Model Curriculum

QP Name: Automotive Machining Operator

QP Code: ASC/Q3501

QP Version: 2.0

NSQF Level: 3

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
Occupation	Machining Operation
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7223.5001
Minimum Educational Qualification and Experience	8th Class Pass with 1 year of relevant experience OR 8th Class Pass + ITI OR 10th Class pass OR Certificate-NSQF (Automotive Machining Assistant Level 2) with 1 Year of experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	20/11/2020
Next Review Date	20/11/2025
NSQC Approval Date	20/11/2020
QP Version	2.0
Model Curriculum Creation Date	20/11/2020
Model Curriculum Valid Up to Date	20/11/2025
Model Curriculum Version	1.0
Minimum Duration of the Course	300 Hours 00 Minutes
Maximum Duration of the Course	300 Hours 00 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.

- Interpret engineering drawings for identification of raw material, tools and required equipment for the machining operations.
- Support technician in pre-machining activities such as inspection of tools and equipment etc.
- Support technician in machining operations such as turning, milling, shaping, grinding, boring, broaching, hobbing, facing, shaping, blanking, piercing etc.
- Support technician in post-machining operations such as inspection, quality check, cleaning.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Optimize the use of resources to ensure less wastage and maximum conservation.
- Communicate effectively using 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 (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Introduction to the role of an Automotive Machining Operator *Bridge Module*	05:00	0:00			05:00
ASC/N9803 – Organize work and resources (Manufacturing) **NOS Version No. – 1.0** **NSQF Level - 3**	**15:00**	**30:00**			**45:00**
Organize work and resources according to safety and conservation standards	15:00	30:00			45:00
ASC/N9802 – Interact effectively with colleagues, customers and others **NOS Version No. – 1.0** **NSQF Level - 3**	**15:00**	**25:00**			**40:00**
Communicate Effectively and Efficiently	15:00	25:00			40:00
ASC/N9805 – Interpret engineering drawing **NOS Version No. – 1.0** **NSQF Level - 4**	**15:00**	**15:00**			**30:00**

Interpret engineering drawing	15:00	15:00			30:00
ASC/N3506 – Support in machining and post-machining activities NOS Version No. – 1.0 NSQF Level - 3	**60:00**	**120:00**			**180:00**
Prepare for machining activities	30:00	60:00			90:00
Support in machining and post-machining activities	30:00	90:00			120:00
Total Duration	**110:00**	**190:00**			**300:00**

Module Details

Module 1

Introduction to the role of an Automotive Machining Operator

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Automotive Machining Operator.

Duration: *<05:00>*	**Duration**: *<00:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the role and responsibilities of an Automotive Machining Operator. • List the job opportunities for an Automotive Machining Operator in the Automotive industry. • Explain about Indian automotive manufacturing market. • List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. • Discuss the standards and procedures involved in the different processes of machining. • Identify the standard checklists and schedules recommended by OEM.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Sample checklist of tools and equipment	

Module 2

Organize work and resources according to safety and conservation standards

Mapped to ASC/N9803

Terminal Outcomes:

- Employ appropriate ways to maintain safe and secure working environment.
- Perform work as per the quality standards.
- Apply conservation practices at the workplace.

Duration: *<15:00>*	**Duration**: *<30:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the potential workplace related risks and hazards, their causes and preventions. • Identify PPE to be used at workplace. • Identify various warning signs used at the workplace. • Describe appropriate strategies to deal with emergencies and accidents at the workplace. • Outline the organizational structure to be followed to report about health, safety and security breaches to the concerned authorities. • Discuss the importance of keeping work area clean and tidy. • Discuss the significance of conforming to basic hygiene practices such as washing hands, using alcohol based hand sanitizers or soap. • Discuss organizational hygiene and sanitation guidelines and ways of reporting breaches/gaps if any to the concerned authorities. • Discuss the ways of dealing with stress and anxiety. • Discuss how to complete the given work within the stipulated time period. • Explain how to maintain a proper balance between team and individual goals. • Explain 5S guidelines at workplace. • List the various materials used at the workplace. • Explain organisational recommended procedure for storage of tools, equipment and material after completion of work. • Explain the ways to optimize usage of resources.	• Apply appropriate safety practices to ensure safety of people at the workplace • Display the correct way of wearing and removing PPE such as face masks, hand gloves, face shields, PPE suits, etc. • Demonstrate the use of fire extinguisher. • Apply basic first aid procedure in case of emergencies. • Perform routine cleaning of tools, equipment and machines. • Employ various techniques for checking malfunctions in the equipment as per Standard Operating Procedure (SOP). • Show how to sanitize and disinfect one's work area regularly. • Demonstrate the correct way of washing hands using soap and water. • Demonstrate the correct way of sanitizing hands using alcohol-based hand rubs. • Demonstrate how to evacuate the workplace in case of an emergency. • Demonstrate sorting of materials, tools and equipment and spare parts after completion of work. • Demonstrate the steps involved in storage of tools, equipment and material after completion of work. • Perform basic checks to identify any spills and leaks and that need to be plugged /stopped. • Demonstrate different disposal techniques depending upon types of waste. • Employ different ways to check if equipment/machines are functioning as per requirements and report malfunctioning, if observed.

