Model Curriculum

QP Name: Automotive Conventional Machining Technician

QP Code: ASC/Q3510

QP Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

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

Table of Contents

Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Machining Operation
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/ 7223.0601, 7223.1701, 7224.0402, 7223.1201
Minimum Educational Qualification and Experience	8th Class + 2 years ITI with 2 years of relevant experience OR 10th Class pass with 2 years of relevant experience OR 10th Class + 2 years ITI OR 12th Class with 1 Year of experience OR Certificate-NSQF (Automotive Machining Operator Level 3) with minimum 2 Years of relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 years
Last Reviewed On	29/01/2021
Next Review Date	29/01/2026
NSQC Approval Date	29/01/2021
QP Version	1.0
Model Curriculum Creation Date	29/01/2021
Model Curriculum Valid Up to Date	29/01/2026
Model Curriculum Version	1.0
Minimum Duration of the Course	390 Hours 00 Minutes
Maximum Duration of the Course	570 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 equipment required for the machining operations.
- Carry out pre-machining activities such as lifting of workpiece, inspection of tools and equipment etc.
- Carry out various machining operations such as turning, drilling, reaming and tapping on conventional lathe and quality checks of the finished products for any damages and deformities.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Optimize the use of resources to ensure less wastage and maximum conservation.
- Carry out grinding operations on conventional lathe and quality checks of the finished products for any damages and deformities.
- Carry out milling operations on conventional lathe and quality checks of the finished products for any damages and deformities.

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
Bridge Module	**5:00**	**0:00**			**5:00**
Module 1: Introduction to the role of an Automotive Conventional Machining Technician	5:00	0:00			5:00
ASC/N9803 – Organize work and resources (Manufacturing) NOS Version No. – 1.0 NSQF Level – 3	**15:00**	**30:00**			**45:00**
Module 2: 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**

Module 3: 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**
Module 4: Interpret engineering drawing	15:00	15:00			30:00
ASC/N3536 – Perform turning operations on conventional lathe NOS Version No. – 1.0 NSQF Level - 4	**30:00**	**60:00**			**90:00**
Module 5: Perform turning operations	30:00	60:00			90:00
ASC/N3537 – Perform drilling, reaming, tapping and boring operations on conventional lathe NOS Version No. – 1.0 NSQF Level - 4	**60:00**	**120:00**			**180:00**
Module 6: Perform drilling, reaming and tapping operations	30:00	60:00			90:00
Module 7: Perform boring operations	30:00	60:00			90:00
ASC/N3539 – Perform grinding operations on conventional lathe NOS Version No. – 1.0 NSQF Level - 4	**30:00**	**60:00**			**90:00**
Module 8: Perform grinding operations	30:00	60:00			90:00
ASC/N3538 – Perform milling operations on conventional lathe NOS Version No. – 1.0 NSQF Level - 4	**30:00**	**60:00**			**90:00**
Module 9: Perform milling operations	30:00	60:00			90:00
Total Duration	**200:00**	**370:00**			**570:00**

Module Details

Module 1: Introduction to the role of an Automotive Conventional Machining Technician

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Automotive Conventional Machining Technician.

Duration: <05:00>	**Duration**: <00:00>
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of an Automotive Conventional Machining Technician. • Discuss the job opportunities of an Automotive Conventional Machining Technician. • 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.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

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

Mapped to ASC/N9803, v1.0

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. • 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.	• 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. • Employ ways for efficient utilization of material and water.

• Discuss the common sources of pollution and ways to minimize it.	
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/N9802, v1.0

Terminal Outcomes:

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

Duration: <15:00>	**Duration**: <30:00>
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 4: Interpret engineering drawing

Mapped to ASC/N9805, v1.0

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 assembly 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 5: Perform turning operations

Mapped to ASC/N3536, v1.0

Terminal Outcomes:

- Identify tools and equipment required for turning job.
- Demonstrate turning operations on conventional lathe machine.
- Show how to carry out post-machining activities such as quality check, cleaning, maintenance etc.

