Course: Metalworking **Unit #/ Unit Name: Unit # 4 – Machine Processing**	**Year of Implementation: 2019-2020**

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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/2014/tech/82.pdf

https://www.state.nj.us/education/aps/cccs/career/

https://www.state.nj.us/education/cccs/2014/career/CareerReadyPractices.pdf

Unit Standards:
8.2 Technology Education, Engineering, and Design: All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society, and the environment.

G. The Designed World: The designed world is the product of a design process that provides the means to convert resources into products and systems.

8.2.12.G.1 - Analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.

8.2.12.D.3 - Determine and use the appropriate resources (e.g., CNC (Computer Numerical Control) equipment, 3D printers, CAD software) in the design, development and creation of a technological product or system.

9.3 21st-Century Life & Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.3.MN-PPD.1- Produce quality products that meet manufacturing standards and exceed customer satisfaction.

9.3.MN-PRO.1 - Diagnose production process problems and take corrective action to meet production quality standards.

9.3.MN-PRO.2 - Manage safe and healthy production working conditions and environmental risks.

Career Ready Practices
CRP8: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11: Use technology to enhance productivity.

Transfer Goal(s): Students will be able to independently use their learning to…

Students will be able to independently use their learning to develop skills in the classroom that provide a foundation for skills needed to operate tools, machines and equipment in the manufacturing industry.

Enduring Understandings	*Essential Questions*
Students will understand that. . . *EU 1* tools and machinery can be applied to a wide variety of materials to produce infinite forms and sizes. *EU 2* joining metals uses various specialized techniques and equipment. *EU 3* finishing metal applies protective layers to products that enhance aesthetics.	*EU 1* ● What are the limits of sheet metal as it is used in industry and art? ● What are the advantages and disadvantages of using hand tools? ● How can a product be efficiently manufactured? ● How does using different materials affect the types of tooling and operations that can be used? *EU 2* ● How does the material's properties affect the type of joining method of metallic materials?

	● How does material, specifications, use and tolerance affect the choice of joining process? ● How do you decide what type of welding to use on a product? *EU 3* ● Why is steel the primary metal used in our lab and around the world? ● How does the use of a product affect the finishing process? ● How does heat affect the metal's material properties?
<u>Knowledge</u> Students will know. . . *EU 1* ● the most effective tool and technique for the desired application. ● when to use hand tools vs. power tools. ● when to use manual machining vs. CNC. *EU 2* ● the role of rivets in metal working. ● the many purposes of threads and how to apply them to products. ● the technique of welding. *EU 3* ● the process of sanding and grinding. ● painting and polishing techniques. ● heat treatment methods of metals.	*<u>Skills</u>* Students will be able to. . . *EU 1* ● select the proper tool for the job. ● select and operate hand tools safely, efficiently and effectively. ● select and operate power tools safely, efficiently and effectively. ● machine various types of metal stock with effective tool choices. *EU 2* ● insert and remove rivets. ● create internal and external threads. ● weld a joint. *EU 3* ● use a grind wheel correctly. ● sand a project through completion. ● file a project to remove burrs. ● alter a metal using heat treatment. ● apply spray paint to a project. ● apply a polish to a project.

Stage Two - Assessment

Other Evidence:

- Quiz/Test on hand tools, power tools, general lab safety, and machines
- Students demonstrate setup, safety, and operation of hand/ power tools/ machines
- Student presentations on safety, form and function of hand/ power tools/ machines
- Group discussions on proper machine practices and uses.
- Student projects
- Teacher observations
- Project rubrics

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.**

- Teacher demonstrations on sheet metal fabrication processes (A) (EC1)
- Teacher demonstrations on machine separating processes (A) (EC1)
- Teacher demonstrations on joining processes (A) (EC2)
- Teacher demonstrations on finishing processes (A) (EC3)
- Use of supplemental materials such as video walkthroughs and presentations used as examples to enhance instruction (A) EC1)
- Students will work in groups to identify the similarities and differences of various machine and processing uses. (A,M) (EC1)
- Students will create a unique design by determining and implementing proper machine and tool use. (M) (EC1 EC2 EC3)
- Teacher led discussions on the different types of fasteners and joining methods (A, M) (EC2)
- Peer critiques as a form of critical assessment (T) (EC1 EC2 EC3)
- Students design self-evaluation rubrics (T) (EC1 EC2 EC3)
- Individual assessment of why specific tools were used in a product (T) (EC1 EC2 EC3)