Model Curriculum

QP Name: Machine Operator – Toolroom (MO-TR)

Code: QG-3.5-CP-04124-2025-V2-CIPET

QP Version: 2.0

NSQF Level: 3.5

Model Curriculum Version: 2.0

Sector: Chemicals & Petrochemicals (CPC)

Central Institute of Petrochemicals Engineering & Technology (CIPET)
Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India
CIPET Head office, T.V.K Industrial Estate, Guindy, Chennai – 600 032.

Table of Contents

Training Parameters

<table>
<tr><td>Sector</td><td>Chemicals &Petrochemicals</td></tr>
<tr><td>Sub-Sector</td><td>Petrochemicals</td></tr>
<tr><td>Occupation</td><td>Machine Operator – Tool Room (MO-TR)</td></tr>
<tr><td>Country</td><td>India</td></tr>
<tr><td>NSQF Level</td><td>3.5</td></tr>
<tr><td>Aligned to NCO/ISCO/ISIC Code</td><td>NCO-2015/7223</td></tr>
<tr><td>Minimum Educational Qualification and Experience</td><td>
<table>
<tr><th>S. No.</th><th>Academic/Skill Qualification (with Specialization - if applicable)</th><th>Required Experience (with Specialization - if applicable)</th></tr>
<tr><td>1.</td><td>Grade 11th</td><td>No Experience required</td></tr>
<tr><td>2.</td><td>Grade 10th or equivalent</td><td>1.5 years relevant experience</td></tr>
<tr><td>3.</td><td>8th grade</td><td>4.5 years relevant experience</td></tr>
<tr><td>4.</td><td>Previous relevant Qualification of NSQF Level 3</td><td>1.5 years relevant experience</td></tr>
</table>
</td></tr>
<tr><td>Pre-Requisite License or Training</td><td></td></tr>
<tr><td>Minimum Job Entry Age</td><td>18 Years</td></tr>
<tr><td>Last Reviewed On</td><td></td></tr>
<tr><td>Next Review Date</td><td></td></tr>
<tr><td>NSQC Approval Date</td><td></td></tr>
<tr><td>QP Version</td><td>2.0</td></tr>
<tr><td>Model Curriculum Creation Date</td><td></td></tr>
<tr><td>Model Curriculum Valid Up to Date</td><td></td></tr>
<tr><td>Model Curriculum Version</td><td>2.0</td></tr>
<tr><td>Minimum Duration of the Course</td><td>600 Hrs.</td></tr>
<tr><td>Maximum Duration of the Course</td><td>600 Hrs.</td></tr>
</table>

Program Overview

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

Training Outcomes

When considering training outcomes for a machine operator in a tool room, it's essential to cover both practical skills and theoretical knowledge. At the end of the program, the learner should have acquired the listed knowledge and skills.

Core Skill Outcomes:

Machine Operation Proficiency:

- Ability to safely and efficiently operate various tool room machinery, including:
  - Lathes (conventional and CNC)
  - Milling machines (conventional and CNC)
  - Grinding machines (surface, cylindrical, etc.)
  - Drilling machines
  - EDM (Electrical Discharge Machining) machines
- Skill in setting up machines, operating the machines,selecting appropriate tools, and adjusting machine parameters (speeds, feeds, depth of cut).

Measurement and Inspection:

- Proficient use of precision measuring instruments:
  - Calipers, micrometers & gauges, etc.
  - Linear Height Master
- Ability to interpret technical drawings and specifications.
- Skill in inspecting finished parts for dimensional accuracy and surface finish.

Tooling and Material Knowledge:

- Understanding of different cutting tools, their applications, and maintenance.
- Knowledge of various materials used in tool making and their properties.
- Ability to select the appropriate tools and materials for specific tasks.

Safety Practices:

- Strict adherence to safety protocols and procedures.
- Proper use of personal protective equipment (PPE).
- Knowledge of emergency procedures.

CNC Programming :

- Basic understanding of G-code programming.
- Ability to edit and modify CNC programs.
- Skill in setting up and operating CNC machines.

Maintenance:

- Basic machine maintenance, including lubrication, cleaning, and minor repairs.

Knowledge Outcomes:

Technical Drawings and Specifications:

- Ability to read and interpret complex engineering drawings.
- Understanding of tolerances, fits, and surface finish requirements.

Machining Principles:

- Knowledge of cutting speeds, feeds, and depth of cut calculations.
- Understanding of the principles of different machining processes.

Material Science:

- Knowledge of the properties of metals and other materials used in tool making.

Quality Control:

- Understanding of quality control principles and procedures.

General Outcomes:

Problem-Solving:

- Ability to identify and resolve machining problems.

Teamwork and Communication:

- Ability to work effectively in a team environment.
- Clear and concise communication skills.

Continuous Improvement:

- Willingness to learn new skills and adapt to new technologies.

