

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- PC16. segregate waste into different categories
- PC17. follow processes specified for disposal of hazardous waste
- PC18. identify recyclable, non-recyclable and hazardous waste
- PC19. dispose non-recyclable, recyclable and reusable waste appropriately at identified location

Material/energy conservation practices

To be competent, the user/individual on the job must be able to:

- PC20. identify ways to optimize usage of material in various tasks/activities/processes
- PC21. check for spills/leakages in various tasks/activities/processes
- PC22. plug spills/leakages and escalate to appropriate authority if unable to rectify
- PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required
- PC24. report malfunctioning (fumes/ sparks/emission/vibration/noise) and lapse in maintenance of equipment
- PC25. ensure electrical equipment and appliances are properly connected and turned off when not in use

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context
- KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same
- KU3. evacuation procedures for workers and visitors
- KU4. how and when to report hazards as well as the limits of responsibility for dealing with hazards
- KU5. potential hazards, risks and threats based on the nature of work
- KU6. preventative and remedial actions to be taken in case of exposure to toxic material
- KU7. various types of fire extinguisher
- KU8. various types of safety signs and their meaning
- KU9. appropriate first aid treatment relevant to different condition e.g. bleeding, minor burns, eye injuries etc.
- KU10. relevant standards, procedures and policies related to 5S followed in the company
- KU11. the various materials used and their storage norms
- KU12. efficient utilisation of material and water
- KU13. basics of electricity and prevalent energy efficient devices
- KU14. common practices of conserving electricity
- KU15. common sources and ways to minimize pollution
- KU16. categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics
- KU17. usage of different colors of dustbins

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KU18. waste management techniques

KU19. significance of greening

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read safety instructions/guidelines

GS2. modify work practices to improve them

GS3. ask for clarifications from superior about the job requirement

GS4. work with supervisors/team members to carry out work related tasks

GS5. complete tasks efficiently and accurately within stipulated time

GS6. inform/report to concerned person in case of any problem

GS7. make timely decisions for efficient utilization of resources

GS8. write reports such as accident report, in at least English/regional language

GS9. be punctual and utilize time efficiently

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain safe and secure working environment</i>	11	5	-	7
PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace	2	1	-	2
PC2. follow safe working practices while dealing with hazards to ensure safety of self and others	2	-	-	1
PC3. carry out routine check of the machine for identifying potential hazards	2	1	-	1
PC4. use appropriate protective clothing/equipment for specific tasks and work	2	1	-	1
PC5. follow safety hazards and preventive techniques during fire drill	2	1	-	1
PC6. report any identified breaches in health, safety and security policies and procedures to the designated person	1	1	-	1
<i>Health and hygiene</i>	7	5	-	2
PC7. ensure workstation and equipment are regularly clean and sanitized	2	2	-	1
PC8. clean hands with soap, alcohol-based sanitizer regularly	1	1	-	1
PC9. avoid contact with ill people and self-isolate in a similar situation	1	-	-	-
PC10. wear and dispose PPEs regularly and appropriately	1	-	-	-
PC11. report advanced hygiene and sanitation issues to appropriate authority	1	1	-	-
PC12. follow stress and anxiety management techniques	1	1	-	-
<i>Perform work as per quality standards</i>	5	3	-	2
PC13. ensure that work is accomplished as per the requirements within the specified timeline	2	2	-	1

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. ensure team goals are given preference over individual goals	3	1	-	1
<i>Effective waste management practices</i>	15	10	-	4
PC15. follow the fundamentals of 5S for waste management	3	2	-	1
PC16. segregate waste into different categories	2	1	-	-
PC17. follow processes specified for disposal of hazardous waste	2	2	-	1
PC18. identify recyclable, non-recyclable and hazardous waste	4	2	-	1
PC19. dispose non-recyclable, recyclable and reusable waste appropriately at identified location	4	3	-	1
<i>Material/energy conservation practices</i>	12	7	-	5
PC20. identify ways to optimize usage of material in various tasks/activities/processes	2	1	-	1
PC21. check for spills/leakages in various tasks/activities/processes	2	1	-	1
PC22. plug spills/leakages and escalate to appropriate authority if unable to rectify	2	1	-	-
PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required	2	2	-	1
PC24. report malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment	2	1	-	1
PC25. ensure electrical equipment and appliances are properly connected and turned off when not in use	2	1	-	1
NOS Total	50	30	-	20

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9803
NOS Name	Organize work and resources (Manufacturing)
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
NSQC Clearance Date	30/12/2021

Qualification Pack

ASC/N9802: Interact effectively with colleagues, customers and others

Description

This NOS unit is about communicating with customers and colleagues/superiors, either in own work group or in other work groups within organisation.

