DeAnza College

Degree Applicable
Effective Quarter: Fall 2008

I. Catalog Information

MCNC 75C **CNC Lathes & Horizontal Machining Centers; Programming & Operation, 4th Rotary Axis, Fixture Design** **4 1/2 Unit(s)**

Prerequisite: Manufacturing and CNC 75B with a grade of C or better.

Nine hours lecture-laboratory

CNC lathe tool path programming using G&M code format, including tool orientation and compensation and canned cycles. Programming for CNC horizontal machining centers and 4th axis rotary tables. Horizontal machining center and lathe controller functions, setup and operations. Fixture design for mills and lathes; base plate layout, supporting, locating, and clamping practices.

II. Course Objectives

A. Setup, operate and edit CNC horizontal machining centers.

B. Plan and describe typical process planning for horizontal machining centers.

C. Write programs for CNC lathes.

D. Setup, operation and editing of CNC lathes.

E. Describe fixture design theories for lathe, milling machine and inspection operations.

F. Write G&M code programs for rotary 4th axis machining on a milling machine.

III. Essential Student Materials

None

IV. Essential College Facilities

CNC programming computer lab and CNC lathes and horizontal machining center,4th axis rotary table.

V. Expanded Description: Content and Form

A. Setup, operate and edit CNC horizontal machining centers.

1. Compare axis, work-holding and table differences to vertical machines.

2. Mount and align fixtures or parts.

3. Set work, fixture, and tool length offsets.

4. Write programs using G&M codes.

5. Download programs into the CNC controller.

6. Translate and execute instructions from a Setup Sheet.

7. Mount tools in appropriate holders and load into tool changer.
8. Perform a dry run checking all necessary parameters.
9. Analyze and edit programs using G&M codes where required.

B. Plan and describe typical process planning for horizontal machining centers.

1. Describe the applications for rotary table, tombstones, and pallet changes.
2. Describe machining procedures for multiple surfaces and parts.
3. Incorporate multiple fixtures and operations for work flow efficiency.
4. Select appropriate fixtures based on part geometry and cost.
5. Select appropriate cutting tools based on material, efficiency, tool life and cost.
6. Write operation setup sheets for machining typical components.

C. Write programs for CNC lathes.

1. Create code for lathe canned cycles such as rough, finish, grooving and threading.
2. Calculate RPM and feed rates.
3. Apply correct tool orientation.

D. Setup, operation and editing of CNC lathes.

1. Set work and tool offsets.
2. Download programs into the CNC controller.
3. Translate and execute instructions from a Setup Sheet.
4. Mount tools in appropriate holders and load into tool changer.
5. Perform a dry run checking all necessary parameters.
6. Analyze and edit programs using G&M codes where required.

E. Describe fixture design theories for lathe, milling machine and inspection operations.

1. Explain location methods based on component datums and tolerances.
2. Describe fixture base plate design to accommodate locators, clamps and accessories.
3. Select locators for flat, cylindrical and irregular surfaces and holes.
4. Describe fixture clamps; types, applications, placement and operation.
5. Illustrate the requirements and uses for pushers, jacks and other support components.
6. Explain the uses for soft tooling such as soft jaws and collets and mandrels.
7. Describe accessories such as drill bushings, dowel pins, fixture keys, threaded inserts.
8. Contrast the construction and advantages between dedicated and modular fixtures.

F. Write G&M code programs for rotary 4th axis machining on a milling machine.

1. Describe typical 4th axis uses and applications.
2. Write G&M code for positioning and transform-rotation operations.
3. Write G&M code for cylindrical and conical helix operations.
4. Verify 4th axis operations.

VI. Assignments

A. Write Computer Numerical Control Programs

B. Take home worksheets involving calculations.

C. Readings from textbooks, references and trade journals.

VII. Methods of Instruction

Lecture and visual aids
Discussion of assigned reading
Discussion and problem solving performed in class
Quiz and examination review performed in class
Homework and extended projects
Laboratory experience which involve students in formal exercises of data collection and analysis

VIII. Methods of Evaluating Objectives

A. Examinations covering lecture material and lab demonstrations

B. Completion of take home worksheets

C. Completion of programming exercises

D. A comprehensive, objective final exam

IX. Texts and Supporting References

A. Examples of Primary Texts and References

1. MCNC Faculty, "MCNC 75C CNC Programming Manual", Cupertino, CA.,De Anza College,2003.

2. MCNC Faculty, "Advanced CNC Programming Manual". Cupertino, CA,De Anza College,2007.

B. Examples of Supporting Texts and References

1. Pusztai, Joseph and Michael Sava, "Computer Numerical Control". Reston, Virginia:Reston, 2000.

2. HASS Automation. "HAAS CNC Lathe Operators Manual". Oxnard,CA. HASS Automation, 2006

3. HASS Automation. "HAAS CNC EC300 Operators Manual". Oxnard,CA. HASS Automation, 2006

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