By focusing on these training outcomes, tool room machine operators can develop the skills and knowledge necessary to perform their jobs effectively and contribute to the success of the organization.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Module 1: CPC/N0411 - Maintain basic health and safety practices at the workplace, 5S	10:00	20:00	00:00	00:00	**30:00**
Module 2: CPC/N5110 - Understanding the basic concepts, design, drawings and planning for machining components, making tools & dies and coordinating with others	14:00	46:00	00:00	00:00	**60:00**
Module 3: CPC/N5111 - Perform fitting operations on machining components using hand tools	12:00	48:00	00:00	00:00	**60:00**
Module 4: CPC/N5112 - Operation on Drilling Machine	20:00	40:00	00:00	00:00	**60:00**
Module 5: CPC/N5113 - Operation on Shaper Machine	14:00	16:00	00:00	00:00	**30:00**
Module 6: CPC/N5114 - Operation on Lathe Machine	10:00	50:00	00:00	00:00	**60:00**
Module 7: CPC/N5115 - Operation on Milling Machine	20:00	40:00	00:00	00:00	**60:00**
Module 8: CPC/N5116 - Operation on Grinding Machines	20:00	40:00	00:00	00:00	**60:00**
Module 9: CPC/N5117 - Basic programming and operation on CNC Machines	20:00	40:00	00:00	00:00	**60:00**
Module 10: CPC/ N7014 - Work effectively with others	10:00	20:00	00:00	00:00	**30:00**
Module 11: DGT/VSQ/N0101 - Employability Skills	30:00	00:00	00:00	00:00	**30:00**
Module 12: On the Job Training (OJT)	00:00	00:00	60:00	00:00	**60:00**
Total	**180:00**	**360:00**	**60:00**	**00:00**	**600:00**

Module Details

Module 1: CPC/N0411 - Maintain basic health and safety practices at the workplace,5S

Mapped to:

Terminal Outcomes:

- Strict adherence to safety protocols and procedures.
- Proper use of personal protective equipment (PPE).
- Knowledge of emergency procedures.

Duration: 10:00	**Duration: 20:00**
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Knowledge of interpreting and applying Occupational Health and Safety. • Demonstrate knowledge of recognizing situations requiring emergency action • Demonstrate knowledge of making appropriate decisions concerning first aid. • Demonstrate knowledge of safe work practices. • Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use. • Ensure sorting, streamlining & organizing, storage and documentation, cleaning, standardization across the plant and office premises of the organization.	• Carry out safe working practices while dealing with hazards to ensure the safety of self and others. • Apply good housekeeping practices at all times • Use the various appropriate fire extinguishers on different types of fires correctly • Demonstrate rescue techniques applied during fire hazard, demonstrate good housekeeping in order to prevent fire hazards, demonstrate the correct use of a fire extinguisher. • Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals, loud noise, and Identify areas in the plant which are potentially Hazardous/unhygienic in nature. • Conduct regular checks with support of the maintenance team on machine health to identify potential hazards due to wear and tear of machine. • Ensure segregation of waste in hazardous/ non Hazardous waste as per the sorting work instructions • Follow the technique of waste disposal and waste storage in the proper bins as per SOP • Segregate the items which are labeled as red tag items for the process area and keep them in the correct places • Follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards. • Check that the items in the respective areas have been identified as broken or damaged Make sure that all material and tools are stored in the designated places and in the manner indicated in the 5S instructions
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, Whiteboard/SmartBoard, Marker, Duster.	
Tools, Equipment and Other Requirements	
Safety PPEs like: Cleaning Brush, Goggles, safety shoes, gloves, Apron, First aid kits & Lights etc.	

Module 2: CPC/N5110 - Understanding the basic concepts, design, drawings and planning for machining components, making tools & dies and coordinating with others

Mapped to:

Terminal Outcomes:

- Ability to read and interpret complex engineering drawings.
- Understanding of tolerances, fits, and surface finish requirements.

Duration: 14:00	**Duration: 46:00**
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of basic drawings and their applications. • Demonstrate lines, lettering, first angle & third angle projection. Orthographic and isometric projection. • Demonstrate knowledge of interpreting and extracting information from drawings. • Demonstrate knowledge of basic freehand sketches. • Demonstrate knowledge of performing an accurate drawing from physical measurements. • Demonstrate surface finish symbols • Demonstrate conventional representation of threads. • Demonstrate knowledge of views of assembly and detail drawings and their applications. • Demonstrate knowledge of sectional views of the design drawing and markings and their applications. Demonstrate knowledge of cutting tools, their applications and procedures for use. • Demonstrate knowledge of cutting tool geometry and its use. • Terminology associated with cutting tools. • Types of cutting tools and types of cutting tool materials and their applications.	❖ Machine operators should have the skill of basic arithmetic like machine specification, raw material size, grade & weight etc. ❖ Machine Operator Toolroom should be able to read warnings, instructions and other text material on machinery, Machining drawings, Process plan & other instructions etc.. ❖ Machine operator will be able to read drawings to execute the assigned machining job. ❖ Operator ensures the importance of drawing and gains the skills to understand lines, lettering, Orthographic and isometric projection. ❖ Operators will acquire the skill on surface finish symbols and GD&T symbols used for machining of components. ❖ Developed Ability by reading/using assembly and detail drawings and their applications. ❖ Selection of cutting tools as per machining process and with respect to workpiece material. ❖ Use of single point cutting tools and multipoint cutting tools. ❖ How to select the cutting tool based on cutting tool material, surface finish, fast production rate.
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, White-Board/Smart Board, Marker, Duster	
Tools, Equipment and Other Requirements	
Drawing tables, Lights, Drafts, Module Drawing guides.	

