Grade, Subject/Course: Introduction to Technology & Engineering	
Unit: Safety	**__X__ Essential _____ Important _____ Compact**
Big Idea: Safety is an inherent part of technology and engineering design.	
STEELS/Tech and Engineering Strand: 3.5.9-12.AA Safely apply an appropriate range of making skills to a design thinking process. 3.5.9-12.L Interpret laws, regulations, policies, and other factors that impact the development and use of technology.	**Pacing:** 2 weeks
Essential Questions: UEQ: Why is safety an attitude not a set of rules? LEQ: What PPE is needed to safely operate tools and machines in making products? LEQ: Why is safety so important in the technology lab? LEQ: What are the machine safety rules and operations used in making design prototypes? LEQ: Why is it important to understand force when operating hand or power tools? LEQ: Why are cleanliness and organization important in the technology lab?	**Understandings:** Students will know that… ● General safety rules for the lab need to be followed based on the PDE safety guide. ● Each machine has specific safety rules and operational processes. ● Rules about the production environment are regulated by the Occupational Safety & Health Association (OSHA). ● Safety Data Sheets (SDS) contain information about hazardous chemicals in the workplace. ● There are codes for fire prevention and safety. ● Lock Out Tag Out procedures are in place to prevent accidents when using machines. ● General lab maintenance and clean-up procedures are necessary to maintain a safe work environment.
Knowledge: General Lab Safety Personal Protective Equipment (PPE) Machine Specific Safety Lab Maintenance	**Do/Skills:** Students will be able to… ● Appropriately use personal protective equipment in the production lab. ● Safely operate all power tools and equipment with 100% accuracy. ● Correctly use SDS sheets to gather information on chemicals and products used in the production lab. ● Recognize possible fire situations, correctly select the appropriate fire extinguisher, and use it efficiently to extinguish a fire. ● Properly maintain established clear standards for student work areas.
Vocabulary: OSHA, SDS, LOTO, Danger Zone, Exposure, Personal Protective Equipment	**Core Resources:** Schoology LMS

Common Assessment(s):	**Supplemental Resources:**
Safety Tests 1. Planer 2. Jointer 3. Table Saw 4. Compound Miter Saw 5. Sanders (Belt/Disc & Oscillating Spindle) 6. Drill Press 7. Band Saw 8. Router 9. Buffer	PDE Safety Guide ITEEA Safety Resources

Grade, Subject/Course: Introduction to Technology & Engineering	
Unit: Problem-Solving (Parachute Egg Drop)	**__X___ Essential _____ Important _____ Compact**
Big Idea: As new ideas, technologies, and perspectives emerge, designs can always be iterated to enhance their effectiveness, efficiency, and appeal.	
STEELS/Tech and Engineering Strand: 3.5.9-12.P Apply a broad range of design skills to a design thinking process. 3.5.9-12.U Evaluate and define the purpose of a design. 3.5.9-12.W Optimize a design by addressing desired qualities within criteria and constraints while considering trade-offs. 3.5.9-12.X Implement the best possible solution to a design using an explicit process.	**Pacing:** 3 weeks
Essential Questions: UEQ: Why is there no single correct solution in design, and how do the context, purpose, and audience influence design decisions? LEQ: What are the two major forces acting on a falling object, and how do they affect its motion? LEQ: How does Galileo's Law help us understand the behavior of falling bodies and the forces at play? LEQ: What are the key components of a parachute, and why are each of these components necessary for proper deployment and function? LEQ: What is terminal velocity, and how does the equilibrium between gravity and air resistance affect a falling object? LEQ: How can the technological design process be applied to develop and construct a functional parachute? LEQ: How do math and science concepts guide a parachute's design, construction, and testing to ensure it can safely land a payload? LEQ: How do we design and construct solutions based on specific problems, and how does this relate to real-world engineering challenges? LEQ: What steps are involved in testing a solution to ensure it meets the desired criteria and performs as expected? LEQ: Why is accurate data collection important, and how does it contribute to drawing reliable conclusions in science and engineering experiments?	**Understandings:** Students will know that… ● Galileo's Law describes the forces acting on falling bodies. ● Parachutes are made of different components needed for proper deployment and function. ● Terminal velocity occurs when there is an equilibrium of gravity and air resistance in falling objects. ● There is a technological design process for developing and constructing a solution. ● Accurate data collection produces reliable conclusions. ● Math and science concepts are used to design, construct, and test a parachute to land a payload safely.

