



**Discipline: Manufacturing and Product Development**  
**Date Submitted: September 13<sup>th</sup>, 2023**

**Cerritos College  
 Articulation Agreement**

<p><b>Cerritos College Course:</b>          MTT 52 - Setup and Operation of CNC Milling Machines (2.5 units)</p> <p>Cerritos College          11110 Alondra Blvd.          Norwalk, CA 90650</p>	<p><b>High School Course:</b>          Machining and Forming Technologies II</p> <p>Downey High School          11040 Brookshire Ave.          Downey, CA 90241</p>
<p><b>General Course Description:</b></p> <p>This Capstone course instructs students in the safe and accurate set-up and production operation of Computer Numerical Control (CNC) mills. Students learn how to load programs, align fixtures, select offset, select cutter radius compensation, and run first article parts. Emphasis includes milling programming and creating samples and parts to demonstrate skills to potential employers.</p> <p>This capstone course provides Advanced Manufacturing content, skill development and leadership training which prepare students to pursue industry certifications, employment, and a postsecondary degree.</p>	
<p><b>College Prerequisite:</b> none</p>	<p><b>HS Prerequisite:</b> Machining and Forming Technologies I</p>
<p><b>Advisories/Recommendations:</b> none</p>	
<p><b>Course Content:</b></p> <p>Operating CNC Milling Machines</p> <ol style="list-style-type: none"> <li>1. Demonstrating how to safely power on, power off, and operate CNC milling machines. Setting up the X and Y axis on the CNC milling machine.</li> <li>2. Applying industry-standard safety practices and specific safety requirements for different machining operations</li> <li>3. Perform basic setup and operation of CNC mill</li> <li>4. Load tools properly in the tool holders</li> <li>5. Establish proper offsets</li> <li>6. Set up several tool height offsets on the CNC milling machine</li> <li>7. Interpret blueprint information and translate into actionable items.</li> </ol>	

## Evaluating Need and Use, within Safety Practices

1. Using an edgefinder. Evaluating need and use, within standard safety practices.
2. Perform basic set up and operations of a CNC mill
3. Apply industry-standard safety practices and specific safety requirements for different machining operations
4. Evaluate need, use, and set-up of tool length offset
5. Evaluate need, use, and set-up of cutter radius compensation.

## CNC Milling Operations

1. Demonstrating how to load and unload programs via serial port and DNC link. Developing skills in set up and alignments of tooling fixtures.
2. Retrieve programs from a USB drive and load them into the CNC milling machines
3. Simulate a program to run on the CNC milling machine
4. Run articles safely on the CNC milling machine
5. Complete an industry inspection report
6. Inspect produced parts to ensure completion per blueprint requirement
7. Align a fixture, if required, for operation.

## CNC Milling Production

1. Producing a workpiece within tolerances of the blueprint using a CNC milling machine and a CNC program of moderate complexity.
2. Calculate necessary tolerances to plan for machine sequences
3. Modify the speed and feed of a program using the controller if necessary
4. Interpret blueprint information and translate it into actionable items
5. Apply industry-standard safety practices and specific safety requirements for different machining operations
6. Inspect the produced part to ensure completion per blueprint requirements.

## Introducing MasterCAM

1. Create basic geometry needed for machining on a CNC milling machine
2. Create basic geometry needed for machining on a CNC lathe
3. Access the proper toolpath to machine the part according to the blueprint
4. Simulate and export pockets, contours, drilling cycles, and surfacing operations
5. Modify an instructor's tool paths after verifying simulation on a virtual CNC milling machine
6. Backplot a part to see how long it will take to machine it on a CNC milling machine
7. Modify the tool parameters used if student or instructor see a need for it
8. Modify toolpaths after students simulate the machining on a virtual CNC milling machine.

## Planning and preparing for a career in advanced manufacturing

1. Determine career area interests
2. Plan future education opportunities
3. Create a preliminary career plan
4. Prepare a portfolio of work to date.

## Certification

This course will integrate the knowledge and experience areas required to prepare the student for the certification examination. Each student enrolled in the pathway will have the opportunity to prepare and/or take the following certification(s) during this course:

- Haas Certification Program

## Competencies and Skill Requirements.

**At the conclusion of this course, the student should be able to:**

- Produce a workpiece within tolerances of the blueprint using a CNC milling machine and a CNC program of moderate complexity
- Safely turn on the CNC milling machine
- Help set up the X and Y on the CNC milling machine
- Set up several tool height offsets on the CNC milling machine
- Demonstrate using an edgfinder
- Retrieve programs from a USB drive and load them onto the CNC milling machine
- Simulate the program they will run on the CNC milling machine
- Safely run articles on the CNC milling machine
- Modify the speed and feed of a program, using the controller if necessary
- Properly load tools in the tools holders
- Align a fixture, if required for operation

## Measurement Methods (quizzes, tests, homework assignments, etc.):

- Quizzes
- Fabrication assignments
- Safe machining practices
- Final exam

## Textbooks or Other Support Materials:

- Textbook: Precision Machining Technology. Peter Hoffman. Cengage Learning 3rd or current edition. January 4, 2019. ISBN 978-1337795302
- Supporting materials: Haas Mill Operators Manual. Haas, 2020

## Procedures for Course Articulation:

Cerritos College credit for the articulated course listed above may be received when the following criteria are met:

1. Student has completed the articulated course listed above, *Machining/Forming Technologies II* with a grade of "C" or higher.
3. Student must enroll at Cerritos College within two (2) years from the semester date in which the course was completed.
4. Student will complete and submit the Cerritos College *Petition for Credit by Examination for Articulated High School Course* form to the Office of Educational Partnerships & Programs at Cerritos College.
5. A maximum of 30 units may be awarded through credit by examination.

This Agreement will be reviewed annually and will remain in effect until cancelled by either party giving 30 days written notice.

High School/ROP District Signatures		Cerritos College Signatures	
<i>Daniela Sanchez</i>	Nov 30, 2023	<i>Chuong Vo</i>	Nov 30, 2023
Instructor/Department Chair	Date	Faculty/Department Chair	Date
<i>Tom Houta</i>	Nov 30, 2023	 Yannick R. [unclear] (Dec 1, 2023 00:24 PST)	Dec 1, 2023
Principal	Date	Dean of Instruction	Date
<i>John A. Garcia, Jr.</i>	Nov 30, 2023		Dec 1, 2023
Superintendent	Date	Vice President	Date