

DE ANZA COLLEGE
APPLIED TECHNOLOGY DIVISION
COURSE OUTLINE

Degree applicable

MANUFACTURING & CNC TECHNOLOGY 76 A-E Effective Winter 2004
(Students may receive credit for one Manufacturing and CNC 76 course with an A through E designation).

I. Catalog Information

MCNC 76 A-E	CAD/CAM Based Computer Numerical Control Programming Using Mastercam	4 1/2 Units
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Advisory: Basic understanding of mill and lathe operations, EWRT 100A and Reading 201 (or ESL 161-163).

Nine hours lecture/lab

Three-axis mill programming; creating part geometry, defining tools and tool paths, and using post-processors to produce word-address format programs.

II. Course Objectives

The student will:

- A. Use the program manager and explain methods of transporting CAD files.
- B. Create tool libraries, program cutter coordinates, and generate motion statements for milling machines.
- C. Access, edit, and plot program files.
- D. Calculate and apply speed and feed rates to milling tools.
- E. Describe components of computer-aided manufacturing including work cells, flexible manufacturing systems, and coordinate measuring machine (CMM) relationships.

III. Essential Student Materials

None

IV. Essential College Facilities

A laboratory/classroom equipped with, computers, CNC machine tools and accessories.

V. Expanded Description: Content and Form

- A. Software manipulation
 - 1. Keystroke commands and menu structure
 - 2. Program manager
 - 3. Re-generating programs
 - 4. Disk utilities (save, copy, and erase)
 - 5. Transport CAD files, input standards
- B. Tool files, tool motion, coordinates and motion statements for milling machines
 - 1. Tool designations

2. Build tool libraries.
3. Cutter length and diameter compensation offsets
4. Canned cycles
 - a. Drilling
 - b. Tapping
 - c. Counterbore / countersink
 - d. Boring and reaming
5. Circular tool paths
6. Contours
 - a. Closed
 - b. Open
7. Pocketing
 - a. Facing
 - b. Re-machining
 - c. Open
 - d. Standard
8. Manual entry and circle toolpath commands.
- C. Access, edit and plot program files
 1. Saving geometry with tool path
 - a. Recalling geometry files
 - b. Importing toolpath operations from a library
 2. Operations manager; arranging operation sequences
 - a. Copy
 - b. Move
 - c. Delete
 - d. Sorting operations
 - (1) Tool number
 - (2) Operation type
 3. Editing operations
 - a. Parameters
 - (1) Common
 - (2) Operation specific
 - b. Add or edit tool information
 - c. Add or edit geometry information
 - d. Numerical Control Intermediate file
 - e. Transforming toolpath
 - (1) Translate
 - (2) Rotate
 - (3) Mirror
 4. Plotting program files
 - a. Backplot
 - (1) Parameters
 - (2) Multiple views
 - (3) Step and run
 - b. VerifyNC commands
 - (1) Graphic process
 - (2) Defining material
 - c. Machine simulator
- D. Speeds and feeds calculation and application
 1. Tool and material libraries
 2. Job setup
- E. Components of computer-aided manufacturing (CAM)

1. Flexible manufacturing systems (FMS)
2. Work cell arrangements
 - a. Use of robotics
 - b. Work flow
3. Computer-aided inspection
 - a. In-process inspection
 - b. Coordinate measuring machine (CMM)

VI. Assignments

- A. Write Numerical Control Programs for mills.
- B. Take home worksheets involving calculations.
- C. Reading from textbooks, references, and trade journals.

VII. Methods of Evaluating Objectives

- A. Examinations covering lecture material and lab demonstrations.
- B. Completion of take home worksheets.
- C. Completion of programming and problem solving exercises.
- D. comprehensive, objective, problem solving final exam.

VIII. Texts and Supporting References

- A. Texts:
 1. Lin, Dr. Jonathon and Dr. Tony Shuie, CNC Programming Using Mastercam, Ann Arbor, MI: Scholars International Publishing Corporation, 2002
- B. References:
 1. CNC Software Inc., Mastercam Reference Manual. Tolland, CT: CNC Software Inc., 2002.
 2. CNC Software Inc., Mastercam Mill/Design Applications Guide. Tolland, CT: CNC Software Inc., 2002
 3. HASS Automation. HAAS CNC Operators Manual. Oxnard, CA. HASS Automation, 2003