

# Unit 3: Machining Safety and Operation of Equipment

Content Area: **Industrial Technology**  
Course(s): **Manufacturing Technology II**  
Time Period: **1 marking period**  
Length: **10 Weeks**  
Status: **Published**

## Unit Overview

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SWBAT safely machine and operate abrasive chop saw, vertical band saw, horizontal band saw, pedestal grinder, disk sander/belt sander, vertical milling machine and metal lathe.

## Transfer

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Students will be able to apply the skills they have learned to their projects and future careers.

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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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SWBAT identify and select the correct machine for the task they are performing on their projects.

## Understandings

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Students will understand that...

How the skills they have acquired can be used in their future careers or to repair items at home.

## **Essential Questions**

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Select right tool for the job

Explain how to maintain machines properly.

Select right type of machine and setup to manufacture metal parts.

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

## **Application of Knowledge and Skill**

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Students will be able to follow the correct procedures for setting up the machine and follow the correct steps when manufacturing a part of their assigned or individual project.

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

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Students will know...

The proper safety procedures and possible hazards when operating any of the machinery in the the manufacturing lab.

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

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Students will be skilled at...

SWBAT safely machine and operate abrasive chop saw, vertical band saw, horizontal band saw, pedestal grinder, disk sander/belt sander, vertical milling machine and metal lathe.

SWBAT to follow proper sequence when operating each piece of machinery and avoid hazards that could

possible cause an accident.

## **Academic Vocabulary**

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grinding, off hand grinding, precision grinding, surface grinding, tool rest, wheel dresser.

chatter, counterbore, countersink, cutting speed, dead center, feed, reaming, spotfacing tapping wiggler.

carriage, compound rest, cross slide, cutting speed, facing, finish turning, parting, roughing, ways.

climb milling, down milling, end mill, face milling, gang milling, milling cutter, peripheral milling, side milling, slitting, straddle milling.

## **Learning Goal 1**

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**SWBAT identify various equipment, parts and identify the parts of each equipment on the abrasive chop saw, vertical band saw, horizontal band saw, pedestal grinder, disk sander/belt sander, vertical milling machine and metal lathe.**

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.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.
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.(1).6	Assess and select a variety of techniques and solutions to ensure safe production of products as well as safe and productive workplaces.
MANU.9-12.9.4.12.M.(1).7	Design a new product that meets identified customer needs, while also demonstrating the use of strategies and techniques for developing manufacturing production processes.
MANU.9-12.9.4.12.M.(2).5	Summarize and employ safety protocols to maintain a safe and productive production workplace.
MANU.9-12.9.4.12.M.(2).7	Identify equipment safety resources (e.g., equipment manufacturers and national safety organizations).
MANU.9-12.9.4.12.M.(2).9	Design a product that satisfies a customer's desires to demonstrate the relationship

	between production processes and meeting customer needs.
MANU.9-12.9.4.12.M.(3).4	Demonstrate knowledge of the safe use of manufacturing equipment in order to ensure safety during maintenance, installation, and repair work.
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.(3).9	Identify and diagnose equipment problems in order to effectively repair manufacturing equipment.
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).2	Analyze investigations of health, safety, and/or environmental incidents and hazards in order to maintain healthy and safe manufacturing work environments.
MANU.9-12.9.4.12.M.(6).3	Evaluate preventive inspections of health, safety, and/or environmental hazards in order to ensure healthy and safe manufacturing work environments.
MANU.9-12.9.4.12.M.(6).6	Evaluate and summarize training in health, safety, and/or environmental issues needed to provide safe, healthy, and productive manufacturing work environments.
MANU.9-12.9.4.12.M.(6).8	Examine and summarize health, safety, and/or environmental programs, projects, policies, or procedures 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.5	Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication.
MANU.9-12.9.4.12.M.8	Use correct grammar, punctuation, and terminology to write and edit documents.
MANU.9-12.9.4.12.M.11	Apply active listening skills to obtain and clarify information.
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.18	Conduct technical research to gather information necessary for decision-making.
MANU.9-12.9.4.12.M.19	Employ technological tools to expedite workflow.
MANU.9-12.9.4.12.M.20	Operate electronic mail applications to communicate.
MANU.9-12.9.4.12.M.32	Analyze and summarize how manufacturing businesses improve performance to demonstrate an understanding of various methods for enhancing production.
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.40	Understand employee rights and responsibilities and employers obligations concerning occupational safety and health.
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.43	Summarize safety, health, and environmental management systems to convey an understanding of how manufacturing businesses comply with governmental policies and procedures.
MANU.9-12.9.4.12.M.44	Employ leadership skills to accomplish goals and objectives.
MANU.9-12.9.4.12.M.45	Employ organizational skills to foster positive working relationships and accomplish organizational goals.
MANU.9-12.9.4.12.M.50	Apply ethical reasoning to a variety of situations in order to make ethical decisions.
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.57	Identify and exhibit traits for retaining employment.
MANU.9-12.9.4.12.M.59	Examine requirements for career advancement to plan for continuing education and training.
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 identify the parts and safe operation of each piece of machinery. The lessons may be more than several days.

## **Target 2**

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SWBAT demonstrate the correct way to operate the machinery and apply it to a project.

## **Learning Goal 2**

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SWBAT identify the different ways the machines can be set up to perform different types of operations by adding different cutters and holding devices and what can be done with each specific type of equipment. Ex: Gears, Miter joints, Slotting, T slots etc.

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.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
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.(1).6	Assess and select a variety of techniques and solutions to ensure safe production of products as well as safe and productive workplaces.
MANU.9-12.9.4.12.M.(2).7	Identify equipment safety resources (e.g., equipment manufacturers and national safety organizations).
MANU.9-12.9.4.12.M.(3).4	Demonstrate knowledge of the safe use of manufacturing equipment in order to ensure safety during maintenance, installation, and repair work.
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.(3).8	Describe predictive and preventive maintenance strategies used to ensure that production processes run smoothly.
MANU.9-12.9.4.12.M.(3).9	Identify and diagnose equipment problems in order to effectively repair manufacturing equipment.
MANU.9-12.9.4.12.M.(4).9	Describe safety inspections and training needed to maintain quality assurance and to provide safe and productive manufacturing workplaces.
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.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.5	Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication.
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.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.57	Identify and exhibit traits for retaining employment.
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.

## **Target 1**

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SWBAT set up the machinery to perform the different types of tasks that each piece of equipment is capable of doing this will be applied to their projects.

## **Target 2**

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SWBAT view the various techniques that are used to manufacture parts in industry and how these parts contribute to society.

### **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 on the specific machines.

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

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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.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
CAEP.9.2.12.C.8	Assess the impact of litigation and court decisions on employment laws and practices.

### **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 graded on project rubric and craftsmanship.

### **Accommodations/Modifications**

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SWBAT research and apply skills on different techniques to operate the various equipment.

### **Unit Resources**

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You tube Videos on Vertical Mill and Metal Lathe Safety, CNC Programming Techniques and Safety.

Modern Metalworking Instructor's Manual by John R. Walker

Modern Metalworking Textbook by John R. Walker

Modern Metalworking Workbook by John R. Walker

Safety Hand outs from NJ and PA. Safety Tests

## **Interdisciplinary Connections**

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LA.RH.11-12.3

Evaluate various perspectives for actions or events; determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.