Module 3: CPC/N5111 - Perform fitting operations on machining components using hand tools

Mapped to:

Terminal Outcomes:

- Skill in setting up machines, selecting appropriate tools, and adjusting machine parameters (speeds, feeds, depth of cut).

Duration: *12:00*	**Duration**: *48:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of basic precision measurement and its use. • Demonstrate knowledge of basic precision measuring instruments, their applications and procedures for use. • Types of precision measuring instruments and describe their applications • Procedures used for transfer of sizes. • Demonstrate knowledge of files, fittings and fitting tools. • Study on Bench Vice, hammers, hacksaw, power hacksaw, chisels, scribers, punches.	❖ Handling skills of hand tools like : files, chisels, punch, hammer, scriber, hacksaw, C-clamp, Angle Plate, Chuck, Bench vice to perform fitting operation on machining components. ❖ Hands-on skill to use the hand drilling machine,hand polishing machine,Disk grinding machine for fitting and finishing the machined components, Die Mould parts etc. ❖ Able to select & set proper machining parameters: cutting speed, feed & depth of cut. ❖ Hands on skill to utilize appropriate measuring instruments for each machining process and product feature.
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, Whiteboard/SmartBoard, Marker, Duster.	
Tools, Equipment and Other Requirements	
Hand Tools & Measuring instruments like: Vernier caliper, Micrometer, steel rulers, measuring tape, Vernier Height gauge, surface table, Bench vice, Try square, Sample job materials & Lights	

Module 4: CPC/N5112 - Operation on Drilling

Mapped to:

Terminal Outcomes:

- **Accurate Hole Placement:**
  - The operator must be able to accurately position and drill holes according to technical drawings and specifications. This includes precise center punching and alignment.
- **Correct Hole Sizing:**
  - They must demonstrate the ability to select the appropriate drill bit and achieve the required hole diameter, adhering to specified tolerances.
- **Proper Drilling Techniques:**
  - Selecting appropriate drilling speeds and feeds for various materials.
  - Applying correct drilling pressure.
  - Managing chip removal to prevent drill bit breakage.
  - Using cutting fluids effectively.
- **Proficiency in Related Operations:**
  - They should be competent in performing associated drilling operations, such as:
    - Countersinking: Creating a conical opening for recessed fasteners.
    - Counterboring: Enlarging the top of a hole to a specific diameter.
    - Reaming: Achieving a precise hole size and smooth finish.
    - Tapping: Creating internal threads within a drilled hole.
    - Spot facing: machining a flat surface around a drilled hole.
- **Safe Drilling Practices:**
  - The operator must consistently follow safety procedures, including:
    - Properly securing workpieces.
    - Using appropriate personal protective equipment (PPE).
    - Recognizing and mitigating potential hazards.
- **Drill Bit Maintenance:**
  - Inspect drill bits for damage.
  - Sharpen drill bits when necessary.
  - Select and store drill bits correctly.
- **Machine Set-Up and Adjustment:**
  - They must be able to properly set up the drilling machine, including setting the correct speeds and feeds, and ensuring the work piece is properly secured.

Duration: *20:00*	**Duration**: *40:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of drills and drill, their applications, maintenance and procedures for use. • To understand the basic principles of the Drilling machines • Describe principle, construction and working various kinds of drill machines. • Study of cutting tools and machining operations carried out on Drilling machine • Get the knowledge to operate Drilling machines in a safe and competent manner.	❖ Operators will be able to use different types of cutting tools used in drilling machines. ❖ Acquire the skill to make accurate hole size and hole positioning as per drawing provided. ❖ Operate the different types of drill machines: bench drill, pillar type drill & Radial drill etc. ❖ Able to perform the different types of machining operations like: drilling, boring, reaming, counter boring & counter sinking etc. in a drilling machine.

