



Degree Applicable
Effective Quarter: Fall 2008

I. Catalog Information

MCNC 76L-Q	CAD/CAM Based Computer Numerical Control Programming Using Mastercam	4 1/2 Unit(s)
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(Students may receive credit for only one Manufacturing and CNC Technology 76 course with an L-Q designation.)

Prerequisite: Manufacturing and CNC 76F-K.

(The appropriate Manufacturing and CNC 76 courses with an F-K designation will be assigned as a prerequisite to the coordinating Manufacturing and CNC courses with a L-Q designation.)

Nine hours lecture-laboratory

Advanced Mastercam; complex surfacing for milling machines and contouring surfaces for lathes. Tooling, workflow and programming for horizontal machining centers.

II. Course Objectives

- A. Apply Mastercam commands to write basic 2 axis programs for lathes.
- B. Develop basic 2 axis programs for lathes.
- C. Write programs requiring advanced surfaces for milling machines.
- D. Develop workflow and writing programs for horizontal machining centers.
- E. Evaluate and use imported CAD files.
- F. Write programs using a milling machine 4th rotary axis.

III. Essential Student Materials

None

IV. Essential College Facilities

CNC programming computer lab with access to CNC vertical and horizontal machining centers and CNC lathes.

V. Expanded Description: Content and Form

- A.** Apply Mastercam commands to write basic 2 axis programs for lathes.
 - 1. Describe basic user graphic interface and menu structure.
 - 2. Select and set toolbar states.
 - 3. Produce construction and tool plan.
- B.** Develop basic 2 axis programs for lathes.
 - 1. Write basic 2 axis programs.
 - 2. Construct contoured surfaces.
 - 3. Identify often used canned cycles.
 - a. Face, rough and finish.
 - b. Grooving and drilling.
 - c. Cutoff operations
 - 4. Verify program for errors.
- C.** Write programs requiring advanced surfaces for milling machines.
 - 1. Review ruled, lofted, revolved and draft surfaces.
 - 2. Create swept, net, fence, trim and offset surfaces.
 - 3. Create surfaces that blend plane, curve.
 - 4. Use surface contours within programs.
 - 5. Calculate RPM and feed rates.
 - 6. Post process and verify programs.
- D.** Develop workflow and writing programs for horizontal machining centers.
 - 1. Apply work coordinate systems.
 - 2. Apply work offsets.
 - 3. Recognize workflow and workholding procedures related to horizontal machines.
 - 4. Describe machining multiple surfaces and parts.
 - 5. Incorporate multiple fixtures and operations in one program.
 - 6. Create and edit tool libraries.
- E.** Evaluate and use imported CAD files.
 - 1. Identify common file types and characteristics.
 - 2. Explain the use of positioning and transform-rotation operations.
 - 3. Construct CNC programs using geometry from files.
- F.** Write programs using a milling machine 4th rotary axis.
 - 1. Describe typical 4th axis uses and applications.
 - 2. Explain the use of positioning and transform-rotation operations.
 - 3. Explain the use of cylindrical and conical helix operations.
 - 4. Select work coordinate systems.

5. Verify 4th axis operations.

VI. Assignments

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

VII. Methods of Instruction

Lecture and visual aids
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 and problem solving exercises.

IX. Texts and Supporting References

A. Examples of Primary Texts and References

1. In-House Solutions Inc., Mastercam X2 Lathe Training Tutorial, Cambridge, Ontario, Canada: In-House Solutions Inc., 2007

B. Examples of Supporting Texts and References

1. In-House Solutions Inc., Mastercam X2 4/5 Axis Mill Training Tutorials, Cambridge, Ontario, Canada: In-House Solutions Inc., 2007
2. CNC Software Inc., Mastercam X Reference Manual, Tolland, CT: CNC Software Inc.,2007.
3. CNC Software Inc., Mastercam X Mill/Design Applications Guide. Tolland, CT: CNC Software Inc.,2007
4. HASS Automation. HAAS CNC Lathe Operators Manual. Oxnard,CA. HASS Automation, 2006
5. HASS Automation. HAAS CNC EC-300 Operators Manual. Oxnard,CA. HASS Automation, 2006

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