सूक्ष्म, लघु एवं मध्यम उद्यम मंत्रालय
DEVELOPMENT COMMISSIONER
MINISTRY OF MICRO, SMALL & MEDIUM ENTERPRISES
MSME TECHNOLOGY CENTRE

MODEL CURRICULUM

Qualification Name:

ASST. OPERATOR - CNC MILLING (TOOL ROOM)

Qualification Code:

Version: 2.0

NSQF Level: 3

Model Curriculum Version: 2.0

Submitted By:

MSME TECHNOLOGY CENTRE

O/o DC MSME, Ministry of Micro, Small and Medium Enterprises

Govt. of India

A-Wing, 7th Floor, Nirman Bhawan, Maulana Azad Road

New Delhi-110108

Contact No. +91-674-2654700

Email- msmetcab@gmail.com

NOS / MODULE TEMPLATE

NOS /Module: Assist in Operation of CNC Milling Machine

NOS /Module Code: MSME/CCCM/01 & Version 1.0

Outcomes:

After completion of course Student should be able to:

- Explain applications and advantages of CNC machines
- Demonstrate and explain various CNC control, calculate technological data for CNC machining
- Prepare and understand line program for various profile
- Prepare programs, demonstrate, simulate and operate CNC lathe machines for various machining operations
- Perform basic maintenance activity on daily basis and prepare record of Machine break down
- Maintain & prepare reports as per standard / check sheet

Theory Hours: 30 **Practical Hours: 330** **Viva Marks: - 100** **Practical Marks: 100**

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	PR hours	PR Marks
UNIT-I	Introduction to CNC technology and Different Cutting tools / Tooling standards	After completion of unit Student should be able to • Explain applications and advantages of CNC machines and technology • Understand and explain difference between conventional & non-conventional machine tool • Demonstrate and explain various CNC control • Calculate technological data for CNC machining	Introduction to CNC technology – CNC machines & controls, History & development of CNC technology, Conventional Vs. non-conventional machine tool, Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system, Types & Selection of standard tools/ cutters/Tool Holders ISO Standard for Cutting Tools and Tool Holders, use and application of single & Multi point cutting tool , Tool Holder Types, Milling Insert Shapes, Work holding methods, Tool holding Devices, Cutting parameters, Need of different oils & lubricants In CNC Milling Machine.	10	60	25
UNIT-II	CNC Programing-Milling	After completion of unit Student should be able to • Understand and explain the concept and importance of CNC programming • Prepare and understand line program for various profiles • Identify and set parameters for various simulators • Prepare and simulate various operation cycles for lathe	CNC programming basics, Introduction to manual NC programming, NC programming, Introduction and demonstration of line programs, NC programming for lathe machine using ISO codes into the CNC simulator. CNC programming for lathe machines using different machining cycles into the CNC simulator, Adoptive Control System and practical exercises. Procedures Associated with part programming, Cutting process parameter selection, Process	5	120	25

		• Use and simulate cycles using various Controls • Analyze parameters for various machining cycles and operations	planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations Exposure for programming and simulator of FANUC, & Controls through post processors .Programming exercise. Machining of programmed exercise on CNC Milling machines.			
UNIT-III	CNC Machining-Milling (Operation and Setup)	After completion of unit Student should be able to • Optimize parameters for Milling operations • Analyze the parameters of lathe operations • Explain operation sequence for the lathe operations • Prepare operation sequence for test run	Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed etc. and set a references for the various operations Prepare operation and operation sequence for the lathe operations like Milling, grooving , Pocket & Slotting etc. Prepare & set CNC milling operations and run the program Execute program and inspect simple geometrical forms / standard part	5	120	25
UNIT-IV	Preventive measures and Maintenance	At the end of this Unit the student should be able to: • Understand the concepts of Maintenance • Understand concept of preventive measures. • Understand different types of maintenance. • Understand about the electrical accidents.	Definition of maintenance, types of maintenance, maintenance philosophy, Preventive measures, Electrical accidents & steps to be taken in such accidents with CNC Milling Machine, Implementation of JH for CNC.	10	30	25

NOS /Module: Demonstrate the working Principle of Machine Tools

NOS /Module Code: MSME/CCCM/02 & Version 1.0

Outcomes:

After completion of course Student should be able to:

- Understand about the basic norms of an organization
- Understand about the environmental sustainability
- Understand an implement various activities involved in 5S
- Understand about the safety rules
- Explain the use of first aid and safety equipment/PPE
- Understand the Waste disposal techniques
- Explain Lathe Machine and its parts
- Explain various operations performed on conventional Lathe machine
- Calculate various cutting parameters like Feed, RPM, Machining time, and tapper angle etc.

