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Unit:	**Technology And Careers**
Big Ideas:	Due to the increasing number of advances in technology, careers in industry are constantly growing.
Unit Essential Questions:	How do various types of technology contribute to a demand for employees?

Concept & Pacing	New Emphasis (Pa Core Standard)	Key Vocabulary	Essential Questions	Mini-Lessons/Activities	Instructional Materials	Assessments
Technology and Careers 1 Week	3.4.12.B1. Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of **technologies**. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach. **CC.3.5.9-10.D:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.	Industrial Revolution Metalworking Technology Semiskilled Workers Skilled Workers Profit Apprentice Programs Technicians	What types of careers are available in the metalworking industry? What is the importance of leadership skills? What does industry expect of an employee?	Lectures Writing prompts Class discussions	Modern Metalworking Textbook Elmo / presentation materials Handouts	Homework Quizzes – t/f, m/c, short answer

Unit:	Metal Classification, Identification, and Production
Big Ideas:	Knowledge of metal classification, identification, and production, is vital in understanding its role in our society
Unit Essential Questions:	Why is knowing how metals are classified, identified, and produced, important?

Metal Classification **Metal Identification** **Metal Production** **3 Weeks**	3.4.12.B1. Analyze ethical, social, economic, and cultural considerations as related to the development,	Alloys Base Metal Steels Ferrous Materials Nonferrous Materials Spark Test	How are metals classified? How do we identify metals? How are metals produced?	**Lecture** Lab Demonstrations Class discussions Metal Classification Demonstration Metal Identification Demonstration	Modern Metalworking Textbook Handouts Machinery Lab Materials	Homework Quizzes – t/f, m/c Test – t/f, m/c, short answer, matching Spark test activity

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	selection, and use of **technologies**. Illustrate how, with the aid of **technology**, various aspects of the environment can be monitored to provide information for decision making. **CC.3.5.9-10.D:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.	Iron Ore Mining Coke Pig Iron Cast Iron Wrought Iron Tool Steel Aluminum Copper Lead Tin Brass		Metal Production Techniques		
Unit:	Technical Drawings					
Big Ideas:	Drawings serve as a means to communicate technical information to an individual or individuals.					
Unit Essential Questions:	What types of information do technical drawings provide?					
Technical Drawings **Precision Measurement** **2 Weeks**	3.4.10.C1. Apply the components of the technological design process. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach.	Elements and principles of design Drawings CAD Dimensions Scale Project Planning Sheet Tolerances Dial Indicator Micrometer Steel Rule Dial Caliper	How is the form of a product dictated by its function? How are different types of information indicated on a drawing? How are drawings produced? How is precision measurement used in a metals lab?	Lecture Technical Drawing Dimensioning Operating CAD Software Solidworks Tutorial Precision Measurement	Lab materials Handouts Class discussion Solidworks Elmo / presentation materials	Class Projects Homework Quiz – t/f, m/c Tests – t/f, m/c, short answer,

	3.4.10.D1. Refine a design by using **prototypes** and modeling to ensure quality, efficiency, and productivity of a final product. 3.4.12.D2. Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. 3.4.10.E7. Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency. **CC.2.4.4.A.6** Measure angles and use properties of adjacent angles to solve problems. **CC.2.1.7.D.1** Analyze proportional relationships and use them to model and solve real-world and mathematical problems. **CC.2.1.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. **CC.3.5.11-12.G:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to					

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	address a question or solve a problem.					
Unit:	Advanced Lathe Turning Techniques					
Big Ideas:	The metal lathe is a very versatile machine tool that requires an extensive understanding in order to produce complex parts.					
Unit Essential Questions:	What types of advanced machining techniques can be achieved on a metal lathe?					
Lathe Turning Review **Taper Turning** **Knurling** **2 Weeks**	3.4.10.C1. Apply the components of the technological design process. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach. **CC.2.4.4.A.6** Measure angles and use properties of adjacent angles to solve problems. **CC.2.1.7.D.1** Analyze proportional relationships and use them to model and solve real-world and mathematical problems. **CC.2.1.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.	Metal Lathe Knurl Taper Offset Tailstock Taper Attachment	What is taper turning? How is taper calculated? How is tailstock setover calculated? How does knurling increase the gripping surface and appearance of a piece of work?	Lecture Taper Calculation Tailstock Setover Calculation Taper Turning Knurling	Handouts Student Participation Calculators Turning materials	Homework Tests – t/f, m/c, short answer, calculations Taper turning rubric
Unit:	Milling Machine Operations					

