Week	Marking Period 1
1	Course Introduction / Project Discussions / Technology Shop Safety
2	Introduction to Measuring and Hand Tool Usage & Safety
3	Introduction to Problem-Solving and Critical Thinking
4	Introduce Air-Powered Race Car
5	Race car design, specifications, racing format, compressed air, and Laws of Motion
6	Air car design, fabrication shaping, and weighing
7	Air car final assembly, evaluation, and racing
8	Introduce Lego Mindstorms Robotic Problem
9	Design and construction of Bunyan Bot
10	Testing and evaluation of Bunyan Bot
Week	Marking Period 2
11	Lesson 1 - Introduction to Design - Activity 1.1: Foot Orthosis Instant Design Challenge
12	Activity 1.2: A Picture Is Worth a Thousand Words
13	Activity 1.3: How Big Was That Fish?
14	Project 1.4: Investigate the Inside
15	Lesson 2 - Modeling and Statistical Analysis - Activity 2.1: Building Blocks
16	Activity 2.2: Taking Modeling to Another Dimension
17	Activity 2.3: Puzzle Cube Statistical Analysis
18	Lesson 3 - Design Challenge - Activity 3.1: Let's Simulate to Elucidate
19	Activity 3.2: Therapeutic Toy Design

DEPARTMENT: Technology COURSE: 6th Grade Applied Technology

Time Frame	September - Week 1

Topic

Course Introduction / Project Discussion/ Technology Shop Safety

Essential Questions

- What are the teacher expectations for shop safety?
- What are the student requirements for shop safety?
- What facilities are available as resources?
- What are the emergency procedures for the technology shop

Enduring Understandings

- Student Safety
- Student responsibility
- Teacher responsibility

Alignment to NJSLS

8.2.8.A.5 - Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

Key Concepts and Skills

- Technology shop safety
- Technology shop classroom procedures

Learning Activities

- Facility tour and explanation of power tools
- Q&A period for students

Assessments

- General shop safety test
- General hand tool safety test

21st Century Skills

Creativity		Critical Thinking	X	Collaboration	X	Communication	
Life & Career Skills	X	Information Technology		Media Literacy			

DEPARTMENT: Technology COURSE: 6th Grade Applied Technology

Interdisciplinary Connections

- Test taking strategies

Technology Integration

Time Frame	Week 2

Topic

Measuring Systems

Essential Questions

- What two measuring systems are used worldwide?
- What are the standard units of measure?
- What are the metric units of measure?
- What is the importance of measuring accuracy?
- What is the history of developed measuring systems?

Enduring Understandings

- Identifying the two distinct measuring systems
- Understanding units of measure

Alignment to NJSLS

8.2.8.A.2 - Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

Key Concepts and Skills

- Measuring accurately to the 1/16th of an inch
- Identifying standard units of measure
- Identifying lineal measuring

Learning Activities

- Making personal measuring device
- Dividing a one inch segment into sixteen parts
- Identifying inches ½'s, ¼'s, ⅛'s, and 1/16th on a ruler

Assessments

- Measuring with a personal instrument
- Reviewing fractions and division skills
- Measuring Tests 1, 2, and 3

21st Century Skills

Creativity	X	Critical Thinking		Collaboration		Communication	
Life & Career Skills	X	Information Technology		Media Literacy			

Interdisciplinary Connections

- Math - Fractions and division

Technology Integration

- Measuring Accuracy

Time Frame	Week 3

Topic

Problem Solving / Critical Thinking

Essential Questions

- What skills are necessary for solving technology problems?
- What is elementary engineering?
- What is the design process?

Enduring Understandings

- The design/engineering process is essential in problem solving

Alignment to NJSLS

8.2.8.C.4 - Identify the steps in the design process that would be used to solve a designated problem.