- Calculate area and volume of various Geometry
- Calculate weight of material and cost estimation.

Theory Hours: 30 **Practical Hours: NA** **Theory Marks: 100** **Practical Marks: NA**

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH Hours	TH Marks
UNIT-I	Introduction	At the end of this Unit the student should be able to: ● Understand about Organizational rules & regulation ● Understand about the source of renewal energy resources ● Understand about the Environmental Sustainability ● understand and explain about 5S ● Understand about the various activities involved in 5S ● Implement 5S in the work area.	Introduction to Organization/ Institute (MSME Technology Centre) Rules & Regulation, mandate, mission and policies, Renewal energy resources and Environmental Sustainability (Benefits and Issues) Introduction & purpose of 5S, Creates a Visual Factory, The 5S Cycle, and 5S Activities, 5S Program Steps :Sort, Straighten, Shine, Standardize and Sustain	4	5
UNIT-II	Occupational health and safety	At the end of this Unit the student should be able to: ● Understand about safety rules ● Understand the use of first aid and safety equipment ● Understand the importance of occupational health and safety ● Understand the environment guidelines ● Understand the Waste disposal techniques ● Understand the use of PPE	Health & Safety: Introduction to safety equipment's and their uses, Introduction of first aid, operation of Electrical mains, Occupational Safety & Health, Importance of housekeeping & good shop floor practices, Disposal procedure, Disposal of waste materials like cotton waste, metal chips/burrs etc, personal protective equipment's (PPE), Basic injury prevention, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message	6	5
UNIT-III	cutting tools, Conventional Milling machine and its Operation	After completion of unit Student should be able to ● Explain pedestal grinding machine ● Understand and explain single point cutting tool ● Tool terminologies ● Explain milling machine ● Describe the milling machine parts & accessories ● Understand about the different types of Milling operations.	Bench & pedestal grinders, features. Wheel dressers, Safety. Construction, Cutting Tool shape & Geometry, Work Holding Devices, Cutting Speed feed and depth of cut. Conventional milling machine and its parts, Specification of a milling Machine and its parts, work and tool holding devices, milling machine operations like: Plain & Step Milling, Parting, Boring, Grooving, Facing, Threading, Profile, Drilling, Tapping, Reaming, Counter boring, Pocketing, slotting etc.	6	20

UNIT-IV	Basics of workshop Calculation	After completion of unit Student should be able to • Explain systems (British & metric) of units, measurement, relationship & conversion problems • Explain the methods of finding Density and percentage • Calculate Percentage & density • Explain about Mass, weight and density • Understand the fundamentals of Algebra and learning to use calculator. • Explain Pythagoras theorem	Introduction, systems (British & metric) of units, measurement, relationship & conversion problems, Concept of density, mass & weight. Density and relative density and comparison between them, Fundamental algebra and simplification problems, Learning to use calculator , Pythagoras theorem, Area, perimeter and other dimension , Exercise based on trigonometric application like measurement of angles in degrees, grades and radians and their conversions.	8	-
UNIT-V	Basics of Quality Assurance	After completion of unit Student should be able to • Understand about the Quality • Understand the quality organization • Understand about the quality system • Explain 7 QC Tools	**Introduction:** Importance and Concepts of quality , quality assurance, International and Indian quality organizations, Quality System, Need for ISO 9000 and Other Quality systems and 7 QC tools.	6	10

COURSES / MODULE TEMPLATE

NOS /Module: Checking dimensions of CNC machined Part

NOS /Module Code: MSME/CCCM/03 & Version 1.0

Outcomes:

After completion of course Student should be able to

- Understand End and line Standard
- Check linear measurements by using Vernier, Micrometer (Digital and Analog type)
- Check Linear Measurement by height gauges (Digital and Analog type).
- Check various geometrical parameters using measuring instruments
- Demonstrate angle and taper measurements by bevel protractor and Sine bar.
- Demonstrate screw thread and gear measurement.
- Use various advance instruments for linear, angular and profile measurement.
- Carry out surface roughness measurement using Surface roughness tester.

