



**CERRITOS COLLEGE  
ARTICULATION AGREEMENT**

<p><b>Cerritos College Course:</b> MTT 180 – Robotics for CNC Machines (3 units)</p> <p>Cerritos College 11110 Alondra Blvd. Norwalk, CA 90650</p>	<p><b>High School Course:</b> Computer Integrated Manufacturing (Project Lead the Way)</p> <p>Corona High School 1150 W 10th St. Corona, CA 92882</p>
<p><b>General Course Description:</b> This course introduces the student to the applications of robotics for computer numerically controlled (CNC) machines by the use of activities-based learning, project-based learning, and problem-based learning. The student will learn how to create a part using software and apply computer-generated toolpaths. The student will also learn about setup, operation, and programming of CNC machines. Techniques of integration between several CNC machines in a work cell environment will be emphasized using simulation and robotic applications.</p>	
<p><b>College Prerequisite(s):</b> None</p>	<p><b>HS/ROCP Prerequisite(s):</b> None</p>
<p><b>Advisories/Recommendations:</b> This course is taught at the 10<sup>th</sup>, 11<sup>th</sup> or 12<sup>th</sup> grade level. Project Lead the Way's Introduction to Engineering Design is a prerequisite and most students are expected to be taking a college prep course sequence throughout high school.</p>	
<p><b>Course Content:</b></p> <ul style="list-style-type: none"> <li>• Computer Integrated Manufacturing Career Awareness</li> <li>• Social responsibility and ethics</li> <li>• Safety practices and standards in the manufacturing environment</li> <li>• Evolution of Programmable Machining</li> <li>• Just in Time Manufacturing</li> <li>• Communication, presentation skills and teamwork</li> <li>• Visualization and sketching techniques</li> <li>• Computer Modeling</li> <li>• CIM drawings and standards</li> <li>• Geometry and coordinate systems</li> <li>• Rapid Prototyping Systems</li> <li>• Engineering units, instruments, tools and measurements.</li> <li>• Properties of materials</li> <li>• Machinist Handbook</li> </ul>	

- Programmable Logic Controllers (PLC)
- History of Computer Numerical Control
- CNC Milling and terminology (CNC programming, spindle speed, cutting speed, feed rate, offset, plunge)
- Properties of types of cutting tools
- Feedback Systems
- Incremental encoders
- CAM
- CAD
- Robotics (Degrees of freedom, pitch, roll, and yaw)
- Flow diagrams
- Demonstrate the ability to work as a team member and collaborate in a diverse environment.

**Competencies and Skill Requirements. At the conclusion of this course, the student should be able to:**

- Define various careers available and terminology used in Computer Integrated Manufacturing
- Demonstrate the understand of social, economical, environmental and ethical impacts of Computer Integrated Manufacturing
- Demonstrate safety practices and standards in Computer Integrated Manufacturing
- Demonstrate ability to effectively communicate verbally, visually and in written format
- Collaborate in a diverse environment
- Apply visualization and sketching techniques in solving Computer Integrated Manufacturing problems
- Create basic Computer Integrated Manufacturing drawings and programs utilizing industry standards
- When presented with a machining problem be able to use their knowledge of CNC milling to complete a NC program supplying information regarding material, cutting speeds, feed rates, mill plunge rates and G&M code.
- Demonstrate the ability to program a simple robot system to perform a task such as loading and unloading parts onto a conveyor belt. A sensor must be used to detect location of parts.
- Using Fischertechnik or similar components, design, build, and program a freight elevator or equivalent system. Using various analog and digital sensors, the system should be able to respond to a command to go to any floor. The system should incorporate safety features to indicate what floor the elevator is on, or if it is in motion.
- Acquire, analyze interpret data, and prepare formal reports.

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

- Tests
- Homework
- Project Based Assessments
- Activity Sheets
- Engineering Notebooks

## Textbooks or Other Support Materials:

### Textbooks:

Project Lead the Way™ provides the curriculum for this course, along with all required support materials; no other textbooks are required.

### Software:

- Edgecam
- Autodesk Inventor
- RobotC

### Materials:

- Engineering Notebook

## Procedures for Course Articulation:

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

1. The student has completed the articulated course listed above, *Computer Integrated Manufacturing*, with a grade of “B” or higher.
2. The student must enroll at Cerritos College within two (2) years from the semester date in which the course was completed.
3. The 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.
4. No more than 15 units of credit may be accepted for 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

Eric Lee

Eric Lee (May 25, 2022 12:02 PDT)

May 25, 2022

Micic

Micic (May 26, 2022 08:17 PDT)

May 26, 2022

Faculty/Department Chair

Date

Instructor/Division Chair

Date

Ben Sanchez

Ben Sanchez (May 25, 2022 14:55 PDT)

May 25, 2022

Nick Real, Ed.D.

May 26, 2022

Administrator, Instructional Programs

Date

Dean of Instruction

Date

[Signature]

May 26, 2022

E. (Rick) Miranda

E. (Rick) Miranda (May 26, 2022 09:24 PDT)

May 26, 2022

Assistant Superintendent, Ed. Services

Date

Vice President

Date