Duration: <30:00>	**Duration**: <60:00>
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information derived from the engineering drawings to identify the work requirements. • State the Standard Operating Procedures (SOP) for operating conventional lathe machine. • Discuss operational fundamentals of turning machines. • Outline the process flow of turning operations. • List input material, jigs and fixtures, tools, cutting tools, workholding devices, equipment and measuring instruments required during the machining and post-machining work. • Summarise the steps to be performed for checking the raw material, tools and equipment before use. • List tooling instructions for fixtures, cutting tools, jigs, gauges etc. mentioned in operating manual/Work instructions. • Discuss how to load, unload, fix and set the machine parts, tools and cutting tools safely on machine. • Recall the steps for mounting, installing, positioning and aligning tools, attachments and fixtures on machine as per work instructions. • Discuss the process of lifting, positioning and verifying the position of the workpiece on the machine by using appropriate tools and equipment. • Elucidate the steps to be performed for selecting and installing the pre-set tooling in tool post. • Discuss machine parameters like cutting speed, depth of cut, feed rate etc. and their impact on output.	• Demonstrate the standard operating procedures to use the tools, cutting tools, workholding devices, equipment and measuring instruments required during job. • Apply appropriate ways of checking the raw material, tools and equipment for defects before use. • Demonstrate how to set the conventional lathe machine for turning operations and adjust the machine controls within specified tolerances as per the work instructions. • Show how to mount, install, position and align tools, cutting tools, attachments and fixtures on machine by using appropriate tools and measuring instruments. • Employ appropriate ways of lifting and positioning the workpiece on machine safely by using appropriate tools and equipment. • Apply appropriate ways to verify the alignment and position of workpiece on machine. • Perform the steps to select and install the pre-set tooling in the machine tool post. • Demonstrate how to set and select the machine parameters as per the work instructions. • Display how to move cutter or turning hand wheel manually for turning job. • Demonstrate organizational specified procedure of starting the machine and performing turning operations. • Employ appropriate ways of inspecting the manufactured component specifications and dimensions with the

• Explain process of evaluating the specifications, dimensions and irregularities of machined component with the specified specifications. • Recall the tasks to be performed post-machining. • Discuss the process of segregating the ok and damaged workpieces and maintaining records of each category. • List the steps to be performed for observing the machine operations for any defects in its component and informing the supervisor/maintenance team. • Discuss organisational standards and procedures for routine machine maintenance and replacing worn out tools. • Discuss the necessary precautions to be taken to avoid any hazard and accident during machining activities.	specified specifications and dimensions in the job orders. • Apply appropriate inspection methods for identifying the defects, checking the quality of machined workpieces and noting the observations of inspection process as per the control plan. • Show how to segregate damaged and ok workpieces and maintain records as per work instructions. • Prepare a report about malfunctions and defects observed in machine during the machining process. • Employ appropriate ways for doing routine machine maintenance and replacing worn out tools timely from the machine.
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 machine with standard accessories • **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. • Hand book, job orders, machine drawings, work order. • **Safety materials**: Fire extinguisher, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, helmet, safety shoe 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: Perform drilling, reaming and tapping operations

Mapped to ASC/N3537, v1.0

Terminal Outcomes:

- Identify tools and equipment required for drilling, reaming and tapping job.
- Demonstrate drilling, reaming and tapping operations on conventional machine.
- Show how to carry out post-machining activities such as quality check, cleaning, maintenance etc.

Duration: <30:00>	**Duration**: <60:00>
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information derived from the engineering drawings to identify the work requirements. • Discuss Standard Operating Procedures (SOP) for operating drilling, reaming and tapping machines. • Outline the process flow of drilling, reaming and tapping operations. • List input material, jigs and fixtures, tools, cutting tools, workholding devices, equipment and measuring instruments required during the machining and post-machining work. • Summarise the steps to be performed for checking the raw material, tools and equipment before use. • Recall tooling instructions for fixtures, cutting tools, jigs, gauges etc. • Discuss how to load, unload, fix and set the machine parts, tools and cutting tools safely on machine. • List the steps for mounting, installing, positioning and aligning tools, attachments and fixtures on machine as per work instructions. • Discuss the process of lifting, positioning and verify the position of the workpiece on the machine by using appropriate tools and equipment. • Discuss machine parameters like cutting speed, depth of cut, feed rate etc. and their impact on output. • Explain process of evaluating the specifications, dimensions and irregularities of machined component with the specified specifications. • Recall the tasks to be performed post-machining.	• Demonstrate the standard operating procedures to use the tools, cutting tools, workholding devices, equipment and measuring instruments required during job. • Apply appropriate ways of checking the raw material, tools and equipment for defects before use. • Demonstrate how to set the conventional lathe machine for drilling, reaming and tapping operations and adjust the machine controls within specified tolerances as per the work instructions. • Show how to mount, install, position and align tools, cutting tools, attachments and fixtures on machine by using appropriate tools and measuring instruments. • Employ appropriate ways for lifting and positioning the workpiece on machine safely by using appropriate tools and equipment. • Apply appropriate ways to verify the alignment and position of workpiece on machine. • Demonstrate how to set and select the machine parameters as per the work instructions. • Show how to operate drilling, reaming and tapping tool or turning hand wheel manually for drilling, reaming and tapping job. • Demonstrate organizational specified procedure of starting the machine and performing drilling, reaming and tapping operations. • Employ appropriate ways of inspecting the manufactured component

