

Course: *Metal Fabrication*  
Unit #2: CAD/CAM

Year of Implementation: 2023-2024

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## Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:

<https://www.state.nj.us/education/cccs/2020/>

[https://www.nj.gov/education/standards/clicks/Docs/2014\\_9.3\\_21LifeAndCareers.pdf](https://www.nj.gov/education/standards/clicks/Docs/2014_9.3_21LifeAndCareers.pdf)

[https://www.nj.gov/education/standards/ela/Docs/2016NJSLS-ELA\\_Companion9-10.pdf](https://www.nj.gov/education/standards/ela/Docs/2016NJSLS-ELA_Companion9-10.pdf)

[https://www.nj.gov/education/standards/ela/Docs/2016NJSLS-ELA\\_Companion11-12.pdf](https://www.nj.gov/education/standards/ela/Docs/2016NJSLS-ELA_Companion11-12.pdf)

- **Unit Standards:**

- **21st Century Life & Career Standards**

- 9.3.MN.4 - Describe career opportunities and means to achieve those opportunities in each of the Manufacturing Career Pathways.
- 9.3.MN.6 - Demonstrate workplace knowledge and skills common to manufacturing.
- 9.3.MN-PPD.3 - Monitor, promote and maintain a safe and productive workplace using techniques and solutions that ensure safe production of products.
- 9.3.MN-QA.1 - Evaluate production operations for product and process quality.
- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.

- **English Companion Standards**

- WHST.9-10.5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

- **Interdisciplinary Content Standards**

- RI.9-10.7. Analyze various perspectives as presented in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
- NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content

- ***NJ Statutes:*** NJ State law mandates the inclusion of the following topics in lesson design and instruction as aligned to elementary and secondary curriculum.

Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A. 18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Diversity and Inclusion (N.J.S.A. 18A:35-4.36a) A board of education shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards.

Asian American and Pacific Islanders (AAPI) P.L.2021, c.410 Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSL) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416)

For additional information, see

**NJ Amistad Curriculum:** <http://www.njamistadcurriculum.net/>

**Diversity and Inclusion:** <https://www.nj.gov/education/standards/dei/index.shtml>

- (Sample Activities/ Lessons): <https://www.nj.gov/education/standards/dei/samples/index.shtml>

**Asian American and Pacific Islanders:**

- [Asian American and Pacific Islander Heritage and History in the U.S.](#)

*A Teacher's Guide from EDSITEment offering a collection of lessons and resources for K-12 social studies, literature and arts classrooms that center around the experiences, achievements and perspectives of Asian Americans and Pacific Islanders across U.S. history.*

**Transfer Goal:** Students will be able to independently use their learning to design and fabricate a part in a metal working facility using CAD/CAM systems.

As aligned with LRHSD Long Term Learning Goal(s):

- Acquire, integrate, and apply design processes and essential technical skills to solve problems, create products, and improve the quality of life for our local and global community.

Enduring Understandings

Students will understand that . . .

*EU 1*

CAD/CAM is an essential part to metal fabrication and machining.

*EU 2*

Careful planning and proper development will create a quality product

Essential Questions

*EU 1*

- How has the use of CAD/CAM technologies changed the ways objects are manufactured?
- How has the metal fabrication industry changed with advancement of technology?

*EU 2*

- Why is planning and development important?
- How does making a technical drawing impact the quality of the product?
- Why is it essential to use the Tool Library to help with setup?

Knowledge

Students will know . . .

*EU 1*

- the proper way to design a part using a CAD system based on their design. (9.3.MN.4)
- the correct milling outputs for 2D and 3D parts (9.3.MN.6)
- career opportunities are available in CAD (9.3.MN.4)

*EU 2*

- a plan is essential to a quality part. (9.3.MN-QA.1)
- the tool library is where the information is stored for the specific tools being used in the CAM equipment. (9.3.MN-QA.1)
- how to use machining processes to insure safe machining of work pieces (9.3.MN-PPD.3)

Skills

Students will be able to . . .

*EU 1*

- evaluate and redesign the design to meet the needs and wants of the design world. (9.3.MN-QA.1)
- monitor the machining process to ensure quality controls. (9.3.MN-PPD.3)
- effectively test the design prior to fabrication using the CAM system. (9.3.MN.6)

*EU 2*

- create and read a technical drawing. (9.3.MN-QA.1)
- create a plan with the use of tool setup/library for the proper sequence of functions. (9.3.MN-QA.1)
- promote and maintain a safe working environment. (9.3.MN-PPD.3)

**Stage Two - Assessment**

**Stage Three - Instruction**

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections:** Each learning activity listed must be accompanied by a learning goal of **A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer**. The following color codes are used to notate activities that correspond with interdisciplinary connections and 21st Century Life & Career Connections (which involves Technology Literacy): **Red = Interdisciplinary Connection; Purple = 21st Century Life & Career Connection**

- Measure the given material and create a technical drawing of the designed piece (A, EU2)
- Create a technical drawing that is fully dimensioned including measurements and tolerances (A, EU2)
- Design the product using a CAD system (A,M, EU1)
- Create a tool library with the specifications of the tools in a Computer Numerically Controlled (CNC) machine. (M, T, EU2)
- Test the effect fit of the designed part prior to fabrication (M,T, EU1)
- Create a setup using the Tool Library to safely and effectively machine the part (T, EU2)
- Fabricate the product using a CAM system (M, T, EU1)
- Safety check and evaluate the part during production and post production (T, EU2)
- Group discussion and evaluation of products (T, EU2)
- Peers will evaluate the products based on form and function (M, T, EU2)

## Pacing Guide

<b>Unit #</b>	<b>Title of Unit</b>	<b>Approximate # of teaching days</b>
1	Safety	30
2	CAD/CAM	40
3	Machining	70
4	Molding/Forming	40

### **Instructional Materials**

*Fully Equipped metal shop*

## Accommodations

*Special Education:* The curriculum will be modified as per the Individualized Education Plan (IEP). Students will be accommodated based on specific accommodations listed in the IEP.

*Students with 504 Plans:* Students will be accommodated based on specific accommodations listed in the 504 Plan.

*English Language Learners:* Students will be accommodated based on individual need and in consultation with the ELL teacher.

*Students at Risk of School Failure:* Students will be accommodated based on individual need and provided various structural supports through their school.

*Gifted and Talented Students:* Students will be challenged to enhance their knowledge and skills through acceleration and additional independent research on the subject matter.