Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASDC™
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# Facilitator Guide



Sector
Automotive

Sub-Sector
Manufacturing

Occupation
Machining Operation

Reference ID: ASC/Q3503, Version-6.0
NSQF Level: 4

# Automotive CNC Machining Technician

Scan this QR Code to access eBook

**Developed by:**

Automotive Skills Development Council (ASDC)

ASDC Contact Details:

Leela Building, 153 GF, Industrial Area,

New Delhi, Delhi 110020

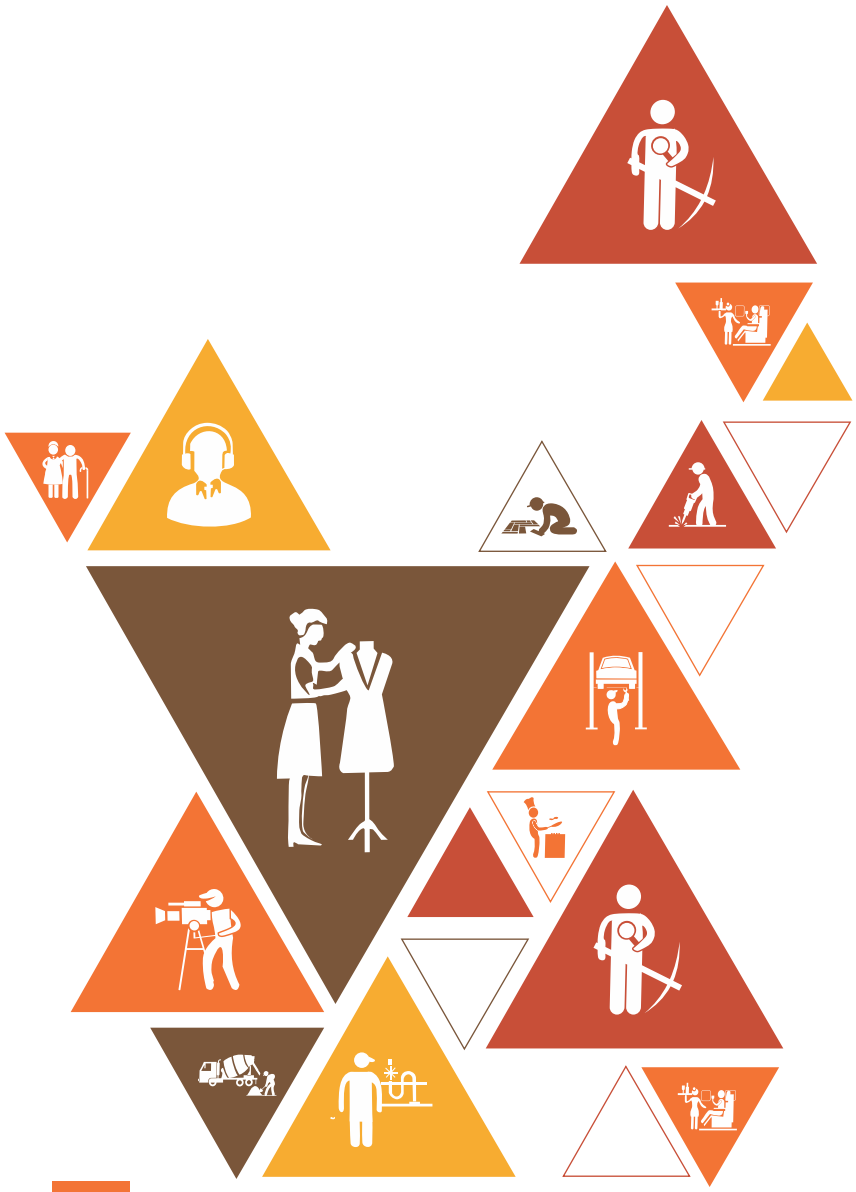
Email: info@asdc.org.in

Website: www.asdc.org.in

Phone: 011 4186 8090

> Skilling is building a better India. If we have to move India towards development then Skill Development should be our mission.

**Shri Narendra Modi**
Prime Minister of India



## Acknowledgements

Automotive Skill Development Council (ASDC) acknowledges the contribution of all the individuals and organizations who have contributed to the preparation of this "Facilitator Guide."

Without their contribution it would not have been completed. Sincere appreciation is extended to our industry partners, all experts for providing technical inputs and reviewing the individual modules.

Preparation of this manual would not have been possible without the Automotive Industry's support. Industry feedback has been extremely encouraging from inception to conclusion and it is with their input that we have tried to bridge the skill gaps existing today in the Industry.

ASDC dedicates this book to the aspiring youth of the country who desire to achieve special skills which will be a lifelong asset for their future endeavours.

## About this Guide

Facilitator Guide is designed for the Trainers to enable training for a specific job role and to enhance the quality of executing the training program. This particular Facilitator Guide is designed for enabling the training program for a job role of "Automotive CNC Machining Technician, L4" in the Automotive Sector.

This course is aligned to Qualification Pack, Automotive CNC Machining Technician, Reference ID: ASC/Q3503.

This Qualification pack is developed by Automotive Skill Development Council (ASDC). This course encompasses all 6 National Occupational Standards (NOS).

Each unit starts with learning objectives followed by relevant activities and corresponding training methodology. Upon successful completion of this course the participant will be able to:

1. ASC/N9803: Organize work and resources (Manufacturing)
2. ASC/N9805: Interpret engineering drawings
3. ASC/N3535: Prepare for machining activities
4. ASC/N3508: Perform machining operations
5. ASC/N3509: Perform post-machining and maintenance activities

Besides, it has been endeavoured to follow the facilitator guide guidelines prescribed by the National Skill Development Authority.

## Symbols Used


Key Learning Outcomes


Practical


Elaborate


Tips


Notes


Unit Objectives


Do


Explain


Say

Ask


Team Activity


Demonstrate


Observation


Facilitation Notes


Exercise


Activity


Summary

# Table of Contents

# Table of Contents

# Table of Contents

Skill India
कौशल भारत-कुशल भारत

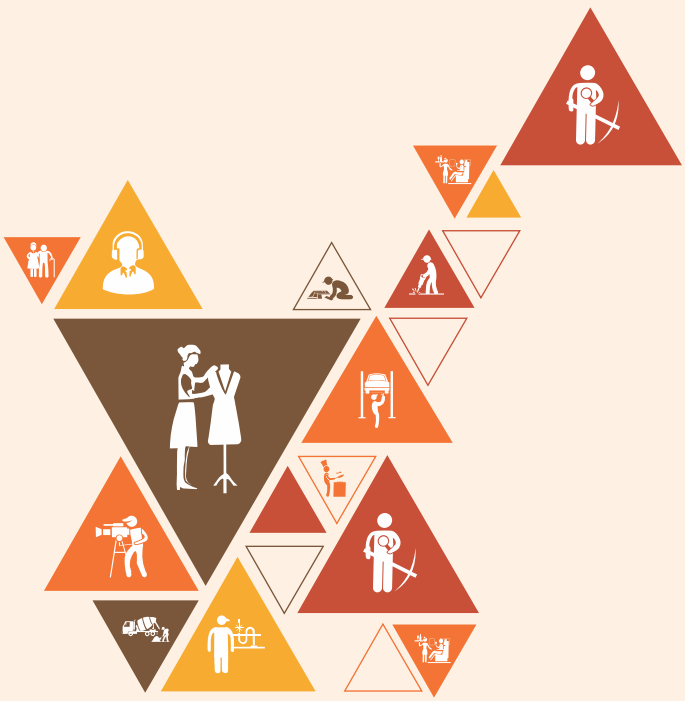
सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASDC™
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# 1. Introduction





## Key Learning Outcomes

**At the end of the module, the trainee will be able to:**

1. Describe the Machine Tools industry and CNC segment
2. Discuss the importance of CNC in User Industry
3. Explain the nature of work for a CNC Machining Technician

# UNIT 1.1: Overview of the Machine Tools Industry

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define Machine tool Industry
2. Identify the Segments in the Machine tool Industry

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Welcome to the training programme on Automotive CNC Machining Technician. I am privileged to be your trainer for the programme.
- This training programme aims to impart knowledge, skills and know-how of Automotive CNC Machining Technician.
- Before we start the programme lets play a small game.

## Do

- Divide the students in two groups
- Randomly select one student from each group at a time and ask them to greet each other and introduce themselves to each other in front of the class. They can talk about their hobbies, likes, dislikes, their academic/professional background, etc. with an ending line revealing what they expect from this training as a trainee. This will be helpful in judging their interpersonal skills.
- Appreciate the participants for their participation in the introduction round, and then introduce yourself mentioning your name and a little additional information such as favourite hobbies, likes, dislikes, etc. with the ending line revealing what you expect from the participants as a trainer.

## Notes for Facilitation

- Start the class five minutes prior to the starting time and close the session on time, so that you can give clear message of valuing your and students time
- Ensure all the resources, such as white board, marker or projector are in working condition
- Use energetic tone and positive body language to energise and enthuse the students and set the tone for the day

## Elaborate

- Elaborate on the following:
  - Machine tool
  - Components/Segments of the machine tool industry
  - Allied industries
  - Importance of machine tool industry in the manufacturing sector

## Ask

- Ask the participants if they can share their views on the segmentation of the CNC machining tools

## Summarize

- Sum up the key learning of the unit and relate the importance and progress in the industry with the potential employment opportunities.

# UNIT 1.2: What is CNC

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define CNC and its types
2. List its benefits

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Ask

- Start the class by asking a few questions on Automotive Industry and give participants the chance to guess before revealing the correct answer.
  - Do you have any idea about CNC machine.

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - What does CNC mean?
  - How is it different from conventional lathe?
  - Benefits of CNC machining
  - Types of the machining process

## Demonstrate

- Display the video/ image of the CNC machine and lathe machine.
- Display the video/image of the milling and turning process.

## Ask

- Recapitulate the delivered knowledge by asking the following questions:
  - How is CNC different from the lathe machine?
  - How can CNC support the automobile industry?

## Summarize

- Sum up the key learning of the unit and relate with the set objectives.

# UNIT 1.3: CNC Segment

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Elaborate the market share of CNC and its segments

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Explain the under mentioned topics:
  - What are the various segments under CNC?
  - Explain each segment.
  - Performance of each segment in the market.

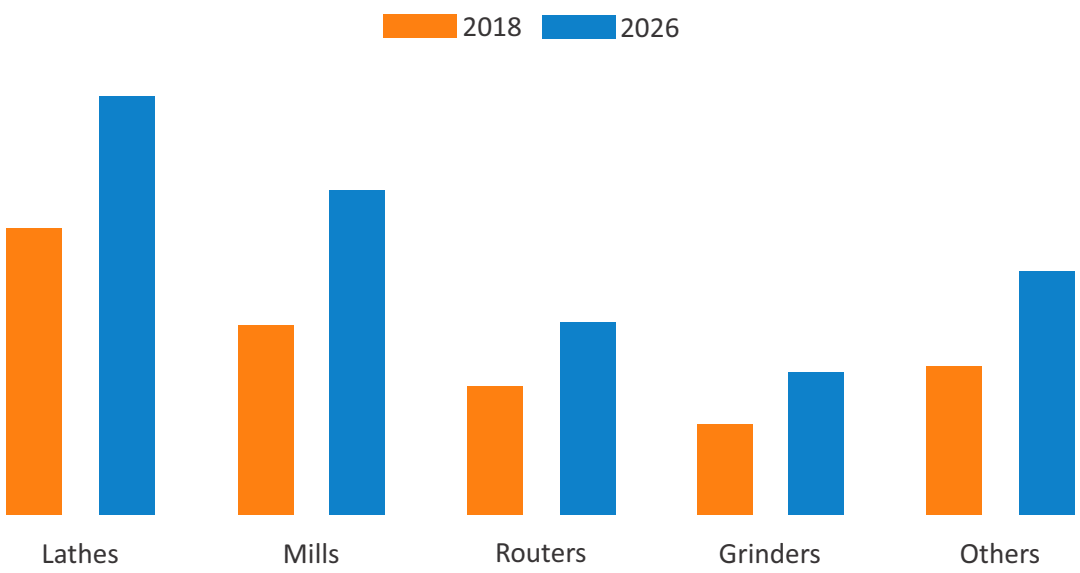



Fig 1.3.1 Performance of each segment in the market

## Ask 


- Culminate the session with appropriate knowledge recap questions.

## Summarize 

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

# UNIT 1.4: Employability Potential of CNC Segment

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Identify the opportunities available in CNC machining

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics
  - How is CNC allied with other industries?
  - The growth potential of CNC machining
  - The trend in the opportunities available in CNC machining.

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 1.5: Tasks of a CNC Technician

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Explain the roles and responsibilities of CNC Technician

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- The tasks performed by a CNC technician in a machining unit.

## Demonstrate

- Display a video of a CNC technician at work. You can use the following link “A day in the life of CNC technician:

  https://www.youtube.com/watch?v=QaM9X_ObqWE

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 1.6: Key Competencies of CNC Technician

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. List the key competencies and skills required to become a CNC Technician

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Activity

| | |
|---|---|
| **Objective** | To create sub-competencies from competency exhibit |
| **Material required** | Worksheet with given table |
| **Procedure** | Steps<br>1. Ask the participants to refer to the participant handbook and perform the following task.<br>2. Rate themselves out of 5 on each of the competencies mentioned in the exhibit.<br>3. Create sub-competencies from competency exhibit and classify them into three categories as mentioned in the following table. |
| **Conclusion** | This activity will help them to understand their progress on each of the competencies. |

## Notes

- Ask the participants to refer to the activity sheet during the course to understand their progress on each of the competencies.

