Model Curriculum

QP Name: Automotive Production Equipment Design Engineer

QP Code: ASC/Q6405

QP Version: 2.0

NSQF Level:5

Model Curriculum Version: 1.0

Automotive Skills Development Council | 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building, New Delhi – 110020

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Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing Support
Occupation	Process Engineering
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISICCode	NCO-2015/2144.0301
Minimum Educational Qualification & Experience	3 years Diploma (Industrial/Production/Mechanical Engineer/Tool Design) from a recognized body (after class 12th) with 1 Year of relevant experience OR B.E./B.Tech (Mechanical/Automobile/Industrial/Production)
Pre-Requisite License or Training	NA
Minimum Job Entry Age	23 Years
Last Reviewed On	29/07/2021
Next Review Date	29/07/2026
NSQC Approval Date	29/07/2021
Version	2.0
Model Curriculum Creation Date	29/07/2021
Model Curriculum Valid Up to Date	29/07/2026
Model Curriculum Version	1.0
Minimum Duration of the Course	510 Hours, 0 Minutes
Maximum Duration of the Course	510 Hours, 0 Minutes

Program Overview

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

Training Outcomes

After completing this programme, participants will be able to:

- Prepare the drawings of new equipment and share it to the in–house tool room or third-party agency.
- Design new equipment mechanism in coordination with the Process Designer, manager and tool Room agency.
- Manage the documentation for engineering changes and release the finalized equipment drawings.
- Use 3D printing machine for the printing of automotive components.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Use resources optimally to ensure less wastage and maximum conservation.
- Communicate effectively and develop interpersonal skills.

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	On-the-Job Training Duration	Total Duration
Bridge Module	**05:00**	**00:00**			**05:00**
Module 1: Introduction to the role of Equipment Designer	05:00	00:00			05:00
ASC/N9810: Manage work and resources (Manufacturing) **NOS Version No. – 1.0** **NSQF Level – 5**	**20:00**	**40:00**	-	-	**60:00**
Module 2: Manage work and resources according to safety and conservation standards	20:00	40:00	-	-	60:00
ASC/N9812 – Interact effectively with team, customers and others **NOS Version No. 1.0** **NSQF Level 5**	**20:00**	**35:00**	-	-	**55:00**

Module 3: Communicate effectively and efficiently	20:00	35:00	-	-	55:00
ASC/N6413 **Design fixtures, workstation and its mechanisms** **NOS Version No. 1.0** **NSQF Level 6**	**54:00**	**96:00**	**00:00**	**00:00**	**150:00**
Module 4: Designing fixtures, workstation and their mechanisms	54:00	96:00	-	-	150:00
ASC/N6422 **Release the drawings and manage the documentation for engineering change** **NOS Version No. 1.0** **NSQF Level 6**	**40:00**	**80:00**	-	-	**120:00**
Module 5: Designing fixtures, workstation and their mechanisms	40:00	80:00	-	-	120:00
ASC/N6811 **Select and operate 3D Printing machine for product generation** **NOS Version No. 2.0** **NSQF Level 6**	**40:00**	**80:00**	-	-	**120:00**
Module 6: Select and operate 3D Printing machine for product generation	40:00	80:00			120:00
Total Duration	**184:00**	**326:00**	-	-	**510:00**

Module Details

Module 1: Introduction to the role of Equipment Designer

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Equipment Designer.

Duration: *<05:00>*	**Duration**: *<00:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of an Equipment Designer • Discuss the job opportunities of an Equipment Designer • Explain about Indian automotive manufacturing market. • List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. • Identify the standard checklists and schedules recommended by OEM. • Discuss the need and importance of computerised systems and updated softwares in Automotive manufacturing process.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

Module 2: Manage work and resources according to safety and conservation standards

Mapped to ASC/N9810, v1.0

Terminal Outcomes:

- Employ appropriate ways to maintain safe and secure working environment
- Apply material and energy conservation practices at the workplace.

