



Course Outcome Summary

Course Information: **Agriculture and Technology Education - 6**

Description: In this course, students will learn about pneumatic (air) and water powered rockets build the correctly dimensioned paper platform and wood truss bridges that can hold hundreds of pounds and construct an aluminum barge that will ‘ship’ the pennies. As time permits, students choose from one of several projects like PVC Bluebird Houses (looks like a Paper Birch tree), Jacob’s Ladder toys, Roman Arch Challenge, or other basic woods/plastics projects to learn proper and safe use of a variety of hand, electric, pneumatic powered tools and equipment, robots and programming with the iPad app controlled SPHERO gyroscope bots and LEGO NXT robots.

Instruction Level: 6

Total Credits: .5

Prerequisites: None

Textbooks: None

Course Standards:

Common Career and Technical Core

1. Communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
2. Identify and apply employability skills.
3. Assess benefits and challenges of working in diverse settings and on diverse teams.
4. Apply leadership skills in real-world, family, community and business and industry applications.

ACT Math Standards

1. Perform one-operation computation with whole numbers and decimals
2. Recognize equivalent fractions and fractions in lowest terms
3. Recognize one-digit factors of a number
4. Order fractions
5. Find and use the least common multiple

Next Generation Science Standards

1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Technology Education Standards

1. Demonstrate use of the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.
2. Add, subtract, multiply and divide in the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.
3. Demonstrate proficiency in the use of simple hand tools such as hammers, screwdrivers, handsaws, planes, sandpaper, nail sets, tin shears, framing squares, utility knives, chalk lines, etc.
4. Demonstrate the safe and proper use of power tools.
5. Demonstrate proficiency in the proper care of all tools used in a class or lab.
6. Students will describe how resources are the things needed to complete a task {e.g., tools, machines, materials, information, energy, people, capital and time}.
7. Use appropriate tools to measure and layout a piece of material {e.g., length, width, thickness, angles, circles, arcs and volume} within tolerances.
8. Explain the relationship between the inputs and outputs of linear, rotary and compound motion mechanisms in terms of direction, distance and force.
9. Define mechanical concepts such as force, work, power, torque, velocity, mechanical advantage and gear ratio.
10. Identify and describe basic types of structures {i.e., mass, bearing wall, framed} as they relate to their function.
11. Use scientific inquiry to test, collect data and make conclusions about the performance of different materials and their application in the making of structures {i.e., tensile, compression, sheer testing}.
12. Design is a creative planning process that leads to useful products and systems.
13. Requirements for a design are made up of criteria and constraints.
14. Modeling, testing, evaluating and modifying are used to transform ideas into practical solutions.
15. Make a product or system and document the solution.
16. Use computers, calculators and technology in various applications.
17. Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
18. Examine how power systems are used to drive and provide propulsion to other technological products and systems.
19. Describe Problem solving as the application of math and science to solve a problem through invention or innovation.
20. Use STEM - Science, Technology, Engineering and Math to solve problems related to the transportation field.

Units

1. **Unit 1 – People Matter – Character, Leadership, and Personal Development**
2. **Unit 2 – STEM applications - Aeronautics with Rocketry**
3. **Unit 3 - STEM Applications – Structures & Design (Paper Platform & Model Truss)**
4. **Unit 4 - Technical Skills & Applications- Jacob’s Ladder & PVC Bluebird House**

Unit Outlines

1. Character and Leadership – “People Matter” and Personal Development

Standards:

- Communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
- Identify and apply employability skills.
- Assess benefits and challenges of working in diverse settings and on diverse teams.
- Apply leadership skills in real-world, family, community and business and industry applications.

Essential Question:

Students will be able to answer the question(s):

- What are some ways I/we can practice the Spartan Way?
- How can I become a better person, classmate or team member?
- Why are “People Matter” skills so important?

Essential Knowledge:

- Ongoing key concepts/vocabulary/ideas that students strive to implement throughout life.
- Ongoing character education, diligence, responsibility, honesty, work ethics, reinforcement of the Sparta School District Initiative- “The Spartan Way- Respectful, Responsible, Safe”

2. STEM applications - Aeronautics with Rocketry

Standards:

- Communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
- Identify and apply employability skills.
- Assess benefits and challenges of working in diverse settings and on diverse teams.
- Apply leadership skills in real-world, family, community and business and industry applications.
- Perform one-operation computation with whole numbers and decimals
- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- Demonstrate proficiency in the use of simple hand tools such as hammers, screwdrivers, handsaws, planes, sandpaper, nail sets, tin shears, framing squares, utility knives, chalk lines, etc.
- Demonstrate the safe and proper use of power tools.
- Demonstrate proficiency in the proper care of all tools used in a class or lab.
- Describe how resources are the things needed to complete a task {e.g., tools, machines, materials, information, energy, people, capital and time}.
- Use appropriate tools to measure and layout a piece of material {e.g., length, width, thickness, angles, circles, arcs and volume} within tolerances.
- Explain the relationship between the inputs and outputs of linear, rotary and compound motion mechanisms in terms of direction, distance and force.
- Define mechanical concepts such as force, work, power, torque, velocity, mechanical advantage and gear ratio.
- Use scientific inquiry to test, collect data and make conclusions about the performance of different materials and their application in the making of structures {i.e., tensile, compression, sheer testing}.
- Design is a creative planning process that leads to useful products & systems.
- Understand requirements for a design are made up of criteria and constraints.
- Modeling, testing, evaluating and modifying are used to transform ideas into practical solutions.
- Make a product or system and document the solution.
- Use computers, calculators and technology in various applications.
- Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
- Examine how power systems are used to drive and provide propulsion to other technological products and systems.
- Describe Problem solving as the application of math and science to solve a problem through invention or innovation.
- Use STEM - Science, Technology, Engineering and Math to solve problems related to the transportation field.

Essential Question:

- What are the basic principles of the science of flight?
- How does the engineering process benefit from trial and error, measurement and documentation, inquiry and the scientific method?

Essential Knowledge:

- Science Principles in Aeronautics:

- A. Mass, Center of Gravity, Forces, Work, Drag,
- B. Mass and Distance Measurement
- Rocketry
 - A. Measurement and Data Collection Methods
 - B. Water Rocket Design, Materials, Construction
 - C. Water Rocket Launch and Data Collection
 - D. Rocket Analysis, Evaluation, Improvement and Re-Launch

3. STEM Applications – Structures & Design

Standards:

- Communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
- Assess benefits and challenges of working in diverse settings and on diverse teams.
- Apply leadership skills in real-world, family, community and business and industry applications.
- Perform one-operation computation with whole numbers and decimals.
- Recognize equivalent fractions and fractions in lowest terms.
- Recognize one-digit factors of a number.
- Order fractions
- Find and use the least common multiple
- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- Demonstrate use of the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.
- Add, subtract, multiply and divide in the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.
- Demonstrate proficiency in the proper care of all tools used in a class or lab.
- Students will describe how resources are the things needed to complete a task {e.g., tools, machines, materials, information, energy, people, capital and time}.
- Use appropriate tools to measure and layout a piece of material {e.g., length, width, thickness, angles, circles, arcs and volume} within tolerances.
- Use scientific inquiry to test, collect data and make conclusions about the performance of different materials and their application in the making of structures {i.e., tensile, compression, sheer testing}.
- Design is a creative planning process that leads to useful products and systems.
- Requirements for a design are made up of criteria and constraints.

- Modeling, testing, evaluating and modifying are used to transform ideas into practical solutions.
- Make a product or system and document the solution.
- Use computers, calculators and technology in various applications.
- Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
- Describe Problem solving as the application of math and science to solve a problem through invention or innovation.

Essential Question:

Students will be able to answer the question(s):

- What geometric shapes are used in creating strong structures for both construction and manufacturing applications?

How does my construction techniques and quality impact the strength of the product?

Essential Knowledge:

Some of the key concepts students will be introduced to are:

- A variety of forces applied to man-made items
- How to engineer and design man-made items to accommodate these forces
- Applying geometry in engineering and design
- Using fractions, adding, subtracting, measuring
- Conducting engineering method testing and data collection

4. Technical Skills and Applications

Standards:

- Communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.
- Identify and apply employability skills.
- Assess benefits and challenges of working in diverse settings and on diverse teams.
- Apply leadership skills in real-world, family, community and business and industry applications.
- Perform one-operation computation with whole numbers and decimals
- Recognize equivalent fractions and fractions in lowest terms
- Recognize one-digit factors of a number
- Order fractions
- Demonstrate use of the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.
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- Demonstrate the safe and proper use of power tools.
- Demonstrate proficiency in the proper care of all tools used in a class or lab.

- Students will describe how resources are the things needed to complete a task {e.g., tools, machines, materials, information, energy, people, capital and time}.
- Use appropriate tools to measure and layout a piece of material {e.g., length, width, thickness, angles, circles, arcs and volume} within tolerances.

Essential Question:

Students will be able to answer the question(s):

- How do we design and build a shelter that meets animal's needs in their natural environment?
- What construction knowledge and skills will I need to build this animal shelter?
- What determines if my structure is built to quality standards?

Essential Knowledge:

What are the key concepts/vocabulary/ideas that students will have mastery of by the completion of the unit?

- A variety of safe hand and power tools use and applications
- Using fractions, adding, subtracting, measuring and layout
- How to cut out and prepare component parts from raw materials
- How to assemble and fasten component parts to make a final product
- Understand the purpose of approved finishing practices, materials and coatings

