

OAN Number:
OAN Date:

Board of Trustees Date: 05/22/08
Effective Date: 08/23/08

CUYAHOGA COMMUNITY COLLEGE
OFFICIAL COURSE OUTLINE
Mapped

SUBJECT AREA TITLE

Mechanical Engineering Technology/Manufacturing Industrial Engineering Technology

COURSE TITLE

CNC Programming and Operation

SUBJECT AREA CODE-COURSE NUMBER

MET - 1400

COURSE CREDIT HOURS

3.00

I. DESCRIPTION OF COURSE:

A. CATALOG DESCRIPTION: Emphasis on blueprint analysis, using math concepts to determine programming points; ascertaining implied part dimensions; calculation of speeds; feeds and tool offset; establishment of work zero and tools home positions. Manual programming of computer numerical control (CNC) machines using G-codes for FANUC controllers; tooling and set-up of CNC lathes and milling machines for machining operations; verification of tool paths by simulation; operating CNC machines to produce mechanical parts.

B. LECTURE HOURS: 2.0

C. LAB HOURS: 3.00

D. OTHER REQUIRED HOURS: 00

E. PREREQUISITE(S):

MET-1240 Machine Tools and Manufacturing Processes, or concurrent enrollment; or Departmental approval: work experience.

II. GENERAL EDUCATION OUTCOMES:

Upon satisfactory completion of MET 1400 - CNC Programming and Operation, the student should be able to perform the following outcomes and supporting objectives:

Outcome:

III. OUTCOMES/OBJECTIVES:

Upon satisfactory completion of MET 1400 - CNC Programming and Operation, the student should be able to perform the following outcomes and supporting objectives:

A. Outcome: Apply the fundamentals of CNC programming to analyze blueprints, plan, write troubleshoot and edit CNC programs for FANUC controllers.

Supporting Objectives:

B. Outcome: Explain the principle, application and advantage of CNC.

Supporting Objectives:

C. Outcome: Apply absolute and incremental methods to place entries on sheets using rules for block format.

Supporting Objectives:

D. Outcome: Program outline of parts to be turned and milled.

Supporting Objectives:

E. Outcome: Recognize error alarms and take corrective action.

Supporting Objectives:

F. Outcome: Verify and validate tool paths by graphical simulation

Supporting Objectives:

G. Outcome: Load, edit, and save program.

Supporting Objectives:

H. Outcome: Download CNC programs, setup and operate CNC Lathe and Milling Machines to produce engineering parts.

Supporting Objectives:

I. Outcome: Identify and select tools.

Supporting Objectives:

J. Outcome: Select feed, cutting speed and cuts.

Supporting Objectives:

K. Outcome: Set up CNC machines for machining operations.

Supporting Objectives:

L. Outcome: Perform hand operations such as inching, traversing, and positioning.

Supporting Objectives:

M. Outcome: Operate CNC lathe or Milling machines to produce engineering parts.

Supporting Objectives:

IV. COURSE CONTENT:

A. CONCEPTS

1. CNC machines description
2. Tool-holder positions
3. Working data
4. Cutting values
5. Hand Operation Techniques
6. Operating elements
7. Traverse indication
8. +, - signs
9. Inching operation
10. Cutting off power
11. Positioning tools
12. CNC Operation
13. Operating elements
14. Metric/inch units conversion
15. CNC-main elements
16. Set-up program
17. Coordinate system
18. Tool path
19. Kinds of program
20. Geometrical information
21. Feed and speed

22. G-functions
23. Format
24. Programming
25. Positioning
26. Fixed cycle
27. Interpolations
28. Threading
29. Control of dimensions
30. Program input
31. Input formats
32. Inputting data
33. Program input
34. Figure keys, word display, memory key, delete key
35. Errors
36. Causes
37. Corrective measures
38. Running program
39. Positions of tool-holders
40. Turning and milling tools, etc.
41. Machine tooling and fixturing

B. SKILLS

1. Perform the four arithmetic operations on whole numbers, arithmetic fractions, and decimal fractions
2. Identify the relationships in geometric figures
3. Convert between the metric and English measurement systems and convert within each system
4. Employ various techniques to recognize and use new vocabulary
5. Demonstrate skills to employ reading strategies and the reading process
6. Demonstrate skill in selecting and using appropriate study skills
7. Read and write "G- and M-codes" Fanuc
8. Compute feeds and speeds for appropriate materials
9. Set up and operate a CNC mill in a safe and efficient manner
10. Operate milling machines

C. ISSUES

1. Equipment sufficiency
2. Safety in Operation of CNC machines
3. CNC interface program updates
4. Networking for direct Programs transfer

V. METHODS OF STUDENT EVALUATION MAY INCLUDE ANY OF THE FOLLOWING:

- A. Lab reports, program sheets and work-piece inspection
- B. Quizzes
- C. Midterm examination

D. Final examination

VI. RESOURCES MAY INCLUDE ANY OF THE FOLLOWING:

- A. Curran, Kelly and Jon Stenerson. *Computer Numerical Control: Operation & Programming*. 3rd Ed. Upper Saddle River, Nj., 2007.
- B. Lin, S. C. Jonathan. *Computer Numerical Control: From Programming to Networking*. Albany, 1997.
- C. Lynch, Mike. *Fundamentals of Computer Numerical Controls (CNC)*. CNC Concepts, Inc, 2000.
- D. Lynch, Mike. *Fundamentals of Computer Numerical Controls (CNC)Workbook*. CNC Concepts, Inc, 2000.
- E. Quesada, Robert. *Computer Numerical Control: Machining and Turning Centers*. Upper Saddle River, Nj., 2005.

VII. ADDITIONAL RESOURCES:

Handouts.

CNC programming tutorials/software.