• Discuss various methods of waste management and its disposal. • List the different categories of waste for the purpose of segregation • Differentiate between recyclable and non-recyclable waste • State the importance of using appropriate colour dustbins for different types of waste. • Discuss common practices for conserving electricity at workplace. • Discuss the common sources of pollution and ways to minimize it.	• Employ ways for efficient utilization of material and water.
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 9

Communicate Effectively and Efficiently

Mapped to ASC/N9802

Terminal Outcomes:

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

Duration: *<15:00>*	**Duration**: *<25:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the organizational structure for communicating with colleagues, seniors and others. • 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. • State the procedure to receive work instructions and report problems to the supervisor. • List the various organizational policies and procedures to be followed at the workplace. • Describe different ways to rectify commonly occurring errors. • Explain the importance of complying with the instructions/guidelines and procedures while performing tasks related to the job specifications. • Discuss the importance of PwD and gender sensitization.	• Employ different means of communication depending upon the requirement while interacting with others. • Demonstrate using new ways to maintain good relationships with colleagues and supervisor. • Prepare a sample report to send the work status to the supervisor. • Demonstrate how to communicate with different genders and persons with disability (PwD) in a sensitive manner.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
Sample of escalation matrix, organisation structure.	

Module

Interpret engineering drawing

Mapped to ASC/N9805

Terminal Outcomes:

- Describe the basics of engineering drawing.
- Interpret the machine drawings and symbols for understanding the job requirements.

Duration: *<15:00>*	**Duration**: *<15:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify uniqueness, dimensioning and important features of 2D and 3D shapes. • Identify types of lines, angles, points and their symmetry in shapes. • Differentiate between first angle and third angle projection. • Interpret 3 axis (x, y and z axis) of projection and machine symbols used in drawing. • Describe GD&T and use of its symbols in the drawings. • Identify required limits and tolerances of component from drawing. • Explain standards used in India for making machine drawings. • Identify organisational drawing standards for interpreting the work requirements appropriately.	• Read an object in first angle and third angle projection. • Demonstrate appropriate way of reading and interpreting the shapes (cones, cylinder, sphere, cuboid, etc) on to a 2D and 3D projection. • Interpret and read orthographic and isometric views. • Read GD&T symbols in the given drawing. • Employ appropriate ways of storing the drawings in a defined and appropriate place. • Role play a situation on how to communicate the changes in drawing to the concerned authority.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Drawing tools • Machine drawing handbook • Machine drawings	

Module

Prepare for machining activities

Mapped to ASC/N3506

Terminal Outcomes:

- Identify tools and equipment required for machining.
- Perform pre-machining activities such as inspection of tools and equipment, measurement and marking of workpiece etc.

Duration: *<30:00>*	**Duration**: *<60:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information derived from the job orders and engineering drawings and identify the work requirements. • Explain different types of machining processes. • Discuss operational fundamentals of conventional and CNC machine. • List jigs and fixtures, tools, cutting tools, equipment and measuring instruments required during the machining and post-machining work. • List tooling instructions for fixtures, cutting tools, jigs, gauges etc. • Discuss machine parameters like cutting speed, depth of cut, feed rate etc. and their impact on output. • Elucidate the importance of selecting correct lubricant and coolant for machine components. • Explain properties and specifications of coolant and lubricant required for machining component. • Summarise the steps to be performed for checking the tools and equipment before use. • Summarise the steps to be performed for checking the raw material or input component for the machining work.	• Demonstrate how to set the machine and select the machine parameters as per the work instructions. • Demonstrate the standard operating procedures and use of tools, cutting tools, equipment and measuring instruments required during job. • Apply appropriate ways of checking the tools and equipment for defects before use. • Demonstrate how to check the input component for the machining work as per the work instructions.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Basic tool box, Work bench with vice • Machining tools/ equipment: Surface marking plate, cutting tools, threading, dies & guides, etc. • Machines: Conventional lathe and vertical milling machine with standard accessories and Production CNC machining center with ATC	

