Syllabus for ASSISTANT CNC MACHINE OPERATOR

Course Name	ASSISTANT CNC MACHINE OPERATOR
Sector	CAPITAL GOODS
Course Code	CGM/2024/ACMO/408
Level	**3**
Occupation	ASSISTANT CNC MACHINE OPERATOR
Job Description	Assistant CNC Machine Operator helps to machining automotive parts starting from selecting proper tools, raw materials and equipment derived from instruction sheet, maintains them during operation, checking them time to time and finishes them with proper quality and dimensions effectively with a minimum wastage of all resources in a safe working condition.
Course Duration	Total Duration 390 Hrs (T- 90, P-180, 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	CTS/ATS in the trade of machinist/ turner with 3 yrs experience in relevant field Diploma in mechanical/production engineering with 2 yrs experience in relevant field BE/B-Tech in mechanical/production engineering with 1 yrs experience in relevant field

Structure of Course:

Module No.	Module name	Outcome	Compulsory/ Optional	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Introduction to safe working condition	Implement safe working condition	Compulsory	10	20	30
2.	Interpretation of Engineering drawing	Interpret Engineering Drawing for making job dimensions along with operations concerned and accessories	Compulsory	20	40	60

Module No.	Module name	Outcome	Compulsory/ Optional	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
3.	Pre machining condition for a CNC machine	Maintain favorable pre-machining condition for a CNC machine	Compulsory	20	40	60
4	Different operations of CNC	Demonstrate various operations of CNC like turning, drilling, milling, etc.	Compulsory	20	40	60
5.	Post machining operations for a CNC machine tool	Perform post machining operations for a CNC machine	Compulsory	20	40	60
6	OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	Compulsory	--	60	60
7.	Employability Skill	As per guided curriculum	Compulsory	60	--	60
		TOTAL:		150	240	390

SYLLABUS:

Module No. 1: Introduction to safe working condition

Outcome: Implement safe working condition

Theory Content:

1.1. Safety: a brief idea,
1.2. Personal safety,
1.3. Personal Protective Equipment (PPE),
1.4. Cause of accident,
1.5. Unsafe working condition,
1.6. Fire-fighting: a brief introduction,
1.7. Fire extinguisher for type A fire.

Practical Content:

1.1) Demonstration of first aid box,
1.2) Use of PPE
1.3) Mock fire-fighting by fire extinguisher,
1.4) Method of eye bandage,
1.5) Bandage on different cut on different parts of the body.
1.6) Write one note about a dummy accident
1.7) Demonstrate Dos & Do Nots for keeping the safe working condition

Tools & Equipment needed :

Helmet, gloves, apron, shoe, goggles, First Aid box with all common components, different charts regarding fire-fighting, accident prevention, Fire extinguisher

Module No. 2: Interpretation of engineering drawing

Outcome: Interpret Engineering Drawing for making job dimensions along with operations concerned and accessories

Theory Content:

1.8. Engineering drawing: a brief introduction,
1.9. Line, area, volume, 2D, 3D: concept.
1.10. Concept of projection. 1st & 3rd angle projection,
1.11. Components of industrial drawing sheet,
1.12. Dimension,
1.13. machine symbols used in drawing,
1.14. brief idea about limit, fit, tolerance,
1.15. cut section,
1.16. standards used in machine drawing: a brief idea
1.17. operation sheet: use, method of reading

Practical Content:

2.1) Draw common geometric figure,
2.2) 2D & 3D. dimensioning,
2.3) Cut section of cylinder & cone,
2.4) calculation of dimension of different parts of a job from the drawing,
2.5) limit, fit, tolerance, surface roughness, etc. may be calculated from the drawing,
2.6) Interpret different components of operation sheet.
2.7) Free hand sketches of some commonly used automotive parts or tools or common geometric shape.

Tools & Equipment needed:

Scale, steel rule, divider, compass, Tee square, Set square, sample drawing sheet of one automotive part, corresponding operation sheet, calculator.

Module No. 3: Pre machining condition for a CNC machine

Outcome: Maintain favorable pre-machining condition for a CNC machine

Theory Content:

3.1. General purpose machine vs CNC,
3.2. Basic major components of a CNC machine: location and use,
3.3. Turning, drilling and milling: a brief idea,
3.4. Sequence of operations for manufacturing one job described in operation sheet,
3.5. work holding device,
3.6. Tool holding device,
3.7. Tools for clamping and unclamping of job and tool,
3.8. jig and fixture used in CNC machine,
3.9. Pneumatic and magnetic chuck, function of ATC

Practical Content:

3.10. List of tools for machining of a particular automotive job from the help of operation chart,
3.11. Sequence of operations to be performed by CNC machine with the help of operation chart,
3.12. Checking for sufficient coolant in the tank,
3.13. List of loots required for clamping the tool/job with tool/job holding device,
3.14. practice for tool holding with tool holding device,
3.15. Practice for clamping job with job holding device,
3.16. Checking parameter of the machine as per machine manual instruction before actual machining

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, micrometer, vernier caliper, outside caliper, inside caliper

Module No. 4: Different operations of CNC

Outcome: Demonstrate various operations of CNC like turning, drilling, milling, etc.

