

# Unit 2: Hack Saw Project Measurement, Layout, Machining, Manufacturing Parts, Assembly

Content Area: **Industrial Technology**  
Course(s): **Manufacturing Technology II**  
Time Period: **1 marking period**  
Length: **Weeks**  
Status: **Published**

## Unit Overview

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Students will be able to construct a Hack Saw out of Mild steel by following a drawing. They will measure correctly, cut out stock, deburr stock, layout stock using bluing and layout tools, safely machine stock on the Metal Lathe and Vertical Mill. The students will then thread project and assemble and apply finish to project.

## Transfer

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Students will be able to independently use their learning to...

Students will be able to read prints from drawings and layout and transfer dimensions to mild steel this will be used in all phases of manufacturing and construction any project once they join the work force. SWBAT use basic hand tool, measuring tools, and machines to make parts. This will also be used once the student joins the workforce.

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For more information, read the following article by Grant Wiggins.

[http://www.authenticeducation.org/ae\\_bigideas/article.lasso?artid=60](http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60)

## Meaning

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Why is it important to be able to read the ruler in 1/64th of an inch?

Why is it important to be able to read the dial caliper and outside micrometer?

Why is it important to read a print and understand what the lines mean and measurements mean?

How do you transfer the dimensions and lines from a drawing onto the metal using bluing?

Why is it important that the lines are accurately laid out and why could it affect the final assembly and appearance of the project?

How do I use the machinery to make my parts?

Does my project look like the project in the print?

## **Understandings**

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Students will understand that...

If they do not read the ruler and dial caliper properly their project will not turn out properly.

Layout techniques are critical for their project to be properly manufactured.

Students will properly use the machines to cut out and bend their projects. If they make a mistake their project will not turn out properly.

That craftsmanship is very important in the manufacturing of any object to make it aesthetically pleasing.

## **Essential Questions**

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Students will keep considering...

Why is it important to be able to read the ruler in 1/64th of an inch?

Why is it important to be able to read the dial caliper and outside micrometer to 1/100th?

Why is it important to read a print and understand what the lines mean and measurement mean?

How do you transfer the dimensions and lines from a drawing onto metal, wood or plastic?

Why is it important that the lines are accurately laid out and why could it affect the final assembly of the project?

How do I use the machinery to make my parts?

Does my project look like the project in the print?

## **Application of Knowledge and Skill**

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Students will be able to apply all of the skills and knowledge they have learned to a hack saw project. This project will be part of their 1st marking period project grade.

## **Students will know...**

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Students will know...

Identify basic measuring tools and gages and explain how they are used.

Measure to 1/64th with a steel rule and 1/100 th with a dial caliper and micrometer.

Read drawings dimensioned in fractional and decimal inches and metric dimensions.

Identify and understand the different types of information indicated on a typical drawing.

Describe how detail, assembly, and subassembly drawing differ.

Explain the purpose of safe layout and how it is used to prepare metal for machining.

Identify common layout tools and use them safely.

Make simple layouts.

List and observe common safety precautions used in layout work.

Identify basic hand tools used in metalworking.

Select right tool for the job

Explain how to maintain tools properly.

Select right tap and die to thread metal parts.

Safely Operate and identify parts of Metal Lathe, Vertical Mill, Pedestal Grinder, Sander and Buffer.

Safely Apply Metal Finishes

## **Students will be skilled at...**

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Students will be skilled at...

Measurement, Layout, Safe use of Hand Tools, Safe operation of Metal Machines.

## **Academic Vocabulary**

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dial indicators

gage blocks

graduations

International System of Units

steel rule

combination set

divider

hermaphrodite caliper

layout dye

reference lines

scriber

square

ball peen hammer

abrasive

anodizing

buffing

painting

polishing

grinding

## Learning Goal 1

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Measurement in 1/64th of an inch on steel rule, measurement of 1/100th of an inch using micrometer and layout of Hack Saw Parts.

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
MANU.9-12.9.4.12.M.(2).3	Recognize problems related to production processes, and design corrections to assure that products meet quality standards.
MANU.9-12.9.4.12.M.(2).8	Maintain equipment, tools, and workstations to provide safe work environments and meet company regulations.
MANU.9-12.9.4.12.M.1	Demonstrate language arts knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.4	Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
MANU.9-12.9.4.12.M.15	Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.
MANU.9-12.9.4.12.M.16	Employ critical thinking and interpersonal skills to resolve.
MANU.9-12.9.4.12.M.19	Employ technological tools to expedite workflow.
MANU.9-12.9.4.12.M.27	Employ computer operations applications to manage tasks.
MANU.9-12.9.4.12.M.52	Identify and demonstrate positive work behaviors and personal qualities needed to succeed in the classroom and/or to be employable.
MANU.9-12.9.4.12.M.54	Demonstrate skills related to seeking and applying for employment in a desired job.
MANU.9-12.9.4.12.M.55	Maintain a career portfolio to document knowledge, skills, and experience in a career field.
MANU.9-12.9.4.12.M.58	Identify and explore careers in one or more career pathways to build an understanding of the opportunities available in the cluster.
MANU.9-12.9.4.12.M.65	Describe and employ technical knowledge and skills required for careers in manufacturing in order to perform basic workplace activities.

