Syllabus for Junior CNC Machinist

Course Name	Junior CNC Machinist
Sector	CAPITAL GOODS
Course Code	CGM/2024/CNCM/285
Level	3
Occupation	Automotive CNC Machinist
Job Description	Jr. CNC Machinist supports to machine different automotive components into desired shape by using CNC machining. They can support to hold the tools and jobs before machining and supports to inspect desired dimension of the job after machining.
Course Duration	Total Duration 360 Hrs (T- 90 hr, P- 150 hr, OJT-60 and ES-60)
Trainees' Entry Qualification	Grade 10 OR Grade 8 with two year of (NTC/ NAC) after 8th OR Grade 8 pass and pursuing continuous schooling in regular school with vocational subject OR 8th grade pass with 2 yrs relevant experience OR Previous relevant Qualification of NSQF Level 2 with one yr experience OR Previous relevant Qualification of NSQF Level 2.5 with 6 months experience
Trainers Qualification	B.E/B.TECH MECHANICAL OR DIPLOMA IN MECHANICAL OR ITI IN MACHINIST TRADE 1 YEAR FOR B.E./B.TECH 2 YEARS FOR DIPLOMA AND 4 YEARS FOR ITI

Structure of Course:

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	**Introduction to safe working condition**	Maintain safe working condition along with first aid	15	15	30
2	**Dimension of the job from Engineering drawing**	Interpret engineering drawing into dimension of the job	15	15	30
3	**Preparation of pre machining condition for CNC**	Secure the work piece in the work holding device and position correctly as per operation, Ready for performing operation.	20	40	60
4	**Performing different machining operations**	Demonstrate various operations that can be performed on a CNC using	30	60	90

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
		fundamental codes			
5	**Measurement of dimensions of jobs machined by CNC**	Demonstrate to inspect finished components by gauge and instrument following inspection plan.	10	20	30
6	**OJT**	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).		60	60
7	**Employability Skill**	As per guided curriculum	60	--	60
		TOTAL:	150	210	360

SYLLABUS:

(1)Module Name: Introduction to safe working condition

Outcome: Maintain safe working condition along with first aid

Theory Content:

- Apply good housekeeping practices at all times, clean work areas.
- Maintain safe and secure working environment.
- Identify common Safety signs.
- Keep the tools in working condition.
- Different types of fire extinguishers.
- First-Aid box and its use.

Practical Content:

- Demonstrate Knowledge of Safe working practices.
- Demonstrate first-aid box and its components.
- Operate fire extinguisher.
- Demonstrate first aid for the victim undergone burning and electric shock.
- Demonstrate the use of helmet, gloves, goggles, shoe, apron, etc.

(2) Module Name: Dimension of the job from engineering drawing

Outcome: **Interpret engineering drawing into dimension of the job**

Theory Content:

- Basic principles of geometry and drawing
- Drawing symbol (Diameter, Radius, Flatness, Straightness, Cylidricity, Daum, etc and common surface finish symbol)
- Unit and measurement (length , mass, time etc.)
- List and explain the common measuring instruments and gauges.
- Drawing of Geometrical Figures .

Practical Content:

- Free hand drawing of Lines, Triangle, Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements etc. Geometrical figures with dimension.
- Measure dimensions as per drawing.
- Identify and use of Measuring equipment's Like steel rules, micrometer vernier Caliper , gauges(Plug gauge, snap gauge, ring gauge, thread ring and plug gauge etc).
- Understand the output product requirement by reading the engineering drawing.

Tools & Equipment needed: Industrial PPE Training Kit, fire extinguishers , first aid kit

(3) Module Name: Preparation of pre machining condition for CNC

Outcome: **Secure the work piece in the work holding device and position correctly as per operation, ensuring readiness.**

Theory Content:

- Job requirements: raw materials.
- Work-holding devices Fixture.
- Instruments and tools to be used, method to mount tool.
- Job instruction sheet/job card; work drawings and instructions.