• Study and understand the different types of work holding & tool holding devices used in drilling machines.	❖ Able to get the basic skill of drilling machine maintenance. ❖ Able to get the skill,how to use the work holding devices & tool holding devices used in drilling machines to perform various machining operations. ❖ Checking dimensions after machining of components.
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, White-Board/Smart Board, Marker, Duster	
Tools, Equipment and Other Requirements	
Drilling machine, charts of various types of drilling machines, raw materials, drill bits, Measuring instruments, work holding device, tool holding device, Machine cleaning materials, coolant items and safety items.	

Module 5: CPC/N5113 - Operation on Shaper

Mapped to:

Terminal Outcomes - Shaper Operations:

- **Accurate Production of Flat Surfaces:**
  - The operator must be able to produce accurate and smooth flat surfaces (horizontal, vertical, and angular) according to specified dimensions and tolerances.
- **Proficient Tool Setting and Adjustment:**
  - They must demonstrate the ability to select, set, and adjust cutting tools for various shaping operations. This includes proper tool holding and alignment.
- **Correct Selection and Adjustment of Machine Parameters:**
  - The operator must be able to:
    - Set the correct stroke length and position.
    - Adjust the cutting speed and feed rate according to the material and cutting tool.
    - Understand and utilize the quick-return mechanism.
- **Ability to Perform Various Shaping Operations:**
  - This includes:
    - Machining horizontal and vertical surfaces.
    - Cutting slots, grooves, and keyways.
    - Machining angular surfaces.
    - Performing contour shaping.
- **Safe Operating Procedures:**
  - The operator must consistently adhere to safety protocols, including:
    - Properly securing workpieces.
    - Using appropriate PPE.
    - Maintaining a clean and organized work area.
    - Understanding emergency stop procedures.
- **Accurate Measurement and Inspection:**
  - They must be able to use measuring instruments to verify the accuracy of their work and ensure that parts meet specifications.
- **Machine Maintenance:**
  - They should be able to perform basic shaper machine maintenance, including lubrication and basic problem identification.

Duration: *14:00*	**Duration**: *16:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
● Demonstrate knowledge of Shapers, their applications, set up and procedures for use. ● Demonstrate knowledge of broaching and key seating machines, their applications, set up and procedures for use. ● Be able to operate a Shaping machine in a safe and competent manner.	❖ Operators will be able to use different types of cutting tools used in shaping machines. ❖ Acquire the skill to make accurate machining of components as per drawing provided. ❖ Operate the shaping machine to perform the machining of horizontal and vertical surfaces, slots, grooves, and keyways.
Classroom Aids:	

Charts, Models, Video presentation, Flip Chart, Whiteboard/SmartBoard, Marker, Duster.
Tools, Equipment and Other Requirements
Shaping machine, charts of various types of Cutting tools, raw materials, Cutting tools, Machine cleaning items, Measuring instruments and Safety items.

Module 6: CPC/N5114 - Operation on Lathe machine

Mapped to:

Terminal Outcomes - Lathe Operations:

- **Proficient in Fundamental Lathe Operations:**
  - **Turning:** Ability to reduce the diameter of a workpiece to precise dimensions.
  - **Facing:** Skill in creating a smooth, flat surface perpendicular to the workpiece's axis.
  - **Parting:** Competence in cutting off a section of the workpiece.
  - **Grooving:** Ability to create grooves of specific dimensions on the workpiece.
  - **Threading:** Skill in cutting external and internal threads.
  - **Boring:** Ability to enlarge an existing hole to precise dimensions.
  - **Knurling:** Competence in creating a patterned surface for improved grip.
  - **Chamfering:** Creating angled edges.
- **Accurate Dimensional Control:**
  - Ability to produce parts within specified tolerances using precision measuring instruments (Verniercalipers, micrometers, etc.).
- **Proper Tool Selection and Setup:**
  - Skill in selecting the correct cutting tools for various materials and operations.
  - Ability to properly mount and align tools.
- **Correct Machine Parameter Settings:**
  - Ability to calculate and set appropriate cutting speeds, feeds, and depths of cut.
- **Understanding of Material Properties:**
  - Knowledge of how different materials react to machining.
- **Safe Operating Practices:**
  - Consistent adherence to all safety protocols, including:
    - Proper workpiece clamping.
    - Use of PPE.
    - Awareness of potential hazards.
- **Ability to Interpret Technical Drawings:**
  - Accurate interpretation of engineering drawings and specifications.
- **Machine Maintenance:**
  - Basic maintenance procedures, including lubrication and cleaning.