LEQ: How can experiments be conducted to determine the efficiency and effectiveness of a parachute design?	
Knowledge: Galileo's Law of Falling Objects Types of Parachutes Parts of Parachutes Efficiency of Design Calculating the Rate of Descent	**Do/Skills:** Students will be able to… ● Describe the two major forces that act on a falling object. ● Identify the major components of a technological system. ● Identify and describe how solutions are dependent on the problem being solved. ● Design and construct a solution to a design problem. ● Design and implement a test to verify the solution meets the design criteria. ● Experiment to determine the efficiency of the solution.
Vocabulary: Creativity, Collaboration, Resourcefulness, Ideation, Design Thinking, Galileo's Law, Gravity, Air Resistance, Terminal Velocity, Rate of Descent, Oscillation, Deployment, Inflation Rate, Skirt, Apex, Vent, Suspension Lines, Pilot Chute, Recovery Container, Harness, Gore, Ribbon, Canopy, Crucifix, Round, Ram-Air (Parafoil).	**Core Resources:** Schoology LMS
Common Assessment(s): Parachute Egg Drop Project Rubric	**Supplemental Resources:** NASA Mars Rover Website Red Bull Stratos Physics of Skydiving

Grade, Subject/Course: Introduction to Technology & Engineering	
Unit: Materials & Processes (Acrylic Dice)	**__X___ Essential _____ Important _____ Compact**
Big Idea: Materials processing involves a systematic sequence of operations that converts raw materials into finished parts or products through industrial methods, and understanding these processes is key to improving production efficiency and product quality.	
STEELS/Tech and Engineering Strand: 3.5.9-12.A Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. 3.5.9-12.B Critically assess and evaluate a technology that minimizes resource use and resulting waste to achieve a goal. 3.5.9-12.E Evaluate how technology and engineering advancements alter human health and capabilities. 3.5.9-12.H Evaluate ways that technology and engineering can impact individuals, society, and the environment. 3.5.9-12.I (ETS) Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. 3.5.9-12.O Apply appropriate design thinking processes to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality. 3.5.9-12.AA Safely apply an appropriate range of making skills to a design thinking process. 3.5.9-12.JJ Identify and explain how the evolution of civilization has been directly affected by and has in turn affected, the development and use of tools, materials, and processes. 3.5.9-12.MM Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.	**Pacing:** 3 weeks
Essential Questions: UEQ: How do various industrial processes transform raw materials into finished products, and what factors influence the efficiency and quality of these transformations? LEQ: What are the fundamental characteristics of plastics, and how do their chemical structures determine their properties?	**Understandings:** Students will know that… ● Plastics are polymers composed of hydrocarbons. ● Plastics can be categorized as thermoplastics, elastomers, or thermosets. ● Abrasives can be categorized as coated, solid, and loose. ● Abrasive materials come from a variety of natural minerals and synthetics. ● Grit size is determined by the screen method and the floating method. ● Grit size determines the proper sequence of abrasives when sanding.

LEQ: How do the different types of plastics (thermoplastics, elastomers, thermosets) influence their use in various applications? LEQ: What are abrasives, and how can they be classified based on their form (coated, solid, loose)? LEQ: How do natural and synthetic materials differ in their use as abrasives, and what are the advantages of each? LEQ: How do you measure and mark materials accurately using the English system of measurement, and why is precision essential in woodworking or other material work? LEQ: What are the key hand sanding techniques for ensuring a smooth, defect-free surface without using power tools? LEQ: How do you assess when to change, repeat, backtrack, or progress in abrasives during the sanding process to achieve the best results? LEQ: Why is it important to follow a specific order of abrasives, and how does it impact the final surface finish? LEQ: What safety precautions must be followed when operating power tools such as a drill press or buffer, and how do you ensure optimal performance and safety? LEQ: What are the steps involved in applying a finish to a surface, and how do you prevent common defects during the finishing process?	● Backing material is determined and graded based on the application of the abrasive. ● The two-step method is used for bonding abrasive grit to the backing material. ● Measurement in the English System uses fractions of an inch. ● Selecting the type of finish is based on different materials and the usage of the product.
Knowledge: Plastics & Polymers Sequence of Abrasives Buffing and Polishing Development & Layout (Learn To Read A Ruler) Working With Acrylics Painting and Finishing	**Do/Skills:** Students will be able to… ● Properly follow the order of abrasives to achieve a desired surface finish on a project. ● Proper hand sanding methods and preparing a surface without the use of power tools ● Judge when to change, repeat, backtrack, or progress in abrasives ● Accurately measure, mark points, and create layout lines to achieve a part plan. ● Utilize proper layout methods for locating points and lines. ● Safely operate a drill press to drill holes. ● Safely operate a buffer to remove scratches and polish a surface. ● Apply a finish properly without defects.
Vocabulary: Abrasives, Abrade, Grit Size, Electrostatic, Make Coat, Size Coat, Backing, Sanding, Plastics, Polymers, Hydrocarbons, Thermoplastics, Thermosets, Elastomers, Pilot Hole, Surface Finish, Natural, Synthetic, Buffing, Polishing, Parallel, Square, Layout, Vice, Muslin Cloth, Flannel Cloth	**Core Resources:** Schoology LMS Wood Technology & Processes Textbook

