COURSE INFORMATION FORM

DISCIPLINE: CIMM
COURSE TITLE: CNC Mill Operation Fundamentals
CR.HR: 4  LECT HR: 2.5  LAB HR: 3  CLIN/INTERN HR: 0  CLOCK HR: 0

CATALOG DESCRIPTION
The student will learn the fundamentals of Computer Numerical Control (CNC) mill programming and operation. This course is designed for students in machining and manufacturing careers.

PREREQUISITES
CIMM 115 or concurrent enrollment

EXPECTED STUDENT OUTCOMES IN THE COURSE (ESO)
Upon completion of this course, the student will be able to:
1. Set up and safely operate a CNC mill.
2. Interpret, load and prove out a CNC program.
3. Describe various canned cycles for CNC milling applications.
4. Describe absolute and incremental positioning systems.
5. Describe machine motion types and the main components of a CNC program.
6. Troubleshoot a basic CNC mill program.
7. Describe machining axes used for milling.
8. Describe linear and circular interpolation.
9. Navigate the machine control panel.
10. Power-up and home a CNC mill.
11. Properly set the work offset or origin of the CNC mill.
12. Identify and select appropriate tooling and workholding devices used for a CNC mill.
13. Safely and properly setup tooling and cutting tools.
14. Set and adjust tooling offsets to ensure part accuracy.
15. Remove burrs on stock.
16. Properly load a workpiece for CNC milling.
17. Verify dimensions to drawing specifications.
18. Define and explain cutter compensation for CNC milling.
19. Define the work coordinate system (WCS) and the machine coordinate system (MCS) for CNC milling.
20. Describe tool geometry, tool wear, and cutter compensation settings.
21. Load a CNC milling program into the Machine Control Unit (MCU).
22. Write a basic CNC milling program using G- and M-code.
23. Perform CNC mill preventive maintenance.

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GENERAL EDUCATION OUTCOMES (ESO)
Specify which general education outcomes, if any, are substantially addressed by the course. Numbers in parentheses identify the Expected Student Outcomes linked to the specific General Education Outcome.

Outcomes ESO

PROGRAM-LEVEL OUTCOMES

CAREER AND TECHNICAL EDUCATION PROGRAM OUTCOMES
Specify which Career and Technical program outcomes, if any, are substantially addressed by the course by completing the “Career and Technical Education template” to show the relationship between course and program outcomes to assessment measures.

1. Students will demonstrate the ability to apply foundational skills in an industrial setting, safely and to industry guidelines.
2. Students will think critically and apply problem-solving skills.
3. The program will graduate individuals who exhibit competence in CNC programming, setup and operation.

CLASS-LEVEL ASSESSMENT MEASURES
Student accomplishment of expected student outcomes may be assessed using the following measures. (Identify which measures are used to assess which outcomes.)

1. Classroom discussion/Participation: (1 – 23)
2. Assignments/Labs: (1 – 23)
3. Written and Application Exam: (1 – 23)
Individual instructors may order this outline as fits the needs of their individual courses. In addition, they may place more emphasis on some areas than on others. What is assured is that this particular list is covered in the course. Other topics may be added to a course as the instructor sees fit, and as time and interest allow. An *asterisk can be used to mark an item as optional.

I. Programming Fundamentals for Milling
   a. Learning G and M codes
   b. Learning the structure of a CNC Program
   c. Writing a program
   d. Loading a program

II. Machine Control Panel

III. Understanding canned cycles

IV. Learning Programming coordinate systems

V. Workholding Setup

VI. Machine and Work Coordinate Systems

VII. Power-up and Homing

VIII. Work Offset Setting
   a. X-axis
   b. Y-axis
   c. Z-axis

IX. Cutting Tools for Milling
   a. Cutting tool installation
   b. Cutting tool offsets for milling

X. Program Entry for Milling

XI. Milling Machine Operations
   a. Prove out
   b. Auto mode

XII. CNC Mill Setup

XIII. Milling Machine Operation
   a. Programming
   b. Program prove out
   c. Auto mode

XIV. Operator Best Practices
   a. Part Loading
   b. Part inspection
   c. Offset adjustments

XV. CNC Mill PM (Preventive Maintenance)