TEACHING PLAN: CNC MACHINES AND AUTOMATION 8th Sem.

SCHOOL OF ENGINEERING AND TECHNOLOGY		**ACADEMIC SESSION: 2022-23**	**FOR STUDENTS' BATCH: 2019-2023**
1	**Course code**	**PCC-ME-405**	
2	**Course Title**	**CNC MACHINES AND AUTOMATION**	
3	**Credits**	**4**	
4	**Learning Hours**	**Contact Hours: 3** **Practical Teaching: 0** **Project, Tutorial, and Assessment: 1** **Total hours: 4**	
5	**Course Objective**	1. To read and interpret part drawings and design callouts correctly 2. Understand fundamentals of NC/CNC Machine 3. Understand to manually program correctly a CNC machine 4. Demonstrates a working knowledge of programs including conversation of M&G codes 5. Learn NC Programming through CAD/CAM 6. Understand hand tool used in cnc machine 7. Understand Maintenance and Trouble Shooting of CNC Machine Tools and demonstrate knowledge of tool holders by selecting the correct holder for a range of tools.	
6	**Course Outcomes**	1. Able to read and measure part drawings and design callouts correctly without 2. Able to Understand fundamentals of NC/CNC Machine for producing quality Product of complexity 3.Able to interpret manually program correctly a CNC machine to reduced waste 4. Capable to use conversation of M&G codes by reading the program and knowing what action the machine intends to take thereby confirming the intended Action. 5. Able to use NC Programming through CAD/CAM and able to produce as per design 6. Able to use hand tools as required during operating of cnc machine 7. Able to proper functioning Maintenance and Trouble Shooting of CNC Machine Tools to maintained market demand in time and Capable to gain proper knowledge of tool holder and work holding device to reduce the chance of Accident.	
7	**Outline syllabus:** Introduction to NC, CNC & DNC, Design features, specification of CNC machines, Control System; Open Loop and Closed Loop System, Introduction to Part programming, Basic concepts of part programming, Common problems in CNC machines related to mechanical, electrical and pneumatic, Automation and NC system, Introduction to robot technology.		

7.01	**Paper Code**	**Unit**	**Introduction**	**Reference number**	**Teaching methods**

		(I)	Introduction to NC, CNC & DNC, their advantages, disadvantages and applications. Basic components of CNC machines, Machine Control Unit, input devices, selection of components to be machined on CNC machines, Axis identification	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata	Whiteboard, PPT slides, Tutorials, Demonstration
		(II)	Construction and Tooling Design features, specification of CNC machines, use of slideways, balls, rollers and coatings, motor and leadscrew, swarf removal, safety and guarding devices, various cutting tools for CNC machines, Concept of CNC tool holder, different pallet systems and automatic tool changer system, management of a tool room.	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata	Whiteboard, PPT slides, Tutorials, Demonstration
	PCC-ME-405	(III)	System Devices Control System; Open Loop and Closed Loop System, Concept of Actuators, Transducers and Sensors, Tachometer, LVDT, opto-interrupters, potentiometers for linear and angular position, encoder and decoder and axis drives	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata	Whiteboard, PPT slides, Tutorials, Demonstration
		(IV)	Part Programming Introduction to Part programming, Basic concepts of part programming, NC words, part programming formats, simple programming for rational components, part programming using conned cycles, subroutines and do loops, tool off sets, cutter radius compensation and tool wear compensation.	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata	Whiteboard, PPT slides, Tutorials, Demonstration
		(V)	Problems in CNC Machines Common problems in CNC machines related to mechanical, electrical and pneumatic, electronic components. Study of common problems and remedies, use of on-time fault finding diagnosis tools in CNC machines. Concept of automation, emerging trends in automation, automatic assembly. Overview of FMS, Group technology,	Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata	Whiteboard, PPT slides, Tutorials, Demonstration

			CAD/CAM and CIM. Introduction to robot technology, basic robot motion and its applications		

8	**Course Evaluation**	
8.10	**CA: 20%**	
8.1	**Attendance**	10%
8.12	**Homework**	10%
8.13	**Quizzes**	-
8.14	**Projects**	-
8.15	**Presentation**	-
8.16	**Any other**	-
8.2	**MTE(IA)**	20%
8.3	**End-term examination: 60%**	
9	**Text Books & References**	
9.1	**Text books**	CNC Machines – Programming and Applications by M Adithan and BS Pabla; New Age International (P) Ltd., Delhi. CNC Machines by M.S. Sehrawat and J.S. Narang; Dhanpat Rai and Co., New Delhi. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata Mc Graw Hill, New Delhi. CNC Machine by Bharaj; Satya Publications, New Delhi.
9.2	**References**	1. https://www.sanfoundry.com/best-reference-books-cnc-machines/ 2. https://en.wikipedia.org/wiki/Numerical_control 3. https://www.researchgate.net/publication/303370721_Study_on_computer_numerical_control_CNC_machines 4. https://stars.library.ucf.edu/cgi/viewcontent.cgi?article=1681&context=honorstheses 5. https://buildmyvocab.com/sentences/books/best-reference-books-for-cnc-machines/
9.3	**Video References**	1. https://nptel.ac.in/courses/112102103 2. https://www.digimat.in/nptel/courses/video/112105211/L01.html 3. https://www.youtube.com/watch?v=pPwyYFvRLts 4. http://www.nitttrc.edu.in/nptel/courses/video/108105088/lec46.pdf