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Big Ideas:	Milling machines are one of the most versatile machine tools and are capable of machining flat or contoured surfaces, slots, grooves, threads, gears, and spirals.					
Unit Essential Questions:	How do we use the milling machine to manipulate the shape of materials?					
Milling Machine **2 Weeks**	3.4.10.C1. Apply the components of the technological design process. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach. **CC.2.4.4.A.6** Measure angles and use properties of adjacent angles to solve problems. **CC.2.1.7.D.1** Analyze proportional relationships and use them to model and solve real-world and mathematical problems. **CC.2.1.HS.F.3** Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays.	Milling Cutter Climb Cut Conventional Cut Side Milling End Milling Drilling Chamfer Wiggler Edge Finder	How do we use the milling machine to manipulate the shapes of materials? How are drilling operations performed? How accurate is our milling machine? What are the three axes of travel on a milling machine?	Lecture Machine Demonstration End Milling Side Milling Hole Location	Modern Metalworking Textbook Milling Machine End Mills Shell Mill Drills Countersinks	Participation – graded daily Homework Test – t/f, m/c, short answer Milling Exercise Rubric
Unit:	Welding, Brazing, and Soldering					
Big Ideas:	Welding, Brazing, and Soldering are metal joining techniques used to fuse similar materials through heating.					
Unit Essential Questions:	How do welding, soldering, and brazing used to join materials?					

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Welding **Soldering** **Brazing** **3 Weeks**	3.4.10.C1. Apply the components of the technological design process. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.B1. Compare and contrast how the use of **technology** involves weighing the trade-offs between the positive and negative effects.	Lincoln Welder Airco Welder Welding Rod Electrode Holder Ground Clamp SMAW GMAW Solder Soldering Iron Flux Brazing Rod Propane Torch Personal Protection Equipment (PPE)	What is SMAW? What is GMAW? What are the components of a SMAW and GMAW system? How do soldering and brazing differ from welding? What is the significance of flux in soldering and welding operations?	Lecture SMAW GMAW Demonstration Soldering Demonstration Brazing Demonstration Surface tension / capillary action demonstration	Modern Metalworking textbook Handouts General welding and soldering equipment PPE	Participation – graded daily Homework Quiz – t/f, m/c Test – t/f, m/c, short answer Welding Assignment Rubric
Unit:	Metal Casting Techniques					
Big Ideas:	Casting is the forming of metal objects by pouring molten metal into a mold, is allowed to cool and solidify, to take on the shape and detail of the mold.					
Unit Essential Questions:	In what way are cast materials used in our everyday lives?					

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Sand Casting **2 Weeks**	3.4.10.C1. Apply the components of the technological design process. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.B1. Compare and contrast how the use of **technology** involves weighing the trade-offs between the positive and negative effects. 3.4.10.C2. Analyze a **prototype** and/or create a working model to test a design concept by making actual observations and necessary adjustments.	Casting Draft Flask Foundry Mold Pattern Slag Furnace Crucible Crucible Tongs Crucible Shank Ingot Mold Lance Pyrometer Ingot Mold	What is the correct procedure to ram a mold in our metals lab? What role does safety play in working with heated metals?	Lecture Foundry introduction Mold ramming demonstration Pouring demonstration Breakout procedure Casting cleanup	Modern Metalworking Textbook Handouts Foundry tools and materials Foundry PPE	Participation – graded daily Homework Test – t/f, m/c, Short Answer Casting Assignment Rubric

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Unit:	Modern Machining Practices
Big Ideas:	21st century machining requires and in-depth understanding of computer systems and automated metalworking machines.
Unit Essential Questions:	What is a benefit of Computer Numeric Controlled machining practices?

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Modern Machining **2 Weeks**	3.4.10.C2. Analyze a **prototype** and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C2. Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly. 3.4.12.C3. Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1. Refine a design by using **prototypes** and modeling to ensure quality, efficiency, and productivity of a final product. 3.4.10.E3. Compare and contrast the major forms of energy: thermal, radiant, electrical, mechanical, chemical, nuclear and others.	CNC CAM Rapid Prototyping Wire EDM Automation CAD/CAM Software	What is automation? What is the benefit of digital blueprints?	Lecture SolidWorks Tutorial Labvolt CNC Lathe	Modern Machining Textbook UPrint SE 3d Printer	Participation – graded daily Homework Test – t/f, m/c, short answer, matching, essay Lab write up / findings