

# NCT 121: CNC PROGRAMMING AND NC TOOL OPERATION

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## History

1. Dec 4, 2025 by Sera Bird (sabird)

**Viewing:** NCT 121 : CNC Programming and NC Tool Operation

**Last approved:** 2025-12-04T08:04:15Z

**Last edit:** 2025-11-20T13:42:38Z

**Effective Term**

Winter 2026

### Rationale and proposal summary

A new pre-requisite in CAM programming (NCT-123) should be added to this course. The outcomes and objectives will be updated to reflect minor changes in new technology. The math level has been lowered as students no longer use trigonometry and advanced algebra in this course.

## Course Cover

### Full Course Title

CNC Programming and NC Tool Operation

### Transcript Title

CNC Programming NC Tool

### Subject Code

NCT - Numerical Control

### Course Number

121

### Department

Advanced Manufacturing (AMTD)

### Banner Division

ATP

### Division/College

Adv Tech/Public Serv Careers (AT)

### Org Code

14450

## Course Description

In this course, students will interpret working drawings of sample parts, write and edit programs, set up and operate Computer Numerical Control (CNC) machining equipment, and inspect the finished products to ensure accuracy. Processing the order of operations, speeds and feeds, program editing, set-up procedures, and program preparation are major topics presented. This is the first in a two-course study of Computer-Aided Design - Computer Aided Manufacturing (CAD-CAM) application in CNC milling and turning centers; knowledge of CAM software is required. The title of this course was previously Manual Programming and NC Tool Operation.

## Planned Delivery Format

Face to Face

## Has this course been approved for online or online blended?

No

## Grading method

Standard Letter, Audit

## CIP Code

159999 - Engineering/Engineering-Related Technologies/Technicians, Other.

**Occupational Indicator**

Yes

**ACS Code**

130

**Credit hours, contact hours, repeatability**

**Repeatable for additional credit**

No

**Course credits**

4

**Lecture contact hours**

30

**Lab contact hours**

60

**Total Contact Hours**

90

**Expected Total Contact Hours**

90

**Prerequisites and prerequisite skill levels**

**College-Level Math**

Level 3

**College-Level Reading and Writing**

College-level Reading and Writing

**Approved Level I Prerequisite:**

Academic Reading and Writing Levels of 6; Academic Math Level 3; NCT 110 and NCT 123, minimum grade "C"

**Is concurrent enrollment an option for this prerequisite?**

No

**Course Assessment Plan**

**Learning Outcome**

**Outcome**

Create programs to manufacture workpieces on CNC milling machines.

**Assessment #1**

**Assessment Tool**

Outcome-related capstone projects

**Anticipated Next Assessment Year**

2025

**Anticipated Next Assessment Term**

Fall

**Assessment Cycle**

Every Three Years

**Anticipated assessment population**

All students from all sections

**How the assessment will be scored**

Departmentally-developed rubric

**Who does the scoring?**

Departmental faculty

**Standard of success**

75% of the students will score 70% or higher.

**Assessment #2**

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**Learning Outcome****Outcome**

Create programs to manufacture workpieces on CNC lathes or turning machines.

**Assessment #1****Assessment Tool**

Outcome-related capstone projects

**Anticipated Next Assessment Year**

2025

**Anticipated Next Assessment Term**

Fall

**Assessment Cycle**

Every Three Years

**Anticipated assessment population**

All students from all sections

**How the assessment will be scored**

Departmentally-developed rubric

**Who does the scoring?**

Departmental faculty

**Standard of success**

75% of the students will score 70% or higher.

**Assessment #2**

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**Learning Outcome****Outcome**

Troubleshoot and debug programs at the CNC machine controllers yielding parts to specification.

**Assessment #1****Assessment Tool**

Outcome-related capstone projects

**Anticipated Next Assessment Year**

2025

**Anticipated Next Assessment Term**

Fall

**Assessment Cycle**

Every Three Years

**Anticipated assessment population**

All students from all sections

**How the assessment will be scored**

Departmentally-developed rubric

**Who does the scoring?**

Departmental faculty

**Standard of success**

75% of the students will score 70% or higher.