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

## Exercise

- Ask the class to open their Participant Handbook and complete the exercise given in Module 1.
- Give the class 20 minutes to complete the exercise.
- The solution to exercises:
    1. Hint: Take help from the unit 1.3.1
    2. Hint: Take help from the unit 1.2.1
    3. Hint: Take help from the unit 1.6.1

**Scan the QR Code to watch the related video**

www.youtube.com/watch?v=lEyNWtM6MW4
What is CNC?

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASDC
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# 2. Organize Work and Resources

Unit 2.1 - Maintaining a Safe and Secure Working Environment

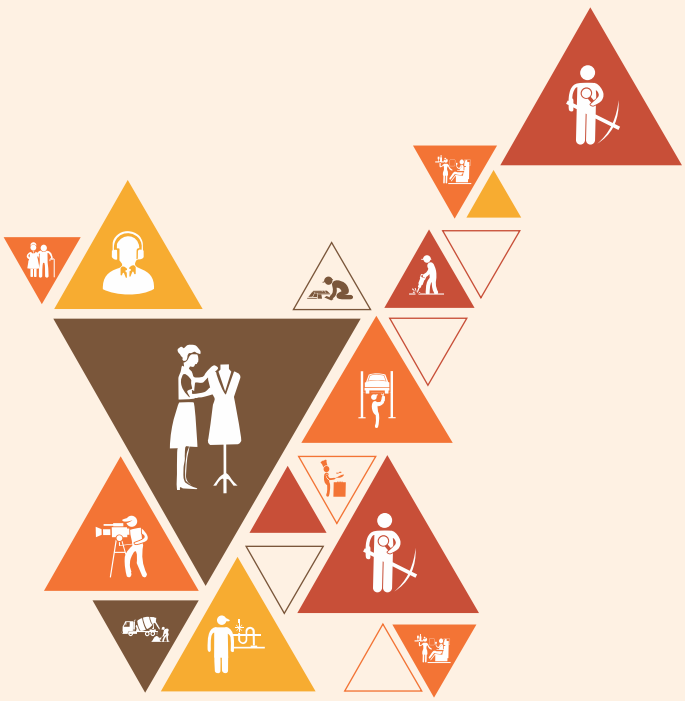
Unit 2.2 - Essential Preventive Measures for CNC Machine Operators

Unit 2.3 - Health and Hygiene Practices for CNC Machine Operators

Unit 2.4 - Quality Management Systems

Unit 2.5 - Waste Management in Manufacturing

Unit 2.6 - Energy Conservation Practices in Manufacturing



ASC/N9803

## Key Learning Outcomes

**At the end of the module, the trainee will be able to:**

1. Discuss the ways to maintain a safe and secure working environment
2. Describe the standard health and hygiene practices to be followed at the workplace
3. Perform the job activities as per quality standard
4. Adhere to effective waste management practices

# UNIT 2.1: Maintaining a Safe and Secure Working Environment

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Distinguish occupational hazards associated with CNC machining
2. Determine the factors aggravating occupational hazards

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - What is workplace safety?
  - How is it important?
  - What are occupational hazards?
  - Identify the potential workplace hazards in the manufacturing.
  - Identify the potential workplace hazards in CNC machining
  - Determine the scenarios which can aggravate occupational hazards

## Ask

- Ask the participants to develop a list of hazards associated with the CNC machining.
- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 2.2: Essential Preventive Measures for CNC Machine Operators

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Apply the rules for keeping safe while operating on CNC machine
2. List the Do's before setting up the machine

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - Elaborate on CNC machinery safety
  - Do's before operating the machine

## Demonstrate

- Display the following video to demonstrate the Do's before operating CNC machine. Refer to the following link:

  https://machineaccident.com/milling-machine-accident-lawyer-2/

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 2.3: Health and Hygiene Practices for CNC Machine Operators

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Discuss the health and hygiene practices at workplace

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - What do you mean by health and hygiene?
  - Health and Hygiene practices for CNC technician

| | |
|---|---|
| **Personal Health and Hygiene Practices for CNC Operators** | Wear proper ear protection and a good pair of safety glasses and ensure they fit well to stay in place |
| | Wear suitable footwear such as safety boots at all times |
| | Long hair must be tied and covered properly |
| | Whenever you are handling or passing tools, avoid touching the cutting edges |
| | Ensure that you turn the machine off completely and clean it whenever you have finished using it |
| | Never wear jewelry or any loose clothing |
| | Keep the premises clean and debris free |

Table 2.3.1 Health and Hygiene practices

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

# UNIT 2.4: Quality Management Systems

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define quality management system
2. Explain automotive quality management system and their compliance principles

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics.
  - What are quality management systems?
  - What is the importance of QMS?

## Explain

- IATF 16949
- Postulates of IATF


Fig 2.4.1 Postulates of IATF

- Compliance principles

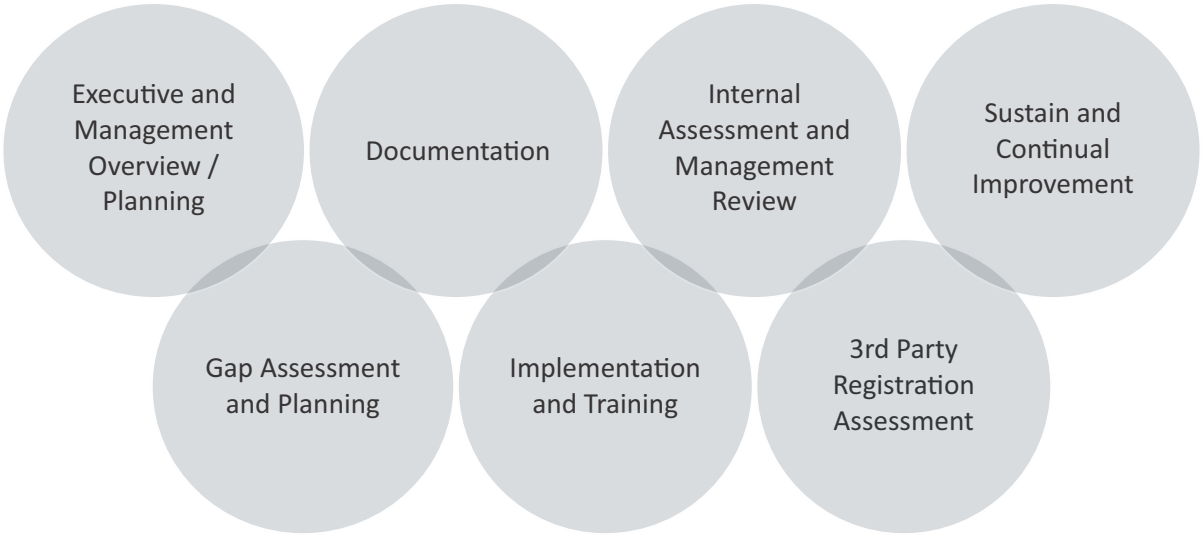



Fig 2.4.2 Compliance Principles

## Demonstrate

- Display the undermentioned video:

  https://www.sgs.com/en/news/2017/01/iatf-16949-2016-what-you-need-to-know

## Ask

- Ask the participants following questions to answer:
  - Do you know what is quality management system?
  - What are the benefits of quality management systems?

## Notes for Facilitation

- Allow one or two students to answer the questions
- Summarize the unit to clear the participants' doubts

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 2.5: Waste Management in Manufacturing

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Identify wastes in the industrial environment
2. Discuss the methods of waste minimization in manufacturing

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Start with the waste management practices generally followed at home. Relate it to the upcoming topic.

## Elaborate

- Elaborate on the following:
  - What is waste management?
  - Identify wastes in industrial set up
  - Recognise the waste minimization practices

## Demonstrate

- Display the following video for the participants and introduce the concept of lean manufacturing:
  https://cerasis.com/lean-manufacturing-strategies/

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 2.6: Energy Conservation Practices in Manufacturing

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Describe the energy conservation practices at workplace

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Ask

- Initiate the class by asking questions related to the last module:
  - What do you mean by waste management?
  - Do you mention three waste management practices?

## Explain

- Explain the concept of energy conversation
- Explain various practices of energy conversation

## Activity

| | |
|---|---|
| **Objective** | To develop a list of methods that can conserve energy for Homes and for industrial set-ups |
| **Material required** | Worksheet |
| **Procedure** | Steps<br>1. Ask them to develop a list of methods that can conserve energy for Homes and for industrial set- ups.<br>2. Ask the groups to reveal their list and develop a comprehensive energy list on the whiteboard. |
| **Conclusion** | This activity will help them to conserve energy for Homes and for industrial set-ups. |

## Exercise

- Ask the class to open their Participant Handbook and complete the exercise given in the Module 2
- Ensure that the participants have opened the correct page for the activity
- The solution to exercises:

1. Hint: Take help from the unit 2.1, 2.2, 2.3, 2.4, 2.5 and 2.6
2. Hint: Take help from unit 2.2
3. Hint 1: Take help from unit 2.2

   Hint 2: Take help from unit 2.3

   Hint 3: Take help from unit 2.4

   Hint 4: Take help from unit 2.4
4. Hint: Take help from unit 2.6

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

**Scan the QR Code to watch the related video**

www.youtube.com/watch?v=ANiJU50JgbM
Health and Hygiene Practices for CNC Machine Operators

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASDC
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# 3. Interpret Engineering Drawing

Unit 3.1 - Engineering Drawing and its Purpose

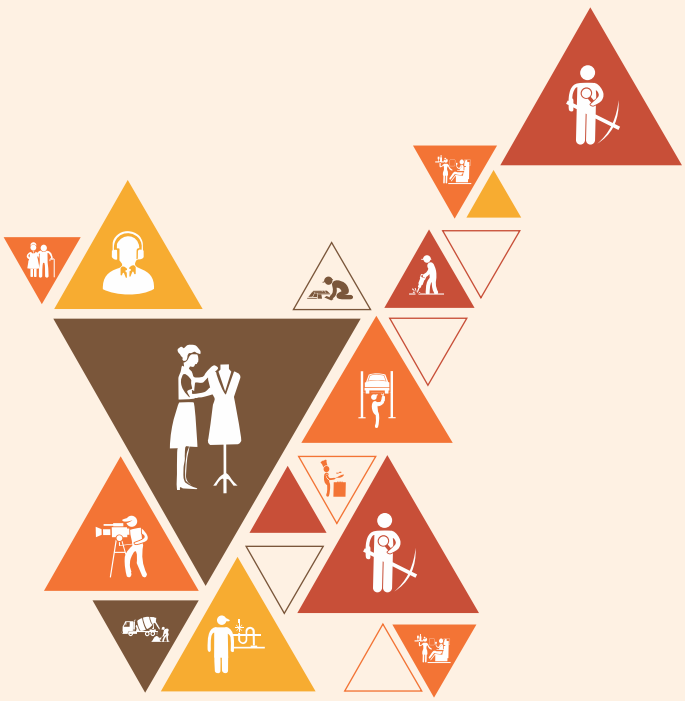
Unit 3.2 - Measurement

Unit 3.3 - Dimensions

Unit 3.4 - Basic Components of an Engineering Drawing

Unit 3.5 - Geometric Dimensioning & Tolerancing (GD&T)

Unit 3.6 - Surface Finish



## Key Learning Outcomes

**At the end of the module, the trainee will be able to:**

1. Differentiate between 2D and 3D shapes
2. Explain section views and projections
3. Interpret the geometric dimensioning and tolerance in a feature frame

# UNIT 3.1: Engineering Drawing and its Purpose

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define engineering drawing and outline its usage

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the engineering drawings?

## Example

- Refer to fig 3.1.1 in the PH and draw an analogy with the drawing of a cup

## Explain

- Relate to the example and explain the format of the engineering drawings.