Theory Content:

4.1. Standard cutting procedure in CNC machine, like turning, drilling and milling- a brief idea,
4.2. Speed, feed, depth of cut in case different standard machining of some standard material,
4.3. Cutting tools for standard machining procedure, correct use of lubricant and coolant,
4.4.Measuring instrument for checking different dimensions of the job in different steps of cutting operations.

Practical Content:

4.5. Checking all parameters of the CNC machine as per instruction sheet,
4.6. List of cutting tools, measuring instruments may be used for a standard cutting operation,
4.7. Appropriate procedure for checking procedure of tools during cutting a job, checking of sufficient coolant and lubricant flow.

Tools & Equipment needed: Industrial grade CNC Turning & Milling Center & cutting tools with carbide insert Cutting Tools, Taps, End Mill's cutter Soft jaw, Scrap Box, Set of Spanners, Bench vices, Screw driver set Allen key set, micrometer, vernier caliper, outside caliper, inside caliper

Module No 5: Post machining operations for a CNC machine tool

Outcome: Perform post machining operations for a CNC machine.

Theory Content:

5.1. Irregularities caused by machining,
5.2. Burrs, sharp edges: their bad effect,
5.3. Importance of chamfering, beveling at edges,
5.4. Methods of inspection of dimension of the job as per drawing at finished stage,
5.5. Select the items as not up to the quality (specially based on dimension),
5.6. Information about not okay items to the supervisor,
5.7. List of steps to be taken for checking the dimensions of a job,
5.8. Discuss methods for disposal of waste material such as waste oil, scraps etc.

Practical Content:

5.7. Demonstrate the steps to be taken for checking the dimensions of a job,
5.8. Demonstrate methods for disposal of waste material such as waste oil, scraps etc.,
5.9. Demonstrate how to remove chips, burrs and sharp edges from different machine areas.
5.10. Apply appropriate inspection methods for identifying the defects and checking the quality of machined workpieces as per the control plan.

Tools & Equipment needed: Set of Spanners, Surface Plate, Bench vices, Screw driver set, Allen key set, flat file, half round file, triangular file, steel rule, micrometer, vernier caliper, outside caliper, inside caliper

Module No. 6: 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.**)

Module No. 7: 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.	Implement safe working condition	**After completion of this module students will be able to:** 1.1. Explain the term Personal safety, 1.2. List of Personal Protective Equipment (PPE) and their individual use. 1.3. Describe different causes of accident. 1.4. Define unsafe working condition, 1.5. Make a brief introduction on fire fighting 1.6. Demonstrate working principle of fire extinguisher for type a fire. 1.7. Demonstration of first aid box, 1.8. Demonstrate mock fire fighting by fire extinguisher. 1.9. Demonstrate the method of eye bandage, 1.10. Demonstrate for making bandage on different cut on different parts of the body. 1.11. Demonstrate Dos & Do Nots for keeping the safe working condition
2.	Interpret Engineering Drawing for making job dimensions along with operations concerned and accessories	**After completion of this module students will be able to:** 2.1. Explain basic Engineering drawing 2.2. Illustrate the concept of line, area, volume, 2D, 3D. 2.3. Describe the concept of projection along with 1st & 3rd angle projection, 2.4. List the components of industrial drawing sheet, 2.5. Describe different ways by which different dimension can be drawn in the object 2.6. List of different machine symbols used in drawing. 2.7. Demonstrate brief idea about limit, fit, tolerance, cut section. 2.8. Explain the standards used in machine drawing 2.9. Demonstrate the use and method of reading of operation sheet 2.10. Draw common geometric figure, 2.11. Explain 2D & 3D figure dimensioning, 2.12. Draw the Cut section of cylinder & cone, 2.13. calculate of dimension of different parts of a job from the drawing, 2.14. Identify the limit, fit, tolerance, surface roughness, etc. from the drawing, 2.15. Interpret different components of operation sheet. 2.16. Draw Free hand sketches of some commonly used automotive parts or tools or common