## Target 1

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SWBAT measure on a steel rule in 1/64th of an inch and 1/100th of an inch using dial calipers.

## Target 2

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SWBAT safely cut out metal stock using Abrasive Cut Off Saw to size and then transfer dimensions from print to metal material to create Hack Saw Project.

## Learning Goal 2

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SWBAT safely operate Abrasive Chop Saw, Pedestal Grinder, Metal Lathe, Vertical Milling Machine, Disk/Belt Sander, and Buffing Machine to create Hack Saw Project.

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
MANU.9-12.9.4.12.M.(1).2	Research new manufacturing processes to manage production of new and/or improved products.
MANU.9-12.9.4.12.M.(2).6	Research the safe use of manufacturing process equipment in order to protect personal well-being in the work environment.
MANU.9-12.9.4.12.M.(2).8	Maintain equipment, tools, and workstations to provide safe work environments and meet company regulations.
MANU.9-12.9.4.12.M.(3).1	Communicate with others regarding maintenance, installation, and repair issues and trends in order to meet business needs.
MANU.9-12.9.4.12.M.(3).3	Demonstrate knowledge of maintenance and repair processes and protocols used to maintain safe and productive workplaces.
MANU.9-12.9.4.12.M.(3).5	Develop hands-on knowledge of equipment operation to identify maintenance needs and maximize performance.
MANU.9-12.9.4.12.M.(4).3	Evaluate production operations for product and process quality to maintain quality assurance.
MANU.9-12.9.4.12.M.(4).4	Demonstrate understanding of ways to enhance product and process to meet quality standards.
MANU.9-12.9.4.12.M.(6).1	Evaluate procedures used to plan for safety in a new production process in order to ensure health, safety, and environmental well-being.
MANU.9-12.9.4.12.M.(6).4	Evaluate a job safety and health analysis of manufacturing jobs, equipment, and processes in order to identify priorities for health, safety, and environmental assurance programs.
MANU.9-12.9.4.12.M.(6).5	Analyze safety inspections findings and implement appropriate safety practices in order to improve the health and safety of manufacturing workplaces.
MANU.9-12.9.4.12.M.(6).9	Examine and summarize continuous improvement protocols, techniques, and practices in order to enhance the health and safety of manufacturing work environments.
MANU.9-12.9.4.12.M.(6).10	Examine and summarize health, safety, and/or environmental quality assurance programs

	in order to ensure healthy and safe manufacturing work environments.
MANU.9-12.9.4.12.M.1	Demonstrate language arts knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
MANU.9-12.9.4.12.M.4	Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
MANU.9-12.9.4.12.M.7	Evaluate and use information resources to accomplish specific occupational tasks.
MANU.9-12.9.4.12.M.15	Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.
MANU.9-12.9.4.12.M.16	Employ critical thinking and interpersonal skills to resolve.
MANU.9-12.9.4.12.M.19	Employ technological tools to expedite workflow.
MANU.9-12.9.4.12.M.30	Describe and use quality control systems and practices to ensure quality products and services.
MANU.9-12.9.4.12.M.33	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
MANU.9-12.9.4.12.M.34	Demonstrate knowledge of employee rights and responsibilities and employers' obligations to maintain workplace safety and health.
MANU.9-12.9.4.12.M.35	Identify emergency procedures that are necessary to provide aid in workplace accidents.
MANU.9-12.9.4.12.M.37	Explain health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
MANU.9-12.9.4.12.M.39	Maintain safe and healthful working conditions and environments to ensure employee safety.
MANU.9-12.9.4.12.M.41	Assess types and sources of workplace hazards common to manufacturing business environments in order to maintain safe working conditions.
MANU.9-12.9.4.12.M.42	Demonstrate understanding of how to control workplace hazards in manufacturing business environments in order to maintain safe working conditions.
MANU.9-12.9.4.12.M.47	Establish and maintain effective relationships in order to accomplish objectives and tasks.
MANU.9-12.9.4.12.M.49	Employ mentoring skills to assist others.
MANU.9-12.9.4.12.M.52	Identify and demonstrate positive work behaviors and personal qualities needed to succeed in the classroom and/or to be employable.

## **Target 1**

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SWBAT safely operate and identify parts of the Abrasive Chop Saw, Vertical Band Saw, and Horizontal Band Saw.

## **Target 2**

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SWBAT safely operate and identify parts of the Pedestal Grinder, Disk and Belt Sander, and Buffing Machine.

### **Target 3**

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SWBAT safely operate and identify parts of the Metal Lathe and the Vertical Milling Machine.

### **Summative Assessment**

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Students will be able to pass a safety test on shop safety rules. Students must pass the test to work in the Manufacturing Lab

### **21st Century Life and Careers**

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Select all applicable standards from the applicable standards

### **Formative Assessment and Performance Opportunities**

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Students will be observed to make sure they are following safety rules and wearing proper safety equipment by the instructor and other students. Students will be grade on project rubric and craftsmanship.

### **Accommodations/Modifications**

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### **Unit Resources**

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## **Interdisciplinary Connections**

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LA.RST.11-12.3

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

MA.K-12.1

Make sense of problems and persevere in solving them.