Duration: *10:00*	**Duration**: *50:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
● Demonstrate knowledge of conventional lathes, their accessories, attachments and applications. ● Demonstrate knowledge of lathe tools and their applications. ● Demonstrate knowledge of conventional lathes, maintenance and procedures for use. ● Demonstrate knowledge of tapers, their attachments and applications. ● Demonstrate knowledge of conventional lathe drilling, boring, reaming, tapping and threading operations. ● Be able to operate Lathe machine in a safe and competent manner	❖ Acquire the skill to operate the conventional lathe machine. ❖ Able to perform the different types of lathe machine operations like: turning, facing, grooving, knurling, parting, ❖ drilling, boring & reaming, etc. ❖ Operators will be able to use different types of cutting tools used in lathe machines. ❖ Ability to produce parts within specified tolerances using precision measuring instruments (vernier calipers, micrometers, dial gauges, etc.). ❖ Ability to calculate and set

	appropriate cutting speeds, feeds, and depths of cut. ❖ Able to get the basic skill of lathe machine maintenance. ❖ Able to get the skill on selection work holding devices & tool holding devices used in lathe machines to perform various machining operations. ❖ Checking dimensions after machining of components
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, Whiteboard/SmartBoard, Marker, Duster.	
Tools, Equipment and Other Requirements	
Shaping machine, charts of various types of Cutting tools, lights, Raw materials, Cutting tools, Machine cleaning items, work holding devices, Tool holding devices, Measuring instruments and Safety items.	

Module 7: CPC/N5115 - Operation on Milling machine

Mapped to:

Terminal Outcomes:

- **Proficient Machine Setup:**
  - Ability to accurately set up milling machines, including work holding, tool selection, and machine parameter adjustments.
  - Properly securing work pieces using various clamping methods.
- **Accurate Tooling and Cutting Parameter Selection:**
  - Skill in selecting appropriate milling cutters for different materials and operations.
  - Ability to calculate and set correct cutting speeds, feed rates, and depths of cut.
- **Performance of Various Milling Operations:**
  - Competence in performing common milling operations, such as:
    - Face milling: Creating flat surfaces.
    - End milling: Cutting slots, grooves, and contours.
    - Pocket milling: Creating recessed areas.
    - Contour milling: Machining complex shapes.
    - Drilling, boring, and tapping on the mill.
- **Dimensional Accuracy and Surface Finish:**
  - Ability to produce parts that meet specified dimensional tolerances and surface finish requirements.
  - Proficient use of measuring instruments to verify accuracy.
- **Interpretation of Technical Drawings:**
  - Accurate interpretation of engineering drawings and specifications to understand part requirements.
- **Safe Operating Procedures:**
  - Consistent adherence to safety protocols, including:
    - Proper use of PPE.
    - Safe handling of cutting tools.
    - Awareness of potential hazards.
- **Machine Maintenance:**
  - Ability to perform basic milling machine maintenance, including lubrication and cleaning.
- **CNC Milling (if applicable):**
  - If the training includes CNC milling, the operator must be able to:
    - Understand basic G-code programming.
    - Set up and operate CNC milling machines.
    - Edit and modify programs as needed.

Duration: *20:00*	**Duration**: *40:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of milling machine types and its applications. • Demonstrate knowledge of milling machine cutting tools and their applications • Identify the components and controls of milling machines, their purpose and operation. • Identify types of milling machine accessories and attachments their applications and maintenance	❖ Acquire the skill to operate the conventional milling machine and produce machined components as per drawing provided. ❖ Able to perform the different types of milling machine operations like: face milling, End milling, profile milling, grooving, drilling, boring & reaming, etc. ❖ Acquire the skill to select suitable cutting tools used for milling machine operations.

• Identify types of cutting tools and their applications • Acquire the knowledge on start up and shut down procedure of milling machines in a safe and competent manner.	❖ Ability to produce parts in a milling machine within specified tolerances using precision measuring instruments (vernier calipers, micrometers, dial gauge, etc.). ❖ Ability to calculate and set appropriate cutting speeds, feeds, and depths of cut. ❖ Able to perform basic milling machine maintenance work. ❖ Able to get the skill on selection work holding devices & tool holding devices used in milling machines to perform various machining operations. ❖ Checking dimensions after machining of components
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, Whiteboard/SmartBoard, Marker, Duster.	
Tools, Equipment and Other Requirements	
Milling machine, charts of various types of Milling machine, lights, raw materials, Cutting tools, Machine cleaning items, work holding devices, tool holding devices, Measuring instruments, Cutting oil and Safety items.	

Module 8: CPC/N5116 - Operation on Grinding machines

Mapped to:

Terminal Outcomes - Grinding Operations:

- **Wheel Selection and Preparation:**
  - Ability to select the correct grinding wheel type, grit, and grade for specific materials and applications.
  - Proficiency in wheel mounting, balancing, dressing, and truing.
- **Precise Dimensional Control:**
  - Ability to achieve very tight dimensional tolerances and surface finishes.
  - Skill in using precision measuring instruments (micrometers, gauges, etc.) to verify accuracy.
- **Performance of Various Grinding Operations:**
  - Competence in performing:
    - Surface grinding: Producing flat surfaces.
    - Cylindrical grinding: Grinding external and internal cylindrical surfaces.
    - Internal grinding: Grinding the inside of holes.
    - Tool and cutter grinding: Sharpening cutting tools.
- **Understanding of Grinding Principles:**
  - Knowledge of grinding wheel speeds, feed rates, and depth of cut.
  - Understanding of the effects of different grinding parameters on workpiece quality.
  - Understanding of the use of coolants.
- **Safe Operating Procedures:**
  - Strict adherence to safety protocols, including:
    - Proper use of PPE.
    - Safe handling of grinding wheels.
    - Awareness of potential hazards (wheel breakage, sparks, etc.).
- **Machine Maintenance:**
  - Ability to perform basic grinding machine maintenance, including lubrication and cleaning.
- **Interpretation of Technical Drawings:**
  - Ability to accurately read and interpret technical drawings and specifications related to grinding operations.

Key Considerations:

- Grinding often involves very fine tolerances, so precision is paramount.
- Safety is especially critical due to the high speeds and potential for wheel breakage.

Duration: *20:00*	**Duration**: *40:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of Pedestal Grinding, Bench Grinding, Surface grinders, Tool and cutter grinder and their set up, maintenance and procedures for use. • Considerations used to determine feed, speed and depth of cut for grinding operations. • Procedures used to set up grinders and align the work piece • Precautions used for truing and dressing a grinding wheel. • Types of surface grinders and accessories used for surface grinding operations and describe their applications • Procedures used to set up and perform	❖ Acquire the skill to operate the conventional grinding machines and produce machined components as per drawing provided. ❖ Able to perform the different types of operations like: surface grinding of flat surfaces, external & internal grinding of cylindrical surfaces ,&tool grinding etc. ❖ Acquire the skill to select the correct grinding wheel type, grit, and grade for specific materials and applications. ❖ Ability to produce parts in a grinding machine within specified tolerances using precision measuring instruments (verniercalipers, micrometers & dial

grinding operations on a surface grinder. ● Be able to operate Surface Grinding machines in a safe and competent manner. ● Demonstrate knowledge of cylindrical grinders, their set up procedures for use. ● Ability to operate Grinding machines to produce precision parts ● Considerations used to determine feed and depth of cut for grinding operations ● Procedures used to plan the sequence for grinding operations. ● Identify types of accessories and attachments used for cylindrical grinding operations ● Be able to operate a Cylindrical Grinding machine in a safe and competent manner.	gauge, etc.). ❖ Ability to calculate and set appropriate cutting speeds, feeds, and depths of cut. ❖ Able to perform basic grinding machine maintenance work. ❖ Ability to achieve very tight dimensional tolerances and surface finishes. ❖ Able to get the skill on work holding,wheel mounting, wheel balancing, dressing, and truing to perform accurate grinding operations.
Classroom Aids:	
CCharts, Models, Video presentation, Flip Chart, Whiteboard/SmartBoard, Marker, Duster.	
Tools, Equipment and Other Requirements	
Surface grinding machine, cylindrical grinding machine, pedestal grinding machine, wheel dresser, magnetic chuck, vice, angle plate, punch, marker, V-block, C-clamp, align key set, PPE, Sink, Liquid Soap, Hand Washing Poster, Paper Towel etc.	

Module 9: CPC/N5117 - Basic programming and operation on CNC Machines

Mapped to:

Terminal Outcomes:

- **Understanding CNC Fundamentals:**
  - Grasping the principles of Computer Numerical Control (CNC) and how it differs from manual machining.
  - Understanding the components of a CNC machine and their functions.
  - Knowledge of coordinate systems (Cartesian coordinates) and machine movements.
- **CNC Programming Skills:**
  - Ability to interpret and write basic CNC programs using G-code and M-code.
  - Understanding of program structure and syntax.
  - Ability to create programs for common machining operations (e.g., drilling, milling, turning).
  - Ability to edit and modify existing CNC programs.
- **CNC Machine Operation:**
  - Proficiency in setting up CNC machines, including work holding and tool setting.
  - Ability to load and execute CNC programs.
  - Skill in monitoring machine operations and making necessary adjustments.
  - Understanding of how to use the machine control panel.
- **Tooling and Material Knowledge:**
  - Understanding of cutting tool selection and application in CNC machining.
  - Knowledge of material properties and their impact on machining.
  - Ability to calculate cutting speeds and feed rates.
- **Safety Practices:**
  - Adherence to strict safety protocols for CNC machine operation.
  - Understanding of potential hazards and how to mitigate them.
  - Knowledge of emergency stop procedures.
- **Quality Control:**
  - Ability to use measuring instruments to verify part accuracy.
  - Understanding of tolerances and surface finish requirements.
  - Ability to make program adjustments to achieve desired quality.
- **CAD/CAM Integration (Often Included):**
  - Understanding of how CAD (Computer-Aided Design) and CAM (Computer-Aided Manufacturing) software is used to generate CNC programs.
  - Basic knowledge of how to generate tool paths from CAD models.
- **In essence, successful completion of basic CNC programming and operation training should result in an individual who can:**
  - Safely and efficiently operate CNC machines.
  - Create and modify basic CNC programs.
  - Produce parts that meet quality standards.

