Washtenaw Community College Comprehensive Report

NCT 221 Advanced Manual Programming and NC Tool Operation
Effective Term: Fall 2022

Course Cover

College: Advanced Technologies and Public Service Careers
Division: Advanced Technologies and Public Service Careers
Department: Advanced Manufacturing
Discipline: Numerical Control
Course Number: 221
Org Number: 14450
Full Course Title: Advanced Manual Programming and NC Tool Operation
Transcript Title: Adv Manual Program/NC Tool Op
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
   Consultation with all departments affected by this course is required.
   Pre-requisite, co-requisite, or enrollment restrictions
Rationale: Students entering this class need to have knowledge in CAD/CAM programming. NCT 123 is the class that teaches this skill set for students to apply all tools in the final class in the certificate they must have taken NCT 123. We have been fortunate that student in the last couple of years have had the skill set needed to do CAD/CAM programming in NCT 221.
Proposed Start Semester: Winter 2022
Course Description: In this course, students will learn complex cutter path generation, cutter compensation, repetitive programming, multi-quadrant circular interpolation, three axis interpolation, threading macros, and other advanced programming techniques are practiced. Geometry creation using computer-aided design/computer-aided manufacturing (CAD/CAM) software will be presented and used in this class. The class format is similar to that of NCT 121. Students with experience equivalent to NCT 121 may contact the instructor for permission to waive the prerequisite. This is the second of a two-course study of manual programming and computer numerical control (CNC) Machine Tool Operation.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 30 **Student:** 30
Lab: Instructor: 60 **Student:** 60
Clinical: Instructor: 0 **Student:** 0

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

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 4

Requisites
Prerequisite
NCT 121 minimum grade "C"
and
Prerequisite
NCT 123 minimum grade "C"

General Education
General Education Area 7 - Computer and Information Literacy
Assoc in Arts - Comp Lit
Assoc in Applied Sci - Comp Lit
Assoc in Science - Comp Lit

Request Course Transfer
Proposed For:

Student Learning Outcomes

1. Create machine tool paths at CNC milling and turning centers using advanced machine tool codes.
   Assessment 1
   Assessment Tool: Outcome-related capstone projects
   Assessment Date: Winter 2024
   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 the students will score a minimum of 70% or higher.
   Who will score and analyze the data: Departmental faculty

2. Analyze machine tool paths to optimize machining processes.
   Assessment 1
   Assessment Tool: Outcome-related capstone projects
   Assessment Date: Winter 2024
   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 the students will score a minimum of 70% or higher.
   Who will score and analyze the data: Departmental faculty

3. Interpret part drawings and develop manuscripts for part programming and part setup at CNC machine tool centers.
   Assessment 1
   Assessment Tool: Outcome-related capstone projects
   Assessment Date: Winter 2024
   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 the students will score a minimum of 70% or higher.

Who will score and analyze the data: Departmental faculty

Course Objectives

1. Apply code including; string statements, loops, subroutines and or macros to produce patterns of holes.
2. Apply G & M codes to produce single and multiple lead threads of various forms at the mills and lathes.
3. Construct local subroutines as well as general subprograms within main program.
4. Apply X-Z & Y-Z linear and circular interpolation within part programs to produce 3-dimensional features.
5. Apply both static and dynamic 4th axis machine tool motion to parts at the mills.
6. Apply single angle, single angle to radius, double angle, and double angle to radius cutter locations using rules with geometry, algebra, and trigonometry. These cutter locations will be used to identify cutter to part transitional locations.
7. Integrate variables, mathematical expressions, counters and conditional statements allowing an operator to produce an array of part features within the structure of a program (families of parts).
8. Design, program and document parts at computer numerically controlled machine tools.
9. Debug and cut parts at computer numerically controlled machine tools.

