INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (MECHANICAL ENGINEERING)
SEMESTER	6
COURSE TITLE	CNC PROGRAMMING
COURSE CODE	09ME1604
COURSE CREDITS	2

Objective:

1 conventional machines are less in use for manufacturing. CNC machines (computerized numerical control machines) are taking place of conventional machines. Efficient use of CNC machines requires excellent knowledge of programming and use of CNC tooling. In this course an attempt has been made to focus exclusively on constructional features of CNC machines, their programming and tooling, so that students may learn to use the CNC machines efficiently for manufacturing desired products.

Course Outcomes: After completion of this course, student will be able to:

1 Identify parameters governing for selection of CNC machines.

2 Pre-set tool on CNC machines, Use qualified tools and tool holders on CNC machines.

3 Identify various work holding and tool holding devices.

4 Prepare part program by using applicable codes like G& M also apply advanced CNC part programming features like canned cycle, do loop, subroutine Describe procedure for setting various compensations on CNC

5 Select suitable standard for CAD/CAM interfacing

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	4	0	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Fundamentals of CNC** Concept, features and differences of NC (Numerical Control), CNC (Computerized Numerical Control) and DNC (Direct Numerical Control), Advantages and limitations of CNC. Selection criteria for CNC machines	0

Contents : Unit	Topics	Contact Hours
2	**Constructional features of CNC machines** CNC machines: Types, classification, working and constructional features, Spindle drives and axes drives on CNC machines. Machine structure- Requirements and reasons, Elements of CNC machines - Types, sketch, working and importance of: Slide ways, Re-circulating ball screw, Feedback devices (transducers, encoders), Automatic tool changer (ATC). Automatic pallet changer (APC), CNC axes and motion nomenclature	0
3	**CNC Turning & Machining Centers** Types, Features, Axes nomenclature, Specification, Work holding devices -types, working and applications, Tool holding and changing devices - types, working and applications of CNC turning centres, and CNC machining centres	0
4	**Part Programming** Axes Identification in CNC turning and machining centers, Machine zero, home position, work piece zero, program zero, CNC part programming: Programming format and Structure of part program, ISO G and M codes for turning and milling-meaning and applications of important codes, Compensations: Tool length compensation, Pitch error compensation, Tool radius compensation, Simple part programming for turning using ISO format having straight turning, taper turning (linear interpolation) and convex/concave turning (circular interpolation), Simple part programming for milling using ISO format, Importance, types, applications and format for: Canned cycles, Macro, Do loops, Subroutine, Mirror image, CNC turning and milling part programming using canned cycles, Do loops and Subroutine	0
5	**Maintenance of CNC Machine** Types of machine tools maintenance, Systems and Sub systems of CNC machines, CNC Maintenance practice: Tools required, Daily checklist, Problems related to mechanical systems, Backlash, Causes and precautions of electronics system	0
Total Hours		**0**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment 1** Collect mechanical components manufactured on CNC machines And show Difference compared to conventional machining	4
2	**Experiment 2** Identify operations on that components	2
3	**Experiment 3** Prepare conventional process plan for at least two components	4
4	**Experiment 4** Demonstrate constructional features and modes of operations of CNC	6

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
5	**Experiment 5** Demonstrate and interpret CNC controllers features	4
6	**Experiment 6** Demonstrate inserts, holders and tool management systems	4
7	**Experiment 7** Develop and simulate CNC turning part program (at least five) and identify errors and manufacture on CNC turning machine	16
8	**Experiment 8** Develop and simulate CNC milling part program (at least three) and identify errors and manufacture on CNC milling machine	16
Total Hours		**56**

Textbook :

1   Computer Aided Manufacturing, Atul Makvana, Atul Prakashan, 2018

References:

1   CNC Fundamental and Programming, CNC Fundamental and Programming, V. J. Patel, Charotar Publication, 2022

2   Introduction to NC/CNC Machines, Introduction to NC/CNC Machines, Vishal S, S.K.Kataria & Sons, 2004

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
30.00	30.00	40.00			

Instructional Method:

1   The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2   The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory.

3   Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

4   Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1 https://www.cnccookbook.com/cnc-programming-g-code/
2 https://gcodetutor.com/fanuc-training-course.html