Key Concepts and Skills

- Identify the seven steps in the problem solving process
- Identify the continuity of the problem solving steps

- Identify the testing and fixing steps as the trial and error method in engineering

Learning Activities

- Paper Towel Activity- Assemble and build the tallest freestanding paper towel tower possible from four sheets of paper and twenty inches of tape

Assessments

- Measuring completed towers with a standard measuring tape while standing

21st Century Skills

Creativity	X	Critical Thinking	X	Collaboration	X	Communication	X
Life & Career Skills		Information Technology		Media Literacy			

Interdisciplinary Connections

- Measuring accuracy and estimating

Technology Integration

- Building technology - Foundations and free standing structures

Time Frame	September - Week 4

Topic

Introduction to Air-Powered Car Race / Hand Tool Review

Essential Questions

- What hand tools are used to layout, cut, and shape an air powered race car?
- What hand tool skills are necessary to shape a race car into its final design shape

Enduring Understandings

- Hand tools can be used in the problem solving process

Alignment to NJSLS

8.2.8.D.3 - Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

Key Concepts and Skills

- Understanding mass as a factor in determining car speed
- Weighing the unfinished car as the design processes
- Changing and adjusting finished car design shapes as time permits

Learning Activities

- Sketching two different full size drawings as a design solution
- Cut drill and shape a finished race car body with a low mass
- Assemble the various race car parts for racing competition
- Paint, decorate or wood burn the final race car design

Assessments

- Teacher made grading rubric
- Side by side racing competition

21st Century Skills

Creativity	X	Critical Thinking	X	Collaboration	X	Communication	X
Life & Career Skills		Information Technology	X	Media Literacy			

Interdisciplinary Connections

- Math- Symmetry as part of the finished design

Technology Integration

- Video of side by side racing competition in slow motion

Time Frame	September - Week 5-7

Topic

Air Powered Race Car

Essential Questions

- What are the key factors that affect the performance of an air powered race car?
- What skills are necessary to fabricate a finished race car design?

Enduring Understandings

- The design process is a key factor in a successful finished race car

Alignment to NJSLS

8.2.8.D.3 - Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

Key Concepts and Skills

- Reviewing and discussing the race car specifications is essential for successful project completion
- Using appropriate hand tools in car fabrication
- Understanding compressed air
- Define friction
- Define aerodynamics

Learning Activities

- Sketching two different full size drawings of race car designs
- Cut out and shape a wedge shaped car blank
- Assemble all race hardware and wheels and axles
- Test and analyze the completed

Assessments

- Evaluate the finished project from a teacher made grading rubric
- Side by side racing competition

21st Century Skills

Creativity	X	Critical Thinking	X	Collaboration		Communication	X
Life & Career Skills		Information Technology	X	Media Literacy			

Interdisciplinary Connections

- Math - Symmetry, aerodynamics, weight

Technology Integration

- Student produced video of side by side racing competition in slow motion using student devices.

Time Frame	September - Week 8-10

Topic

Lego Mindstorms: Intro to Mobile Robotics

Essential Questions

- What is robotics?
- What are the functions robots can perform?
- What machines and mechanisms are necessary for assembling robots?

Enduring Understandings

- The design/engineering process is essential in understanding how robots perform

Alignment to NJSLS

8.2.8.D.2 - Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
8.2.8.D.3 - Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

Key Concepts and Skills

- Simple computer programming - Computer Science

Learning Activities

- Assembling a motorized functioning robot
- Programming a lego robot for a teacher developed movement problem “The Bunyan Bot”

Assessments

- Teacher made grading rubric for the completed Bunyan Bot Task

21st Century Skills

Creativity	X	Critical Thinking	X	Collaboration	X	Communication	X
Life & Career Skills		Information Technology	X	Media Literacy			

Interdisciplinary Connections

- Computer Science - programming

Technology Integration

- Computer programming of motors and mechanisms

Time Frame	**4 Weeks - Weeks 11-14**

Topic

Lesson 1 - Introduction to Design

Essential Questions

- How is a design process used to effectively develop a design solution that solves a problem or addresses a design opportunity?
- What role do team norms play in making a collaborative team more successful
- Why is accurate measurement, precise dimensioning, and thorough documenting necessary for both mechanical dissection and creative problem solving?