New Resources for Course

Course Textbooks/Resources

Textbooks
Manuals
Periodicals
Software

Equipment/Facilities

Level III classroom

Reviewer	Action	Date
Faculty Preparer:		
Thomas Penird	*Faculty Preparer*	*Aug 16, 2021*
Department Chair/Area Director:		
Thomas Penird	*Recommend Approval*	*Aug 16, 2021*
Dean:		
Jimmie Baber	*Recommend Approval*	*Aug 19, 2021*
Curriculum Committee Chair:		
Randy Van Wagnen	*Recommend Approval*	*Feb 17, 2022*
Assessment Committee Chair:		
Shawn Deron	*Recommend Approval*	*Feb 23, 2022*
Vice President for Instruction:		
Kimberly Hurns	*Approve*	*Feb 23, 2022*

Washtenaw Community College Comprehensive Report

NCT 221 Advanced Manual Programming and NC Tool Operation
Effective Term: Fall 2014

Course Cover
Division: Advanced Technologies and Public Service Careers
Department: Industrial Technology
Discipline: Numerical Control
Course Number: 221
Org Number: 14450
Full Course Title: Advanced Manual Programming and NC Tool Operation
Transcript Title: Adv Manual Program/NC Tool Op
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
  Consultation with all departments affected by this course is required.
  Course description
  Pre-requisite, co-requisite, or enrollment restrictions
  Outcomes/Assessment
  Objectives/Evaluation
Rationale: Regular 3-year review. Conditionally approved - seeking full approval.
Proposed Start Semester: Winter 2014
Course Description: This is the second of a two-course study of manual programming and CNC Machine Tool Operation. Complex cutter path generation, cutter compensation, repetitive programming, multi-quadrant circular interpolation, three axis interpolation, threading macros, and other advanced programming techniques are practiced. Geometry creation using CAD/CAM software will be presented and used in this class. The class format is similar to that of NCT 121. Students with experience equivalent to NCT 121 may contact the instructor for permission to waive the prerequisite.

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College-Level Reading and Writing
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College-Level Math
Level 4

Requisites

Prerequisite
NCT 121 minimum grade "C"

General Education
General Education Area 7 - Computer and Information Literacy
Assoc in Arts - Comp Lit
Assoc in Applied Sci - Comp Lit
Assoc in Science - Comp Lit

Request Course Transfer
Proposed For:

Student Learning Outcomes

1. Use advanced machine tool codes for creating machine tool paths at CNC milling and turning centers.
   Assessment 1
   Assessment Tool: Capstone Projects
   Assessment Date: Fall 2014
   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 the students will score a minimum of 70% or higher.
   Who will score and analyze the data: Department Faculty

2. Examine machine tool paths and make needed changes for optimizing machining processes.
   Assessment 1
   Assessment Tool: Capstone Projects
   Assessment Date: Fall 2014
   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 the students will score a minimum of 70% or higher.
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3. Interpret part drawings and develop manuscripts for part programming and part setup at CNC machine tool centers.
   Assessment 1
   Assessment Tool: Capstone Projects
   Assessment Date: Fall 2014
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All
   Number students to be assessed: All
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Course Objectives
1. Apply code including; string statements, loops, subroutines and or macros to produce patterns of holes.
   Matched Outcomes

2. Apply G & M codes to produce single and multiple lead threads of various forms at the mills and lathes.
   Matched Outcomes
3. Construct local subroutines as well as general subprograms within main program.
   Matched Outcomes
4. Apply X-Z & Y-Z linear and circular interpolation within part programs to produce 3-dimensional features.
   Matched Outcomes
5. Apply both static and dynamic 4th axis machine tool motion to parts at the mills.
   Matched Outcomes
6. Apply single angle, single angle to radius, double angle, and double angle to radius cutter locations using rules with geometry, algebra, and trigonometry. These cutter locations will be used to identify cutter to part transitional locations.
   Matched Outcomes
7. Integrate variables, mathematical expressions, counters and conditional statements allowing an operator to produce an array of part features within the structure of a program (families of parts).
   Matched Outcomes
8. Design, program, document, debug and cut parts at computer numerically controlled machine tools.
   Matched Outcomes

New Resources for Course
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Reviewer	Action	Date
Faculty Preparer:		
Thomas Penird	*Faculty Preparer*	*Dec 19, 2013*
Department Chair/Area Director:		
Thomas Penird	*Recommend Approval*	*Dec 19, 2013*
Dean:		
Marilyn Donham	*Recommend Approval*	*Jan 10, 2014*
Vice President for Instruction:		
Bill Abernethy	*Approve*	*Feb 10, 2014*