Common Assessment(s):	**Supplemental Resources:**
Acrylic Dice Project Rubric Popular Science Plastics	Learn To Read A Ruler Game

Grade, Subject/Course: Introduction to Technology & Engineering	
Unit: Construction & Manufacturing (Woodworking)	**__X___ Essential _____ Important _____ Compact**
Big Idea: Manufacturing and construction are similar creative industrial processes that both result in the creation of an object. Buildings, bridges, tunnels, etc., are constructed on-site, while manufactured products are often utilized at locations where they were not created.	
STEELS/Tech and Engineering Strand: 3.5.9-12.A Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems. 3.5.9-12.B Critically assess and evaluate a technology that minimizes resource use and resulting waste to achieve a goal. 3.5.9-12.E Evaluate how technology and engineering advancements alter human health and capabilities. 3.5.9-12.H Evaluate ways that technology and engineering can impact individuals, society, and the environment. 3.5.9-12.I (ETS) Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. 3.5.9-12.O Apply appropriate design thinking processes to diagnose, adjust, and repair systems to ensure precise, safe, and proper functionality. 3.5.9-12.AA Safely apply an appropriate range of making skills to a design thinking process. 3.5.9-12.JJ Identify and explain how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools, materials, and processes. 3.5.9-12.MM Troubleshoot and improve a flawed system embedded within a larger technological, social, or environmental system.	**Pacing:** 5 weeks
Essential Questions: UEQ: How are products manufactured? LEQ: How do we get lumber? LEQ: How does a tree grow? LEQ: What are the characteristics of different lumber types?	**Understandings:** Students will know that… ● Managing forests for health and resources is the role of a forester. ● Selective cutting for specific species and diameters is the preferred method of harvesting trees. ● Trees undergo a harvesting process to be turned into lumber.

LEQ: What is the difference between defect and character? LEQ: What are the components of a project plan? LEQ: How are wood joints selected? LEQ: What operations are considered to be secondary processing? LEQ: What is the process of squaring a board? LEQ: How are processes selected to produce parts? LEQ: How does the term value-added describe a part? LEQ: What role do jigs and fixtures play in producing parts? LEQ: What can be done if a part does not meet specifications? LEQ: Why are dry-fitting parts important before gluing or securing them with fasteners? LEQ: How is a finish selected and applied?	● There are advantages and disadvantages to plain-sawn and quarter-sawn lumber. ● Lumber needs to be seasoned before it can be used to manufacture products. ● Rough-cut lumber must undergo a squaring process in preparation for constructing a project. ● The different parts of a tree represent growth characteristics and structure. ● The formula for calculating board feet is (thickness x width x length) / 144 ● Wood joints are selected based on strength, appearance, and construction difficulty. ● Detailed plans are needed to produce parts that outline the steps to construct and assemble a product. ● Secondary processing takes rough materials and further refines them into parts that can be made into products. ● Well-designed jigs and fixtures can save time, reduce waste, and provide a safe way to produce multiple parts of the same dimensions. ● Manufactured parts must be checked for meeting specifications ● Dry-fitting of parts is a necessary step in the assembly of a product ● Finishes are selected based on the overall desired look, application techniques available, drying time, and end-use environment.
Knowledge: Wood Species Characteristics Planning & Design Reading Drawings Squaring A Board Woodworking Joinery Construction & Assembly Staining & Finishing	**Do/Skills:** Students will be able to… ● Identify different types of wood according to their characteristics, uses, or colors. ● Create a bill of materials for a woodworking project. ● Manufacture a wood project from a set of construction drawings. ● Safely operate a planer to surface a board to thickness. ● Safely operate a jointer to square an edge of a board. ● Safely operate a table saw to rip a board to width. ● Safely operate a compound miter saw to crosscut a board to length. ● Safely operate a router table to shape a decorative edge. ● Follow the proper steps in squaring a board to produce parts for a product. ● Produce a variety of functioning wood joinery. ● Pre-assemble manufactured parts to ensure proper fit and accuracy. ● Assemble parts using adhesives and clamping methods to produce a final product. ● Prepare for finishing and apply a finish to a wood project.

