Washtenaw Community College Comprehensive Report

NCT 269 4 and 5 Axis Machining for the CNC Vertical Mills
Effective Term: Fall 2016

Course Cover

Division: Advanced Technologies and Public Service Careers
Department: Industrial Technology
Discipline: Numerical Control
Course Number: 269
Org Number: 14400
Full Course Title: 4 and 5 Axis Machining for the CNC Vertical Mills
Transcript Title: 4 & 5 Axis Machining CNC Mills
Is Consultation with other department(s) required: No
Publish in the Following:
Reason for Submission: New Course
Change Information:
Rationale: This class is being created for an advanced certificate in the advanced manufacturing program. This course is needed to get students the skills to operate new equipment being purchased for our program.
Proposed Start Semester: Fall 2016
Course Description: In this course, students will develop skills required to setup 4 and 5 axis operations on CNC Mills. Students in this class will write manual code to position the 4th and 5th axis as well as use MasterCam software to generate 4 and 5 axis part geometry and tool paths for machining. Students will set-up and machine parts using the 4th and 5th axis programs.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 45 **Student:** 45
Lab: Instructor: 45 **Student:** 45
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90
Repeatable for Credit: NO
Grading Methods: Letter Grades
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

No Level Required

Requisites

Prerequisite
NCT 221 minimum grade "C"
and
Prerequisite
NCT 259 minimum grade "C"

General Education

Request Course Transfer

Proposed For:

Student Learning Outcomes

1. Apply CAD CAM software to create 3D geometry for use with the 4th and 5th axis devices on the CNC milling machines.
   Assessment 1
   Assessment Tool: Capstone project art to program
   Assessment Date: Fall 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: All
   How the assessment will be scored: departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of students will score 75% or higher.
   Who will score and analyze the data: Department faculty

2. Set up the CNC milling machines for operation of 4th and 5th axis devices.
   Assessment 1
   Assessment Tool: Capstone project art to program
   Assessment Date: Fall 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: All
   How the assessment will be scored: departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of students will score 75% or higher.
   Who will score and analyze the data: Department faculty

3. Machine 4th and 5th axis parts at the CNC milling machines.
   Assessment 1
   Assessment Tool: Capstone project art to program
   Assessment Date: Fall 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: All
   How the assessment will be scored: departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of students will score 75% or higher.
   Who will score and analyze the data: Department faculty

Course Objectives

1. Use reference frame appropriate to centers of rotation for the 4th and 5th axis.
2. Generate tool paths for 4th axis part (Positioning and Dynamic controls).
3. Generate tool paths for 5th axis parts (Positioning and Dynamic controls).
4. Apply proper methods for loading, and aligning 4th axis and 5th axis devices into the CNC machine tools.
5. Apply proper methods for electrical and pneumatic connection required for the 4th axis and 5th axis devices.
6. Adjust settings and parameters for operation of the 4th axis and 5th axis part.
7. Find origin points necessary to establish machine tool offsets for cutting parts.
8. Update settings at controller required for mitigating tool to trunnion crashes.
9. Apply needed code into programs to call for safe tool change positioning.
10. Cut 4 and 5 axis parts to specification at the CNC vertical mills.

New Resources for Course

4 and 5 axis equipment is currently being purchased for this class

Course Textbooks/Resources

Textbooks

Manton,Matthew and Weidinger,Duane. *Mastercam X9 4&5 Axis Training Guide*, X9 ed. Kitchner Ontario: Cam Instructor Inc., 2015, ISBN: 978-1-927359-.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Computer workstations/lab

Reviewer	Action	Date
Faculty Preparer:		
Thomas Penird	*Faculty Preparer*	*Aug 29, 2015*
Department Chair/Area Director:		
Thomas Penird	*Recommend Approval*	*Aug 29, 2015*
Dean:		
Brandon Tucker	*Recommend Approval*	*Oct 06, 2015*
Curriculum Committee Chair:		
Kelley Gottschang	*Recommend Approval*	*Nov 30, 2015*
Assessment Committee Chair:		
Michelle Garey	*Recommend Approval*	*Dec 01, 2015*
Vice President for Instruction:		
Michael Nealon	*Approve*	*Dec 14, 2015*