Enduring Understandings

- Collaboration and communication are important for a multi-disciplinary team.
- Sketches are used to document and communicate design ideas with accuracy.
- Accurate measurement, precise dimensioning, and thorough documentation is necessary for both mechanical dissection and creative problem solving.

Alignment to NJSLS

- 8.2.8.A.1 - Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs).
- 8.2.8.A.2 - Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
- 8.2.8.A.3 - Investigate a malfunction in any part of a system and identify its impacts.
- 8.2.8.A.4 - Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.
- 8.2.8.A.5 - Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
- 8.2.8.B.1 - Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers.
- 8.2.8.B.2 - Identify the desired and undesired consequences from the use of a product or system.
- 8.2.8.B.3 - Research and analyze the ethical issues of a product or system on the

environment and report findings for review by peers and /or experts.

- 8.2.8.B.4 - Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
- 8.2.8.B.5 - Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.
- 8.2.8.B.6 - Compare and contrast the different types of intellectual property including copyrights, patents and trademarks.
- 8.2.8.B.7 - Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product.

Key Concepts and Skills

- Describe and/or analyze moments within a problem-solving process where persistence, iteration, and the positive role of failure played an important role in gaining understanding about a problem or unexpected observation.
- Apply an iterative process to solve a problem or create an opportunity that can be justified.
- Create a physical model or prototype.
- Collaborate and communicate effectively for specific purposes and settings on a diverse and multi-disciplinary team.
- Document a process according to professional standards.
- Describe the role, connections between disciplines, and impact of engineering, biomedical science, and computer science on society.
- Sketch and/or interpret perspective, isometric, and multiview drawings with adequate attention to standards and critical annotations.
- Measure and present values appropriate to standards of accuracy and precision.
- Translate and interoperate between 2D and 3D design representations.
- Analyze and describe design functionality by observation of an artifact.

Learning Activities

- Foot Orthosis Design Activity
- Sketching
- Investigate the Inside Project

Assessments

- Ongoing daily assessments
- Reflection Table
- Measuring and Unit Conversions Readiness Assessments
- Investigate the Inside Project

21st Century Skills

✓	Creativity	✓	Critical Thinking	✓	Communication	✓	Collaboration

✓	Life & Career Skills	✓	Information Literacy		Media Literacy

Interdisciplinary Connections

- English Language Arts
- Mathematics
- Science
- Social Studies

Technology Integration

- NONE

Time Frame	3 Weeks - Weeks 15-17

Topic

Lesson 2 - Modeling and Statistical Analysis

Essential Questions

- Why is it important for an engineer to be aware of the criteria and constraints when designing a project?
- How can mathematical modeling help designer understand a design?
- How can computational thinking be applied when developing an engineering solution?
- How is design testing data used to improve design solutions?

Enduring Understandings

- The design process is used to effectively develop a design solution that solves a problem or addresses a design opportunity
- An engineer must be aware of the criteria and constraints when designing a project.
- Documentation play a critical role in each step of the design process.

Alignment to NJSLS

- 8.2.8.C.1 - Explain how different teams/groups can contribute to the overall design of a product.
- 8.2.8.C.2 - Explain the need for optimization in a design process.
- 8.2.8.C.3 - Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. The application of engineering design.
- 8.2.8.C.4 - Identify the steps in the design process that would be used to solve a designated problem.
- 8.2.8.C.5 - Explain the interdependence of a subsystem that operates as part of a system.
- 8.2.8.C.5.a - Create a technical sketch of a product with materials and measurements labeled.
- 8.2.8.C.6 - Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.
- 8.2.8.C.7 - Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.

- 8.2.8.C.8 - Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

Key Concepts and Skills

- Recognize that models are used to make predictions and/or learn about a phenomenon, situation, or design.
- Apply an iterative process to solve a problem or create an opportunity that can be justified.
- Apply computational thinking to solve problems.
- Apply a mathematical model to represent an authentic situation.
- Construct a computer-generated solid model.
- Measure and present values appropriate to standards of accuracy and precision.
- Translate and interoperate between 2D and 3D design representations.
- Sketch and/or interpret perspective, isometric, and multiview drawings with adequate attention to standards and critical annotations.
- Select and apply tools and technology appropriately to develop solutions, create artifacts, and/or conduct investigations to engineering, biomedical science, and computational problems/needs.
- Collaborate and communicate effectively for specific purposes and settings on a diverse and multi-disciplinary team.
- Describe and/or analyze moments within a process where persistence, iteration, and the positive aspect of failure played an important role in gaining understanding about a problem or unexpected observation.
- Analyze problems or artifacts when developing solutions.
- Construct and communicate informed decisions supported by evidence.

