Product Reverse Engineering

Unit Code: ASC/N8115

Version: 1.0

NSQF Level: 5.5

Automotive Skills Development Council || 153, GF, Okhla Industrial Area, Phase 3
New Delhi 110020 || email:garima@asdc.org.in

Description

This NOS unit is about scanning the object, carry out reverse engineering for product modification, designing of new models by using appropriate computer graphic techniques and 3D printing of designed model for developing the protype of product.

Scope

The scope covers the following :

- Carry out object scanning, reverse engineering and designing modified component
- Develop product prototype by 3D printing

Elements and Performance Criteria

Carry out object scanning, reverse engineering and designing modified component

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

PC1. obtain the design requirements and specifications such as material used for making the component, packaging and other requirements to decide the dimensions, measurements and tolerances of the aggregate/component and instructions from the design team or supervisor

PC2. prepare the object for scanning by spray coat a temporary matte powder on object to improve scan accuracy

PC3. use a high accuracy 3D scanner to capture the important sections of the part

PC4. scan the object and create mesh files of the object in 3D scanner by following SOP

PC5. import the mesh files or scanned data into CAD software equipped with reverse engineering tools

PC6. extract the shape of the scan in order to create a solid model that is editable with CAD tools i.e. semi-automatic surfacing, automatic surfacing, and manual redrawing

PC7. identify flaws in the scanned model, fix issues and create a blueprint by using reverse engineering tools in CAD software

PC8. use the scanned data or model of object in CAD software as a reference for reverse engineering process

PC9. Create a rectified 3D model of product

PC10. prepare layouts and various views of drawing to generate a relationship between components and assemblies

PC11. Submit the drawings to the supervisor and design team

PC12. tag and store the drawings with the right numbers and codes properly as per the organisational guidelines

PC13. convert the object model into STL or AMF file format as per the 3D printer requirement.

PC14. transfer the verified object model STL / AMF file into portable storage device or directly to 3D printer as per SOP/WI

Develop product prototype by 3D printing

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

PC15. set the 3D printing machine and its parameters such as room temperature range, air cleanliness as per SOP/WI

PC16. select encoding format for the 3D printing program file

PC17. set the part orientation, printing time & the amount of material used on the machine

PC18. set the laser or nozzles temperature to defined values as per process specification

PC19. start and operate the machine and perform 3D printing operations as per SOP/WI to develop prototype of product

PC20. rectify any process errors if any during the machine operation and report the same to the concerned person as per organizational guidelines

PC21. remove the printed prototype of product from machine without damaging its structure

PC22. clean the prototype for improving the surface finish as per SOP

PC23. inspect the prototype as per the drawing/process using for required quality and if nonconforming, take action as per organisational guidelines

PC24. store & preserve the prototype of product manufactured as per organizational guidelines and procedures

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. relevant standards and procedures followed in the company

KU2. Reverse engineering 3D

KU3. steps of the reverse engineering process

KU4. different types of 3D scanners

KU5. working mechanism of 3D scanner

KU6. procedure of using 3D scanner and printer

KU7. various requirements in terms of design and utility of the component

KU8. different types of designing processes and associated software like CATIA, AutoCAD, Unigraphics etc

KU9. Droughting Standards & Techniques- e.g. ANSI series IS/ ISO

KU10. technical drawing practices as per the company standards

KU11. drawings and modelling techniques like 2D and 3D

KU12. different type of views generated in engineering drawings

KU13. computer programming and drafting

KU14. Limits & Fits, GD&T etc.

