

**Course Assessment Report
Washtenaw Community College**

Discipline	Course Number	Title
Numerical Control	101	NCT 101 07/22/2019- Introduction to Computerized Machining (CNC) - I
Division	Department	Faculty Preparer
Advanced Technologies and Public Service Careers	Advanced Manufacturing	Thomas Penird
Date of Last Filed Assessment Report		

I. Review previous assessment reports submitted for this course and provide the following information.

1. Was this course previously assessed and if so, when?

Yes 2016

2. Briefly describe the results of previous assessment report(s).

All students who completed the class were successful. No changes were needed.

3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

No changes were needed although the Lathe setup was the weaker area for the program. We recently added a lathe to the lab which should aid in student time on task.

II. Assessment Results per Student Learning Outcome

Outcome 1: Students will improve ability to recognize and apply nomenclature to CNC controllers.

- Assessment Plan
 - Assessment Tool: Pre Test - Post Test This tool is utilized to identify those students returning for retraining and identify improvement.
 - Assessment Date: Fall 2011

- Course section(s)/other population: All
- Number students to be assessed: All
- How the assessment will be scored: Immersive software scores and shows Pre-test, post-test results
- Standard of success to be used for this assessment: There will be a minimum increase of 30% in score on average from the combined pre-test to the combined post-test results, for all students.
- Who will score and analyze the data: Departmental Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2017, 2016	2018	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
67	52

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Five students withdrew.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All evening students

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Quizzes were used to aid in nomenclature. Students entering the classroom score lower than 25% on average as the materials and terms are new to them.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Nomenclature scores on written final were on average 75.1 percent.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students come into the classroom with little to no knowledge of the nomenclature at the controller. All students leave the class with a strong foundation on how to operate the CNC machine tools.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

For those students specializing in CNC machining, understanding of nomenclature improves with additional CNC classes. For students in the mechatronics program that are taking an alternate specialty track, they have the basic understanding needed for system integration.

Outcome 2: Identify the layers of the machine tool controllers.

- Assessment Plan
 - Assessment Tool: Quizzes
 - Assessment Date: Fall 2011
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: Quizzes are scored using an answer key
 - Standard of success to be used for this assessment: 75% of the students will score 75% or greater on all questions selected.
 - Who will score and analyze the data: Department Faculty
- 1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018, 2016	2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
60	52

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Five students withdrew.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

These classes are taught in the evening. A pool of students across three different instructors using the same tools were used.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This was done using a quiz with written questions as well as a hands-on proficiency test.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The average score for the quiz for all sections/all students was 75.1 percent. The average score for the hands-on portion was 81.5 percent.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students scored 88.8 percent on their capstone projects on average.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Lathe setup has been one of the weak areas due to minimal machines available.

This year, we added a new lathe to the lab so I would expect this area to strengthen.

Outcome 3: Recognize setup and operation procedures needed to manufacture parts.

- Assessment Plan
 - Assessment Tool: Project
 - Assessment Date: Fall 2011
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: Students projects (parts) will be determined complete or incomplete.
 - Standard of success to be used for this assessment: 75% of the students will be successful at completing all parts.
 - Who will score and analyze the data: Department Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018, 2016	2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
60	52

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Five students withdrew.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Evening students

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Capstone Projects:
 Mill - Turner's cube, Andy's cube, keytag
 Lathe: chess pieces, baseball bat

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The capstone projects had multiple areas of assessment in their rubric.

- Set-up: Pre-data sheet (add offsets to leave material on part feature sizes that have tolerance)
- Post-data sheet reflecting end setting to machine part within specification.
- Good-deburred/clean part assembled and submitted.

The average score for part project work for the students was at 88.8 percent.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are confident in machine tool jog, loading tool to spindle/cut location, setting tool length offsets and work offsets.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Using "old school" methods for alignment and edge detection are areas where 25% of the students struggle. The good news is that 75% of industry has moved to probing systems which automatically perform these tasks.

We have added Saturday open lab times for students to come into the lab and improve their proficiency in these areas.

Outcome 4: Apply the key processes in creating geometry CAD CAM system.

- Assessment Plan
 - Assessment Tool: Project
 - Assessment Date: Fall 2011
 - Course section(s)/other population: All
 - Number students to be assessed: All

- How the assessment will be scored: Students will use the software to develop geometry for a capstone project at the CNC machine tool. The project will be evaluated using a rubric.
- Standard of success to be used for this assessment: The overall average score of the student project will be 75% (3 of 4 or better)
- Who will score and analyze the data: Department Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2016	2018, 2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
59	52

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

Five students withdrew.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

Evening students

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Students found geometry (picture online) to trace onto 10x10 graph paper. Pencil plot points emphasized trace. The Cartesian coordinates for each of the points were recorded into a spreadsheet and graphed. Data was compiled and converted to an X-Y point file. G and M codes were added to the file and then debugged at the CNC machine controller. Students made a pen plot of their work.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

A rubric was used to score each of the areas based on the number of points, graph paper with points submitted, NC program written and debugged, and the pen plot of the object.