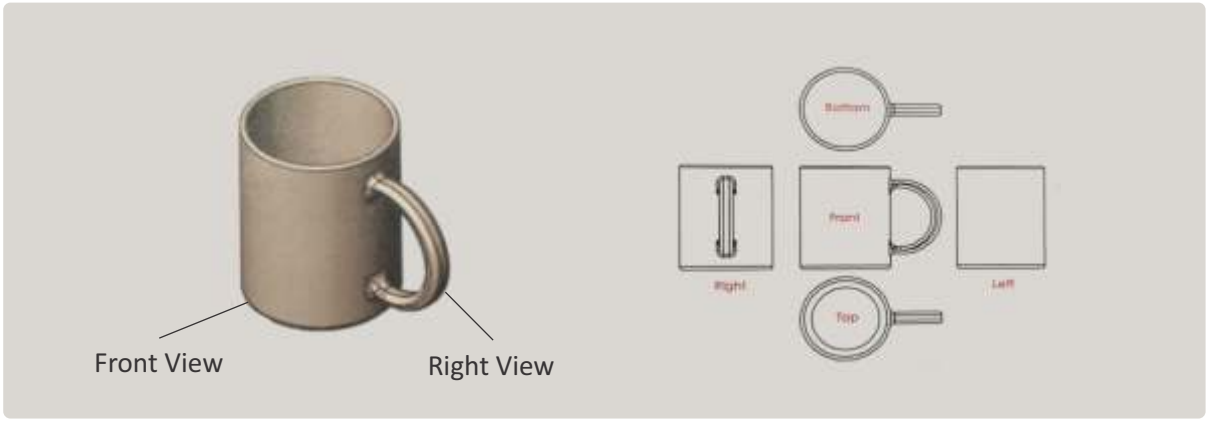



Fig 3.1.1 Engineering drawing

## Ask


- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 3.2: Measurement

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define measurement and its units

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Ask

- Ask the participants how they communicate in the following scenarios:
  - How far is my home from the workplace?
  - Buying sugar form the grocer
  - Buying milk from the milkman
  - What is the duration of a video?
  - How hot or cold is it in your area?
- List the answers on the whiteboard

## Explain

- Relate to the list on the white board and explain the SI units of measurement

| Quantity | Meaning | Units | Conversion Units |
|---|---|---|---|
|  | Length describes how long a thing is from one end to the other. | Millimeter (mm)<br>Centimeter (cm)<br>Inches (”)<br>Meter (mts)<br>Kilometers (km) | 10 mm = 1 cm<br>1Inch = 2.54 cm<br>1 meter = 100 cm/ 25.5 inches<br>1km = 1000 mts |
|  | Amount of matter in a substance or to tell how heavy or light. | Milligram (mg)<br>Gram (gm)<br>Kilogram (kg) | 1000 mg = 1 gm<br>1000 gm = 1kg |
|  | Tells the capacity or how much can a container hold. | Millilitres (ml)<br>litres (l) | 1000 ml = 1l |

- Relate to the list on the white board and explain the SI units of measurement

| Quantity | Meaning | Units | Conversion Units |
|---|---|---|---|
|  | The ongoing sequence of events | Seconds<br>Minutes<br>Hours | 60 seconds = 1 minute<br>60 minutes = 1 hour |
|  | Tells how hot or cold a substance is. | Degree Celsius<br>Degree Fahrenheit | 0 Celsius = 32 Fahrenheit<br>Divide by 5, then<br>°C to °F = multiply by 9, then add 32<br>°F to °C =Deduct 32, then multiply by 5, then divide by 9 |

Fig 3.2.1 SI units of measurement

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 3.3: Dimensions

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Compare between 1D, 2D, and 3D shapes
2. Interpret the angles and axis

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Explain the concept of dimensions. Explain the following in detail:
  - 1D, 2D, and 3D shapes
  - Angles in the shapes
  - Explain the difference between 2D and 3D shapes
  - Explain various types of 2D and 3D shapes and their properties

## Demonstrate

- Show the 3D objects to the participants while explaining the properties of 3D shapes.

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 3.4: Basic Components of an Engineering Drawing

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Distinguish between types of lines and their interpretation in engineering drawings
2. Classify types of views
3. Differentiate between the types of angles of projection

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - Types of lines in the drawings and their interpretations
  - Letter classification of lines
  - Types of views
  - Angles of projection -1st and 3rd angle
  - Difference between first and third angle projection

## Demonstrate

- Demonstrate an engineering drawing to the participants and explain the following elements:
  - Lines used in the drawing
  - Angle of projection used

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 3.5: Geometric Dimensioning & Tolerancing (GD&T)

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define GD & T
2. Identify the symbols for GD & T
3. Discuss the benefits of GD&T
4. Define & interpret Datum and Notation
5. Elaborate feature control frame

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following:
  - What is geometric dimensioning and tolerancing?
  - What are the benefits of using GD&T?
  - Symbols of GD&T
  - What is datum and notation?
  - Symbols of datum and notation.
  - What is a feature control frame?
  - Interpretation of feature control frame

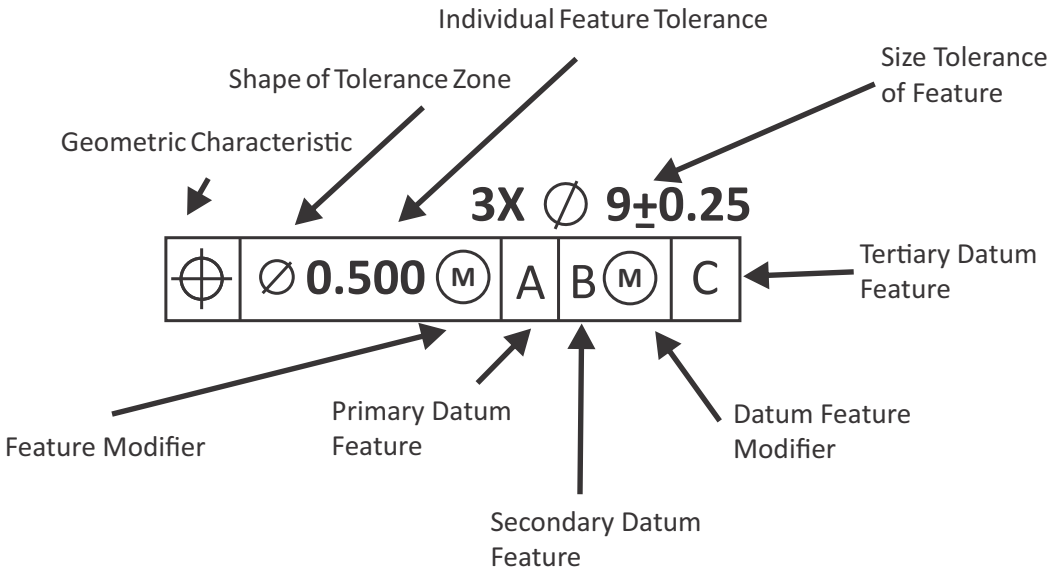



Fig 3.5.1 Interpretation of feature control frame

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 3.6: Surface Finish

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define surface finish and its types
2. Identify and interpret Surface roughness symbols

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - What is surface finish?
  - Types of surface finish and its characteristics
  - Surface roughness symbols

As **Machined** parts have minor visible tool marks. The standard as machined surface roughness (Ra) is 3.2 µm. Surface finish requirements can be increased to 1.6, 0.8 and 0.4 µm.

**Bead blasted** parts have a matte finish with a light texture. Mainly for visual purposes

| | |
|---|---|
|  |  |
| **Anodizing** adds a corrosion resistant, ceramic layer to the surface of the part. Can be dyed to different colors. Available only for Aluminum and Titanium | **Powder coating** adds a wear and corrosion finish to the surface of the parts. Has higher impact resistance compared to anodizing. Large range of colors available.Can be applied to any metal |

Table 3.6.1 Types of surface finish and its characteristics

## Exercise

- Ensure that the participants have opened the correct page for the activity
- The solution to exercises:

1. Hint: Take help from the unit 3.3
2. Hint: Take help from the unit 3.4
3. Hint: Take help from the unit 3.5
4. Hint: Take help from the unit 3.5
5. Hint: Take help from the unit 3.5

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

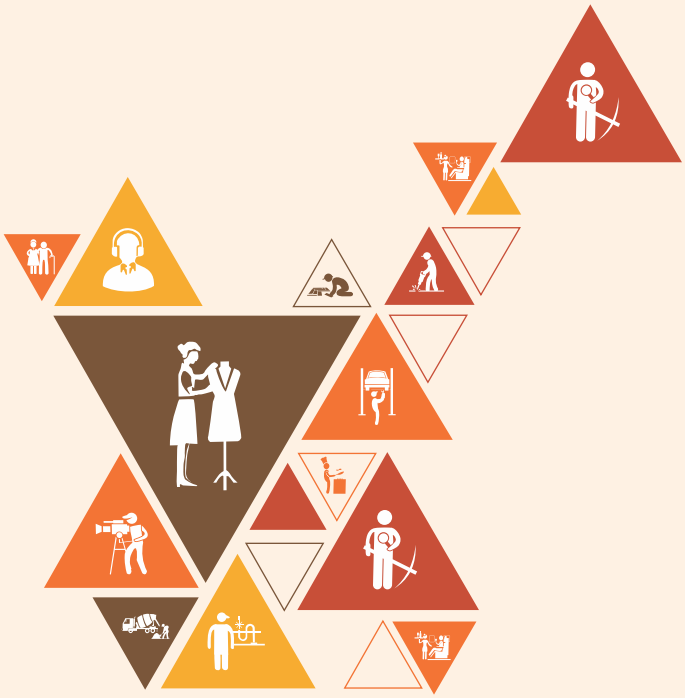
**Scan the QR Code to watch the related video**

www.youtube.com/watch?v=M8fAF0xMxBs
Engineering Drawing and its Purpose

ASDC™
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# 4. Perform Pre-Machining Activities





## Key Learning Outcomes

**At the end of the module, the trainee will be able to:**

1. Elaborate the process of CNC
2. Explain the tools and raw material used in CNC

# UNIT 4.1: What is CNC?

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define CNC technically
2. Describe the process of CNC machining

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following topics:
  - Define CNC Machining concept
  - Basic process of CNC
  - Process to design the CAD model of the part.
  - G-Code and inputs
  - Execution of machining operations

## Demonstrate

- Demonstrate a running CNC machine through a video. Refer to the following link:
  https://www.youtube.com/watch?v=Qj0A7FFyP8U

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 4.2: Parts of CNC machine

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Identify the parts of CNC machine and their functions

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

Elaborate on the parts of the CNC machine and their role in the machining process flow

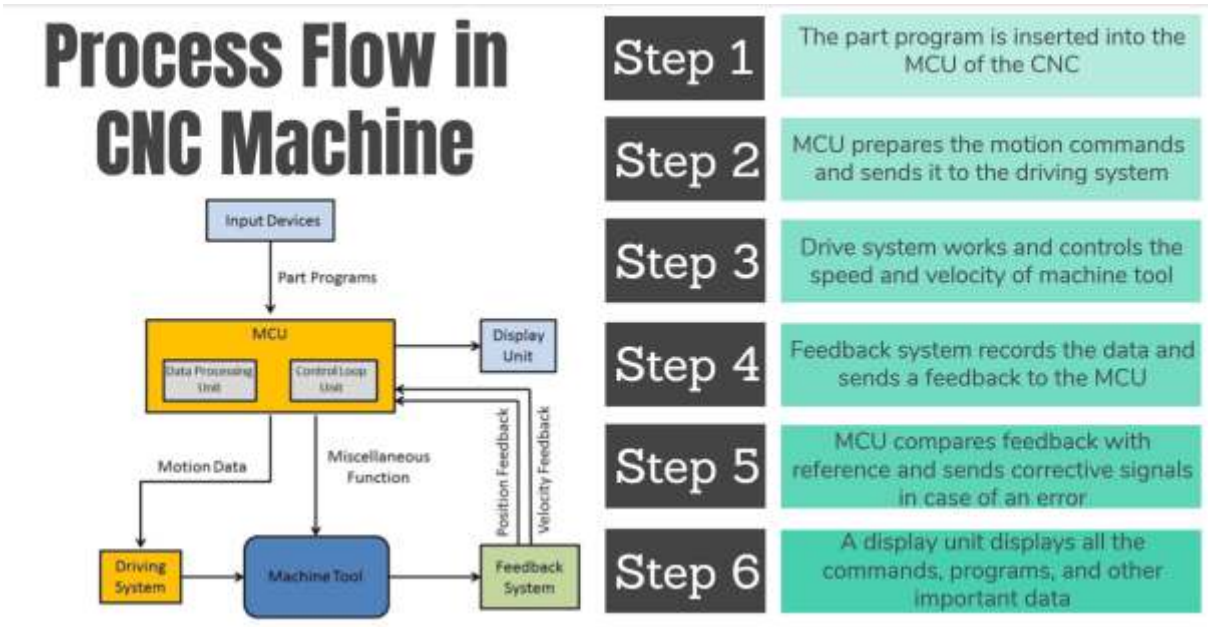



Fig 4.2.1 Parts of the CNC machine

## Field Visit 

- Participants must visit an actual facility to learn about the various parts of CNC and their role.

## Ask 


- Culminate the session with appropriate knowledge recap questions.

## Summarize 

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 4.3: How does CNC Machining Works?

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Elaborate on the types of CNC machining system and its process flow
2. Identify the cutting tools used in CNC machining

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Explain CNC milling and the process.
- Explain CNC Turning and the process

## Demonstrate

- Demonstrate the milling process using the referred link:
  https://www.youtube.com/watch?v=osqX7iQEnuI
- Demonstrate the turning process using the referred link:
  https://www.youtube.com/watch?v=-9htuGLegbI

## Elaborate

- Continue the session by elaborating on the following topics:
  - What are cutting tools?
  - Types of cutting tools and their application

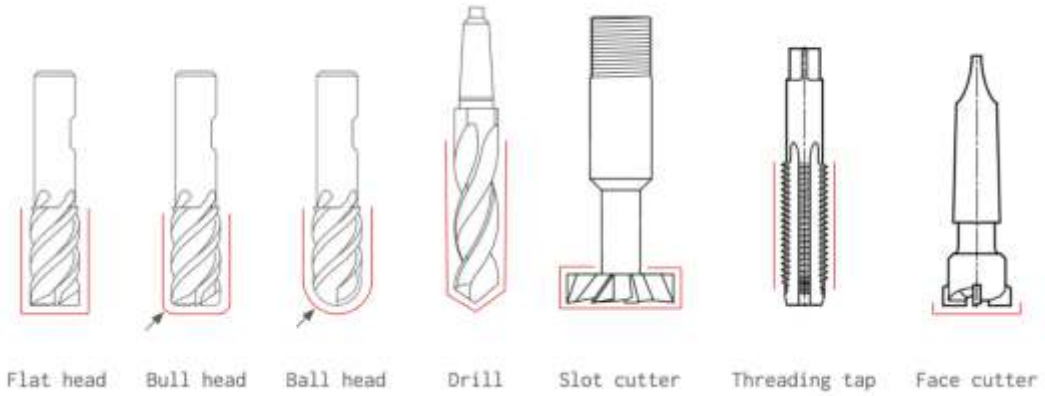



Fig 4.3.1 Types of cutting tools

## Field Visit

- Participants must visit an actual facility to learn about the milling and turning process.