KU15. algebra and trigonometric rules and applications

KU16. how to interpret Tolerance Analysis sheet supplied by the design team

KU17. how to check various dimensional mismatches which may happen on the actual product assembly

KU18. Technology 3D Printing such as Fused Deposition Modelling, Stereo Lithography, Metal Laser Sintering

KU19. symbols and notifications being displayed by the 3D Printing machine and their corresponding meaning

KU20. functionality of different buttons and switches available on the Scanner/printer Machine dashboard

KU21. how to upload and remove code files from the machine memory

KU22. preservation of critical electronic parts/equipment from moisture/heat/environmental external conditions as specified in the process

KU23. how to maintain the log book for produced parts

KU24. how to detect and rectify error at various stages of part generation

KU25. types of materials available for fabrication in various 3D printing technique

KU26. various inspection methods for inspecting the quality of product

KU27. optimum temperature range, air cleanliness and humidity required for the Scanner/Printer

KU28. techniques of fabricating a component with 3D Printing

Generic Skills (GS)

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

GS1. read and interpret notes, designs and instructions shared by different internal team

GS2. communicate the process requirements to the supervisor and co-workers

GS3. attentively listen and comprehend the information given by the supervisor/team members

GS4. write 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. plan and organise work according to the work requirements

GS8. complete the assigned tasks with minimum supervision

GS9. visualize designs

GS10. share technical information clearly using appropriate language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Carry out object scanning, reverse engineering and designing modified component	**18**	**31**	**-**	**12**
PC1. obtain the design requirements and specifications such as material used for making the component, packaging and other requirements to decide the dimensions, measurements and tolerances of the aggregate/component and instructions from the design team or supervisor	1	2	-	1
PC2. prepare the object for scanning by spray coat a temporary matte powder on object to improve scan accuracy	1	2	-	1
PC3. use a high accuracy 3D scanner to capture the important sections of the part	1	2	-	1
PC4. scan the object and create mesh files of the object in 3D scanner by following SOP	2	4	-	2
PC5. import the mesh files or scanned data into CAD software equipped with reverse engineering tools	1	1	-	1
PC6. extract the shape of the scan in order to create a solid model that is editable with CAD tools i.e. semi-automatic surfacing, automatic surfacing, and manual redrawing	2	2	-	1
PC7. identify flaws in the scanned model, fix issues and create a blueprint by using reverse engineering tools in CAD software	2	4	-	1
PC8. use the scanned data or model of object in CAD software as a reference for reverse engineering process	2	3	-	1
PC9. Create a rectified 3D model of product	1	2	-	1
PC10. prepare layouts and various views of drawing to generate a relationship between components and assemblies	1	2	-	1
PC11. Submit the drawings to the supervisor and design team	1	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. tag and store the drawings with the right numbers and codes properly as per the organisational guidelines	1	2	-	-
PC13. convert the object model into STL or AMF file format as per the 3D printer requirement.	1	2	-	1
PC14. transfer the verified object model STL / AMF file into portable storage device or directly to 3D printer as per SOP/WI	1	2	-	-
Develop product prototype by 3D printing	**12**	**19**	**-**	**8**
PC15. set the 3D printing machine and its parameters such as room temperature range, air cleanliness as per SOP/WI	1	2	-	1
PC16. select encoding format for the 3D printing program file	1	1	-	1
PC17. set the part orientation, printing time & the amount of material used on the machine	1	2	-	1
PC18. set the laser or nozzles temperature to defined values as per process specification	1	2	-	1
PC19. start and operate the machine and perform 3D printing operations as per SOP/WI to develop prototype of product	2	3	-	1
PC20. rectify any process errors if any during the machine operation and report the same to the concerned person as per organizational guidelines	1	2	-	1
PC21. remove the printed prototype of product from machine without damaging its structure	1	1	-	-
PC22. clean the prototype for improving the surface finish as per SOP	1	2	-	1
PC23. inspect the prototype as per the drawing/process using for required quality and if nonconforming, take action as per organisational guidelines	2	3	-	1
PC24. store & preserve the prototype of product manufactured as per organizational guidelines and procedures	1	1	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8115
NOS Name	Product Reverse Engineering
Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Designing
NSQF Level	5.5
Credits	2
Minimum Educational Qualification & Experience	Certificate-NSQF (in Computer Aided Product Design, Level 5.5)
Version	1.0
Next Review Date	NA
CCN Category	1