All students completing the class were successful at completing this task with a score greater than 75%.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students come to class with a strong understanding of the Cartesian coordinate system. Creating the point plot and obtaining the X-Y data is not difficult for our students.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The challenge for students comes at the machine controller when their X-Y data draws a line that is not what they intended. Visually interpreting the X-Y data on the controller and making updates spatially is a challenge. This assignment teaches students to look at X-Y data at the controller and visualize where the tool will move. This is needed for debugging at the controller. Students continuing on into manual programming will step through programs line by line on the simulators to find errors in their code.

In the NCT 121 class (next semester), I will be providing programs that need debugging to improve these skills.

III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

No changes were needed

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

This course meets the needs of the MACHINE tool program as well as the Mechatronics program

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

This information has been shared with all full/part timers teaching the class.

4.

Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Course Assignments	In the NCT 121 class I will be providing programs that need debugging to improve their visualization skills.	The challenge for students comes at the machine controller when their X-Y data draws a line that is not what they intended. Visually interpreting the X-Y data on the controller and making updates spatially is a challenge. This assignment teaches students to look at X-Y data at the controller and visualize where the tool will move. This is needed for debugging at the controller. Students continuing on into manual programming will step through programs line by line on the simulators to find errors in their code.	2020
Course Materials (e.g. textbooks, handouts, on-line ancillaries)	Added Saturday open lab times for student to improve their proficiency in alignment and edge detection.	Students have more difficulty with the "old school" methods and approximately 25% of them need additional practice.	2020

Course Materials (e.g. textbooks, handouts, on-line ancillaries)	Adding a new lathe to the lab so students can have more access.	We anticipate this will improve student performance on lathe setup tasks	2020
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5. Is there anything that you would like to mention that was not already captured?

6.

III. Attached Files

[NCT101 DATA](#)

Faculty/Preparer: Thomas Penird **Date:** 07/22/2019
Department Chair: Thomas Penird **Date:** 08/14/2019
Dean: Brandon Tucker **Date:** 09/12/2019
Assessment Committee Chair: Shawn Deron **Date:** 08/25/2020

Course Assessment Report
Washtenaw Community College

Discipline	Course Number	Title
Numerical Control	101	NCT 101 03/31/2016- Introduction to Computerized Machining (CNC) - I
Division	Department	Faculty Preparer
Advanced Technologies and Public Service Careers	Industrial Technology	Thomas Penird
Date of Last Filed Assessment Report		

I. Assessment Results per Student Learning Outcome

Outcome 1: Students will improve ability to recognize and apply nomenclature to CNC controllers.

- Assessment Plan
 - Assessment Tool: Pre Test - Post Test This tool is utilized to identify those students returning for retraining and identify improvement.
 - Assessment Date: Fall 2011
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: Immersive software scores and shows Pre-test, post-test results
 - Standard of success to be used for this assessment: There will be a minimum increase of 30% in score on average from the combined pre-test to the combined post-test results, for all students.
 - Who will score and analyze the data: Departmental Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2015		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
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3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All students who were present the day(s) of assessment.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

This class only runs face-to-face.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

The Immersive Software collapsed on us during the semester. Difficulties in keeping the software running, and a cost associated with maintenance fees lead to us dropping this software from the program.

We currently are using quiz materials, developed by the department to reflect growth in students' development. We see a sharp improvement from day one in the semester through the end of the 7.5 week semester. With code challenge pretest sheets and introduction to controller terminology students, on average, come in with knowledge on the topic below 10%. (Note; Some students are coming from employers and have been lightly exposed to the equipment.) On topics including G&M codes, absolute and incremental positioning, work offsets, verification codes and, abbreviations, terms and definitions at the machine control unit.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Quizzes gain ground in topic material as the semester progresses.

Students start with fundamentals of basic G & M code.

Pre –test scores are in the 5-10% range.

Scores for the first quiz on this topic average 50%.

By the end of the semester we see 80-85% retention on this material.

Similar results were seen in coordinate positioning, work offset and definitons.

Weak areas are seen in developing the verification codes given scenarios at the machine tools, as well as critical thinking question related to the machine tool controllers.

The student averages in these situations are at 40-50%. This is to be expected and is a great foundation for the second half of the setup class (NCT110 CNC Setup and Oper II).

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Identification of G&M codes, work offset vales, machine tool definitions, and terminology are strengths for the group

Weak areas are seen in developing the verification codes given scenarios at the machine tools, as well as critical thinking questions related to the machine tool controllers.

The student averages in these situatons are at 40-50%. This is to be expected and is a great foundation for the second half of the setup class (NCT110 CNC Setup and Oper II).

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Based on past data, student progression for the first 7.5 weeks in the program are at an expected level.

Soft spots in the program are centered around lathe work, as we have fewer pieces of equipment, and therefore fewer opportunities for students to work with the controllers.

I will address this in the future with capital equipment needs/Perkins funds.

Outcome 2: Identify the layers of the machine tool controllers.