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

# UNIT 4.4: Material for CNC Machining

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Explain variety of materials used in CNC machining and their properties
2. Identify appropriate material with suitable properties for CNC machining

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following.
  - Material used in CNC machining

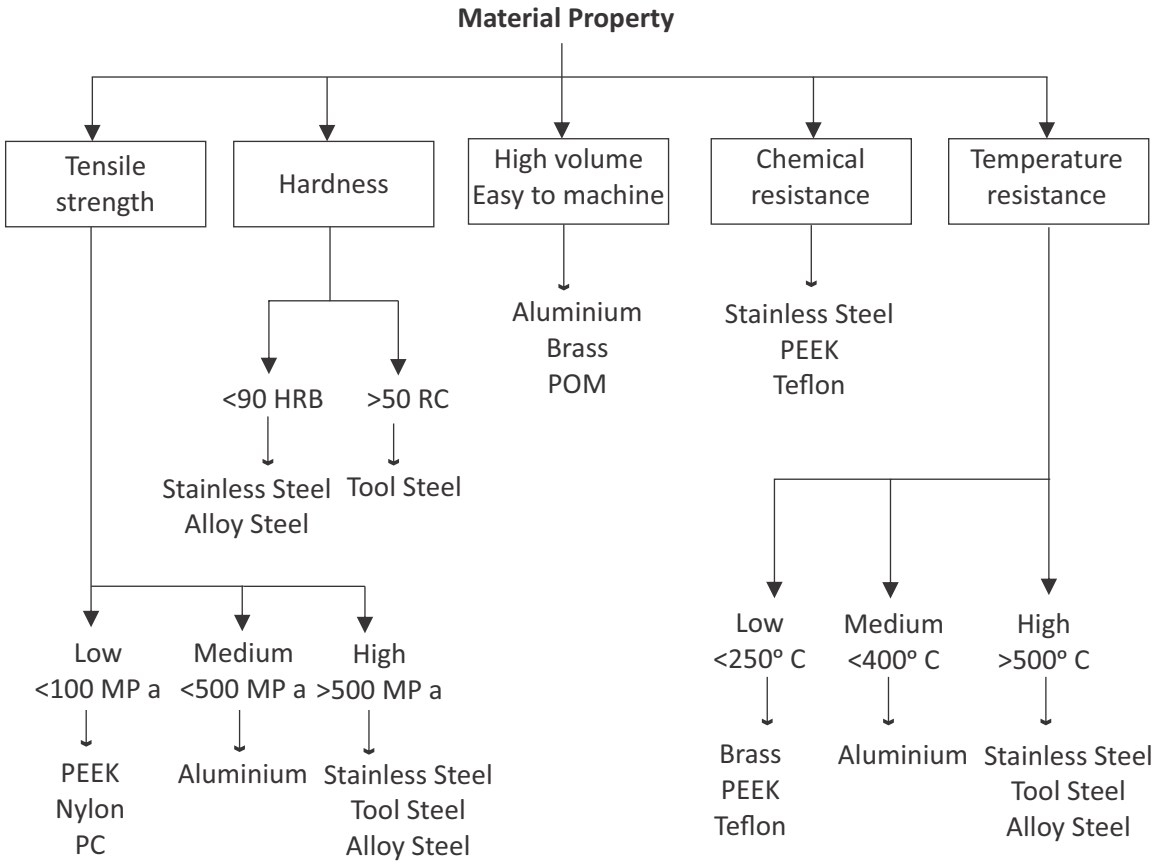



Fig 4.4.1 Material used in CNC machining

- Properties/characteristics of the material used
- Appropriate process of selecting the material

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 4.5: Measurement for CNC Machining

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Identify measuring machines for CNC
2. Discuss how to use the measuring equipment

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following.
  - Importance of precise measurement in the CNC machining
  - Tools used to measure the object

**Surface Plate**

**Go/No-Go Gauge**

**Calipers**


**Micrometers**

Caliper Micrometer

Bore Micrometer

Depth Micrometer

**Air Gage**

Table 4.5.1 Measuring Machines for CNC

- Step-wise method of using the measuring tools and calculating precise readings
- Importance of calibrating the measuring tool

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 4.6: G Code and its functions

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define G Code
2. Explain the functions of G-Code

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following.
  - What is G Code and its function in CNC machining
  - Format of G-Code
  - G Codes and their function

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 4.7: Machine Coordinates

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define Coordinates and cartesian coordinate system
2. Describe the procedure of aligning machine motion with coordinate

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following.
  - What is a number line?

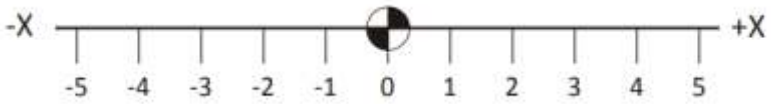



Fig 4.7.1 Number line

  - What is Cartesian coordinate system?
  - How is the system applicable on the CNC machine?
  - What are machine coordinates?

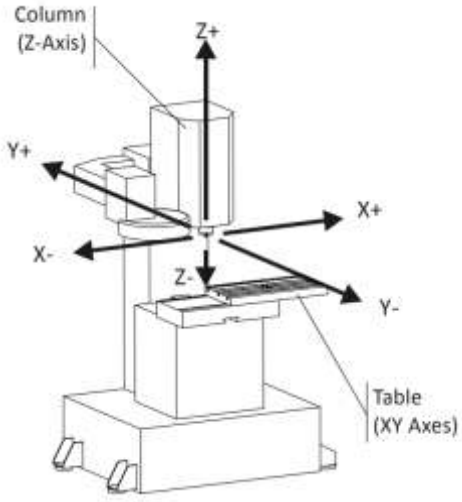



Fig 4.7.2 Machine coordinators

## Ask


- Ask the participants to draw 5 objects that they see around themselves and establish their coordinates.
- Culminate the session with appropriate knowledge recap questions.

## Explain

- Review the work done by each of the participants and clarify the doubts, if any.

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

# UNIT 4.8: Work and Tool Offsets

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Compare between work and tool offsets

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following.
  - What are offsets?
  - Types of Offsets and components involved
  - Difference between the work and tool offsets

## Ask

- Culminate the session with appropriate knowledge recap questions

## Summarize

- Sum up the key learning of the unit and relate with the objectives

# UNIT 4.9: Cycle Time and OEE

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define Cycle time and OEE
2. Discuss the method of calculating OEE

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following.
  - What is cycle time?
  - How is cycle time calculated?
  - What is OEE and why is it important?
  - How to calculate OEE?

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 4.10: Benefits and Limitations of Using CNC Machine

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Elaborate the pros and cons of CNC machining

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Refer to Participant Handbook, compare with the developed list and elaborate on each benefit and limitation.

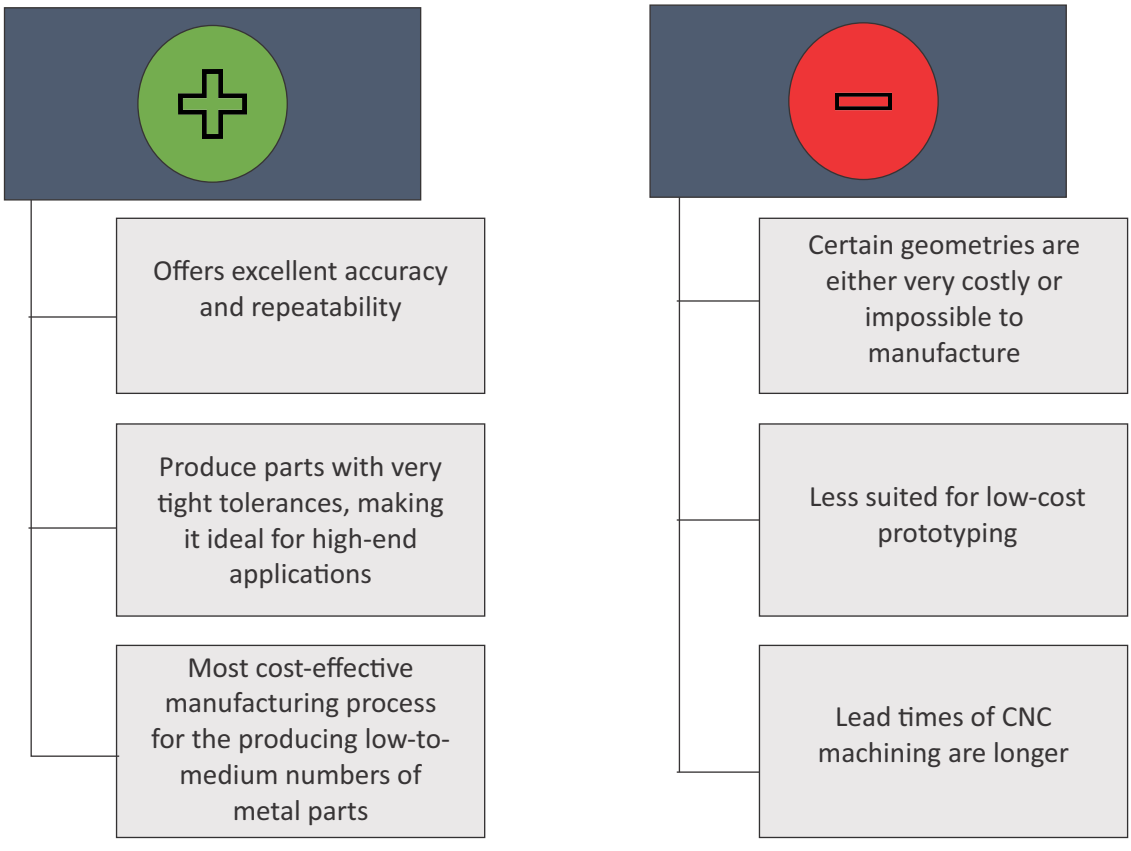



Fig 4.10.1 Potential benefits and limitations of using CNC machine

## Exercise

- Ask the class to open their Participant Handbook and complete the exercise given at the end of Unit 4.10
- Ensure that the participants have opened the correct page for the activity
- The solution to exercises:

1. Hint: Take help from the unit 4.1 to 4.10
2. Hint: Take help from the unit 4.7
3. Hint: Take help from the unit 4.8

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

**Scan the QR Code to watch the related video**

www.youtube.com/watch?v=CzZ9IEcuNeE
Parts of CNC Machine

www.youtube.com/watch?v=BHZALtqAjeM
Material for CNC Machining

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASDC
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

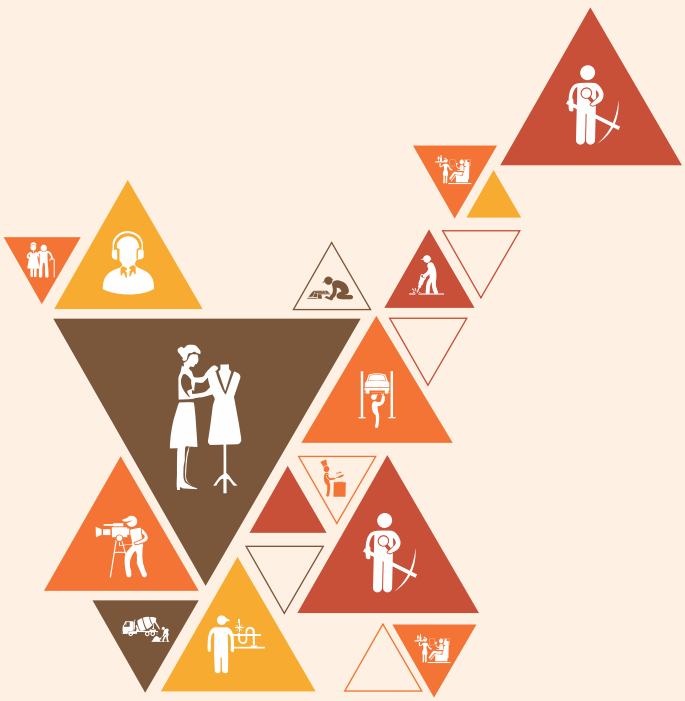
# 5. Perform Machining Activities

Unit 5.1 - Overview of CNC Setup

Unit 5.2 - CNC Machine Setup

Unit 5.3 - CNC Machine Troubleshooting

Unit 5.4 - CNC Process Records



ASC/N3508

## Key Learning Outcomes

**At the end of the module, the trainee will be able to:**

1. Explain the steps to set up a CNC machine
2. Identify the location and purpose of operating controls
3. Explain the stepwise process of operating CNC machine
4. Identify the data points to be recorded during operation

# UNIT 5.1: Overview of CNC Setup

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Explain the steps to operate on a CNC machine

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Explain the steps of CNC process.

## Field Visit

- Participants must visit an actual facility to learn about the milling and turning process.