Duration: *20:00*	**Duration**: *40:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of computer systems and their operation. • Demonstrate knowledge of popular software packages and their applications. • Demonstrate knowledge of security issues related to computers. • Use electronic mail • Demonstrate knowledge of CNC machine tools, their accessories, attachments and applications. • Advantages of using CNC machine tools. • Demonstrate knowledge of basic CNC programming. • Demonstrate knowledge of CNC machine tools, their set up, maintenance and procedures for use. • Understand the role of CAD/CAM software as applied to CNC Machines. • Be able to operate CNC machines in a safe and competent manner. • Be capable of tool setting for CNC Machines. Be capable of inputting CNC programs through manual data input.	❖ Acquire the skill to identify the different components of a CNC machine and their functions. ❖ Ability to interpret and write basic CNC programs using G-code and M-code. ❖ Acquire the computer operating skill to create basic CNC programs & do the program simulation to verify the correctness of CNC program. ❖ Safely and efficiently operate CNC Lathe & CNC Milling machines and produce tight tolerance. ❖ Create and modify basic CNC programs. ❖ Acquire the skill on tool setting, workpiece setting, and selection of proper cutting parameters. ❖ Ability to operate the machine in different operating modes like: Edit mode, Jog mode, MDI mode & Auto mode etc. ❖ Able to perform different operations like: turning, facing, milling, drilling, boring & reaming in CNC machines to produce highly finished and tight tolerance components.
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Duster.	
Tools, Equipment and Other Requirements	
CNC Simulators, CNC machines, charts of various types of CNC machine, lights, raw materials, Cutting tools, Machine cleaning items, work holding ,tool holding devices, Measuring instruments, Cutting oil and Safety items.	

Module 10: CPC/ N7014 - Work effectively with others

Mapped to:

Terminal Outcomes:

- **Problem-Solving:**
  - Ability to identify and resolve machining problems.
- **Teamwork and Communication:**
  - Ability to work effectively in a team environment.
  - Clear and concise communication skills.

Duration: *10:00*	**Duration**: *20:00*
Theory–Key Learning Outcomes	**Practical–Key Learning Outcomes**
• Demonstrate knowledge of the importance of well-developed writing skills in theWorkplace. • Demonstrate knowledge of the purpose of various types of workplace correspondence. • Demonstrate knowledge of the principles of effective workplace writing. • Demonstrate knowledge of standard formats for letters. • Demonstrate the ability to prepare and deliver an oral presentation. • Demonstrate knowledge of the importance of effective interpersonal skills in the workplace. • Identify common trade specific forms • Demonstrate knowledge of good customer service practices. • Clear and concise communication skills.	• Ability to identify and resolve machining problems. • Ability to work effectively in a team environment. • Gain effective interpersonal skills in the workplace.
Classroom Aids:	
Charts, Models, Video presentation, Flip Chart, Whiteboard/Smart Board, Marker, Duster.	
Tools, Equipment and Other Requirements	
NA	

Module 11: Employability Skills

Mapped to: DGT/VSQ/N0101

Mandatory Duration: *30:00*			
Location: Training Centre			
S. No.	**Module Name**	**Key Learning Outcomes**	**Duration (hours)**
1.	Introduction to Employability Skills	● Discuss the importance of Employability Skills in meeting the job requirements.	1
2.	Constitutional values - Citizenship	● Explain constitutional values, civic rights, duties, citizenship, responsibility towards society etc. that are required to be followed to become a responsible citizen. ● Show how to practice different environmentally sustainable practices.	1
3.	Becoming a Professional in the 21st Century	● Discuss 21st century skills. ● Display positive attitude, self -motivation, problem solving, time management skills and continuous learning mindset in different situations.	1
4.	Basic English Skills	● Use appropriate basic English sentences/phrases while speaking.	2
5.	Communication Skills	● Demonstrate how to communicate in a well -mannered way with others. ● Demonstrate working with others in a team.	4
6.	Diversity & Inclusion	● Show how to conduct oneself appropriately with all genders and PwD. ● Discuss the significance of reporting sexual harassment issues in time.	1
7.	Financial and Legal Literacy	● Discuss the significance of using financial products and services safely and securely. ● Explain the importance of managing expenses, income, and savings. ● Explain the significance of approaching the concerned authorities in time for any exploitation as per legal rights and laws.	4
8.	Essential Digital Skills	● Show how to operate digital devices and use the associated applications and features, safely and securely. ● Discuss the significance of using the internet for browsing, accessing social media platforms, safely and securely.	3
9.	Entrepreneurship	● Discuss the need for identifying opportunities for potential business, sources for arranging money and potential legal and financial challenges.	7
10.	Customer Service	● Differentiate between types of customers. ● Explain the significance of identifying customer needs and addressing them. ● Discuss the significance of maintaining hygiene and dressing appropriately.	4