**Assessment #2****Course Objectives**

	Objective(s)
1.	Manufacture workpieces consisting of holes of various types.
2.	Manufacture workpieces consisting of slots of varying depth.
3.	Manufacture workpieces consisting of two-dimensional contoured shapes, pockets, and flanges.
4.	Manufacture workpieces consisting of three-dimensional surfaces.
5.	Manufacture workpieces consisting of grooves.
6.	Manufacture workpieces consisting of intricate curved profiles requiring multiple types of cutting tools.
7.	Manufacture workpieces consisting of screw threads.
8.	Manufacture workpieces consisting of internal profiles.
9.	Manufacture workpieces requiring multiple types of CNC machines.
10.	Create documentation to correspond to written programs for use by setup operators.
11.	Manufacture workpieces made from a variety of solid materials.
12.	Use precision measurement tools to inspect workpieces for dimensional tolerances.
13.	Locate published data for industry standard parts.
14.	Program appropriate parameters for each module to simulate the final shape of the workpiece.

**General Education Area(s)****Area 1: Writing**

No

**Area 2: 2nd Writing or Communication/Speech**

No

**Area 3: Mathematics**

No

**Area 4: Natural Science**

No

**Area 5: Social and Behavioral Science**

No

**Area 6: Arts and Humanities**

No

**MTA General Education**

No

## **Review**

**Is conditional approval requested?**

No

**Is this course currently conditionally approved, and you are now submitting it for full approval?**

No

Key: 7668

## Washtenaw Community College Comprehensive Report

### NCT 121 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:** 121  
**Org Number:** 14450  
**Full Course Title:** Manual Programming and NC Tool Operation  
**Transcript Title:** Manual Programming NC Tool  
**Is Consultation with other department(s) required:** No  
**Publish in the Following:** College Catalog , Time Schedule , Web Page  
**Reason for Submission:** Course Change  
**Change Information:**

**Pre-requisite, co-requisite, or enrollment restrictions**

**Outcomes/Assessment**

**Rationale:** Removal of MTT 102 as pre-req. MTT102 has been inactivated. NCT100 is the replacement and is a pre-req for the NCT101/110 course already required but may not enroll concurrently. The coursepack is also no longer used.

**Proposed Start Semester:** Fall 2022

**Course Description:** In this course, students will interpret working drawings of sample parts, write and edit programs, setup and operate CNC machine tools, and inspect the finished products in the process of manufacturing parts. Feeds and speeds, fixed cycles, program editing, set up procedures, and program preparation are major topics presented. This is the first in a two-course study of manual programming of CNC milling and turning centers. Students with experience equivalent to NCT 101 and NCT 110 may contact the instructor for permission to waive the prerequisites. Programming time outside of the classroom is required to be successful in this course.

#### 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 101 minimum grade "C"

and

### **Prerequisite**

NCT 110 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. Construct programs using G-code and M-code machine tool language in proper module format.

### **Assessment 1**

Assessment Tool: Outcome-related capstone projects

Assessment Date: Fall 2023

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: The capstone project will be scored using the departmentally-developed rubric.

Standard of success to be used for this assessment: 75% of the students will score 70% or higher on the capstone project.

Who will score and analyze the data: Departmental faculty

2. Apply the appropriate process for machining a product from start to finish.

### **Assessment 1**

Assessment Tool: Outcome-related capstone projects

Assessment Date: Fall 2023

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: The capstone project will be scored using the departmentally-developed rubric.

Standard of success to be used for this assessment: 75% of the students will score 70% or higher on the capstone project.

Who will score and analyze the data: Departmental faculty

3. Troubleshoot and debug programs at the CNC machine tool controllers yielding parts to specification.

### **Assessment 1**

Assessment Tool: Outcome-related department exam questions

Assessment Date: Fall 2023

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: The department exam will be scored using an answer sheet.

Standard of success to be used for this assessment: 75% of the students will score 70% or higher on the exam.