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 5.2: CNC Machine Setup

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Describe the home position in the CNC machine
2. Describe how to Adjust tool length offsets
3. Explain the functions of the buttons on the CNC machine
4. Elaborate how to perform a CNC machine set up

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Home position of the CNC machine
- Setting tool length Offsets

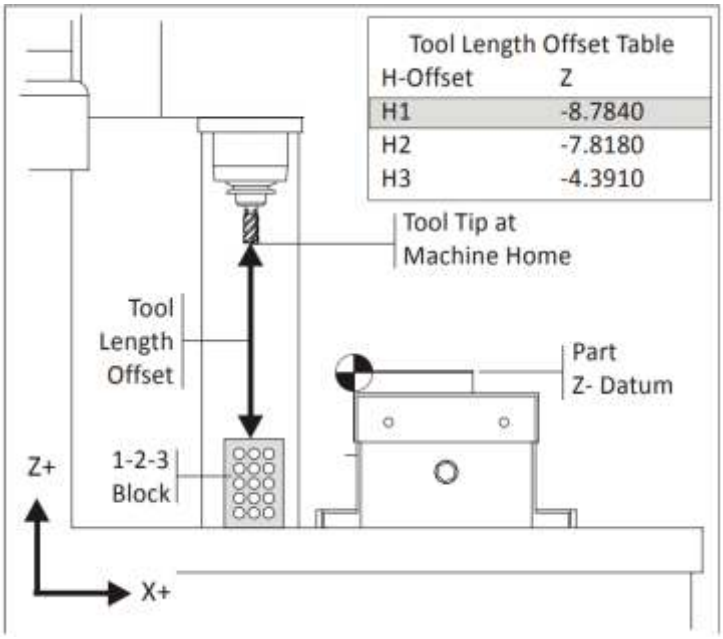



Fig 5.2.1 Setting tool length Offsets

- Controls and buttons on the machine

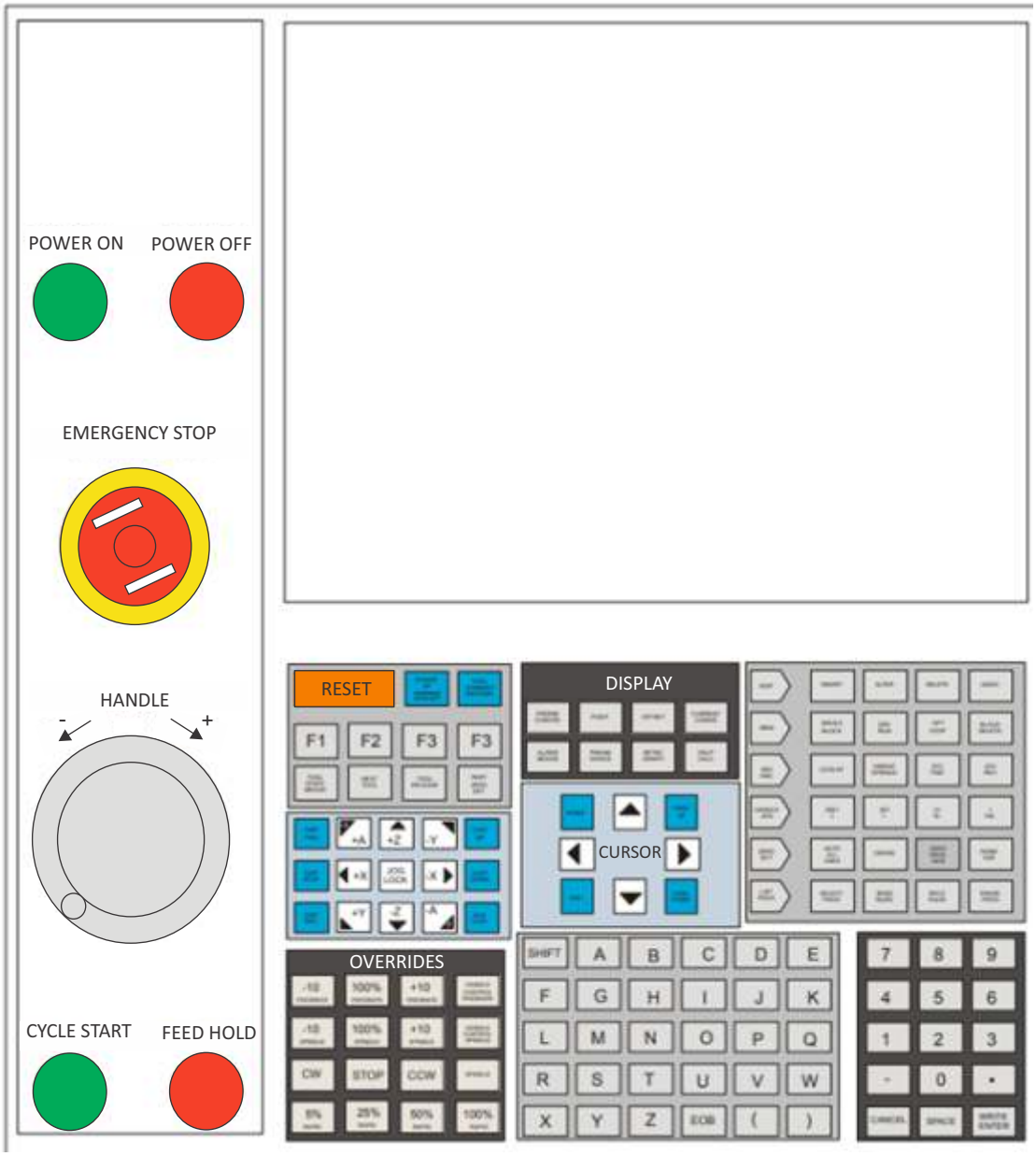



Fig 5.2.2 Controls and buttons on the machine

- Explain the step of operating the CNC machine

## Demonstrate

- Demonstrate the CNC process from start to finish with the help of the referred video.
  https://www.youtube.com/watch?v=bDpfTzV6StA

## Field Visit 

- Participants must visit an actual facility to learn about the CNC control panel and operating process.

## Ask 


- Culminate the session with appropriate knowledge recap questions.

## Summarize 

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 5.3: CNC Machine Troubleshooting

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Explain the types of problems and performing the trouble shooting mechanism

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the kind of problems associated with the CNC machine operations, its cause, and the trouble shooting mechanism.

## Demonstrate

- Table an example with the help of the referred video:
  https://www.youtube.com/watch?v=hnJ75-GJlV0&feature=emb_logo

## Ask

- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 5.4: CNC Process Records

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Explain the importance of maintaining process records in CNC operations
2. Explain how to find the data points for process improvement

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the following:
  - Importance of data gathering and record keeping in CNC machining
  - Kind of data to be gathered during CNC machining
  - Identification of changes and their cause in CNC machining process

## Ask

- Ask the following knowledge recapitulation questions from the participants:
  - What is the process of CNC machining?
  - Why is it important to determine the home position before starting?
  - What are the data points on which the data must be gathered for CNC machining?

## Summarize

- Summarize the session on CNC process records
- Ask participants if they have any doubts
- Answer their queries, if any

## Exercise

- Ask the class to open their Participant Handbook and complete the exercise given at the end of Unit 5.4
- Ensure that the participants have opened the correct page for the activity
- The solution to exercises:

1. Hint: Take help from the unit 6.2 for all the exercise question's answer

**Scan the QR Code to watch the related video**

www.youtube.com/watch?v=dFDOZcznm68
CNC Machine Setup

www.youtube.com/watch?v=cWfXgmhKYWQ
CNC Machine Troubleshooting

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

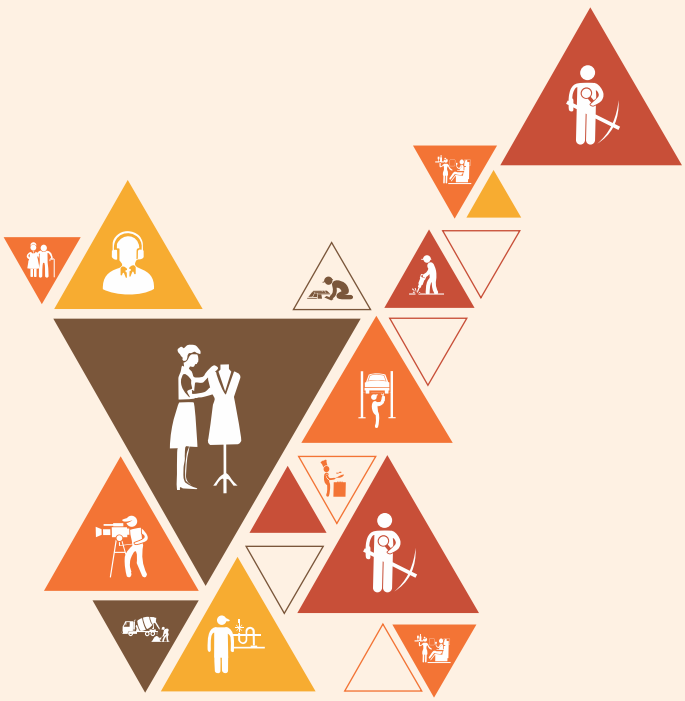
ASDC
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# 6. Perform Post-Machining and Maintenance Activities

Unit 6.1 - Defining Deburring

Unit 6.2 - Quality Control and Inspection

Unit 6.3 - Maintenance of CNC Machines



ASC/N3509

## Key Learning Outcomes

**At the end of the module, the trainee will be able to:**

1. Perform de- burring activity on the machined components
2. Describe the ways to check the quality of machined component (Gauging)
3. Perform machine maintenance activities

# UNIT 6.1: Defining Deburring

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Define Deburring and its importance
2. List the types of deburring techniques
3. Identify deburring tools

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Elaborate

- Elaborate on the undermentioned topics.
  - What is deburring?
  - Why is it important?
  - Types of deburring
  - Tools used for deburring

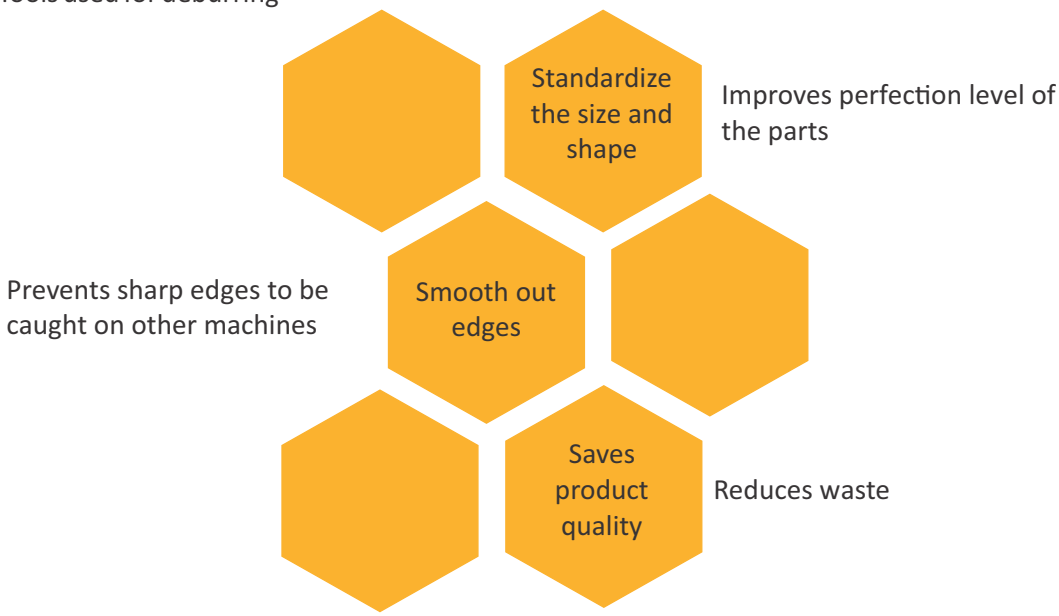



Fig 6.1.1 Importance of Deburring

## Ask


- Take a knowledge recap by asking questions from the participants.
- Culminate the session with appropriate knowledge recap questions.

## Demonstrate

- Demonstrate the deburring process with the help of the referred video:
  https://www.youtube.com/watch?v=UdhjZSx-JGY

## Field Visit

- Participants must visit an actual facility to learn about the deburring process.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 6.2: Quality Control and Inspection

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Explain the importance of maintaining quality in CNC operation
2. Define the principal functions of manufacturing quality
3. List and explain the quality control mechanisms
4. Define the modes of inspection and the parameters

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Ask

- Ask the participants to share their past experience with maintaining quality at their workplace or even homes.

## Elaborate

- Relate the experiences of the participants with the definition & benefits of quality control and elaborate on the following:
  - Quality control in CNC operations
  - Three Principal functions of Manufacturing Quality
  - Benefits of Quality Control

| Eliminating Errors | Sustained Quality | Improved Compliance |
|---|---|---|
| Strong quality control practices like Six Sigma not only help spot quality issues but also work to prevent defects from happening in the first place. | Quality control practices help detect the root problem of a defect, then revise processes to fix issues and improve over quality and avoid defects in the future. | Improving quality control often includes focusing on quality standards, including those that OSHA and other regulatory bodies use to monitor companies and products. |

Fig 6.2.1 Benefits of Quality Control

- Manufacturing Stages and Modes of Quality Inspection
- General Inspection parameters


Fig 6.2.2 General Inspection parameters

- Process of Inspection

## Demonstrate

- Demonstrate the maintenance auditing process with the help of the referred video: https://www.youtube.com/watch?v=2Phfb5oVQxg

## Ask

- Take a knowledge recap by asking questions from the participants.
- Culminate the session with appropriate knowledge recap questions.

## Summarize

- Sum up the key learning of the unit and relate with the objectives.

# UNIT 6.3: Maintenance of CNC Machines

## Unit Objectives

**After the completion of this unit, the trainee will be able to:**

1. Discuss the benefits of CNC maintenance programs
2. Describe how to operate in line with the maintenance requirements

## Resources to be Used

- Participant handbooks
- Paper, Pens, Notepad, Chart paper
- Computer, Projector
- Whiteboard, Marker, and Duster

## Say

- Begin the session with a brief recapitulation of the previous session.