Scope

The scope covers the following :

- Communicate effectively with colleagues, customers and others
- Interact with supervisor or superior

Elements and Performance Criteria

Communicate effectively with colleagues, customers and others

To be competent, the user/individual on the job must be able to:

- PC1. maintain clear communication with colleagues, customers and others, wherever needed, through all means i.e. face-to-face, telephonic or written
- PC2. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity
- PC3. work in a way that shows respect for colleagues and others
- PC4. follow the organisation's policies and procedures while working in a team
- PC5. respect personal space of colleagues and customers

Interact with supervisor or superior

To be competent, the user/individual on the job must be able to:

- PC6. identify work requirements by receiving instructions from reporting supervisor
- PC7. escalate problems to supervisors that cannot be handled including repairs and maintenance of machine
- PC8. report the completed work
- PC9. rectify errors as per feedback

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the importance of effective communication and establishing good working relationships with colleagues and supervisor
- KU2. different methods of communication as per the circumstances
- KU3. gender based concepts, issues and legislation

Generic Skills (GS)

User/individual on the job needs to know how to:

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- GS1. read instructions/guidelines/procedures
- GS2. listen effectively and orally communicate information
- GS3. ask for clarification and advice from the concerned person
- GS4. maintain positive and effective relationships with colleagues and customers
- GS5. evaluate the possible solution(s) to the problem
- GS6. deliver consistent and reliable service to customers
- GS7. complete written work with attention to detail
- GS8. check that the work meets customer requirements

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicate effectively with colleagues, customers and others</i>	36	11	-	14
PC1. maintain clear communication with colleagues, customers and others, wherever needed, through all means i.e. face-to-face, telephonic or written	8	-	-	4
PC2. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity	8	-	-	-
PC3. work in a way that shows respect for colleagues and others	7	4	-	3
PC4. follow the organisation's policies and procedures while working in a team	7	4	-	3
PC5. respect personal space of colleagues and customers	6	3	-	4
<i>Interact with supervisor or superior</i>	14	19	-	6
PC6. identify work requirements by receiving instructions from reporting supervisor	7	4	-	-
PC7. escalate problems to supervisors that cannot be handled including repairs and maintenance of machine	-	5	-	3
PC8. report the completed work	7	5	-	-
PC9. rectify errors as per feedback	-	5	-	3
NOS Total	50	30	-	20

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9802
NOS Name	Interact effectively with colleagues, customers and others
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
NSQF Clearance Date	30/12/2021

Qualification Pack

ASC/N6427: Operate and maintain 3D printing machine for product generation

Description

This NOS is about operation and maintenance of 3D printing machines for product generation and performing the post processing of the fabricated product as per organizational standards.

Scope

The scope covers the following :

- Prepare for 3D printing work
- Select and upload code files into system memory
- Perform printing operations
- Perform post-printing activities
- Carry out maintenance of 3D Printing machine

Elements and Performance Criteria

Prepare for 3D printing work

To be competent, the user/individual on the job must be able to:

- PC1. identify the work to be done and work requirements by interpreting instructions received from the supervisor
- PC2. identify and select suitable 3D printing machine as per specified machine specifications (i.e. build speed, extrusion speed, nozzle temperature) and raw material to print the automotive components as per product specifications
- PC3. check material and machine for any issues and required quality standards before use
- PC4. determine the part orientation and support structure requirement from Computer Aided Design (CAD) data
- PC5. set the 3D printing machine and its parameters such as room temperature range, air cleanliness as per SOP/WI
- PC6. clean the 3D printing machine by following organisational recommended process before starting the operation

Select and upload code files into system memory

To be competent, the user/individual on the job must be able to:

- PC7. select the standard tessellation language (.stl) code file needed for machine operation
- PC8. connect the data storage devices with the machine
- PC9. coordinate with designer to rectify any errors which are generated during the file uploading process or errors observed during the running of the process

Perform printing operations

To be competent, the user/individual on the job must be able to:

- PC10. pre-heat the bed of the machine to adequate temperature as per process specifications
- PC11. set the laser or nozzles temperature to defined values as per process specification

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- PC12. start and operate the machine and perform 3D printing operations as per SOP/WI
- PC13. use the emergency stop button in case of any unfavorable situation
- PC14. rectify any process errors if any during the machine operation and report the same to the concerned person as per organizational guidelines

Perform post-printing activities

To be competent, the user/individual on the job must be able to:

- PC15. remove the printed part from machine without damaging its structure
- PC16. identify & carefully remove the support structures present in the fabricated part
- PC17. clean the part for improving the surface finish as per SOP
- PC18. clean and store the tools, equipment and auxiliaries after completion of work as per the guidelines
- PC19. inspect the part as per the drawing/process using for required quality and if non-conforming, take action as per organisational guidelines
- PC20. store & preserve the automotive parts manufactured as per organizational guidelines and procedures

Carry out maintenance of 3D Printing Machine

To be competent, the user/individual on the job must be able to:

- PC21. perform daily check of machine's critical parts as per maintenance checklist or manufacturer guidelines
- PC22. carry out minor repairs, adjustments and alignment of loose bolts, belts, drive slacks, guards and covers
- PC23. carry out troubleshooting of machine for issues and defects identification
- PC24. perform lubrication of machine by using appropriate lubricant
- PC25. place tags on machines for next maintenance cycles
- PC26. maintain records of maintenance activities done on machine as per organizational procedures