Duration: *<20:00>*	**Duration**: *<40:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss organisational procedures for health, safety and security and individual role and responsibilities related to the same. • List the potential workplace related risks, threats and hazards, their causes and preventions. • List personal protective equipment like safety gloves, glasses, shoes and mask used at the workplace. • List various types of fire extinguisher. • Identify various safety boards/ signs placed on the shop floor. • Explain 5S standards, procedures and policies followed at workplace. • Discuss organisational procedures to deal with emergencies and accidents at the workplace and importance of following them. • State the importance of conducting safety drills or training sessions. • Explain the process of filling daily check sheet for reporting to the concerned authorities about improvements done and risks identified. • Discuss how and when to report about potential hazards identified in the workplace and limits of responsibility for dealing with them. • Outline the importance of keeping workplace, equipment, restrooms etc. clean and sanitised. • Explain the importance of following hygiene and sanitation regulations developed by organisation at the workplace. • Discuss the importance of maintaining the availability of running water, hand wash and alcohol-based sanitizers at the workplace.	• Apply appropriate ways to implement safety practices to ensure safety of people at the workplace. • Display the correct way of wearing and disposing PPE. • Demonstrate the use of fire extinguisher. • Demonstrate how to provide first aid procedure in case of emergencies. • Demonstrate how to evacuate the workplace in case of an emergency. • Employ various techniques for checking malfunctions in the machines with the support of maintenance team and as per Standard Operating Procedures (SOP). • Demonstrate to arrange tools/ equipment/ fasteners/ spare parts into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions. • Apply appropriate ways to organise safety drills or training sessions for others on the identified risks and safety practices. • Prepare a report about the health, safety and security breaches. • Apply appropriate ways to check that workplace, equipment, restrooms etc. are cleaned and sanitised. • Role play a situation to brief the team about the hygiene and sanitation regulations developed by organisation. • Demonstrate the correct way of washing hands using soap and water and alcohol-based hand rubs. • Apply appropriate methods to support the employees to cope with stress, anxiety etc. • Demonstrate proper waste collection and disposal mechanism depending upon types of waste. • Perform the steps involved in storage of

• Discuss the significance of conforming to basic hygiene practices such as washing hands, using alcohol based hand sanitizers or soap. • Recall ways of reporting advanced hygiene and sanitation issues to the concerned authorities. • Elucidate various stress and anxiety management techniques. • Discuss the significance of greening. • Classify different categories of waste for the purpose of segregation. • Differentiate between recyclable and non-recyclable waste. • Discuss various methods of waste collection and disposal. • List the various materials used at the workplace. • Explain organisational recommended norms for storage of tools, equipment and material. • Discuss the importance of efficient utilisation of material and water. • Explain basics of electricity and prevalent energy efficient devices. • Explain the processes to optimize usage of material and energy/electricity. • Enlist common practices for conserving electricity at workplace.	tools, equipment and material after completion of work. • Employ appropriate ways to resolve malfunctioning (fumes/ sparks/ emission/ vibration/ noise) and lapse in maintenance of equipment as per requirements. • Perform the steps to prepare a sample material and energy audit reports. • Employ practices for efficient utilization of material and energy/electricity.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Housekeeping material: Cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel, fire extinguisher • Safety gears: Safety shoes, ear plug, goggles, gloves, helmet, first-aid kit	

Module 3: Communicate Effectively and Efficiently

Mapped to ASC/N9812, v1.0

Terminal Outcomes:

- Use effective communication and interpersonal skills.
- Apply sensitivity while interacting with different genders and people with disabilities.

Duration: *<20:00>*	**Duration**: *<35:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of complying with organizational requirements to share information with team members. • Discuss the ways to adjust the communication styles to reflect sensitivity towards gender and persons with disability (PwD). • Explain the importance of respecting personal space of colleagues and customers. • Describe the ways to manage and coordinate with team members for work integration. • State the importance of team goals over individual goals, keeping commitment made to team members, and informing them in case of delays. • Discuss the importance of following the organisation's policies and procedures • Discuss the importance of rectifying errors as per feedback and minimizing mistakes. • Discuss gender-based concepts, issues and legislation as well organization standards, guidelines, rights and duties of PwD. • Discuss the importance of PwD and gender sensitization to ensure that team shows sensitivity towards them. • State the importance of following organizational standards and guidelines related to PwD. • Recall the rights and duties at workplace with respect to PwD. • Outline organisation policies and procedures pertaining to written and verbal communication.	• Employ different means and methods of communication depending upon the requirement to interact with the team members. • Employ appropriate ways to maintain good relationships with team members and superiors. • Apply appropriate techniques to resolve conflicts and manage team members for smooth workflow. • Conduct training sessions to train the team members on proper reporting of completed work and receiving feedback. • Employ suitable ways to escalate problems to superiors as and when required. • Prepare a sample report on the progress and team performance . • Role play a situation on how to offer help to people with disability (PwD) if required at work.
Classroom Aids:	
Whiteboard/blackboard, marker/chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	

Module 4: Designing fixtures, workstation and their mechanisms

Mapped to ASC/N6413, v2.0

Terminal Outcomes:

- Analyse the dimensions for the new equipment, prepare its design and drawing and share it with the in–house tool room or third-party agency.
- Discuss the design and drawing with the Process Designer, manager andTool Room agency