## Explain

- Explain what maintenance means

## Elaborate

- Elaborate on the following
  - Benefits of maintaining CNC
  - Preventive maintenance formats and checklist
  - Maintenance checklist

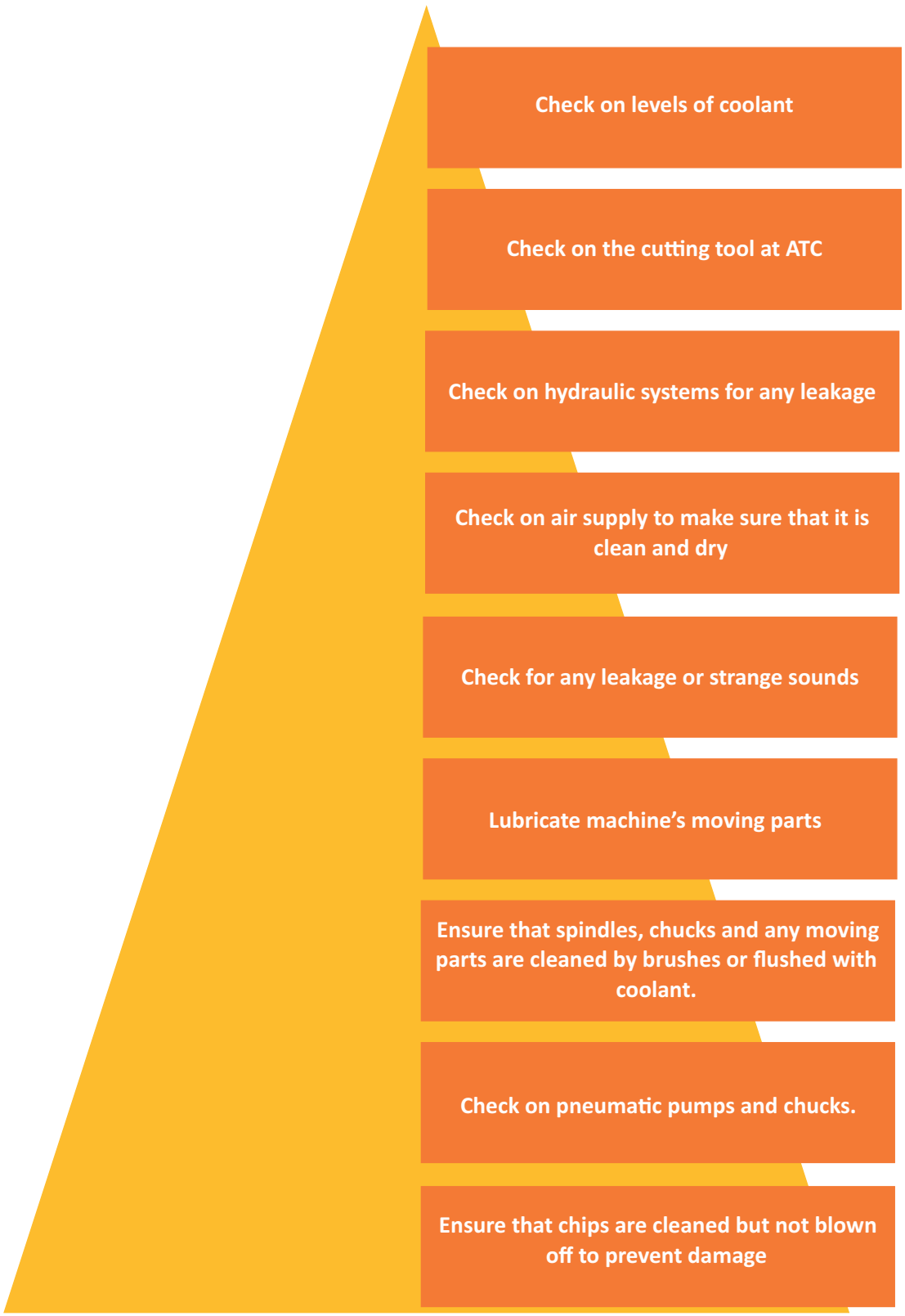



Fig 6.3.1 Maintenance checklist

## Exercise

- Ask the class to open their Participant Handbook and complete the exercise given at the end of Unit 6.3
- Ensure that the participants have opened the correct page for the activity
- The solution to exercises:

1. Hint: Take help from the unit 6.2
2. Hint: Take help from the unit 6.3
3. Hint: Take help from the unit 6.1

## Ask

- Take a knowledge recap by asking questions from the participants.

## Summarize

- Summarize the session
- Ask participants if they have any doubts
- Encourage them to ask questions
- Answer their queries patiently

**Scan the QR Code to watch the related video**

www.youtube.com/watch?v=VM_PucqVPcA
Quality Control and Inspection

www.youtube.com/watch?v=9Xlx7KJPhWk
Maintenance of CNC Machines

Skill India
कौशल भारत-कुशल भारत

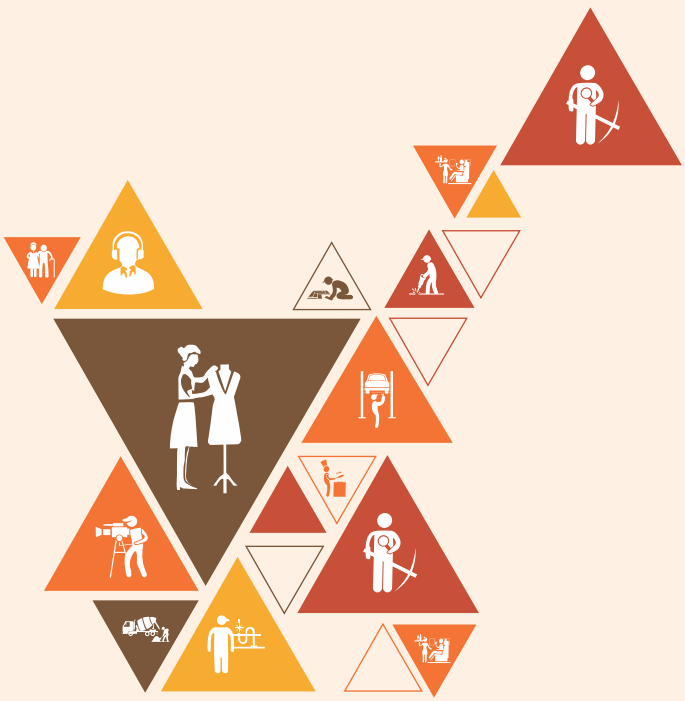
सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ASDC
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

# 7. Employability and Entrepreneurship Skills

https://eskillindia.org/NewEmployability

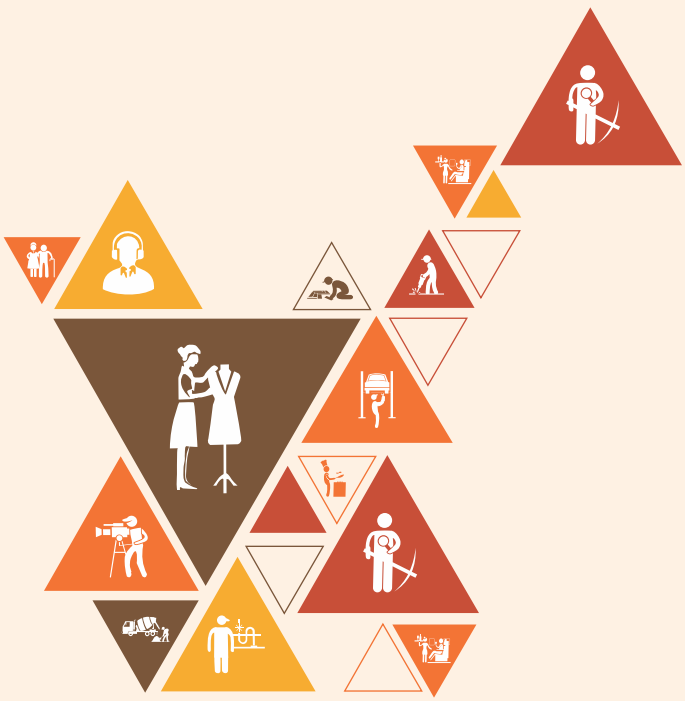


# 8. Annexures

Annexure I : QR Codes

Annexure I : Training Delivery Plan

Annexure II : Assessment Criteria



# ANNEXURE - QR Codes

| Chapter No. | Unit No. | Topic Name | Page No. | QR code(s) | URL |
|---|---|---|---|---|---|
| Chapter - 1 Introduction | UNIT 1.2 What is CNC? | 1.2 What is CNC? | 12 | | https://www.youtube.com/watch?v=lEyNWtM6MW4 |
| Chapter - 2 Organize Work and Resources | UNIT 2.3 Health and Hygiene Practices for CNC Machine Operators | 2.3 Health and Hygiene Practices for CNC Machine Operators | 23 | | https://www.youtube.com/watch?v=ANiJU50JgbM |
| Chapter - 3 Interpret Engineering Drawings | UNIT 3.1 Engineering Drawing and its Purpose | 3.1 Engineering Drawing and its Purpose | 35 | | https://www.youtube.com/watch?v=M8fAF0xMxBs |
| Chapter - 4 Perform Pre-Machining Activities | UNIT 4.2 Parts of CNC Machine | 4.2 Parts of CNC Machine | 53 | | https://www.youtube.com/watch?v=CzZ9IEcuNeE |
| Chapter - 4 Perform Pre-Machining Activities | UNIT 4.4 Material for CNC Machining | 4.4 Material for CNC Machining | 53 | | https://www.youtube.com/watch?v=BHZALtqAjeM |
| Chapter - 5 Perform Machining Activities | UNIT 5.2 CNC Machine Setup | 5.2 CNC Machine Setup | 62 | | https://www.youtube.com/watch?v=dFDOZcznm68 |
| Chapter - 5 Perform Machining Activities | UNIT 5.3 CNC Machine Troubleshooting | 5.3 CNC Machine Troubleshooting | 62 | | https://www.youtube.com/watch?v=cWfXgmhKYWQ |

# ANNEXURE - QR Codes

| Chapter No. | Unit No. | Topic Name | Page No. | QR code(s) | URL |
|---|---|---|---|---|---|
| Chapter - 6 Perform Post-Machining and Maintenance Activities | UNIT 6.2 Quality Control and Inspection | 6.2 Quality Control and Inspection | 71 | | https://www.youtube.com/watch?v=VM_PucqVPcA |
| Chapter - 6 Organize Work and Resources | UNIT 6.3: Maintenance of CNC Machines | 6.3 Maintenance of CNC Machines | 71 | | https://www.youtube.com/watch?v=9Xlx7KJPhWk |
| Chapter - 7 Employability and Entrepreneurship Skills | | Employability and Entrepreneurship Skills | 72 | | https://eskillindia.org/NewEmployability |

