

Curriculum Map: Technology Education 7 Intro to Technology – Structural Technology

Meadville Area Middle School

Technology Education

Course Description: This 9 week course is specifically designed for the student who plans to pursue a college education (or career). It will teach students about the basics of Technology and STEM (Science Technology engineering Math) education. This course introduces students to the scope and sequence of technology, problem solving, STEM studies, and real life problems they will face upon graduation. A STEM based class means taking Technology Education and applying Math and Science to the lessons to create a cross curricular course that benefits students in all classes and areas of study.

Unit Title: Structural Engineering

Suggested time frame: _5_ weeks

Standards:

3.6.7.B - Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7.C - Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions

3.7.10.C - Apply basic computer operations and concepts.

3.8.7.A - Explain how sciences and technologies are limited in their effects and influences on society.

3.8.7.B - Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7.C - Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

3.2.7.B - Apply process knowledge to make and interpret observations.

3.2.7.D - Know and use the technological design process to solve problems.

3.6.7.A - Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.

3.4.7.C - Identify and explain the principles of force and motion.

3.1.4.A - Explain the parts of a simple system and their relationship to each other.

Math - CC.2.2.HS.C.9 - Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Math 2.4 - Measurement, Data, and Probability

Big Idea:

Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories.

Essential Questions:

- What methods of designing can we use to develop solutions?
- How do we evaluate the impact of modifying a system to improve performance?
- How can we use tools, machines, and systems to improve our needs and wants?
- How can we use Math equations to design Structures?
- What makes a strong geometric design?
- How is Technology important in our modern society?

Competency	Vocabulary	Strategy	Resource
<ul style="list-style-type: none"> • SWBAT • Understand and explain how structures are built • Use geometry to create strong structures • Differentiate between Geometric shapes when designing • Critique designs and come up with solutions • Understand the pros and cons of Technology • Understand the working definition of Technology • Identify Dead and Live loads in structures • Differentiate between Static and Dynamic loads 	Technology Needs and Wants Engineering Structural Engineering Design Process Dead Load Live Load Static Load Dynamic Load Environmental Load Compression Tension Shearing Truss Structural Design Arch, Suspension, Beam, Truss Bridge Abutment	Hands on structural activity challenge Bridge Design worksheet using Pythagoreans Theorem Select structures and identify all loads and forces applied to it Understand the difference between compression, tension, and shearing forces Provide examples of how technology applies to modern society Understand the safe and appropriate use of hand tools	Computers/Internet Smartboard Balsa Wood Cutting Device Glue Bridge Models -Suspension Bridge -Arch Bridge -Beam Bridge -Truss Bridge Tower Models Truss Models Spaghetti/Marshmallows Tape, Cardboard, Wax paper Trebuchet Model Catapult Model Pythagoreans worksheet Pythagoreans Triangle Model

<ul style="list-style-type: none"> • Identify different forces such as Compression, Tension, and Shearing • Explain qualities of materials such as Concrete, Steel, and Reinforced Concrete • Explains strengths and weaknesses of different materials • Identify the strengths and weaknesses of different bridge designs • Use Pythagoreans Theorem to calculate lengths of trusses in structural design • Use Pythagoreans Theorem to create a detailed bridge design • Use knowledge of structures to build a Tower and Bridge • Test towers and bridges and evaluate their performance • Identify the loads and forces that act on bending beams 	<p>Concrete Steel Reinforced Concrete Pythagoreans Theorem Variables Exponents Trebuchet</p>	<p>Understand the use of measurement devices List and describe qualities of materials Create structures designed with material strengths in mind Properly label forces on bending beams Use Pythagoreans Theorem to design a bridge Play an interactive bridge building game online Explain how leverage works on a Trebuchet</p>	
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Unit Title: Transportation Technology

Suggested time frame: _2_ weeks

Standards:

3.6.7.B - Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7.C - Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions

3.7.10.C - Apply basic computer operations and concepts.

3.8.7.A - Explain how sciences and technologies are limited in their effects and influences on society.

3.8.7.B - Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7.C - Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

3.2.7.B - Apply process knowledge to make and interpret observations.

3.2.7.D - Know and use the technological design process to solve problems.

3.6.7.A - Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.

3.4.7.C - Identify and explain the principles of force and motion.

3.1.4.A - Explain the parts of a simple system and their relationship to each other.

Math - CC.2.2.HS.C.9 - Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Math 2.4 - Measurement, Data, and Probability

Big Idea:

Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories.

Essential Questions:

- What methods of designing can we use to develop solutions?
- How do we evaluate the impact of modifying a system to improve performance?
- How can we use tools, machines, and systems to improve our needs and wants?
- How does an airplane fly using Bernoulli's Principle?
- How do you control the flight of the airplane using various control systems?

