GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI

STATE PROJECT COORDINATION UNIT

(Established under Canada India Institutional Cooperation Project)

CURRICULUM

Course Name	**CNC PROGRAMMING & OPERATIONS**
Course Code	ME/2020/009
Course Duration	120 Hours
Minimum Eligibility Criteria	ITI/10th/+2/Diploma/Graduates
Pre-requisites (if any)	-
Course Objectives	Training module has been designed to provide the participants to • Understand the concept and requirement of Design and Manufacturing. • Understand the components and working principle of CNC Lathe • Understand the components and working principle of CNC Vertical Machining Centre • Learn the programming methods for CNC Lathe and CNC Vertical Machining Centre for typical components.
Course Outcomes	At the end of training, the participants will be able to • Operate CNC Machine tools and equipment's efficiently • Identify all the components of CNC Machine tool • Prepare CNC programs for both CNC Lathe and CNC Vertical Machining Centre • Make use of special programming features and execute on the CNC Lathe and CNC Vertical Machining Centre
Expected Job Roles	CNC Programmer, Operator and Service Technician

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
ME/2020/009	**CNC PROGRAMMING & OPERATIONS**	Theory	60	10	20	3 Hours
		Practical	60	40	80	
		Total	120	50	100	

ME/2020/009 - CNC PROGRAMMING & OPERATIONS

DETAILED SYLLABUS

Unit No.	Modules	No. of Hours	
		Theory	Practical
I	**Introduction to Computer Numerical Control (CNC):**	**04 Hours**	
1.1	General Safety & Maintenance – Typical applications of CNC – Advantages and limitations of CNC – Classification of CNC machine tools.	04	
II	**Programming fundamentals:**	**06 Hours**	
2.1	Procedure for manual NC programming – Structure of a program – Programming methods – Data input	03	
2.2	Axes Designation for various CNC machine tools- Zero and Reference points on CNC Machine Tools.	03	
III	**Part Programming for CNC Turning Centre**	**25 Hours**	
3.1	G codes and M codes for CNC turning Centre-Introduction to Fanuc simulation software, Part programming practice-simple turning, facing, step turning, taper turning, circular interpolation	08	
3.2	Part programming practice - thread cutting, grooving cycle, multiple turning cycle and multiple facing cycle, Internal operations-drilling and peck drilling	07	
3.3	**Practical:** Program proving through FANUC simulation software and to provide training for CNC Lathe in Tool Offset and Part programming for typical components.		10
IV	**Part Programming for CNC Vertical Machining Centre**	**25 Hours**	
4.1	Co-ordinate system – absolute and incremental co-ordinate system, G codes and M codes for CNC VMC, Part Programming practice – linear Interpolation	08	
4.2	Part Programming practice circular interpolations, Program using subroutines, Program for cutter radius compensation	07	
4.3	**Practical:** Program proving through FANUC simulation software and to provide training for CNC Vertical Machining Centre in Tool Offset and Part programming for typical components.		10

V	Training in CNC lathe and Vertical Machining Centre	60 Hours	
5.1	Tool and Work holding devices, Tool selection – Process planning – cutting tool specification and tool selection, Tool offset setting, Work piece datum setting and Cutting parameters calculation.	20	
5.2	**Practical:** Tool offset setting, Work piece datum setting, CNC Machine Control Unit, The console, Console key pad, Operators panel and Machining Practice (simple exercises)		40
	Total Theory and Practical hours	**60**	**60**
	Total hours	**120**	

HARDWARE REQUIREMENTS

S.NO.	LIST OF TOOLS /EQUIPMENTS
1.	• CNC Lathe and CNC Vertical Machining Centre • Tool Holders (CNC Lathe & CNC Vertical Machining Centre) • Various types of tools (CNC Lathe & CNC Vertical Machining Centre)

SOFTWARE REQUIREMENT

S.NO.	LIST OF SOFTWARE
1.	CAM Software (CNC Lathe & CNC Vertical Machining Centre Simulation)

REFERENCE BOOKS

S. NO.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1.	CAD/CAM/CIM	R.Radhakrishnan S.Subramanian	New Age International Pvt.Ltd., New Delhi, 3rd Edition 2008
2.	CAD/CAM	Mikell P.Groover Emory Zimmers Jr	Pearson Education, New Delhi. 2002
3.	Computer control of manufacturingsystems	Yoram Koren	McGraw Hill book company,USA
4.	CAD/CAM Principles and Applications	Dr.P.N.Rao	Tata Mc Graw Hill Publishing Company Ltd., New Delhi.2002
5	CAD/CAM/CIM	R.Radhakrishnan S.Subramanian	New Age International Pvt. Ltd., 3rd Edition 2008, New Delhi – 100 002.

6	Computer Aided Design and Manufacturing	Khushdeep Goyal	S.K. Kataria & Sons Educational Publisher, reprint 2021, New Delhi – 100 002.
7	Production Management	Dr.A.P.Varma	S.K. Kataria & Sons, 5th edition 2020, New Delhi – 110 002.
8	Geometric Dimensioning and Tolerancing	P.S.Gill	S.K. Kataria & Sons, 5th edition 2020, New Delhi – 100 002.

ASSESSMENT AND CERTIFICATION

S.No	Criteria for assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training , Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

END EXAMINATION

ALLOCATION OF MARKS

S.NO	Description	Max.Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Aim and Procedure	20
	b)Demonstration / Execution	25
	c) Result & Viva Voce	15
	d)Record	20
	Total Marks	**100**

THEORY MODEL QUESTION PAPER

ME /2020/009 - CNC PROGRAMMING & OPERATIONS

(Maximum Marks: 20)

(N.B: Answer any **Twenty** questions) **20x1= 20 Marks**

1. Name any two safety devices.
2. Write any two hand tools.
3. Write any two types of safety.
4. Write any two parts of Centre Lathe.
5. What are the two types of chucks?
6. Write any two tools used in Milling Machine.
7. Write any two Operations in Lathe.
8. List out any two parts of Milling Machine.
9. What is the use of Tailstock?
10. Name of the materials used to Manufacture Lathe bed.
11. What is CNC Machine?
12. List out any two CNC Control systems.
13. Write any two parts of CNC Vertical Machining Centre.
14. What is meant by ATC?
15. Write any two operations performed in CNC Lathe.
16. Write any two advantages of CNC Vertical Machining Centre.
17. Differentiate CNC VMC and CNC HMC.
18. Name the Code used to change the tool.
19. Write any two parts of CNC Lathe.
20. Write two co-ordinate systems.
21. What is G Code used for multiple turning?
22. Name any two communication methods.
23. What is meant by Listening Skill?
24. What is meant by Reading Skill?
25. What is meant by Motivation?