

Course: *Metalworking: Welding and Assembly*
Unit #2: *Mechanical Fasteners*

Year of Implementation: 2023-2024

Curriculum Team Members: *Jim Scott* (jscott@lrhsd.org) & *Mike Condurso* (mcondurso@lrhsd.org)

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/ela/Docs/2016NJSLs-ELA_Companion9-10.pdf

https://www.nj.gov/education/standards/ela/Docs/2016NJSLs-ELA_Companion11-12.pdf

- **Unit Standards:**

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

- 9.3.MN.6 Demonstrate workplace knowledge and skills common to manufacturing.
- 9.3.MN-LOG.2 Demonstrate proper handling of products and materials in a manufacturing facility.
- 9.3.MN-MIR.1 Demonstrate maintenance skills and proficient operation of equipment to maximize manufacturing performance.
- 9.3.MN-PPD.1 Produce quality products that meet manufacturing standards and exceed customer satisfaction.
- 9.3.MN-PPD.2 Research, design and implement alternative manufacturing processes to manage production of new and/or improved products.
- 9.3.MN-PPD.5 Develop procedures to create products that meet customer needs.
- 9.3.MN-PRO.5 Demonstrate the safe use of manufacturing equipment.

- **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 apply the most effective strategy to assemble different metallic materials.

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

- communicate and collaborate using appropriate technical terms to describe, analyze, interpret, and judge their work and the work of others.
- 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

careful consideration should be used when selecting a fastener depending on the needs of a project.

EU 2

fasteners are made of different materials with different chemical compositions in order to withstand varying environmental conditions.

Essential Questions

EU 1

- What conditions should be considered when selecting a fastener to combine metallic parts?
- What negative consequences can occur if environmental conditions are not considered in the selection of fastener type?
- How do the forces exerted on a joint affect the type of fastener that is best to use?

EU 2

- What role does the chemical composition of the fastener play in selecting a fastener to combine metallic parts?
- What environmental factors can contribute to corrosion for metallic fasteners?

	<ul style="list-style-type: none"> ● What forces and stresses do fasteners have placed on them and how does that affect the desired material used to create them?
<p><u>Knowledge</u> Students will know . . .</p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> ● that threaded fasteners have a nomenclature used to identify several factors that identify the mechanical properties of a bolt, nut or screw. (9.3.MN-MIR.1) ● methods of machining to properly prepare and manufacture a fastener to a direct specification and tolerance of fit. (9.3.MN-PRO.5) ● Finish can be applied to the surface of a fastener in order to improve performance for some applications. (9.3.MN.6) <p><i>EU 2</i></p> <ul style="list-style-type: none"> ● the corrosive effects that metallic parts can undergo in the different environmental conditions. (9.3.MN.6) ● the properties of common available metallic part fasteners based on their chemical composition and identify the advantages and disadvantages of the fasteners. (9.3.MN-PPD.2) ● The finish applied to fasteners impact the durability of the fastener in a variety of conditions. (9.3.MN.6) 	<p><u>Skills</u> Students will be able to . . .</p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> ● select the proper fasteners for assembling metallic parts that are needed for the specific constraints of the intended purpose of the job. (9.3.MN.6) ● layout and prepare a metallic part for the assembly of a fastener. (9.3.MN-LOG.2, 9.3.MN-PPD.1) ● machine and successfully align a fastener to a specific tolerance and fit from a technical drawing. (9.3.MN-PPD.1, 9.3.MN-PRO.5) ● how to read technical drawings and be able to interpret the drawings to be able to layout and machine a part. (9.3.MN-PPD.5) <p><i>EU 2</i></p> <ul style="list-style-type: none"> ● select the best fastener for a job based on the environmental conditions that the metallic part will be exposed to. (9.3.MN.6) ● select and apply the required finish to add environmental protection to parts based on the material they are made from and the anticipated conditions they will need to function in. (9.3.MN-PRO.5)

- properly install common metal working fasteners. (9.3.MN-MIR .1, 9.3.MN-PRO.5)

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**

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- Teacher-led presentation and demonstration for the types of fasteners. Presentation will include the installation process required, strength of bond, technical details and best applications for each type of fastener. **(A EU1,2)**
- Compare and contrast the commonly used fasteners to assemble metallic parts and be able to make informed decisions on selecting the best uses for each fastener. **(A, M EU1)**
- Read and interpret technical drawings **(A, EU1)**
- Layout, create and machine a part to the exact specifications engineered for a product. **(M, T EU1)**
- Interpret the nomenclature on a technical drawing and be able to assemble several metallic parts using a wide variety of fasteners to given specifications including bolts, washers, nuts, tapped holes, rivets, and anchors for assembling metallic parts. **(M, T EU1)**

- Compare and contrast the properties of common fasteners based on their chemical composition such as galvanized, brass, zinc coated, stainless steel and determine the best uses for each fastener based on the environmental conditions that they will be exposed to. **(A, M EU2)**

Pacing Guide

Unit #	Title of Unit: Safety	Approximate # of teaching days
1	Safety	40
2	Mechanical Fasteners	30
3	Welding, Soldering and Brazing	110

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.