Vocabulary: Forester, Clear Cut, Selective Cut, Plain Sawn, Quarter Sawn, Deciduous, Coniferous, Hardwood, Softwood, Rough Lumber, Surfaced Lumber, Kiln-Dried, Air-Dried, Rip Cut, Crosscut, Chop Cut, Slide Cut, Dado, Rabbet, Groove, Kerf, Miter, Square, Warp, Cup, Crook, Bow, Knot, Check, Shake, Kickback, Planer, Jointer, Table Saw, Miter Saw, Chop Saw, Router	**Core Resources:** Schoology LMS Wood Technology & Processes Textbook
Common Assessment(s): Woodworking Project Rubric Wood Identification Quiz	**Supplemental Resources:**

Grade, Subject/Course: Introduction to Technology & Engineering	
Unit: Engineering Design (CO2 Dragster)	**__X___ Essential _____ Important _____ Compact**
Big Idea: The engineering design process provides a structured, iterative framework for addressing complex technological problems.	
STEELS/Tech and Engineering Strand: 3.5.9-12.P Apply a broad range of design skills to a design thinking process. 3.5.9-12.U Evaluate and define the purpose of a design. 3.5.9-12.W Optimize a design by addressing desired qualities within criteria and constraints while considering trade-offs. 3.5.9-12.X Implement the best possible solution to a design using an explicit process. 3.5.9-12.Y (ETS) Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	**Pacing:** 5 weeks
Essential Questions: UEQ: How are engineered products designed, tested, and evaluated? LEQ: What information is contained in the design brief? LEQ; What is the difference between a limitation and a specification? LEQ: How is research conducted for a design solution? LEQ: What information should be used to develop possible solutions? LEQ: How is a solution chosen? LEQ: What occurs during the developmental stage of the engineering design process? LEQ: What is the difference between a model, mock-up, and a prototype? LEQ: How are prototypes tested? LEQ: How are prototypes evaluated?	**Understandings:** Students will know that… ● The engineering design process is a multi-step iterative process that is used to develop solutions to design challenges. ● Clearly defining the problem is key to developing an effective and practical solution. ● The research phase of the engineering design process provides information needed to properly understand the problem being addressed. ● Brainstorming is conducted during the ideation phase of the engineering design process, and it is a way to innovate. ● Solutions are created from information gathered during research. ● Evaluating design alternatives involves assessing trade-offs involved in finding the best possible solution. ● Prototypes are physical or virtual representations of a design used for testing. ● Testing and data analysis help to determine if the design meets the required specifications and performs well. ● Reflection and feedback are important for continuous improvement.

Knowledge:	**Do/Skills:** Students will be able to…
Problem & Design Brief Research & Gathering Information ● The Science of Going Fast ● The Engineering of Going Fast ● The Math of Going Fast ● The Technology of Going Fast Developing Ideas & Solutions ● Brainstorm Possible Solutions (Thumbnail Sketches) ● Rough Sketches Choosing The Best Solution Final Working Drawing Building Prototypes Testing & Data Collection Evaluation & Analysis	● Identify the problem and define project constraints, objectives, and requirements. ● Conduct research and gather relevant information about the problem. ● Use brainstorming and ideation techniques to generate multiple design alternatives. ● Identify trade-offs between different solutions and select the most appropriate design. ● Create design plans, including sketches, CAD models, and technical drawings. ● Construct a model and prototype to test the design concepts. ● Test and analyze the performance of prototypes to see if they meet the requirements of a problem. ● Modify the design based on test results and feedback to improve performance and address any issues.
Vocabulary: Design Envelope, Aerodynamics, Fluid Friction, Surface Friction, Resistance, Mass, Weight, Turbulence, Drag, Laminar Flow, Boyle's Law, Velocity, Speed, Brainstorming, Thumbnail Sketch, Rough Sketch, Model, Prototype, Engineering Design Process, Specifications, Tolerances, Trade-offs, Evaluation, Testing, Data Collection, Analysis	**Core Resources:** Schoology LMS
Common Assessment(s): ● Science of Speed WebQuest ● Thumbnail Sketches ● Rough Sketches ● Final Working Drawing ● Styrofoam Model ● CO2 Dragster Project	**Supplemental Resources:**