- Measuring equipment: Vernier calipers, micrometre, feeler gauges, bore gauge, slip gauge, thickness gauge, steel ruler, measuring tape, height, gauge, dial gauge, angle plate, set square compass etc.
- Consumables: Oil stones, Emery, Dressing stone, File cord, Tool post packing, Spares for cutting tools, Carbide inserts, Grinding Wheels etc.
- Hand book, job orders, work order, completion material requests, and Technical Reference Books.
- Safety materials: Fire extinguisher, helmet, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, safety shoes and first-aid kit
- Cleaning material: Tip cleaner, wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel

Module 6

Support in machining and post-machining activities

Mapped to ASC/N3506

Terminal Outcomes:

- Perform various machining operations such as turning, milling, boring etc.
- Identify requirements for post-machining activities.
- Perform post-machining activities.

Duration: *<30:00>*	**Duration**: *<60:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss importance of selecting correct program in the CNC machine for machining operation as per the work instructions. • Explain process of evaluating the irregularities of machined input with the specified quality standards. • Explain methods of inspecting the quality of machined workpieces. • Discuss the process of segregating the ok and damaged workpieces. • List the steps to be performed for checking the machine operations for any defects in its component and informing the supervisor/maintenance team. • Discuss the impact of burrs, edges and chips on the quality of machined workpieces. • Identify different methods for disposing off waste material such as waste oil, scrap, etc. • Discuss the necessary precautions to avoid any hazard and accident during machining activities.	• Demonstrate organizational specified procedure of all machining operations such as turning, milling, shaping, grinding, boring, broaching, hobbing, facing, shaping, blanking, piercing etc. • Demonstrate how to support Technician in selecting the right program in the CNC machine and mass production of components. • Employ appropriate ways of measuring and comparing manufactured component dimensions with the specified dimensions in the job orders. • Prepare a report for the supervisor about the issues faced during the machining process. • Apply appropriate inspection methods for identifying the defects and checking the quality of machined workpieces as per the control plan. • Show how to segregate damaged and ok workpieces. • Demonstrate how to remove chips, burrs and sharp edges from different machine areas.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Basic tool box, Work bench with vice • Machining tools/ equipment: Surface marking plate, cutting tools, threading, dies & guides, etc. • Machines: Conventional lathe and vertical milling machine with standard accessories and Production CNC machining center with ATC • Measuring equipment: Vernier calipers, micrometre, feeler gauges, bore gauge, slip gauge, thickness gauge, steel ruler, measuring tape, height, gauge, dial gauge, angle plate, set square compass etc.	

- Consumables: Oil stones, Emery, Dressing stone, File cord, Tool post packing, Spares for cutting tools, Carbide inserts, Grinding Wheels etc.
- Hand book, job orders, work order, completion material requests, and Technical Reference Books.
- Sample of Rejected parts for defects like dent, scratch, damage and burrs
- Safety materials: Fire extinguisher, helmet, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, safety shoes and first-aid kit
- Cleaning material: Tip cleaner, wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
ITI	Machinist/Turner	3	CNC Machining	1	CNC Machining	NA
ITI	Machinist/Turner	4	CNC Machining	0	CNC Machining	**NA**
Certificate NSQF- Level 5	Automotive Machining Lead Technician	3	CNC Machining	1	CNC Machining	**NA**
Diploma	Mechanical/ Automobile	2	CNC Machining	1	CNC Machining	**NA**
Diploma	Mechanical/ Automobile	3	CNC Machining	0	CNC Machining	**NA**

Trainer Certification	
Domain Certification	**Platform Certification**
"Automotive Machining Operator, ASC/Q3501, version 2.0". Minimum accepted score is 80%.	"Trainer, MEP/Q2601" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
ITI	Machinist/Turner	4	CNC Machining	1	CNC Machining	NA
ITI	Machinist/Turner	5	CNC Machining	0	CNC Machining	**NA**
Certificate NSQF- Level 5	Automotive Machining Lead Technician	4	CNC Machining	1	CNC Machining	**NA**
Diploma	Mechanical/ Automobile	3	CNC Machining	1	CNC Machining	**NA**
Diploma	Mechanical/ Automobile	4	CNC Machining	0	CNC Machining	**NA**

Assessor Certification	
Domain Certification	**Platform Certification**
"Automotive Machining Operator, ASC/Q3501, version 2.0". Minimum accepted score is 80%.	"Assessor; MEP/Q2701" Minimum accepted score is 80%.

Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/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
    - Centre 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 can
    - didate

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
SOP	Standard Operating Procedure
GD&T	Geometric Dimensioning & Tolerancing
CAD	Computer-Aided Drafting
CAM	Computer-Aided Manufacturing
CNC	Computerized Numerical Control
WI	Work Instructions
PPE	Personal Protective equipment