Competency	Vocabulary	Strategy	Resource
<ul style="list-style-type: none"> • SWBAT • Understand and explain how structures are built • Use geometry to create strong structures • Differentiate between Geometric shapes when designing • Critique designs and come up with solutions • Understand the pros and cons of Technology • Understand the working definition of Technology • Identify Dead and Live loads in structures • Differentiate between Static and Dynamic loads 	Transportation Technology Fuselage Airfoil Elevator Rudder Aileron Control Systems Yaw Pitch Roll Lift Thrust Drag Bernoulli's Principle Low Pressure Biomimicry Air Flow MagLev Vehicle	Students will identify the five parts of an airplane Identify Yaw Pitch and Roll Combine airplane motions with parts of the airplane Adjust parts of an airplane to adjust flight path Define Biomimicry and provide real life examples Define Bernoulli's Principle Draw an Airfoil and show where High Speed air is Show where Low Pressure is on an airfoil Show how Bernoulli's Principle makes an airplane fly	Computers/Internet Airplane model Enlarged Airfoil model Airplane Kits Smartboard Maglev Track and Car Google Car Video NXT Robot NXT Programming Software

<ul style="list-style-type: none"> • Identify different forces such as Compression, Tension, and Shearing • Explain qualities of materials such as Concrete, Steel, and Reinforced Concrete • Explains strengths and weaknesses of different materials • Identify the strengths and weaknesses of different bridge designs • Use Pythagoreans Theorem to calculate lengths of trusses in structural design • Use Pythagoreans Theorem to create a detailed bridge design • Use knowledge of structures to build a Tower and Bridge • Test towers and bridges and evaluate their performance • Identify the loads and forces that act on bending beams 	<p>Self-Driving Car Ultrasonic Sensor Automation Robotics Engineering</p>	<p>Use magnets to display how a MagLev vehicle works Understand positive and negative magnetic poles Understand how sensor work in a Self Driving car Discuss positives and negatives of Automation Discuss examples of automation in everyday life Build a Styrofoam airplane and adjust controls/parts to make it fly straight Adjust Pitch/Yaw/Roll on an airplane</p>	
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Unit Title: Six Simple Machines

Suggested time frame: _2_ weeks

Standards:

3.6.7.B - Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

3.6.7.C - Explain physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design.

3.7.10.A - Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions

3.7.10.C - Apply basic computer operations and concepts.

3.8.7.A - Explain how sciences and technologies are limited in their effects and influences on society.

3.8.7.B - Explain how human ingenuity and technological resources satisfy specific human needs and improve the quality of life.

3.8.7.C - Identify the pros and cons of applying technological and scientific solutions to address problems and the effect upon society.

3.2.7.B - Apply process knowledge to make and interpret observations.

3.2.7.D - Know and use the technological design process to solve problems.

3.6.7.A - Explain biotechnologies that relate to related technologies of propagating, growing, maintaining, adapting, treating and converting.

3.4.7.C - Identify and explain the principles of force and motion.

3.1.4.A - Explain the parts of a simple system and their relationship to each other.

Math 2.4 - Measurement, Data, and Probability

S4.A.3.1.1 Categorize systems as either natural or human-made (e.g., ballpoint pens, simple electrical circuits, plant anatomy, water cycle).

Big Idea:

Technology is the application of tools, materials, processes and systems by humans to solve problems and provide benefits to humankind. Effective technology education combines knowledge of content, process and skills to provide students with a holistic approach to learning. Technology education offers unique opportunities to apply numerous academic concepts through practical, hands-on applications. The relationship between science and technology is one where science builds principles or theories and technology provides the practical application of those principles or theories. Six Simple Machines dives into how physics has an impact on our technological world. These six simple machines are the foundation for all mechanical components in existence and each one uses different methods to change its mechanical advantage

Essential Questions:

- What methods of designing can we use to develop solutions?
- How do we evaluate the impact of modifying a system to improve performance?
- How can we use tools, machines, and systems to improve our needs and wants?
- How can we use Math equations to calculate Mechanical Advantage?
- How can we use Simple Machines to improve our technological world?

Competency	Vocabulary	Strategy	Resource
<ul style="list-style-type: none"> • SWBAT • Understand and explain the Six Simple Machines • Use key physics terms to identify parts of and functions of Simple Machines • Differentiate between various Simple Machines and their uses • Understand how to adjust the Mechanical Advantage of various simple machines • Understand the working definition of Mechanical Advantage • Identify the function of Simple machines 	Technology Six Simple Machines Mechanical Advantage Force Work Lever Pulley Wheel and Axle Screw Inclined Plane Wedge Fulcrum Speed Distance $Work = Force \times Distance$ Trebuchet Archimedes Screw	-Hands on demonstrative of Simple Machines -Allow students to experiment adjusting - Mechanical advantage of simple machines -Calculate the Mechanical Advantage of Simple Machines -Understand the difference between Force and Work - Provide examples of how Simple Machines apply to the Technological World Understand the safe and appropriate use of hand tools	Computers/Internet Smartboard Trebuchet Model Catapult Model Pulley Model Lever/Fulcrum Screw Demonstration Archimedes Screw Video Robotic Car for Inclined Plane demonstration Digital Pull Scale Inclined Plane and Weighted Car Blade, Wedge, Hammer Wheel and Axle Models

<ul style="list-style-type: none"> • Identify different forces such as Compression, Tension, and Shearing • Explain how simple machines can be integrated into renewable energy methods • Explains strengths and weaknesses of Simple Machines • Use the equation for Work to calculate the predicted force or distance of a Simple Machine in action • Test Simple Machines and measure their Mechanical Advantage 	<p>Archimedes' Claw Wind Turbine Renewable Energy</p>	<ul style="list-style-type: none"> - Understand the use of measurement devices List and describe qualities of materials - Properly label parts of Simple Machines - Use the equation for Work to calculate Force and Distance - Discuss historical figures and innovators impact on Simple Machines and their use - Explain how leverage works on a Trebuchet 	
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