THEORY HOURS: NA PRACTICAL HOURS: 30 THEORY MARKS: NA PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR Marks

UNIT-I	Introduction to basic Engineering Measurement & Metrology	After completion of unit Student should be able to • Describe and explain End and line standards. • Demonstrate the use of Slip gauges • Explain and demonstrate various gauges	Define Metrology, Accuracy and Precision, End & line standards Desirable features of end standards, and use of slip gauge	6	20
UNIT-II	Measuring Instruments: Gauges & Comparators	After completion of unit Student should be able to • Explain and demonstrate various gauges • Understand and demonstrate comparators like multi angle, sigma comparators	Gauges: GO- No GO type , Plug, Ring, tapper, thread, Snap, filler gauge etc., Comparators: Multi angle Sigma comparator, Back pressure and free flow type pneumatic comparators, Differential back pressure gauge.	6	20
UNIT-III	Measuring Instruments: Vernier , Micrometer and height Gauge	After completion of unit Student should be able to • Explain various measuring machines • Demonstrate and explain Optical dividing head • Analyze the co-ordinate systems and its applications	vernier Caliper (Digital, Analog and Dial type), micrometer (Analog and Digital type), height gauges (Digital and Analog type), Dial indicator, calculation of least count for various instruments (Vernier Caliper, Micrometer and Height Gauge), inside micrometer, depth micrometer, bevel protractor and Sine bar, Optical Flat, Sprit level , Roughness tester and profile projector	12	40
UNIT-IV	Screw Threads and Form Errors	After completion of unit Student should be able to • Evaluate straightness & flatness • Evaluate and do analysis of parameters of screw threads • Identify and understand pitch errors • Determine and describe various methods of measurements of Screw threads	Evaluation of straightness & flatness, evaluation of roundness – intrinsic & extrinsic datum. Surface Finish: stylus instrument (TALYSURF), Measurement of thread elements for internal & external threads,	6	20

COURSES / MODULE TEMPLATE

NOS /Module: Create Part Drawing using Auto-CAD

NOS /Module Code: MSME/CCCM/04 & Version 1.0

Outcomes:

After completion of course Student should be able to

- Explain the application of engineering drawing.
- Construct orthographic Projections giving proper dimensioning with title block using appropriate line type and scale for any geometrical figure in Auto CAD
- Explain various drawing Equipment's.
- Understand of Engineering Dimensioning method and their application
- Distinguish between Isometric view and Isometric projections.
- Explain about GD&T
- Create 2D geometric sketches by using Auto CAD Software
- Develop 3D modeling by using advanced command
- Understand design generative & interactive drafting

THEORY HOURS: -30 PRACTICAL HOURS: 60 THEORY MARKS: - RACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	PR Marks
Unit-I	Introduction to auto cad	At the end of this Unit the student should be able to: • Understand CAD/CAM/CAE software. • Capability of Auto CAD • Use of various Visualization command • Documentation Quick tour • Create and Access documentation • Layout and plotting • Understand concept of hardware & software.	Capability of Auto Cad, Starting AUTOCAD ,Various Visualization commands, Documentation Quick tour, Creating and Accessing documentation, Layout and plotting, Concept of hardware & software, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	10	20
Unit-II	Editing methods and controlling drawing display	At the end of this Unit the student should be able to: • AUTOCAD & interface • Setting new drawing. • Accessing command • Opening & saving existing file & function keys etc. • Work with Co-ordinates system and their type • Drawing Line, curve objects (Circle, Arc, Ellipse, elliptical arcs,) • Create solid filled areas-Regions, Hatch, Dot-nut, DD type	Create the replica of model using copy, array, Work with models in the modify toolbar, Work with Erase, Trim, Break, Break at point, Create mirror, fillet & chamfer, Execute dimensions through dimension style option Understand of design intent & edit the design intent, Identify Sketch Entities line arc, rectangle, circle etc., Use sketch settings, Use of Style toolbar (text style, Multilayer style etc.),Concept of creating single entity object, Perform Revision cloud and wipe out command	10	20
Unit-III	Layer management	At the end of this Unit the student should be able to: • Edit objects using the object property tool bar and various method • Adjusting snap & Grid alignment using Ortho mode • Use object snap and object tracking methods. • Understand the concept and use of layers • Work with Layer	Edit objects using the object property tool bar and various method, Concepts of layers, Create the layers by various line property., Extract the layers from the saved file by design Centre option, Application of layers on/off, Use of layers for block, text, dimension, freeze, lock. Work with snap & Grid alignment using Ortho modes, Define Attributes for variable text of block, Use of purge to eliminate the unused layers, blocks, Create title block using table option.	4	10