• Discuss the process of segregating the ok and damaged workpieces and maintaining records of each category. • List the steps to be performed for observing the machine operations for any defects in its component and informing the supervisor/maintenance team. • Discuss organisational standards and procedures for routine machine maintenance and replacing worn out tools. • Discuss the necessary precautions to be taken to avoid any hazard and accident during machining activities.	specifications and dimensions with the specified specifications and dimensions in the job orders. • Apply appropriate inspection methods for identifying the defects, checking the quality of machined workpieces and noting the observations of inspection process as per the control plan. • Show how to segregate damaged and ok workpieces and maintain records as per work instructions. • Prepare a report for the supervisor about malfunctions and defects observed in machine during the machining process. • Employ appropriate ways for doing routine machine maintenance and replacing worn out tools timely from the machine.

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 machine with standard accessories
- **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.
- Hand book, job orders, machine drawings, work order etc.
- **Safety materials**: Fire extinguisher, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, helmet, safety shoe 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 7: Perform boring operations

Mapped to ASC/N3537, v1.0

Terminal Outcomes:

- Identify tools and equipment required for boring job.
- Demonstrate boring operations on conventional machine.
- Show how to carry out post-machining activities such as quality check, cleaning, maintenance etc.

Duration: <30:00>	**Duration**: <60:00>
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information derived from the engineering drawings to identify the work requirements. • Discuss Standard Operating Procedures (SOP) for operating boring machines. • Outline the process flow of boring operations. • List input material, jigs and fixtures, tools, cutting tools, workholding devices, equipment and measuring instruments required during the machining and post-machining work. • Summarise the steps to be performed for checking the raw material, tools and equipment before use. • Recall tooling instructions for fixtures, cutting tools, jigs, gauges etc. mentioned in operating manual/Work instructions. • Discuss how to load, unload, fix and set the machine parts, tools and boring tool safely on machine. • List the steps for setting boring tool into boring bar as per work instructions. • Discuss the process of lifting, positioning and verify the position of workpiece on the machine by using appropriate tools and equipment. • Discuss machine parameters like cutting speed, depth of cut, feed rate etc. and their impact on output. • Explain process of evaluating the specifications, dimensions and irregularities of machined component with the specified specifications. • Recall the tasks to be performed post-machining.	• Demonstrate the standard operating procedures to use the tools, cutting tools, workholding devices, equipment and measuring instruments required during job. • Apply appropriate ways of checking the raw material, tools and equipment for defects before use. • Demonstrate how to set the conventional boring machine as per the work instructions. • Show how to set and position the boring tool, attachments and fixtures on machine by using appropriate tools and measuring instruments. • Employ appropriate ways for lifting and positioning the workpiece on machine safely by using appropriate tools and equipment. • Apply appropriate ways to verify the alignment and position of workpiece on machine. • Demonstrate how to set and select the machine parameters as per the work instructions. • Show how to operate boring tool or turning hand wheel manually for boring job. • Demonstrate organizational specified procedure of starting the machine and performing boring operations. • Employ appropriate ways of inspecting the manufactured component specifications and dimensions with the specified specifications and dimensions in the job orders. • Apply appropriate inspection methods for identifying the defects, checking the quality of machined workpieces and