# Annexure II

# Training Delivery Plan

| Training Delivery Plan | | | |
|---|---|---|---|
| **Program Name** | **Automotive CNC Machining Assistant** | | |
| **Qualification Pack, Name and Reference ID** | Automotive CNC Machining Assistant<br>**ASC/Q3503, v6.0** | | |
| **Version No.** | 6.0 | **Version Update Date** | 17-11-2022 |
| **Pre-requisites to Training (If any)** | NA | | |
| **Training Outcome** | **After completing this programme, participants will be able to:**<br>1. Interpret engineering drawings for identification of raw material, tools and equipment requirement for the machining operations.<br>2. Perform pre-machining activities such as lifting of workpiece, inspection of tools and equipment etc.<br>3. Perform various machining operations such as turning, milling, shaping, grinding, boring, broaching, hobbing, facing, shaping, blanking, piercing etc.<br>4. Perform post-machining operations to finish the final output workpiece with the required specifications and industry standards.<br>5. Conduct quality checks and inspection of the finished products for any damages and deformities.<br>6. Work effectively and efficiently as per schedules and timelines.<br>7. Implement safety practices.<br>8. Optimize the use of resources to ensure less wastage and maximum conservation.<br>9. Communicate effectively and develop interpersonal skills. | | |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| 1. | Introduction | Overview of the Machine Tools Industry | 1. Define Machine tool Industry<br>2. Identify the Segments in the Machine tool Industry | N/A | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 1<br>P:0 |
| | | What is CNC? | 1. Define CNC and its types<br>2. List its benefits | N/A | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 1<br>P:0 |
| | | CNC Segment | 1. Elaborate the market share of CNC and its segments | N/A | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 1<br>P:0 |
| | | Employability Potential of CNC segment | 1. Identify the opportunities available in CNC machining | N/A | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 1<br>P:0 |
| | | Tasks of a CNC Technician | 1. Explain the roles and responsibilities of CNC Technician | N/A | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 0.5<br>P:0 |
| | | Key Competencies of CNC Technician | 1. List the key competencies and skills required to become a CNC Technician | N/A | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 0.5<br>P:0 |
| 2. | Organize Work and Resources in Manufacturing | Maintaining a Safe and Secure Working Environment | 1. Distinguish occupational hazards associated with CNC machining | ASC/N9803 | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 2<br>P:3 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Maintaining a Safe and Secure Working Environment (contd.) | 2. Determine the factors aggravating occupational hazards | | | | T : 2<br>P : 3 |
| | | Essential Preventive Measures for CNC Machine Operators | 1. Apply the rules for keeping safe while operating on CNC machine | | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 2<br>P: 3 |
| | | Essential Preventive Measures for CNC Machine Operators (Contd.) | 2. List the Do's before setting up the machine | | | | T: 2<br>P: 3 |
| | | Health and Hygiene Practices for CNC Machine Operators | 1. Discuss the health and hygiene practices at workplace | | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 2<br>P: 3 |
| | | Quality Management Systems | 1. Define quality management system | | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 2<br>P: 4 |
| | | Quality Management Systems (Contd.) | 2. Explain automotive quality management system and their compliance principles | | | | T: 2<br>P: 4 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Waste Management in Manufacturing | 1. Identify wastes in the industrial environment | | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 2<br>P: 4 |
| | | Waste Management in Manufacturing (Contd.) | 2. Discuss the methods of waste minimization in manufacturing | | | | T: 2<br>P: 4 |
| | | Energy Conservation Practices in Manufacturing | 1.Describe the energy conservation practices at workplace | | Interactive Lecture in the Class | Pen, Notebook, Projector, Participant Handbook | T: 2<br>P: 4 |
| 3. | Employability Skills (60 hours) | Introduction to Employability Skills | 1. Discuss the importance of Employability Skills in meeting the job requirements | DGT/VSQ/N0102 | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 0.5<br>P: 1.0 |
| | | Constitutional values - Citizenship | 1. Explain constitutional values, civic rights, duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen. | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 0.5<br>P: 1.0 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Becoming a Professional in the 21st Century | 1. Discuss 21st century skills.<br>2. Describe the benefits of continuous learning | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 1.0<br>P: 1.5 |
| | | Basic English Skills | 1. Describe basic communicati on skills | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 4<br>P: 4 |
| | | Basic English Skills (Contd..) | 2. Discuss ways to read and interpret text written in basic English | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 0<br>P: 2 |
| | | Career Developme nt & Goal Setting | 1. Discuss need of career development plan | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1 |
| | | Communica tion Skills | 1. Explain the importance of active listening for effective communicati on<br>2. Discuss the significance of working collaborativel y with others in a team | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 3 |
| | | Diversity & Inclusion | 1. Discuss the significance of reporting sexual harassment issues in time | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1.5 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Financial and Legal Literacy | 1. List the common components of salary and compute income, expenditure, taxes, investments etc.<br>2. Discuss the legal rights, laws, and aids | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 3 |
| | | Essential Digital Skills | 1. Describe the role of digital technology in today's life | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 4<br>P: 2 |
| | | Essential Digital Skills (Contd…) | 2. Discuss the significance of using internet for browsing, accessing social media platforms, safely and securely | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 0<br>P: 2 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Entrepreneurship | 1. Explain the types of entrepreneurship and enterprises<br>2. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan<br>3. Describe the 4Ps of Marketing- Product, Price, Place and Promotion and apply them as per requirement | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 4 |
| | | Customer Service | 1. Explain the significance of identifying customer needs and addressing them.<br>2. Explain the significance of identifying customer needs and responding to them in a professional manner | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 3 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | | 3. Discuss the significance of maintaining hygiene and dressing appropriately | | | | |
| | | Getting ready for apprentices hip & Jobs | 1. Discuss the significance of maintaining hygiene and confidence during an interview<br>2. List the steps for searching and registering for apprenticeshi popportuniti es | | Interactive Lecture in the Class | Participant handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 5 |
| 4. | Interpre t Enginee ring Drawin g | Engineerin g Drawing and its Purpose | 1. Define engineering drawing and outline its usage | ASC/ N98 05 | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 2 |
| | | Measure ment | 1. Define measuremen t and its units | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1 |
| | | Dimension s | 1. Compare between 1D, 2D, and 3D shapes | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Dimensions (Contd.) | 2. interpret the angles and axis | | | | T: 1<br>P: 1 |
| | | Basic Components of an Engineering Drawing | 1. Distinguish between types of lines and their interpretation in engineering drawings | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1 |
| | | Basic Components of an Engineering Drawing (Contd.) | 2. Classify types of views | | | | T: 1<br>P: 1 |
| | | Basic Components of an Engineering Drawing (Contd.) | 3. Differentiate between the types of angles of projection | | | | T: 1<br>P: 1 |
| | | Geometric Dimensioning & Tolerancing (GD&T | 1.Define GD & T | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1 |
| | | Geometric Dimensioning & Tolerancing (GD&T (Contd.) | 2. Identify the symbols for GD &T | | | | T: 1<br>P: 1 |
| | | Geometric Dimensioning & Tolerancing (GD&T (Contd.) | 3. Discuss the benefits of GD&T | | | | T: 1<br>P: 1 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Geometric Dimensioning & Tolerancing (GD&T (Contd.) | 4.Define & interpret Datum and Notation | | | | T: 1<br>P: 1 |
| | | Geometric Dimensioning & Tolerancing (GD&T (Contd.) | 5. Elaborate feature control | | | | T: 1<br>P: 1 |
| | | Surface Finish | 1. Define surface finish and its types | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 1 |
| | | Surface Finish (Contd.) | 2. Identify and interpret surface roughness symbols | | | | T: 1<br>P: 1 |
| 5. | Prepare for Machining Activities | What is CNC | 1. Define CNC technically | ASC/N3535 Pc1, | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |
| | | What is CNC (Contd.) | 2. Describe the process of CNC machining | | | | T: 1<br>P: 4 |
| | | Parts of CNC machine | 1. Identify the parts of CNC machine and their functions | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | How does CNC Machining Work? | 1. Elaborate on the types of CNC machining system and its process flow | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |
| | | How does CNC Machining Work? (Contd.) | 2. Identify the cutting tools used in CNC machining | | | | T: 1<br>P: 4 |
| | | Material for CNC Machining | 1. Explain variety of materials used in CNC machining and their properties | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |
| | | Material for CNC Machining (Contd.) | 2. Identify appropriate material with suitable properties for CNC machining | | | | T: 1<br>P: 4 |
| | | Measure ment for CNC Machining | 1. Identify measuring machines for CNC | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Measurement for CNC Machining (Contd.) | 2. Discuss how to use various measuring equipment | | | | T: 1<br>P: 4 |
| | | G Code and its functions | 1. Define G Code | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |
| | | G Code and its functions (Contd.) | 2. Explain the functions of G-Code | | | | T: 1<br>P: 4 |
| | | Machine Coordinates | 1. Define Coordinates and Cartesian coordinate system | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |
| | | Machine Coordinates (Contd.) | 2. Describe the procedure of aligning machine motion with coordinate | | | | T: 1<br>P: 4 |
| | | Work and Tool Offsets | 1. Compare between work and tool offsets | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 1<br>P: 4 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Cycle Time and OEE | 1. Define Cycle time and OEE<br>2. Discuss the method of calculating OEE | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 2 |
| | | Benefits and Limitation s of using CNC | 1. Elaborate the pros and cons of CNC machining | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 2 |
| 6. | Perfor m Machini ng Operati ons | Overview of CNC Setup | 1. Explain the steps to operate on a CNC machine | ASC/ N35 08 | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 5 |
| | | Overview of CNC Setup (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Machine Setup | 1. Describe the home position in the CNC machine | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 5 |
| | | CNC Machine Setup (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Machine Setup (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Machine Setup (Contd.) | 2. Describe how to adjust tool lengths offsets | | | | T: 3<br>P: 5 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | CNC Machine Setup (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Machine Setup (Contd.) | 3. Explain the functions of the buttons on the CNC machine | | | | T: 3<br>P: 5 |
| | | CNC Machine Setup (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Machine Setup (Contd.) | 4. Elaborate how to perform a CNC machine set up | | | | T: 2<br>P: 5 |
| | | CNC Machine Troublesh ooting | 1. Explain the types of problems and performing the trouble shooting mechanism | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 5 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | CNC Machine Troubleshooting (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Process Records | 1. Explain how to find the data points for process improvement | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 5 |
| | | CNC Process Records (Contd.) | | | | | T: 0<br>P: 5 |
| | | CNC Process Records (Contd.) | 2. Explain how to find the data for process improvement | | | | T: 2<br>P: 5 |
| 7. | Perform Post-Machining and Maintenance Activities | Defining Deburring | 1. Define Deburring and its importance | ASC/N 3509 | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 3<br>P: 5 |
| | | Defining Deburring (Contd.) | | | | | T: 0<br>P: 5 |
| | | Defining Deburring (Contd.) | 2. List the types of deburring techniques | | | | T: 3<br>P: 5 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Defining Deburring (Contd.) | 3. Identify deburring tools | | | | T: 2<br>P: 5 |
| | | Quality Control and Inspection | 1. Explain the importance of maintaining quality in CNC operation | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 5 |
| | | Quality Control and Inspection( Contd.) | | | | | T: 0<br>P: 5 |
| | | Quality Control and Inspection( Contd.) | 2. Define the principal functions of manufacturing quality | | | | T: 2<br>P: 5 |
| | | Quality Control and Inspection( Contd.) | | | | | T: 0<br>P: 5 |
| | | Quality Control and Inspection( Contd.) | 3. List and explain the quality control mechanisms | | | | T: 2<br>P: 5 |
| | | Quality Control and Inspection( Contd.) | 4. Define the modes of inspection and the parameters | | | | T: 2<br>P: 5 |

| Sl No. | Module Name | Session Name | Session Objectives | NOS Ref. | Methodology | Training Tools/Aids | Duration (hh:mm) |
|---|---|---|---|---|---|---|---|
| | | Quality Control and Inspection( Contd.) | | | | | T: 0<br>P: 5 |
| | | Maintenance of CNC Machines | 1. Discuss the benefits of CNC maintenance programs | | Interactive Lecture in the Class | Participant Handbook, Projector, Whiteboard, Marker, and Duster | T: 2<br>P: 5 |
| | | Maintenance of CNC Machines (Contd.) | | | | | T: 0<br>P: 5 |
| | | Maintenance of CNC Machines (Contd.) | 2. Describe how to operate in line with the maintenance requirements | | | | T: 2<br>P: 5 |
| | | Maintenance of CNC Machines (Contd.) | | | | | T: 0<br>P: 5 |
| | | | **Total (In Hours)** | | **Theory** | | 124 |
| | | | | | **Practical** | | 296 |
| | | | | | **On-the-Job Training** | | 30 |
| | | | | | ***Grand Total (in Hours)** | | 450 hours |

# Annexure III

# Assessment Criteria

## CRITERIA FOR ASSESSMENT OF TRAINEES

| Assessment Criteria for Automotive Sales executive | |
|---|---|
| **Job Role** | **Automotive CNC Machining Assistant** |
| **Qualification Pack** | **ASC/Q3503, v6.0** |
| **Sector Skill Council** | **Automotive** |