Duration: *54:00*	**Duration**: *96:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Ensure and share the drawings for the new equipment to the in–house tool room or third-party agency • Identify the company manufacturing process, the equipment in use and sequence of operations • communicate with the process engineer, in case of robotics/automation application for equipment functioning. • Analyse and verify the dimensions and other details for selected equipment to be used such as motors, sensors, automation parts, etc. • Discuss the design and drawing with the Process Designer, manager andTool Room agency till the final equipment dimensions, profile, mechanism of operation etc. are finalized • examine the typical allowances for trimming, shrinkage and warping, etc. • discuss with the in–house tool room or third-party agency for reviewing the complete equipment profile, dimensions etc and update the drawings after finalizing the above parameters.	• Examine the apparatus to manufacture the new equipment such as workstation, mechanisms, gauge, fixtures & associated parts • Verify the dimensions for the new equipment based on the process requirement. • Use CAD software and GD&T for new equipment drawing • Analyse and use simulation software for demonstrating the equipment operation and review thedrawings. • Identify type of automotive systems being used for the process • Identify problem solving techniques such as TOPS 8D, 7 QC tools etc. • Identify trouble shooting/fault finding in pneumatic, hydraulic, electrical control system elements
Classroom Aids:	
Laptop, White board, Marker, Projector & stationary	
Tools, Equipment and Other Requirements	
PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) CAD, GD&T 18 documents of PPAP, Design records, Design Records, Authorized Engineering Change Documents, Customer Engineering Approval, Design Failure Modes and Effects Analysis	

(DFMEA), applied in special situations, Process Flow Diagram, Process Failure Modes and Effects Analysis (PFMEA) Control Plan, Part Submission Warrant (PSW), Engineering Change Documents Dimensional Results, PLC Simulator, Hydraulic, Pneumatic, Electronic Control Systems Simulator, Internet of Things study material and IOT communication devices, Manufacturing Execution system, manufacturing operation management system. Hydraulics and pneumatics systems simulator, PLC Simulator with required software, Air Cylinders, valves, connector/tubing simulators, Pick and place robots assembly Electronics sensor like proximity, optical, magnetic sensors.

Module 5: Designing fixtures, workstation and their mechanisms

Mapped to ASC/N6422, v2.0

Terminal Outcomes:

- Analyse the drawing and release to the production department/in- house/external tool Room.

Duration: *40:00*	**Duration**: *80:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Ensure completion of all parts listed and drawings/specifications for all the items required for the equipment • Analyse and release the drawings of the equipment to the production department/in- house/external tool Room as per SOP. • Discuss with in–house tool room or a third-party agency for modification of design • Summarize final changes in documentation after trials by validation agency and release thechanged documents as per SOP • share the finalized documents for equipment & PFMEA, CP (control plan) with the end-users in discussion with the process engineer/CFT (Cross-functional team) • identify process control and automation systems installed for the processes • Determine technical and functional requirements for tools, online gauges, fixtures etc • Identify the requirement of Quality Management System (QMS) • Identify documentation requirements of PFMEA/CP/WI, APQP, PPAP and ECN/PCN •	• Examine the impact on fixture parts/mechanism in case of an engineering change and decide the action of Rework based on cost and time available/production schedules on the equipment • Define activities related to WIP, stocks during ECN (Engineering Change Notice) Management and record these on the ECN document • complete the changes in drawing and order the parts with the help of validation or process engineer • Identify sequence of operation and type of systems used in the process • Identify trouble shooting & fault finding for all the systems
Classroom Aids:	
Laptop, White board, Marker, Projector & stationary	
Tools, Equipment and Other Requirements	
PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) 18 documents of PPAP, Design records, Design Records, Authorized Engineering Change Documents, Customer Engineering Approval, Design Failure Modes and Effects Analysis	

(DFMEA), applied in special situations, Process Flow Diagram, Process Failure Modes and Effects Analysis (PFMEA) Control Plan, Part Submission Warrant (PSW), Engineering Change Documents Dimensional Results, PLC Simulator, Hydraulic, Pneumatic, Electronic Control Systems Simulator, Internet of Things study material and IOT communication devices, Manufacturing Execution system, manufacturing operation management system. Hydraulics and pneumatics systems simulator, PLC Simulator with required software, Air Cylinders, valves, connector/tubing simulators, Pick and place robots assembly Electronics sensor like proximity, optical, magnetic sensors.

Module 6: Operate 3D Printing machine for production

Mapped to ASC/N6811, v1.0

Terminal Outcomes:

- Identify raw material, machine, components and automotive parts involved in manufacturing process.
- Perform the steps to operate and set up the machine for printing the automotive components.
- Demonstrate post-processing activities like quality check, segregation, storage etc.