• Discuss the process of segregating the ok and damaged workpieces and maintaining records of each category. • List the steps to be performed for observing the machine operations for any defects in its component and informing the supervisor/maintenance team. • Discuss organisational standards and procedures for routine machine maintenance and replacing worn out tools. • Discuss the necessary precautions to be taken to avoid any hazard and accident during machining activities.	noting the observations of inspection process as per the control plan. • Show how to segregate damaged and ok workpieces and maintain records as per work instructions. • Prepare a report about malfunctions and defects observed in machine during the machining process. • Employ appropriate ways for doing routine machine maintenance and replacing worn out tools timely from the machine.
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, boring tool, etc. • **Machines**: Boring machine with standard accessories • **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. • Hand book, job orders, machine drawings, work order etc. • **Safety materials**: Fire extinguisher, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, helmet, safety shoe 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 8: Perform grinding operations

Mapped to ASC/N3539, v1.0

Terminal Outcomes:

- Identify tools and equipment required for grinding job.
- Demonstrate grinding operation on conventional machine.
- Show how to carry out post-machining activities such as quality check, cleaning, maintenance etc.

Duration: <30:00>	**Duration**: <60:00>
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information derived from the engineering drawings to identify the work requirements. • Discuss Standard Operating Procedures (SOP) for operating conventional grinding machine. • Outline the process flow of grinding operations. • List input material, jigs and fixtures, tools, cutting tools, workholding devices, equipment and measuring instruments required during the machining and post-machining work. • Summarise the steps to be performed for checking the raw material, tools and equipment before use. • Recall tooling instructions for fixtures, cutting tools, jigs, gauges etc. mentioned in operating manual/Work instructions. • Discuss how to load, unload, fix and set the machine parts, tools and grinding wheels on the machine safely. • List the steps for mounting, installing positioning and aligning tools, attachments and fixtures on machine as per work instructions. • Discuss the process of lifting, positioning and verifying the position of workpiece on the machine by using appropriate tools and equipment. • Discuss grinding parameters like wheel revolutions, wheel approach speed, feed rate etc. and their impact on output. • Explain process of evaluating the specifications, dimensions and irregularities of machined component with the specified specifications.	• Demonstrate the standard operating procedures to use the tools, cutting tools, workholding devices, equipment and measuring instruments required during job. • Apply appropriate ways of checking the raw material, tools and equipment for defects before use. • Demonstrate how to set the conventional lathe machine for grinding operations as per the work instructions. • Show how to mount, instal, position and align cutting tools, tools, attachments and fixtures on machine by using appropriate tools and measuring instruments. • Employ appropriate ways for lifting and positioning the workpiece on machine safely by using appropriate tools and equipment. • Apply appropriate ways to verify the position and alignment of workpiece on machine. • Demonstrate how to set and select the grinding parameters as per the work instructions. • Demonstrate organizational specified procedure of starting the machine and performing grinding operations. • Employ appropriate ways of inspecting the manufactured component specifications and dimensions with the specified specifications and dimensions in the job orders. • Apply appropriate inspection methods for identifying the defects, checking the quality of machined workpieces and noting the observations of inspection process as per the control plan.

• Recall the tasks to be performed post-machining. • Discuss the process of segregating the ok and damaged workpieces and maintaining records of each category. • List the steps to be performed for observing the machine operations for any defects in its component and informing the supervisor/maintenance team. • Discuss organisational standards and procedures for routine machine maintenance and replacing worn out tools. • Discuss the necessary precautions to be taken to avoid any hazard and accident during machining activities.	• Show how to segregate damaged and ok workpieces and maintain records as per work instructions. • Prepare a report about malfunctions and defects observed in machine during the machining process. • Employ appropriate ways for doing routine machine maintenance and replacing worn out tools timely from the machine.

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, grinding wheel, etc.
- **Machines**: Conventional lathe machine with standard accessories
- **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.
- Hand book, job orders, machine drawings, work order etc.
- **Safety materials**: Fire extinguisher, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, helmet, safety shoe 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 9: Perform milling operations

Mapped to ASC/N3538, v1.0

Terminal Outcomes:

- Identify tools and equipment required for milling job.
- Demonstrate milling operations on conventional machine.
- Show how to carry out post-machining activities such as quality check, cleaning, maintenance etc.