Practical Content

- Secure the work piece in the work holding device and position correctly as per operation.
- Preliminary check ensuring readiness: e.g. machine is clean, lubrication is functioning, coolant level is correct,
- Check tools, fixtures for any damage, breakage.
- Ensure that the correct program is being used and the tool is set properly.
- Identify suitable work holding or fixture as per the work requirement

Tools & Equipment needed: Bench Drill, Bench Grinder, Hacksaw (Spare Blade), Consumables Like Coolant/Oils, Different Raw Materials-Bars Set Of Files, Oil Stone Set Of Spanners, Surface Plate ,Bench vices, Center punch Hammer, Soft hammer, Screw driver set Allen key set

(4) Module Name: Performing different machining operations

Outcome: Demonstrate various operations that can be performed on a CNC using fundamental codes

Theory Content:

- Describe various turning operations that can be performed on a CNC.
- Turning operations: turning (OD and ID), facing, Drilling,internal turning contour turning.
- Relationship to the machine datum and reference points.
- basic motion commands G00, G01, G02/03 and M unction M3,M4,M8,M9 etc tool radius compensation; F, S, T commands; program transfer to CNC machine .
- Work-holding devices: chucks with hard jaws, chucks with soft jaws, fixtures, drive centres, collet chucks .
- Cutting tools: turning tool (OD and ID), grooving tool (OD and ID), parting tool, threading tool, form tools, centre drills, twist/insert drills, reamers.

Practical Content:

- Adjust machine tool operating parameters (wear offset , speed , feed etc)
- Set tool datum, position, length, offset and radius compensation .
- How to change tool and tool insert.
- Coolant on /off system function working properly
- Check correctness of the program through dry run and single block check. .
- Perform first cut by setting tool offsets to get an oversized part .

Tools & Equipment needed: Industrial grade CNC Turning
Center & cutting tools with carbide insert Cutting Tools ,Taps, End Millscutter Soft jaw, Scrap Box

(5) Module Name: Measurement of dimensions of jobs machined by CNC

Outcome: Demonstrate to inspect produced components by gauge and instrument following inspection plan

Theory Content:

- Measure the job without removing the work piece from the machine.
- Linear dimensions such as length ,Diameter, depths, Visual inspection of surface finish.
- Follow machining sequence while producing components.
- Follow inspection plan to inspect produced components.
- Store finished products.

Practical Content:

- How to fill or prepare job card.
- Inspect tools and specific intervals and decide on the tool change.
- Check the dimensional tolerance of the finished component.
- Perform documentation of operation.

Tools & Equipment needed: Steel rule ,Micrometer, Gauges ,Vernier Caliper .

(6) Module Name : OJT

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for **60 Hours.**)

(7) Module Name : Employability Skills **(60 Hrs)**

Key Learning Outcomes

Introduction to Employability Skills Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration:5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely
19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria

Module No.	Outcome	Assessment Criteria
1	**Maintaining safe working condition**	**After completion of this module students will be able to:** 1.1 work safely at all times, complying with health and safety, 1.2 keep the work area clean and tidy 1.3 ensure that all tools and equipment are in a safe and usable condition 1.4 read and understand safety instructions, warning signs on the CNC machines used 1.5 guidelines for personal protective equipment (PPE)
2	**Interpret engineering drawing into dimension of the job**	**After completion of this module students will be able to:** 2.1 Read & interpret the information on drawings and apply in practical work. 2.2 Gather information from the drawing . 2.3Drawings, dimensioning 2.4 Understand the output product requirement by reading the engineering drawing .
3	**Preparation of pre machining condition for CNC**	**After completion of this module students will be able to:** 3.1 Support the operator in aligning and securely hold fixtures, cutting tools etc. onto the machine 3.2 Preliminary check ensuring readiness: e.g. machine is clean, lubrication is functioning, coolant level is correct, 3.3 Check tools, fixtures for any damage, breakage and calibration 3.4 Ensure that the correct program is being used and the tool is set properly. 3.5 Feed the relevant tool data tool types, tool lengths, tool offsets
4	**Performing different machining operations**	**After completion of this module students will be able to:** 4.1 Basic Knowledge of turning (OD and ID), facing, contour turning, internal turning, threading 4.2 basic motion commands G00, G01, G02/03,M3,M4,M8,M9 etc tool radius compensation; F, S, T commands; program transfer to CNC machine 4.3 Basic knowledge of Common cutting tool turning tool (OD and ID), grooving tool (OD and