Duration: *40:00*	**Duration:** *80:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss manufacturing and automotive product design standards and procedures followed in the company. • Explain various 3D Printing technologies such as Fused Deposition Modelling, StereoLithography etc. • Identify various symbols and notifications being displayed by the 3D Printing machine. • Describe functionality of the 3D printing machine. • Discuss the importance of preserving critical electronic parts/equipment from moisture/ heat/ environmental external conditions. • List the machine, support structure, raw material etc. required for work. • List types of materials available for fabrication in various 3D printing technique. • Explain the selection criteria of raw material and 3D printing machine as per the product specifications. • Recall various specifications of machine such as build speed, extrusion speed, nozzle temperature etc. • List machine operating parameters such as room temperature range, air cleanliness. • List types of files such as .stl, code file, etc generated in the various steps of the process. • Explain standard tesselation language (.stl) code file and its selection criteria for machine operation. • List the steps to be performed for deleting unwanted code files, uploading new code files and selecting any pre-stored program	• Demonstrate how to select the raw material and 3D printing machine for printing the automotive components as per product specifications. • Use appropriate resources to obtain information about part orientation, support structure requirement, machine specifications, machine operating parameters etc. as per the work requirement. • Show how to delete unwanted code files, upload new code files and select any pre-stored program in the machine memory. • Demonstrate how to connect the data storage devices with the machine. • Show how to check the number of automotive parts needed to be manufactured. • Role play a situation on how to co-ordinate with the designer for rectifying the errors generated during file uploading and observed during running of process. • Apply appropriate ways to check the critical components of machine. • Demonstrate how to set and clean the 3D printing machine before starting the printing operation by following organisational procedures. • Apply appropriate techniques to decipher the codes to calculate the volume of material • Show how to load appropriate amount of consumables material. • Show how to pre-heat the bed of the machine and set the laser or nozzles temperature of the machine to defined values.

in the machine memory. • Summarise the steps to be performed for checking the critical components of machine. • List steps for preparing 3D printing machine for operation. • List the steps to be performed for operating the 3D printing machine. • Describe post-processing techniques such as removing and cleaning fabricated parts, inspection, segregation etc. of parts. • Discuss ways for removing the fabricated part from machine and support structures from the part. • Explain methods of inspecting the quality and non-conformities of the part. • Discuss the process of segregating of damaged and ok parts as per organisational guidelines. • Discuss the process of storing of ok parts as per organisational guidelines. • Discuss the documents needed to be maintained related to work.	• Demonstrate organizational specified procedure of operating the 3D printing machine for printing of automotive components. • Apply appropriate ways to identify and rectify errors in machine during the machine operation. • Show how to stop the machine during an unwanted situation. • Demonstrate how to remove the fabricated part and support structures from the machine carefully. • Apply appropriate ways to clean the part for getting required surface finish. • Apply appropriate inspection methods for checking the quality and non-conformities of the part. • Show how to segregate the parts into rework or reject as per organisational guidelines. • Demonstrate how to store the manufactured automotive parts as per organisational guidelines.
Classroom Aids:	
Laptop White board, Marker, Projector & stationary	
Tools, Equipment and Other Requirements	
3D Printing machines- Fixed Deposition Modelling Machine, Stereo-Lithography Machine, Metal Sintering Machine & any other type of 3D printing machine with the all the consumables required. Flash Drive (With pre-stored program)	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Mechanical/Automobile	5	R&D/Engg	1	R&D/Engg	**NA**
B.E./B. Tech	Mechanical/Automobile	4	R&D/Engg	1	R&D/Engg	**NA**
B.E./B. Tech	Mechanical/Automobile	5	R&D/Engg	0	R&D/Engg	**NA**
M.E / M.TECH	Mechanical/Automobile	2	R&D/Engg	2	R&D/Engg	**NA**

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Automotive Equipment Design Engineer" mapped to QP: "ASC/Q6405". Minimum accepted score as per ASDC guidelines is 70%.	"Trainer, MEP/Q2601 v1.0" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Mechanical/Automobile	6	Engineering	1	Engineering	**NA**
B.E./B. Tech	Mechanical/Automobile	5	Engineering	1	Engineering	**NA**
B.E./B. Tech	Mechanical/Automobile	6	Engineering	0	Engineering	**NA**
M.E / M.TECH	Mechanical/Automobile	3	Engineering	2	Engineering	**NA**

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "Automotive Equipment Design Engineer" mapped to QP: "ASC/Q6405". Minimum accepted score as per ASDC guidelines is 70%.	"Assessor; MEP/Q2701 v1.0" 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

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
CFT	Complement Fixation Test