Duration: <30:00>	**Duration**: <60:00>
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information derived from the engineering drawings to identify the work requirements. • Discuss Standard Operating Procedures (SOP) for operating conventional milling machine. • Outline the process flow of turning operations. • List input material, jigs and fixtures, tools, cutting tools, workholding devices, equipment and measuring instruments required during the machining and post-machining work. • Summarise the steps to be performed for checking the raw material, tools and equipment before use. • Recall tooling instructions for fixtures, cutting tools, jigs, gauges etc. mentioned in operating manual/Work instructions • Discuss how to load, unload, fix and set the machine parts, tools and cutting tools safely on machine. • List the steps for mounting, installing positioning and aligning tools, attachments and fixtures on machine as per work instructions. • Discuss the process of lifting, positioning and verifying position of workpiece on the machine by using appropriate tools and equipment. • Elucidate the steps to be performed for selecting and installing the pre-set tooling in tool post. • Discuss machine parameters like cutting speed, depth of cut, feed rate etc. and their impact on output. • Explain process of evaluating the specifications, dimensions and	• Demonstrate the standard operating procedures to use the tools, cutting tools, workholding devices, equipment and measuring instruments required during job. • Apply appropriate ways of checking the raw material, tools and equipment for defects before use. • Demonstrate how to set the conventional milling machine for milling operations and adjust the machine controls within specified tolerances as per the work instructions. Show how to mount, install, position and align tools, attachments, cutting tools and fixtures on machine by using appropriate tools and measuring instruments. • Employ appropriate ways of lifting and positioning the workpiece on machine safely by using appropriate tools and equipment. • Apply appropriate ways to verify the position and alignment of workpiece on machine. • Apply appropriate ways for selecting and installing the pre-set tooling in the machine tool post. • Demonstrate how to set and select the machine parameters as per the work instructions. • Show how to operate cutter or turning hand wheel manually for milling job. • Apply organisational specified procedure for setting the angular cutting by indexing the milling head on milling machine. • Demonstrate organizational specified procedure of starting the machine and

irregularities of machined component with the specified specifications. • Recall the tasks to be performed post-machining. • Discuss the process of segregating the ok and damaged workpieces and maintaining records of each category. • List the steps to be performed for observing the machine operations for any defects in its component and informing the supervisor/maintenance team. • Discuss organisational standards and procedures for routine machine maintenance and replacing worn out tools. • Discuss the necessary precautions to be taken to avoid any hazard and accident during machining activities.	performing milling activities such as face milling, side milling, angle milling of parts, etc.. • Employ appropriate ways of inspecting the manufactured component specifications and dimensions with the specified specifications and dimensions in the job orders. • Apply appropriate inspection methods for identifying the defects, checking the quality of machined workpieces and noting the observations of inspection process as per the control plan. • Show how to segregate damaged and ok workpieces and maintain records as per work instructions. • Prepare a report about malfunctions and defects observed in machine during the machining process. • Employ appropriate ways for doing routine machine maintenance and replacing worn out tools timely from the machine.
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 milling machine with standard accessories • **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. • Hand book, job orders, machine drawings, work order etc. • **Safety materials**: Fire extinguisher, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, helmet, safety shoe 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	5	Machining	1	Machining	NA
ITI	Machinist/Turner	6	Machining	0	Machining	**NA**
Certificate NSQ- Level 6	Machining Master Technician	3	Machining	1	Machining	**NA**
Diploma	Mechanical/Automobile	3	Machining	1	Machining	**NA**
Diploma	Mechanical/Automobile	4	Machining	0	Machining	**NA**

Trainer Certification	
Domain Certification	**Platform Certification**
"Automotive Conventional Machining Technician, ASC/Q3510, version 1.0". Minimum accepted score is 80%.	"Trainer, MEP/Q2601 v1.0" 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	6	Machining	1	Machining	NA
ITI	Machinist/Turner	7	Machining	0	Machining	**NA**
Certificate NSQ- Level 6	Machining Master Technician	4	Machining	1	Machining	**NA**
Diploma	Mechanical/Automobile	4	Machining	1	Machining	**NA**
Diploma	Mechanical/Automobile	5	Machining	0	Machining	**NA**

Assessor Certification	
Domain Certification	**Platform Certification**
"Automotive Conventional Machining Technician, ASC/Q3510, version 1.0". Minimum accepted score is 80%.	"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 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 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
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