Learning Activities

- Building Blocks
- Taking Modeling to Another Dimension

Assessments

- Ongoing daily assessments
- Puzzle Cube

21st Century Skills

✓	Creativity	✓	Critical Thinking	✓	Communication	✓	Collaboration
✓	Life & Career Skills	✓	Information Literacy		Media Literacy		

Interdisciplinary Connections

- English Language Arts
- Mathematics

- Science
- Social Studies

Technology Integration

- GeoGebra
- SketchUp Pro 2017

Time Frame	2 Weeks - Weeks 18-19

Topic

Lesson 3 - Design Challenge

Essential Questions

- How do computational solutions improve our society?
- How are modeling and simulation used in various professions?
- Why are teams of people more successful than an individual when solving problems?
- Why is brainstorming, research, and testing important when creating, modifying, or improving a design solution?

Enduring Understandings

- Using the design process, allows you to create all the necessary documentation in each of the steps of the design process.
- Creating a design solution, testing the solution, and analyzing the test data allows the evaluation of solution and, if time permits, revisit the design to improve it.

Alignment to NJSLS

- 8.2.8.D.1 - Design and create a product that addresses a real world problem using a design process under specific constraints.
- 8.2.8.D.2 - Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
- 8.2.8.D.3 - Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
- 8.2.8.D.4 - Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.
- 8.2.8.D.5 - Explain the impact of resource selection and the production process in the development of a common or technological product or system.
- 8.2.8.D.6 - Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment.

Key Concepts and Skills

- Apply computational thinking to solve problems.
- Organize, process, and analyze data to understand a real-world situation.
- Use computer models and simulations to study an authentic system.
- Select and apply tools and technology appropriately to develop solutions, create artifacts,

and/or conduct investigations to engineering, biomedical science, and computational problems/needs.

- Describe the role, connections between disciplines, and impact of engineering, biomedical science, and computer science on society.
- Describe and/or analyze moments within a process where persistence, iteration, and the positive aspect of failure played an important role in gaining understanding about a problem or unexpected observation.
- Demonstrate creativity and courage to take risks in proposing designs and describe the value of unique attributes or approaches.
- Analyze problems or artifacts when developing solutions.
- Recognize that models are used to make predictions and/or learn about a phenomenon, situation, or design.
- Identify ethical considerations that must be considered within design requirements, an experimental setup, and/or a process.
- Apply an iterative process to solve a problem or create an opportunity that can be justified.
- Analyze and describe design functionality by observation of an artifact.
- Construct a computer-generated solid model.
- Create a physical model or prototype.
- Measure and present values appropriate to standards of accuracy and precision.
- Translate and interoperate between 2D and 3D design representations.
- Sketch and/or interpret perspective, isometric, and multiview drawings with adequate attention to standards and critical annotations.
- Collaborate and communicate effectively for specific purposes and settings on a diverse and multi-disciplinary team.
- Document a process according to professional standards.
- Construct and communicate informed decisions supported by evidence.
- Demonstrate the ability to manage multiple resources throughout a project.
- Justify decisions and provide rationales when making trade-offs between resources.

Learning Activities

- Let's Simulate to Elucidate Activity
- Decision Matrix
- Design Brief

Assessments

- Ongoing daily assessments
- Therapeutic Toy Design Project

21st Century Skills

✓	Creativity	✓	Critical Thinking	✓	Communication	✓	Collaboration

✓	Life & Career Skills	✓	Information Literacy		Media Literacy

Interdisciplinary Connections

- English Language Arts
- Mathematics
- Science
- Technology

Technology Integration

- OpenSim
- GeoGebra
- SketchUp Pro 2017