Module No.	Outcome	Assessment Criteria
		geometric shape.
3	Maintain favorable pre-machining condition for a CNC machine	**After completion of this module students will be able to:** 3.1. Distinguish General purpose machine and CNC, 3.2. Describe basic major components of a CNC machine along with location and use, 3.3. Demonstrate the machining operations like turning, drilling and milling. 3.4. Explain the sequence of operations for manufacturing one job described in operation sheet. 3.5. Elaborate tool holding devices used in CNC. 3.6. Identify different tools for clamping and unclamping. 3.8. Explain jig and fixture used in CNC machine. 3.9. Demonstrate pneumatic and magnetic chuck along with their applications. 3.10. Describe the function of ATC 3.11. List of tools for machining of a particular automotive job from the help of operation chart, 3.12. State sequence of operations to be performed by CNC machine with the help of operation chart. 3.13. Check for sufficient coolant in the tank. 3.14. List of tools required for clamping. 3.15. Practice for tool holding with tool holding device. 3.16. Practice for clamping job with job holding device. 3.17. Check parameter of the machine as per machine manual instruction before actual machining.
4	Demonstrate various operations of CNC like turning, drilling, milling, etc.	4.1. Demonstrate cutting procedures in CNC machine like turning, drilling and milling- a brief idea 4.2. Describe standard machining practices for various materials involve evaluating the parameters of speed, feed, and depth of cut. 4.3. State cutting tools for standard machining procedure, 4.4. Elaborate correct use of lubricant and coolant, 4.5. List of measuring instrument for checking different dimensions of the job in different steps of cutting operations. 4.6. Check all parameters of the CNC machine as per instruction sheet. 4.7. List of cutting tools, measuring instruments may be used for a standard cutting operation, 4.8. Demonstrate appropriate procedure for checking procedure of tools during cutting a job, checking of sufficient coolant and lubricant flow.
5	Perform post machining operations for a CNC machine.	**After completion of this module students will be able to:** 5.1. Explain negative impact of machining

Module No.	Outcome	Assessment Criteria
		irregularities, burrs, and sharp edges. 5.2. Describe the importance of chamfering, beveling at edges. 5.3. Demonstrate various methods of inspection of dimension of the job as per drawing at finished stage. 5.4. Select the items as not up to the quality (specially based on dimension). 5.5. Demonstrate the method by which information about not okey items may pass to the supervisor, 5.6. List of steps to be taken for checking the dimensions of a job. 5.7. Demonstrate methods for disposal of waste material such as waste oil, scraps etc., 5.8. Demonstrate how to remove chips, burrs and sharp edges from different machine areas. 5.9. Apply appropriate inspection methods for identifying the defects and checking the quality of machined workpieces as per the control plan.
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
10	Micrometer	Outside Micrometer 0-25 mm	1no
11	Industrial grade CNC Turning & Milling Center & cutting tools with carbide insert	Industrial grade CNC Turning & Milling Center & cutting tools (Turning, boring, drilling, threading, grooving external and internal, end milling, side milling, gear cutting, hobbing, broaching) with	1no

Sl No	Items Name	Specification	Qty
		carbide insert	
12	Gauges	Plug And Snap Gauges, Ring gauge, Thread gauge (plug and Ring)	1no each
13	Set Of Files, Oil Stone	Set Of Files, Oil Stone	1 no each
14	Set Of Spanners	Set Of Spanners mm/inch	1set
15	Industrial PPE Training Kit	Industrial PPE Training Kit	2 set
16	Surface Plate	Surface Plate 18x24 inch	2 nos
17	V Block and Clamps	V Block and Clamps 50mm dia capacity	2 **Nos**
18	Vernier Caliper	Vernier Caliper 0-150 mm	2 **Nos**
19	Bench vices	Bench vices -150mm	4 **Nos**
20	Center punch	Center punch-100mm	2 **Nos**
21	Hammer	Ball pein Hammer-250gm	2 nos
22	Scrap Box	Scrap Box	Scrap Box
23	Soft jaw	Soft jaw	Soft jaw
24	Steel Almirah For tools and equipment	Steel Almirah For tools and equipment 78X36X19 INCH	Steel Almirah For tools and equipment
25	Screw driver set	Screw driver set	Screw driver set
26	Allen key set	Allen key set metric	Allen key set
27	Soft hammer		Soft hammer
28	Steel rule	Steel rule-15 cm	Steel rule
29	Surface Plate	Surface Plate 18x24 inch	Surface Plate
30	Outside caliper	0-50 mm	
31	Inside caliper	0-50 mm	
32	Apron , Helmet, shoe		30 set

Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Implement safe working condition	CGM/0707/OC1	30	100	0
Interpret Engineering Drawing for making job dimensions along with operations concerned and accessories	CGM/0707/OC2	30	140	0
Maintain favorable pre-machining condition for a CNC machine	CGM/0707/OC3	30	130	0
Demonstrate various operations of CNC like turning, drilling, milling, etc.	CGM/0707/OC4	30	140	0
Perform post machining operations for a CNC machine	CGM/0707/OC5	30	140	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	CGM/0707/OC6	0	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0