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. relevant manufacturing standards and procedures followed in the company
- KU2. organization methodology/procedures used for automotive product design
- KU3. Technology 3D Printing such as Fused Deposition Modelling, Stereo Lithography, Metal Laser Sintering
- KU4. symbols and notifications being displayed by the 3D Printing machine and their corresponding meaning
- KU5. functionality of different buttons and switches available on the machine dashboard
- KU6. how to upload and remove code files from the machine memory
- KU7. preservation of critical electronic parts/equipment from moisture/heat/environmental external conditions as specified in the process
- KU8. how to maintain the log book for produced parts
- KU9. how to detect and rectify error at various stages of part generation

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- KU10. recommended process for cleaning machine
- KU11. post-processing techniques
- KU12. types of materials available for fabrication in various 3D printing technique
- KU13. various inspection methods for inspecting the quality of product
- KU14. optimum temperature range, air cleanliness and humidity required for the machine
- KU15. techniques of fabricating a component with 3D Printing
- KU16. maintenance activities for a 3D printing machine

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. read equipment manuals and process documents
- GS2. attentively listen and comprehend the information given by the process managers
- GS3. communicate effectively at the workplace
- GS4. write observations and any work related information in English/regional language
- GS5. recognise a workplace problem and take suitable action
- GS6. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently
- GS7. complete assigned tasks in a timely and efficient manner

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare for 3D printing work</i>	7	11	-	4
PC1. identify the work to be done and work requirements by interpreting instructions received from the supervisor	1	1	-	1
PC2. identify and select suitable 3D printing machine as per specified machine specifications (i.e. build speed, extrusion speed, nozzle temperature) and raw material to print the automotive components as per product specifications	2	4	-	1
PC3. check material and machine for any issues and required quality standards before use	1	1	-	-
PC4. determine the part orientation and support structure requirement from Computer Aided Design (CAD) data	2	1	-	1
PC5. set the 3D printing machine and its parameters such as room temperature range, air cleanliness as per SOP/WI	1	3	-	1
PC6. clean the 3D printing machine by following organisational recommended process before starting the operation	-	1	-	-
<i>Select and upload code files into system memory</i>	2	4	-	1
PC7. select the standard tessellation language (.stl) code file needed for machine operation	1	2	-	-
PC8. connect the data storage devices with the machine	-	1	-	-
PC9. coordinate with designer to rectify any errors which are generated during the file uploading process or errors observed during the running of the process	1	1	-	1
<i>Perform printing operations</i>	7	11	-	5

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. pre-heat the bed of the machine to adequate temperature as per process specifications	2	3	-	1
PC11. set the laser or nozzles temperature to defined values as per process specification	1	3	-	1
PC12. start and operate the machine and perform 3D printing operations as per SOP/WI	2	2	-	1
PC13. use the emergency stop button in case of any unfavorable situation	-	1	-	1
PC14. rectify any process errors if any during the machine operation and report the same to the concerned person as per organizational guidelines	2	2	-	1
<i>Perform post-printing activities</i>	4	10	-	4
PC15. remove the printed part from machine without damaging its structure	-	2	-	1
PC16. identify & carefully remove the support structures present in the fabricated part	1	1	-	1
PC17. clean the part for improving the surface finish as per SOP	-	1	-	-
PC18. clean and store the tools, equipment and auxiliaries after completion of work as per the guidelines	1	2	-	1
PC19. inspect the part as per the drawing/process using for required quality and if non-conforming, take action as per organisational guidelines	1	2	-	1
PC20. store & preserve the automotive parts manufactured as per organizational guidelines and procedures	1	2	-	-
<i>Carry out maintenance of 3D Printing Machine</i>	10	14	-	6
PC21. perform daily check of machine's critical parts as per maintenance checklist or manufacturer guidelines	2	4	-	2

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. carry out minor repairs, adjustments and alignment of loose bolts, belts, drive slacks, guards and covers	2	3	-	2
PC23. carry out troubleshooting of machine for issues and defects identification	2	3	-	1
PC24. perform lubrication of machine by using appropriate lubricant	-	1	-	-
PC25. place tags on machines for next maintenance cycles	2	2	-	-
PC26. maintain records of maintenance activities done on machine as per organizational procedures	2	1	-	1
NOS Total	30	50	-	20

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National Occupational Standards (NOS) Parameters

NOS Code	ASC/N6427
NOS Name	Operate and maintain 3D printing machine for product generation
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Production Engineering
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
NSQC Clearance Date	30/12/2021

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.
5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

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Minimum Aggregate Passing % at QP Level : 65

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N9803.Organize work and resources (Manufacturing)	50	30	-	20	100	15
ASC/N9802.Interact effectively with colleagues, customers and others	50	30	-	20	100	10
ASC/N6427.Operate and maintain 3D printing machine for product generation	30	50	-	20	100	75
Total	130	110	-	60	300	100

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Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
PPE	Personal Protective Equipment
PwD	Person with Disability
SOP	Standard Operating Practices
PwD	Persons with Disability

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Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

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Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.