Who will score and analyze the data: Departmental faculty

## **Assessment 2**

Assessment Tool: Outcome-related capstone projects

Assessment Date: Fall 2023

Assessment Cycle: Every Three Years

Course section(s)/other population: All

Number students to be assessed: All

How the assessment will be scored: The capstone project will be scored using the departmentally-developed rubric.

Standard of success to be used for this assessment: 75% of the students will score 70% or higher on the capstone project.

Who will score and analyze the data: Departmental faculty

## **Course Objectives**

1. Apply appropriate G-codes and M-codes to produce holes of various types and depth into different materials, using varying peck and dwell cycle and return plane conditions at the mill or lathe.
2. Apply appropriate G-codes and M-codes to produce patterns of holes at the mill.
3. Apply appropriate G-codes and M-codes to produce slots of varying depth into parts at the mill.
4. Apply appropriate G-codes and M-codes to produce linear and circular profile paths using cutter diameter compensation to control feature size into parts at the mills and lathes.
5. Apply appropriate G-codes and M-codes to produce circular pockets at the mills.
6. Apply appropriate G-codes and M-codes to produce irregular pockets, with and without islands, at the mills.
7. Apply appropriate G-codes and M-codes to face materials of part at the lathe.
8. Apply appropriate G-codes and M-codes to produce outside and inside contours on cylindrical parts at the lathes using roughing and finishing cycles.
9. Locate tool center positions about the part using geometry, algebra and trigonometry.
10. Create documentation to correspond to written programs for use by setup operators.
11. Create works to replace construct in all locations.

## **New Resources for Course**

### **Course Textbooks/Resources**

Textbooks

Manuals

Periodicals

Software

### **Equipment/Facilities**

Level III classroom

<b><u>Reviewer</u></b>	<b><u>Action</u></b>	<b><u>Date</u></b>
<b>Faculty Preparer:</b>		
<i>Allan Coleman</i>	<i>Faculty Preparer</i>	<i>Jan 26, 2022</i>
<b>Department Chair/Area Director:</b>		
<i>Allan Coleman</i>	<i>Recommend Approval</i>	<i>Jan 26, 2022</i>
<b>Dean:</b>		
<i>Jimmie Baber</i>	<i>Recommend Approval</i>	<i>Jan 26, 2022</i>
<b>Curriculum Committee Chair:</b>		
<i>Randy Van Wagnen</i>	<i>Recommend Approval</i>	<i>Feb 22, 2022</i>



**Assessment Committee Chair:**

<i>Shawn Deron</i>	<i>Recommend Approval</i>	<i>Feb 23, 2022</i>
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**Vice President for Instruction:**

<i>Kimberly Hurns</i>	<i>Approve</i>	<i>Feb 23, 2022</i>
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# **Washtenaw Community College Comprehensive Report**

## **NCT 121 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:** 121

**Org Number:** 14450

**Full Course Title:** Manual Programming and NC Tool Operation

**Transcript Title:** Manual Programming NC Tool

**Is Consultation with other department(s) required:** No

**Publish in the Following:** College Catalog , Time Schedule , Web Page

**Reason for Submission:** Course Change

**Change Information:**

**Consultation with all departments affected by this course is required.**

**Rationale:** Conditionally approved - seeking full approval.

**Proposed Start Semester:** Winter 2014

**Course Description:** This is the first in a two-course study of manual programming of CNC milling and turning centers. Students experience the entire process of part manufacturing by processing working drawings of sample parts, writing and editing of programs, set up and operation of CNC machine tools, and inspection of the finished products. Feeds and speeds, fixed cycles, program editing, set up procedures, and tape preparation are major topics presented. Laboratory time is required outside of class time. Students with experience equivalent to NCT 101 and NCT 110 may contact the instructor for permission to waive the prerequisites.

### **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**

MTT 102 minimum grade "C"  
and

**Prerequisite**

NCT 101 minimum grade "C"; may enroll concurrently and

**Prerequisite**

NCT 110 minimum grade "C"; may enroll concurrently

**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. Construct programs using G&M machine tool language in proper module format.