| Sr. No. | Guidelines for Assessment |
|---|---|
| 1. | Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC. |
| 2. | The assessment for the theory part will be based on knowledge bank of questions created by the SSC. |
| 3. | Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below). |
| 4. | Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria. |
| 5. | In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack. |
| 6. | In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack. |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| **ASC/N9803: Organize work and resources (Manufacturing)** | **Maintain safe and secure working environment** | **11** | **5** | **-** | **7** |
| | PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace | 2 | 1 | - | 2 |
| | PC2. follow safe working practices while dealing with hazards to ensure safety of self and others | 2 | - | - | 1 |
| | PC3. carry out routine check of the machine for identifying potential hazards | 2 | 1 | - | 1 |
| | PC4. use appropriate protective clothing/equipment for specific tasks and work | 2 | 1 | - | 1 |
| | PC5. follow safety hazards and preventive techniques during fire drill | 2 | 1 | - | 1 |
| | PC6. report any identified breaches in health, safety and security policies and procedures to the designated person | 1 | 1 | - | 1 |
| | **Health and hygiene** | **7** | **5** | **-** | **2** |
| | PC7. ensure workstation and equipment are regularly clean and sanitized | 2 | 2 | - | 1 |
| | PC8. clean hands with soap, alcohol-based sanitizer regularly | 1 | 1 | - | 1 |
| | PC9. avoid contact with ill people and self-isolate in a similar situation | 1 | - | - | - |
| | PC10. wear and dispose PPEs regularly and appropriately | 1 | - | - | - |
| | PC11. report advanced hygiene and sanitation issues to appropriate authority | 1 | 1 | - | - |
| | PC12. follow stress and anxiety management techniques | 1 | 1 | - | - |
| | **Perform work as per quality standards** | **5** | **3** | **-** | **2** |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC13. ensure that work is accomplished as per the requirements within the specified timeline | 2 | 2 | - | 1 |
| | PC14. ensure team goals are given preference over individual goals | 3 | 1 | - | 1 |
| | **Effective waste management practices** | **15** | **10** | **-** | **4** |
| | PC15. follow the fundamentals of 5S for waste management | 3 | 2 | - | 1 |
| | PC16. segregate waste into different categories | 2 | 1 | - | - |
| | PC17. follow processes specified for disposal of hazardous waste | 2 | 2 | - | 1 |
| | PC18. identify recyclable, non-recyclable and hazardous waste | 4 | 2 | - | 1 |
| | PC19. dispose non-recyclable, recyclable and reusable waste appropriately at identified location | 4 | 3 | - | 1 |
| | **Material/energy conservation practices** | **12** | **7** | **-** | **5** |
| | PC20. identify ways to optimize usage of material in various tasks/activities/processes | 2 | 1 | - | 1 |
| | PC21. check for spills/leakages in various tasks/activities/processes | 2 | 1 | - | 1 |
| | PC22. plug spills/leakages and escalate to appropriate authority if unable to rectify | 2 | 1 | - | - |
| | PC23. check if the equipment/machine is functioning normally before commencing work and rectify wherever required | 2 | 2 | - | 1 |
| | PC24. report malfunctioning (fumes/ sparks/emission/vibration/noise) and lapse in maintenance of equipment | 2 | 1 | - | 1 |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC25. ensure electrical equipment and appliances are properly connected and turned off when not in use | 2 | 1 | - | 1 |
| | NOS Total | 50 | 30 | - | 20 |
| **DGT/VSQ/N0102 : Employability Skills (60 Hours)** | **Introduction to Employability Skills** | **1** | **1** | **-** | **-** |
| | PC1. identify employability skills required for jobs in various industries | - | - | - | - |
| | PC2. identify and explore learning and employability portals | - | - | - | - |
| | **Constitutional values – Citizenship** | **1** | **1** | **-** | **-** |
| | PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc. | - | - | - | - |
| | PC4. follow environmentally sustainable practices | - | - | - | - |
| | **Becoming a Professional in the 21st Century** | **2** | **4** | **-** | **-** |
| | PC5. recognize the significance of 21st Century Skills for employment | - | - | - | - |
| | PC6. practice the 21st Century Skills such as Self- Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life | - | - | - | - |
| | **Basic English Skills** | **2** | **3** | **-** | **-** |
| | PC7. use basic English for everyday conversation in different contexts, in person and over the telephone | - | - | - | - |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English | - | - | - | - |
| | PC9. write short messages, notes, letters, e-mails etc. in English | - | - | - | - |
| | Career Development & Goal Setting | 1 | 2 | - | - |
| | PC10. understand the difference between job and career | - | - | - | - |
| | PC11. prepare a career development plan with short- and long-term goals, based on aptitude | - | - | - | - |
| | Communication Skills | 2 | 2 | - | - |
| | PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings | - | - | - | - |
| | PC13. work collaboratively with others in a team | - | - | - | - |
| | Diversity & Inclusion | 1 | 2 | - | - |
| | PC14. communicate and behave appropriately with all genders and PwD | - | - | - | - |
| | PC15. escalate any issues related to sexual harassment at workplace according to POSH Act | - | - | - | - |
| | Financial and Legal Literacy | 2 | 3 | - | - |
| | PC16. select financial institutions, products and services as per requirement | - | - | - | - |
| | PC17. carry out offline and online financial transactions, safely and securely | - | - | - | - |
| | PC18. identify common components of salary and compute income, expenses, taxes, investments etc | - | - | - | - |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation | - | - | - | - |
| | **Essential Digital Skills** | **3** | **4** | **-** | **-** |
| | PC20. operate digital devices and carry out basic internet operations securely and safely | - | - | - | - |
| | PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively | - | - | - | - |
| | PC22. use basic features of word processor, spreadsheets, and presentations | - | - | - | - |
| | **Entrepreneurship** | **2** | **3** | **-** | **-** |
| | PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research | - | - | - | - |
| | PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion | - | - | - | - |
| | PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity | - | - | - | - |
| | **Customer Service** | **1** | **2** | **-** | **-** |
| | PC26. identify different types of customers | - | - | - | - |
| | PC27. identify and respond to customer requests and needs in a professional manner. | - | - | - | - |
| | PC28. follow appropriate hygiene and grooming standards | - | - | - | - |
| | **Getting ready for apprenticeship & Jobs** | **2** | **3** | **-** | **-** |
| | PC29. create a professional Curriculum vitae (Résumé) | - | - | - | - |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively | - | - | - | - |
| | PC31. apply to identified job openings using offline /online methods as per requirement | - | - | - | - |
| | PC32. answer questions politely, with clarity and confidence, during recruitment and selection | - | - | - | - |
| | PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements | - | - | - | - |
| | **NOS Total** | **20** | **30** | **-** | **-** |
| **ASC/N9805:Interpret engineering drawing** | **Interpret information from various views, projection, 2D and 3D shapes** | **21** | **11** | **-** | **10** |
| | PC1. interpret engineering drawing's uniqueness, dimensions and important features in 2D and 3D shapes | 5 | 3 | - | 2 |
| | PC2. identify the difference between 2D and 3D shapes | 4 | 2 | - | 2 |
| | PC3. explain difference between first angle projection and third angle projection in mechanical engineering drawing | 4 | - | - | 2 |
| | PC4. interpret all the 3 axes (x, y and z axis) and geometrical shapes (cones, cylinder, sphere, cuboid, etc) on to a 2D and 3D projection | 5 | 3 | - | 2 |
| | PC5. identify details of the machine component which are not clearly visible by interpreting section views | 3 | 3 | - | 2 |
| | **Identify drawing standards and symbols** | **23** | **15** | **-** | **8** |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC6. interpret Geometric Dimensioning and Tolerencing (GD&T) symbols in the drawings | 6 | 4 | - | 2 |
| | PC7. interpret symbols of Radius, controlled radius, spherical radius, diameter, spherical diameter, square, counterbore, spotface, depth, countersink, "by", maximum dimension, minimum dimension, reference, dimension origin etc | 6 | 4 | - | 2 |
| | PC8. identify the sequence of operations which enables the selection and prioritization of the datums | 5 | 3 | - | 2 |
| | PC9. read and interpret information from Tolerance Zone boundaries for part features in terms of shape and size | 6 | 4 | - | 2 |
| | **Modification and storage of drawing** | **6** | **4** | **-** | **2** |
| | PC10. observe any modification, changes required in the drawing and communicate the same to the concerned team in the organization | 3 | 2 | - | 1 |
| | PC11. store the drawings in an easily accessible place, avoiding damage from moisture, chemicals and fire | 3 | 2 | - | 1 |
| | **NOS Total** | **50** | **30** | **-** | **20** |
| ASC/N3535: Prepare for machining activities | **Identify raw material and tools requirement** | **14** | **22** | **-** | **7** |
| | PC1. identify the input and output product based on engineering drawing | 4 | 6 | - | 3 |
| | PC2. identify the raw materials required for the job | 4 | 6 | - | 2 |
| | PC3. select tools, jigs, fixtures and machining parameters like cutting speed, depth of cut and feed as per work instructions | 6 | 10 | - | 2 |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | **Checking the specifications of the component** | **12** | **22** | **-** | **6** |
| | PC4. check the input component as per the required quality standard | 2 | 4 | - | - |
| | PC5. measure and mark reference points/cutting lines on the work pieces by using compass, callipers, rulers and other measuring tools | 4 | 9 | - | 3 |
| | PC6. identify required limits of machining e.g. surface finish, specific orientation, gauge inspection etc.as per organisational policy | 6 | 9 | - | 3 |
| | **Support in programming the CNC machine** | **4** | **6** | **-** | **7** |
| | PC7. support the Lead Technician in programming the CNC/numerically controlled machine as per the work instructions | 2 | 6 | - | 4 |
| | PC8. take support from the supervisor/maintenance team in machine programming during the downtime | 2 | - | - | 3 |
| | **NOS Total** | **30** | **50** | **-** | **20** |
| **ASC/N3508: Perform machining operations** | **Setting up machine** | **7** | **12** | **-** | **7** |
| | PC1. set-up and adjust the machine tools, fixtures/jigs and cutting tools as per the process requirement | 2 | 4 | - | 2 |
| | PC2. lift the work piece/metal stock manually or by hoist, position the same securely on the machine bed using fasteners and hand tools and verify their positions with measuring instruments if required | 1 | 2 | - | 1 |
| | PC3. check the working of different holding fixtures, gears, stops etc. to prevent work piece movement using hand tools, power tools, tightening tools, torque measuring instruments etc. | 1 | 2 | - | 1 |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC4. follow the do's and don'ts of the manufacturing process as defined in SOPs/Work Instructions or given by supervisors | 1 | 1 | - | 1 |
| | PC5. set the machine for auto cycle | - | 1 | - | 1 |
| | PC6. check and confirm the level of lubricant and flow-rate in the storage tank as per control plan | 2 | 2 | - | 1 |
| | **Perform machining on the component** | **17** | **21** | **-** | **8** |
| | PC7.start the turning/ drilling/ reaming/ tapping/boring for operations | 8 | 12 | - | 6 |
| | PC8. ensure that the right programme is selected in the CNC machine as defined in the SOP | 2 | 2 | - | - |
| | PC9. maintain length to bore ratio of the tool to avoid deflection of cutting tool in case of boring operations | 2 | 2 | - | 1 |
| | PC10. turn on the coolant valves and start its flow to maintain temperature of work piece and tool | 1 | 2 | - | 0.5 |
| | PC11. brush or spray lubricating material on work pieces as per requirement | - | 1 | - | - |
| | PC12. take appropriate action in case of any irregularities e.g. power failure, rejection, tool breakage etc. | 2 | - | - | 0.5 |
| | PC13. extract or lift jammed pieces from machines through use of wire hooks, lift bars, hands etc. | 2 | 2 | - | - |
| | **Observe and record data related to machine operations** | **3** | **8** | **-** | **3** |
| | PC14. record the non-confirming dimensions in the output and rectify the same if required | - | 2 | - | 0.5 |
| | PC15. observe the machine operations for any malfunctions/defects in the component and immediately inform the supervisor/maintenance team for correction | 2 | 4 | - | 0.5 |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC16. record the data related to the loss time in case of machine stops | 1 | - | - | 1 |
| | PC17. maintain the record of tool offsetting and key dimensions on control charts/SPC record as per organization policies | - | 2 | - | 1 |
| | **Perform tool change during machining operation** | **3** | **9** | **-** | **2** |
| | PC18. ensure that the blunt tools are timely and safely replaced with new tools | 1 | 2 | - | - |
| | PC19. replace machine part as per work instructions using hand tools or notify supervisor/engineering personnel for taking corrective actions | 2 | 3 | - | - |
| | PC20. ensure tool changing cycle from spindle to magazine and vice versa is correctly performed | - | 2 | - | 1 |
| | PC21. ensure that all the tools are put in the right pockets | - | 1 | - | 1 |
| | PC22. ensure tool replacement as per recommended tool life in number of pieces | - | 1 | - | - |
| | **NOS Total** | **30** | **50** | **-** | **20** |
| **ASC/N3509: Perform post machining and maintenance activities** | **Perform de- burring activity on the machined components** | **7** | **10** | **-** | **6** |
| | PC1. conduct de-burring operations with the help of correct tool to remove extra burrs, sharp edges, rust and chips from the metal surface | 2 | 5 | - | 2 |
| | PC2. use Personal Protective equipment (PPE) like goggles and hand gloves | 1 | 2 | - | 1 |
| | PC3. use automated technique to conduct shot blasting/vibro processes for completing de-burring operations | 2 | - | - | 2 |
| | PC4. clean machine parts as per the defined process and quality control standards | 2 | 3 | - | 1 |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | **Check quality of machined component (Gauging)** | **9** | **17** | **-** | **4** |
| | PC5. check the component as per the control plan, work instructions for product quality | 1 | 4 | - | - |
| | PC6. ensure use of calibrated equipment to check the workpiece for conformance to the required specifications and standards | 2 | - | - | 2 |
| | PC7. note down the observations of the basic inspection process and identify pieces which are as per the specified standards | 2 | 4 | - | 1 |
| | PC8. separate the defective pieces which can be repaired/reworked and pieces which are beyond repair and maintain records of each | 2 | 5 | - | 1 |
| | PC9. get the inspection done by QA in the Standard Room for critical components and record the observations | 2 | 4 | - | - |
| | **Perform machine maintenance activities** | **14** | **23** | **-** | **10** |
| | PC10. maintain the machine as per proper operational condition/daily maintenance check list | 2 | 3 | - | 1 |
| | PC11. clean and oil the machine and its components as per checklist | 2 | 4 | - | 2 |
| | PC12. clean the hydraulic tank/gauge/tools/fixtures as per the cleaning schedule provided in Work Instruction/SOP manual | 3 | 6 | - | 1 |
| | PC13. check coolant and lubricant level in the machine as per standards | 1 | 2 | - | 1 |
| | PC14. apply appropriate lubricant as per manufacturer specification | 1 | 2 | - | - |
| | PC15. remove chips from different machine areas and dispose scrap or waste material into the disposal area in accordance with the company policies and environmental regulations | 1 | 2 | - | 1 |

| Total Marks: 550 | Compulsory NOS | | | | |
|---|---|---|---|---|---|
| **Assessable Outcomes** | **Assessment criteria for outcomes** | **Total Marks (550)** | **Theory Marks** | **Practical Marks** | **Viva Marks** |
| | PC16. verify broaching operations to ensure that the broach teeth are not broken and is free from any metal chips | 2 | - | - | 2 |
| | PC17. carry out minor repairs and adjustments of the machine and report any malfunctions/repairs in the machine beyond own scope to the concerned person | 2 | 4 | - | 2 |
| | **NOS Total** | **30** | **50** | **-** | **20** |

## Glossary

- **Sector:** Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
- **Sub-sector:** Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
- **Occupation:** Occupation is a set of job roles, which perform similar/ related set of functions in an industry. Job role: Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
- **Occupational Standards (OS):** OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
- **Performance Criteria (PC):** Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
- **National Occupational Standards (NOS):** NOS are occupational standards which apply uniquely in the Indian context.
- **Qualifications Pack (QP):** QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
- **Unit Code:** Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
- **Unit Title:** Unit title gives a clear overall statement about what the incumbent should be able to do.
- **Description:** Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
- **Scope:** Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
- **Knowledge and Understanding (KU):** Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
- **Organisational Context:** Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
- **Technical Knowledge:** Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
- **Core Skills/ Generic Skills (GS):** Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
- **Electives:** Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
- **Options:** Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Scan this QR Code to access eBook

ASDC™
AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL


**Address:** 153, GF, Okhla Industrial Area, Phase - III, Leela Building, New Delhi 110020
**Email:** www.asdc.org.in
**Web:** info@asdc.org.in
**Phone:** 011 42599800