COURSE INFORMATION FORM

DISCIPLINE: Cimm
COURSE TITLE: CNC Programming Fundamentals

CR.HR: 2  LECT HR: 1.5  LAB HR: 1  CLIN/INTERN HR: 0  CLOCK HR: 0

CATALOG DESCRIPTION
The student will learn the fundamentals of Computer Numerical Control (CNC) programming, write a basic lathe and mill program, load and prove out a program. This course is designed for students in machining and manufacturing careers.

PREREQUISITES
CIMM 105 and CIMM 110 or CIMM 115 or concurrent enrollment

EXPECTED STUDENT OUTCOMES IN THE COURSE (ESO)
Upon completion of this course, the student will be able to:

1. Demonstrate the ability to interpret a CNC program, load and prove out a program.
2. Describe the Cartesian and polar coordinate system.
3. Describe absolute and incremental positioning systems.
4. Describe and select G- and M-codes used in programming.
5. Describe word addresses, modal codes and CNC block.
6. Describe machine motion types and the main components of a CNC program.
7. Troubleshoot a basic CNC lathe and mill program.
8. Identify and describe CNC lathe and mill nomenclature.
9. Describe machining axis used for turning and milling.
10. Identify and select appropriate tooling and workholding devices used in CNC machining.
11. Describe linear and circular interpolation.
12. Describe radial and diametral programming.
13. Describe CNC roughing, finishing, threading and tapping operations.
14. Describe various canned cycles for CNC turning and milling applications.
15. Define and explain tool nose radius compensation (TNRC).
16. Define the work coordinate system, (WCS) and the machine coordinate system (MCS) for CNC.
17. Describe tool geometry, tool wear, tool nose offsets and tool quadrant settings for TNRC.
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.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>ESO</th>
</tr>
</thead>
</table>

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 the entry-level skills of technical profession manufacturing technology.
4. 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 – 17)
2. Assignments/Labs: (1 – 17)
3. Written Exam: (2 – 17)
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. CNC safety
II. Types of CNC machines
III. Coordinate Positioning
IV. CNC tools and toolholding
   A. Collets
   B. Chucks
   C. Cutting tools
V. CNC process planning
VI. Coordinate positioning
VII. Types of motion
   A. Rapid Traverse
   B. Linear Interpolation
   C. Circular Interpolation
VIII. Non-axis commands
IX. Machining operations
   A. Facing
   B. Drilling and hole making
   C. Straight, taper and contour turning
   D. Roughing
   E. Finishing
   F. Canned cycles
X. CNC Programming
   A. G- and M-codes
   B. Speeds and feeds
   C. Sequence
   D. Motion
   E. Operations
   F. Cutter Compensation
XI. Machine Setup and Operation