**Assessment 1**

**Assessment Tool:** Capstone Projects

**Assessment Date:** Fall 2015

**Assessment Cycle:** Every Three Years

**Course section(s)/other population:** All

**Number students to be assessed:** All

**How the assessment will be scored:** The capstone project will be scored using the departmentally-developed rubric.

**Standard of success to be used for this assessment:** 75% of the students will score a minimum of 70% or higher on the capstone project.

**Who will score and analyze the data:** Department Faculty

2. Apply the appropriate process for machining a product from start to finish.

**Assessment 1**

**Assessment Tool:** Capstone Projects

**Assessment Date:** Fall 2015

**Assessment Cycle:** Every Three Years

**Course section(s)/other population:** All

**Number students to be assessed:** All

**How the assessment will be scored:** The capstone project will be scored using the departmentally-developed rubric.

**Standard of success to be used for this assessment:** 75% of the students will score a minimum of 70% or higher on the capstone project.

**Who will score and analyze the data:** Department Faculty

3. Troubleshoot and debug programs at the CNC machine tool controllers yielding parts to specification.

**Assessment 1**

**Assessment Tool:** Capstone Projects

**Assessment Date:** Fall 2015

**Assessment Cycle:** Every Three Years

**Course section(s)/other population:** All

**Number students to be assessed:** All

**How the assessment will be scored:** The capstone project will be scored using the departmentally-developed rubric.

**Standard of success to be used for this assessment:** 75% of the students will score a minimum of 70% or higher on the capstone project.

**Who will score and analyze the data:** Department Faculty

## **Assessment 2**

**Assessment Tool:** Department Exam

**Assessment Date:** Fall 2015

**Assessment Cycle:** Every Three Years

**Course section(s)/other population:** All

**Number students to be assessed:** All

**How the assessment will be scored:** The department exam will be scored using an answer sheet.

**Standard of success to be used for this assessment:** 75% of the students will score a minimum of 70% or higher on the exam.

**Who will score and analyze the data:** Department Faculty

## **Course Objectives**

1. Apply appropriate G & M codes to produce holes of various types and depth into different materials, using varying peck and dwell cycle and return plane conditions at the mill or lathe.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
2. Apply appropriate G & M codes to produce patterns of holes at the mill.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
3. Apply appropriate G & M codes to produce slots of varying depth into parts at the mill.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
4. Apply appropriate G & M codes to produce linear and circular profile paths using cutter diameter compensation to control feature size into parts at the mills and lathes.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
5. Apply appropriate G & M codes to produce circular pockets at the mills.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
6. Apply appropriate G & M codes to produce irregular pockets, with and without islands, at the mills.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
7. Apply appropriate G & M codes to face materials of part at the lathe.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
8. Apply appropriate G & M codes to produce outside and inside contours on cylindrical parts at the lathes using roughing and finishing cycles.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
9. Locate tool center positions about the part using geometry, algebra and trigonometry.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.
10. Create documentation to correspond to written programs for use by set-up operators.

### **Matched Outcomes**

1. Construct programs using G&M machine tool language in proper module format.

## **New Resources for Course**

### **Course Textbooks/Resources**

Textbooks

Manuals

Periodicals

Software

### **Equipment/Facilities**

Level III classroom

<b><u>Reviewer</u></b>	<b><u>Action</u></b>	<b><u>Date</u></b>
<b>Faculty Preparer:</b> <i>Thomas Penird</i>	<i>Faculty Preparer</i>	<i>Dec 19, 2013</i>
<b>Department Chair/Area Director:</b> <i>Thomas Penird</i>	<i>Recommend Approval</i>	<i>Dec 19, 2013</i>
<b>Dean:</b> <i>Marilyn Donham</i>	<i>Recommend Approval</i>	<i>Jan 10, 2014</i>
<b>Vice President for Instruction:</b> <i>Bill Abernethy</i>	<i>Approve</i>	<i>Feb 10, 2014</i>