Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

Course Title:	Introduction to Technology and Engineering
Grade Level(s):	6th grade

Duration:	*Full Year:*		*Semester:*		*Marking Period:*	X
Course Description:	*Introduction to Technology and Engineering 6th Grade* is a 7-week exploratory course offered in the Middle School during the sixth grade. This course is designed to develop students' problem solving, technological and engineering skills. Upon completion of the course, the student will be prepared to take the next step in design, construction, using both hand and power tools, as well Computer aided design programs. Students learn to work in cooperative groups, apply the design loop to problems and construct projects and design portfolios. Students learn the basics of the technological processes and engineering principals through lab activities which require students to collect and organize data, construct prototypes and models using hand and power tools; as well as develop and present documentation. The goal of the course is to make students aware of the technology and engineering processes used in creating our modern world.					
Grading Procedures:						
Primary Resources:						

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st Century Skills for College and Career Readiness in a global society

Designed by:	Patrick Goliszewski
Under the Direction of:	Malika Moore

Written: 8/2023

Revised:

BOE Approval:

Unit Title: 1 – Introduction and Overview

Unit Description: Unit 1 provides an overview of: the course, the grading procedure, and the classroom rules. Emergency procedures in the classroom will be reviewed. The cycle project which will tie all the segments of the unit together. Emphasis is placed on good classroom citizenship, listening skills and how the information and skills presented, as part of this course, will possibly shape the students career path choice

Unit Duration: 2 days

Desired Results

Standard(s): 8.2.8.ED.1-7, 8.2.8.ITH.1-5, 8.2.8.NT.1-4, 8.2.8.ETW.1-4, 8.2.8.EC1-2, 9.2.12.CAP.2-6, 9.3.12.AC.1-7, 9.3.12.AC-CST.1-7 & 9, 9.3.12.AC-DES.1-8, 9.3.12.AR.1,2 &5, 9.3.12.AR-PRF.1, 9.3.12.AR-TEL.3, 9.3.MN.1, 9.3.MN.4, 9.3.MN-HSE.1, 9.3.ST.1, 3-6, 9.3.ST-ET.1-6, 9.3.ST-SM.1,2, 9.4.12.CI.1-3, 9.4.12.CT.1-2

Indicators: Students will be able to appropriately react to classroom emergencies and identify differences in engineering career fields

Understandings:
Students will understand that…
1. Technology is the application of knowledge and use of resources to solve problems.
2. In an emergency situation following established procedures is the appropriate behavior for the situation.
3. Learning and innovation skills are necessary for an increasingly complex life and work environments in the 21st century.

Essential Questions:
1.What outcomes should a student expect from this course?
2. Why is it important to understand emergency procedures?
3. How will the content from this course help me as a lifelong learner?
4. What is technology and how has it changed society?

Assessment Evidence

Performance Tasks:
1. Overarching goals and Grades
2. Expected behavior and conduct.
3. Define Technology

Other Evidence:
Teacher observations
Informal checks for understanding
Independent reading/student conferences
Independent writing/student conferences
Class discussions
Collaboration with others
Group work
Classwork
Teacher-created tests and quizzes
Teacher-created multimedia project

Benchmarks:
Career Assessment
Emergency Safety Review

Learning Plan

Learning Activities:
1. Goals and Grades
2. Emergency procedures
3. What is Technology Activities
4. Lab tour scavenger hunt

Resources:
1.Handouts
2.Teacher made web resources
3. Devices and internet

Unit Modifications for Special Population Students	
Advanced Learners	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. • Avoid comparisons to other students
Struggling Learners	• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Chunk Assignments • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. • Prepare materials at varying levels of ability
English Language Learners	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. • Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here.

	Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators: Students will be making connections to Math (measuring, fractions, decimal conversions), Health (safety), Digital Literacy (computer software) and ELA (design loop paperwork)

Integration of 21st Century Skills

Indicators:

1. Critical thinking
2. Communication skills
3. Creativity
4. Problem solving
5. Perseverance
6. Collaboration
7. Information literacy
8. Technology skills and digital literacy
9. Media literacy
10. Global awareness
11. Self-direction
12. Social skills
13. Literacy skills
14. Civic literacy
15. Social responsibility
16. Innovation skills
17. Thinking skills

Unit Title: 2 Safety and Measurement

Unit Description:
This unit provides an overview of: Safety in the classroom, at home and in the workplace, The use of measuring tools and forms of measurement, Introduction to hand tools and power tools

Unit Duration: 10 days

Desired Results

Standard(s): 8.2.8.ED.1-7, 8.2.8.ITH.1-5, 8.2.8.NT.1-4, 8.2.8.ETW.1-4, 8.2.8.EC1-2, 9.2.12.CAP.2-6, 9.3.12.AC.1-7, 9.3.12.AC-CST.1-7 & 9, 9.3.12.AC-DES.1-8, 9.3.12.AR.1,2 &5, 9.3.12.AR-PRF.1, 9.3.12.AR-TEL.3, 9.3.MN.1, 9.3.MN.4, 9.3.MN-HSE.1, 9.3.ST.1, 3-6, 9.3.ST-ET.1-6, 9.3.ST-SM.1,2, 9.4.12.CI.1-3, 9.4.12.CT.1-2

Indicators: Students will pass the safety Quiz with a 100% and be able to accurately measure to 1/16 of an inch

Understandings:
Students will understand that…

They are responsible for their own safety and the safety of those around them while they are using tools in the classroom, at home and in the workplace.

Measuring tools assist with the design and material processing.

Hand and power tools assist with manufacturing, construction and modification.

Essential Questions:

What situations can be dangerous and how do I minimize the risk of injury?

How do you create objects to uniform or specified sizes?

What can be used to modify materials to meet specific needs?

Assessment Evidence

Performance Tasks:
Students will use proper protective equipment and conduct themselves in a safe and appropriate manner in the classroom and the lab.
Use a ruler to measure.
Draw various straight edges and angles.
Reduce to the nearest 1/16th of an inch.
Utilize hand tools in order to manufacture the cycle project(s).
Utilize basic computer programs to design the cycle project(s).

Other Evidence:
Teacher observations
Informal checks for understanding
Independent reading/student conferences
Independent writing/student conferences
Class discussions
Collaboration with others
Group work
Classwork
Teacher-created tests and quizzes
Teacher-created multimedia project

Benchmarks:
Students will appropriately apply measuring and safety practices to complete a tool skills project.

Learning Plan

Learning Activities:

Demonstration
1.Safety
2.First aid procedures
3.Measurement Techniques
4.Computer sketches
5.Hand tools
6.Power tools
Learning Activity Examples
1. Classroom Measuring
2.Tool Skills Projects

Resources:

Middle school level Safety resources
1. Safety Packet
2. Review Worksheet
3. Safety Quiz
(Paper or Schoology or other web based platform) Various Measuring devices
1. Rulers (metric and standard)
2. Measuring tapes
3. Tape measures
Assorted hand and power tools as per laboratory and individual project
Wood and materials as available or required

Unit Modifications for Special Population Students	
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Struggling Learners	• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Chunk Assignments • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. Prepare materials at varying levels of ability
English Language Learners	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that

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Interdisciplinary Connections

Indicators:
Students will be making connections to Math (measuring, fractions, decimal conversions), Health (safety), Digital Literacy (computer software) and ELA (design loop paperwork)

Integration of 21st Century Skills

Indicators:

1. Critical thinking
2. Communication skills
3. Creativity
4. Problem solving
5. Perseverance
6. Collaboration
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8. Technology skills and digital literacy
9. Media literacy
10. Global awareness
11. Self-direction
12. Social skills
13. Literacy skills
14. Civic literacy
15. Social responsibility
16. Innovation skills
17. Thinking skills

Unit Title: 3 Design, The Design Loop and Problem Solving

Unit Description:
This unit introduces the concept of Design in its many forms (i.e., artistic, industrial and engineering) and the Design Process / Problem Solving. Problem solving will be explained through the steps of the design loop. Students will use the elements of design to create an original design of a product and Students will use the design loop to design / engineer a solution to a real-world problem. An emphasis will be placed on the use of CAD software to create design ideas.