- Assessment Plan
 - Assessment Tool: Quizzes
 - Assessment Date: Fall 2011
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: Quizzes are scored using an answer key
 - Standard of success to be used for this assessment: 75% of the students will score 75% or greater on all questions selected.
 - Who will score and analyze the data: Department Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2015		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
24	16

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All who were present on the day(s) of assessment.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

This is reflected in the hands-on assessment test at the end of the semester, as well as in the written portion of the final in the definitions section of the test.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

This was accomplished using a hands-on competency test as well as a written final.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The average for all students at the controller's during the hands-on segment of the final was 95%.

The written portion of the test was significantly lower at 69%. This does not disappoint me; by the end of the second half of the setup class (NCT110 CNC Setup and Oper II), I expect this number to be significantly higher.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

The average for all students at the controllers during the hands-on segment of the final was 95%.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The lathe controllers are the weak spot. Although the students met the standard of success established, it would be nice to offer more time at the lathe controllers.

I will address this in the future with capital equipment needs/Perkins funds.

Outcome 3: Recognize setup and operation procedures needed to manufacture parts.

- Assessment Plan

- Assessment Tool: Project
- Assessment Date: Fall 2011
- Course section(s)/other population: All
- Number students to be assessed: All
- How the assessment will be scored: Students projects (parts) will be determined complete or incomplete.
- Standard of success to be used for this assessment: 75% of the students will be successful at completing all parts.
- Who will score and analyze the data: Department Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2015		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
24	16

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All students who were present on the day(s) of assessment.
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4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All students were responsible for completion of set-up and cutting parts at each of the 5 stations during the semester.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

<p>Mill Projects; Included; (alignment of fixtures, setting work and tool length offsets, applying verification codes, running machines)</p> <ul style="list-style-type: none"> ○ Red Wing Keytag. Two-sided key tag with hole for ring ○ Turner’s Cube – Six facets with multiple stepped pockets

- **Andy's Cube – Six facets with varying shapes**

Lathe Projects; Included (loading of tools, setting tool geometry, applying verification codes, running machines)

Chess Piece - Rook

BaseBall Bat

This is also reflected in the hands-on assessment test at the end of the semester, as well as in the written portion of the final in the definitions section of the test.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

All students were successful at manufacturing all parts assigned. Students missing classes were able to utilize the weekend open labs to attain 100% on this segment of the class. This semester students manufactured;

The average for all students at the controllers during the hands- on segment of the final was 95%.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

All Students complete the (5) Projects assigned, as well as plotted their student art project.

The average for all students at the controllers during the hands-on segment of the final was 95%.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

The lathe controllers are the weak spot. Although the students met the standard of success established, it would be nice to offer more time at the lathe controllers.

I will address this in the future with capital equipment needs/Perkins funds.

Outcome 4: Apply the key processes in creating geometry CAD CAM system.

- Assessment Plan
 - Assessment Tool: Project
 - Assessment Date: Fall 2011
 - Course section(s)/other population: All
 - Number students to be assessed: All
 - How the assessment will be scored: Students will use the software to develop geometry for a capstone project at the CNC machine tool. The project will be evaluated using a rubric.
 - Standard of success to be used for this assessment: The overall average score of the student project will be 75% (3of 4 or better)
 - Who will score and analyze the data: Department Faculty

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2015		

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
24	16

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

All students who were present on day(s) of assessment.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

This class is only offered as face-to-face.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Students: created their own art for a nightlight they will machine in the NCT 110 class. This will be cut into pieces of acrylic and then edge lit.

Student Part (Art) 350points min blocked letters etc. do not count = 20%

Art – Outlined on graph paper

X-Y Data points entered into Excel spreadsheet

X-Y data pasted into Notepad file (.txt)

Program start – end – z moves added to x-y data file

Program uploaded into EDIT-NC and debugged

Program run at CNC MILL (Pen Plot – 1 for student 1 for instructor)

Note: We will cut this into aluminum blanks in the NCT110 class

Students were required to complete a capstone project. See attached rubric for details

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

All students completing the class were successful at meeting the 350 point minimum. 9 of 16 exceeded expectations to earn an A.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

All students completed their student art projects for passing grades. 9/16 completed with the minimum points required to achieve an A.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

With the grading rubric and the steps outlined, I do not believe we need to take any measures to improve this process at this time.

II. Course Summary and Action Plans Based on Assessment Results

1. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Students are able to move on to the the next stage, which incorporates advanced set-up and manufacturing parts to specification. The transition from operation to controller manipulation is transparent with the next level of training.

2. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

This information has been shared with other machine tool faculty.

3. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
No changes intended.			

4. Is there anything that you would like to mention that was not already captured?

5.

III. Attached Files

[NCT101 Assessment Tables and Pictures](#)

Faculty/Preparer: Thomas Penird **Date:** 03/31/2016

Department Chair: Thomas Penird **Date:** 04/04/2016

Dean: Brandon Tucker **Date:** 05/19/2016
Assessment Committee Chair: Michelle Garey **Date:** 08/03/2016