Mapping of Outcomes v. Topics

Course Outcome	Program Outcome												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3	2

QUESTION BANK

1. Define the Use of computer in CNC machine.
2. Define the random access memory.
3. Explain the CNC machine.
4. Define and explain the objectives of CNC technology.
5. Explain the read only memory.
6. Define the various scope of the CNC technology.
7. Define and explain the central processing unit.
8. Describe the outcomes of the CNC technology.
9. Define what the use of numerical code in CNC technology is.
10. Explain the most popular type of drive for CNC machines today.
11. Describe the history of CNC machine.
12. Explain the numerical control machine.
13. Explain in detail numerical control machine
14. Describe the application of CNC over NC machine.
15. Explain difference between the CNC machine and conventional machine.
16. Explain the NC control system
17. Explain the difference between DNC and CNC.
18. Explain the first generation of CNC machine.
19. Explain the CNC Plasma Cutting Machine.
20. Explain the difference between NC and CNC.
21. Explain the features of CNC machine.
22. Explain the applications of CNC.
23. Explain CNC mean in manufacturing.
24. Explain the basic components of NC system briefly discuss function of each component.
25. Describes CNC machine advantages and disadvantages.
26. Describes CNC mean in manufacturing.
27. Describe the disadvantages of CNC.
28. Define and explain the timing belts and pulleys.
29. Explain the types of CNC tools are there.
30. Explain the NC motion control systems.
31. Explain the spindle and spindle bearing.
32. Describe the basic components of NC system.
33. Describes NC define equipment.
34. Explain compensate for backlash.
35. Explain check backlash on a CNC machine.
36. Explain reduce backlash in ball screws.
37. Describe ball screw in CNC machine.
38. Explain check ball screw conditions.
39. Explain preload a ball screw. Explain it.
40. Describe linear motion products.
41. Describe tool magazine in CNC.
42. Explain a CNC spindle work.
43. Describe linear motion guide ways.
44. Describe of bearing is used for linear motion.
45. Explain a linear guide work.
46. Describe two types of ATC.
47. Explain a CNC tool changer work.

48. Describe automatic pallet changer.
49. What are the features of CNC machine?
50. Define and explain the applications of CNC machine in industry.
51. Define and explain maintain a CNC machine.
52. Explain the Control system features.
53. Explain the memory features of CNC machine.
54. Explain the programming features of CNC machine.
55. Define and explain the parts of CNC machine.
56. Define and explain motor is used in CNC. Explain in detail
57. Define and explain Foot Switch or Foot Pedals and CNC Control Panel.
58. Describe test a stepper motor.
59. Describe stepper motors run continuously.
60. Describe the benefit of a stepper motor.
61. Explain a CNC machine work.
62. Describe stepper motors AC or DC.
63. Explain a stepper motor move.
64. Describe control the speed of a servo motor.
65. Describe movement is controlled by G word in CNC.
66. Describe why servo motors are used in CNC machines.
67. Define and explain linear scale resolver and linear inductosyn.
68. Define tolerance in CNC. Explain it.
69. Describe in detail the magnetic sensors for spindle orientation.
70. Describe automatic pallet changer.
71. Describe how do you use a tool Presetter.
72. Describe how do you calibrate a Haas tool probe.
73. Describe G code and M code.
74. Describe work zero in CNC. Also explain G003 code.
75. Describe how many types of CNC programming are there.
76. Describe automatic pallet changer.
77. Describe how do you use a tool Presetter.
78. Describe how do you calibrate a Haas tool probe.
79. Describe which software is used for CNC programming.
80. Mention Any 4 Post Processor Statements In Apt.
81. Describe Preparatory Function. Also explain Part Program.
82. Describe do you mean by G04.
83. Describe do you mean by G21.
84. Describe do you mean by G23.
85. Describe do you mean by G00.
86. Describe do you mean by GO1.
87. Describe do you mean by G03.
88. Describe APT automation? Explain the programming language.
89. Describe NC part programming. Explain coordinate and angular data.
90. Describe Do loops CNC programming. Describe the tool code.
91. Explain the Factors influencing selection of CNC machine.
92. Explain the F requirements in selection of tools for CNC machining.
93. Explain the F elements of CNC. Explain the tool set up.
94. Define maintain a CNC machine.
95. Define how a CNC machine works.
96. Define which movement is controlled by G word in CNC.
97. Explain the types of CNC tools are there.
98. Explain the type of CNC control system uses a feedback device.
99. Define CNC what are the deferent types of CNC.
100. Explain the Factors influencing selection of CNC machine.
101. Explain the F requirements in selection of tools for CNC machining.

102. Explain the F elements of CNC. Explain the tool set up.
103. Describe and explain the Cost of operation of cnc machine.
104. Describe operate a CNC machine.
105. Describe designing a CNC machining parts.
106. Explain the CAD CAM advantages and disadvantages.
107. Explain the computer aided part programming.
108. Describe in detail introduction to computer automated part programming.
109. Explain the Practical aspects of introducing cnc machine in industries.
110. How many types of CNC tools are there?
111. Define and explain the Industries for removing metal.
112. Describe Tool compensation in CNC.
113. Describe CNC machine tools.
114. Define the wood working industry.
115. Explain the CAD CAM advantages and disadvantages.
116. Explain the computer aided part programming.
117. Describe in detail introduction to computer automated part programming.
118. Explain the Maintenance features of CNC machine.
119. Describe and explain in detail the preventive maintenance.
120. Describe and explain the way lubrication levels on your CNC machine.