Unit-IV	Basic Dimensioning, Geometric dimensioning & Tolerance.	At the end of this Unit the student should be able to: • Need for Dimension • Detailed discussion on Dimensioning and tolerance method in AUTOCAD • Edit method • Add text with various engineering symbols • Concept of block, formation of block, Attribute definition • DD attribute and edit block • Insert, Modify, renaming block	Use of linear dimensioning (Linear, Align, Ordinates), Use of circular dimensioning (Radius, Diameter, Arc length), Create Baseline dimension & continuous dimensions for linear & angular dimension. Identify the appropriate Tool to create and modify the model, Add text with various engineering symbols, Deform the object by scale, lengthen, stretching, extend, Change the orientation of the object by align, offset, rotate, Concept of standard dimension, Use of angular dimension, Use of leader with text, block reference, concepts of Block, create the Block, Write block & extract the block from saved block.	4	10
Unit V	Getting started with 3d & Working in 3d space"	At the end of this Unit the student should be able to: • Concept of Isometric Drawing, axes and planes • Defining the paper setting • View ports • Overview of 3D model • Solid modeling in AutoCAD • Surface modeling in AutoCAD	Concept of Isometric Drawing, axes and planes, so-circle, Defining the paper setting ,Overview of 3D model, Solid modeling in AutoCAD(creating technique),Solid modeling in AutoCAD(editing and modification technique),Solid modeling in AutoCAD(editing and modification technique),Review of previous Class, Surface modeling in AutoCAD(creating, editing and modification technique),Converting wire frame models in to surface mode	10	10
Unit VI	Introduction to engineering drawing & drawing instruments	• After completion of unit Student should be able to • Explain applications and advantages of Engineering Drawing • Understand and explain difference between Drawing and Engineering Drawing • Demonstrate and explain various Drawing instruments • Calculate Representative • Understand and demonstrate method of dimensioning	Introduction and importance of engineering drawing, difference between Drawing and Technical drawing, Drawing Instruments - their Standard and uses, types of pencils used in technical Drawing, Lines, Drawing of Geometrical Figures, Lettering and Numbering, Dimensioning , Free hand drawing, sizes and Layout of Drawing Sheets, Method of presentation, Symbolic Representation.	4	5
Unit VII	Projections and plane:	After completion of unit Student should be able to • Understand and explain the concept and importance of Plane and projection • Understand between first and third angle of projection	Introduction to projections and planes, types of projection, difference between first angle projection and third angle of projections, types of plane, symbols used in angle of projection, practical examples on plane and projections.	4	5

		• Use appropriate symbol in engineering drawing			
Unit VIII	Orthographic projections:	After completion of unit Student should be able to • Draw geometrical figures • Read and understand engineering drawing of any components / Parts • Identifies the drawing with different angle of projection with respect to different views	Introduction to orthographic Projection, Construction of Geometrical Figures, Drawing of Solid figures, Drawing of Orthographic projection of blocks, Orthographic Drawing of simple fastener, practical examples of different component drawing in different angles of projection, drawing the projection of Points, line and solids in different views	7	10
Unit IX	Units & dimensioning.	After completion of unit Student should be able to • Understand and use of dimensioning systems • Understand the conversion of units in different standards • Understand and application of limit, fit and tolerances.	Introduction to units, Dimension and tolerance, Limit, Fit, types of fit, geometrical tolerance symbols and characteristics, surface texture symbols, Surface texture value & location	7	10

COURSES / MODULE TEMPLATE

NOS /Module: Employability Skill

NOS /Module Code: MSME/ES/01

THEORY HOURS: 30 PRACTICAL HOURS: - THEORY MARKS: 100 PRACTICAL MARKS: -

Refer Standard Curriculum developed by NCVET. (https://nqr.gov.in/downloads/pdfs/30-hours_MC_Employability_Skills.pdf)