Module No.	Outcome	Assessment Criteria
		ID), parting tool, threading tool, form tools, centre drills, twist/insert drills, reamers. 4.4 changes insert when worn out. 4.5 Adjust machine tool operating parameters (wear offset , speed , feed etc)
5	**Measurement of dimensions of jobs machined by CNC**	**After completion of this module students will be able to:** 5.1 Measure Job dimension. 5.2 Fill or prepare job card 5.3 Produce Finished product 5.4 Store finished products
6	OJT	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 60 Hours.)
7	Employability Skill	As per guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees (Practical)

Sl No	Items Name	Specification	Qty
1	Industrial PPE Training Kit	Industrial PPE Training Kit	2 set
2	fire extinguishers - dry powder	fire extinguishers - dry powder	2 nos
3	first aid kit;	first aid kit;	2 box
4	Bench Drill	Bench Drill-12 mm capacity	1 nos
5	Bench Grinder	Bench Grinder	1 nos
6	Consumables Like Coolant/Oils	Consumables Like Coolant/Oils	5litres
7	Cutting Tools (Taps, End Mills)	Cutting Tools (Taps-M10), End Mills(16MM DIA, Drill -10MM DIA)	1 no each
8	Different Raw Materials-Bars	Different Raw Materials MS round And Alluminium bar	As per job
9	Hacksaw (Spare Blade)	Fixed Hacksaw-300mm (Spare Blade)	2 nos
11	Micrometer	Outside Micrometer 0-25 mm	1no
12	Industrial grade CNC Turning Center & cutting tools with carbide insert	Industrial grade CNC Turning Center & cutting tools(Turning, boring, drilling, threading , grooving external and internal) with carbide insert	1no
13	Gauges	Plug And Snap Gauges, Ring gauge, Thread gauge(plug and Ring)	1no each
14	Set Of Files, Oil Stone	Set Of Files, Oil Stone	1 no each
15	Set Of Spanners	Set Of Spanners mm/inch	1set

Sl No	Items Name	Specification	Qty
16	Surface Plate	Surface Plate 18x24 inch	1no
17	V Block And Clamps	V Block And Clamps 50mm dia capacity	1 no
18	Vernier Caliper	Vernier Caliper 0-150 mm	1 no
19	Bench vices	Bench vices -150mm	4 nos
20	Center punch	Center punch-100mm	4 nos
21	Hammer	Ball pein Hammer-250gm	4 nos
22	Scrap Box	Scrap Box	1 no
23	Soft jaw	Soft jaw	1 set
24	Steel Almirah For tools and equipment	Steel Almirah For tools and equipment 78X36X19 INCH	1 no
25	Screw driver set	Screw driver set	1 set
26	Allen key set	Allen key set metric	1 set
27	Soft hammer		1 no
28	Steel rule	Steel rule-15 cm	4 nos
	Ball pein hammer	Ball pein hammer-250gm	4 nos

Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Maintain safe working condition along with first aid	CGM/0706/OC1	20	100	0
Interpret engineering drawing into dimension of the job	CGM/0706/OC2	20	100	0
Secure the work piece in the work holding device and position correctly as per operation, Ready for performing operation.	CGM/0706/OC3	40	160	0
Demonstrate various operations that can be performed on a CNC using fundamental codes	CGM/0706/OC4	50	180	0
Demonstrate to inspect finished components by gauge and instrument following inspection plan.	CGM/0706/OC5	20	110	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	CGM/0706/OC6	0	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0