11	Getting ready for apprenticeship & Jobs	• Create biodata. • Use various sources to search and apply for jobs. • Discuss the significance of dressing up neatly and maintaining hygiene for an interview. • Discuss how to search and register for apprenticeship opportunities.	2

LIST OF TOOLS & EQUIPMENT FOR EMPLOYABILITY SKILLS		
S.No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations – and Internet connection with standard operating system and standard word processor and worksheet software (Licensed) (all software should either be latest version or one/two version below)	As required
2.	UPS	As required
3.	Scanner cum Printer	As required
4.	Computer Tables	As required
5.	Computer Chairs	As required
6.	LCD Projector	As required
7.	Whiteboard	As required
Note: Above Tools & Equipment not required, if Computer LAB is available in the institute.		

Module 12: On-the-Job Training

Mapped to:

Mandatory Duration: *60:00*
Module Name: On-the-Job Training
Location: On Site
Terminal Outcomes ● On-the-Job Training (OJT) is a hands-on learning method where participants acquire skills and knowledge while performing their job tasks. ● Participants learn specific job-related skills that are directly applicable to their roles. ● Industrial training often leads to participants becoming more effective and efficient in their learning. ● Industrial training experience builds the confidence level of participants. ● Training occurs in the actual work environment, reducing the need for induction training programs while joining in industry. ● Interaction with industry captains or mentors during training strengthens learning teamwork and workplace relationships. ● Trainees become familiar with the industrial tools, systems, and workflows quickly. ● Participants encounter and address challenges in industry, developing critical thinking and adaptability.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Mechanical / Production / Plastics Mould / Tool / Tool & Die / Manufacturing Engineering / Technology	2	Metal Component Manufacturing, Conventional & CNC Machining, Mould, Tool & Die Making	-	-	-
B.E. / B.Tech.	Mechanical / Production / Plastics Mould / Tool / Tool & Die / Manufacturing Engineering / Technology	-	-	-	-	-

Trainer Certification	
Domain Certification	**Platform Certification**
Minimum Educational Qualification as above, additionally he/ she should have done a job role relevant skill training course from CIPET.	Recommended that the Trainer Should have done a job role relevant upskilling course from CIPET.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma	Mechanical / Production / Plastics Mould / Tool / Tool & Die / Manufacturing Engineering / Technology	2	Metal Component Manufacturing, Conventional & CNC Machining, Mould, Tool & Die Making	3	Tool Room, CNC Technologies, Mould / Die Manufacturing	-
B.E. / B.Tech.	Mechanical / Production / Plastics Mould / Tool / Tool & Die / Manufacturing Engineering / Technology	1	Metal Component Manufacturing, Conventional & CNC Machining, Mould, Tool & Die Making	1	Tool Room, CNC Technologies, Mould / Die Manufacturing	-

Assessor Certification	
Domain Certification	**Platform Certification**
Minimum Educational Qualification as above, additionally he/ she should have done a job role relevant skill training course from CIPET.	Recommended that the Trainer Should have done a job role relevant upskilling course from CIPET.

Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

Mention the detailed assessment strategy in the provided template.

1. Assessment System Overview:
    - Batches are assigned to Training Assessment Wing (TAW), CIPET HO for planning of assessment
    - Training Centers request TAW for Assessment and Certification of Trainees
    - TAW identifies suitable assessor and nominates the assessor to the respective Training Centre
    - TAW monitors the assessment process
    - Training Centers maintain necessary records

2. Testing Environment:
    - Check the Assessment location, date and time
    - If the batch size is more than 30, then there should be 02 Assessors in a day (or) 01 assessor in 2 days
    - Check that the allotted time to the candidates to complete the Theory & Practical Assessment

3. Assessment Quality Assurance levels/Framework:
    - Question bank / Question Paper is prepared by the Subject Matter Experts (SME) / Assessor
    - Questions are mapped to the specified assessment criteria
    - Certified Assessor & Trainer will be engaged in the process

4. Types of evidence or evidence-gathering protocol:
    - Date / Time recorded for the reporting of the assessor from assessment location
    - Assessment batch - Group Photo of Trainees along with Assessor

5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Virtual meet with the Assessor / Trainees

6. Method for assessment documentation, archiving, and access
    - Hard copies of the documents are stored, soft copies of assessment evidences are stored in Email for future correspondence

References

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 a similar/ related set of functions in an industry.
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 qualification pack code.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
OJT	On-the-job Training
PwD	People with Disability
PPE	Personal Protective Equipment
ES	Employability Skills