Unit Duration: 10 days

Desired Results

Standard(s): 8.2.8.ED.1-7, 8.2.8.ITH.1-5, 8.2.8.NT.1-4, 8.2.8.ETW.1-4, 8.2.8.EC1-2, 9.2.12.CAP.2-6, 9.3.12.AC.1-7, 9.3.12.AC-CST.1-7 & 9, 9.3.12.AC-DES.1-8, 9.3.12.AR.1,2 &5, 9.3.12.AR-PRF.1, 9.3.12.AR-TEL.3, 9.3.MN.1, 9.3.MN.4, 9.3.MN-HSE.1, 9.3.ST.1, 3-6, 9.3.ST-ET.1-6, 9.3.ST-SM.1,2, 9.4.12.CI.1-3, 9.4.12.CT.1-2

Indicators: Students will be able to follow the 7-step design loop to create an original solution to a real-world problem

Understandings:
Students will understand that…
The design loop is a guideline/ systematic approach for problem solving and can be used in any circumstance

There are 4 elements of design and 7 principles of design

CAD software is more accurate and easier to manipulate variables in than traditional paper and pencil drawings

Essential Questions:
1. What are the seven steps to the design loop/ problem solving model

2. What are the 4 elements of design and 7 principles of design?

3. How can a computer create a drawing quicker and more accurate than traditional drafting?

4. How does following the design loop aid the design process?

Assessment Evidence

Performance Tasks:

Learn the seven sequential steps to the design loop to problem solving and use skills such as research, sketching, 3D modeling, and testing to solve problems

Identify how a product's use of line, shape & form, texture, and color was used to create an appealing design

Identify the use of the elements; balance, proportion, harmony, contrast, pattern, movement and rhythm in an existing designed work

Use Computer Aided Design (CAD) software to create drawings, 3D models or renderings of an original design

Other Evidence:

Teacher observations
Informal checks for understanding
Independent reading/student conferences
Independent writing/student conferences
Class discussions
Collaboration with others
Group work
Classwork
Teacher-created tests and quizzes
Teacher-created multimedia project

Benchmarks:
Students will document their design process following the 7 step problem solving model
Students will create an artifact to solve a real world problem

Learning Plan

Learning Activities:

1. Label the 7 steps to the design process by creating a poster or PowerPoint
2. Apply the elements and principles of design in all possible solutions for design briefs
3. Use CAD software to re-create and create drawings of simple objects
4. Use CAD to create a design of a room within a house or a floor plan of a single-story home
5. Use CAD and the design loop to create a solution to a real-world problem.

Resources:
Computers, projectors and presentation software
Examples of engineered products
Assorted materials- wood, foam core, cardboard, etc.
Various hand and power tools

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Integration of 21st Century Skills

Indicators:

1. Critical thinking
2. Communication skills
3. Creativity
4. Problem solving
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7. Information literacy
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Unit Title: 4 Technological Systems

Unit Description:
This unit will introduce students to what a system is and how technological systems such as mechanical systems (gears or hydraulics), home systems (heating and cooling) or electrical systems (mobile phones) interact to help control our world. Students will explore systems and create a prototype system to solve a real world problem.

Unit Duration:15 days

Desired Results

Standard(s): 8.2.8.ED.1-7, 8.2.8.ITH.1-5, 8.2.8.NT.1-4, 8.2.8.ETW.1-4, 8.2.8.EC1-2, 9.2.12.CAP.2-6, 9.3.12.AC.1-7, 9.3.12.AC-CST.1-7 & 9, 9.3.12.AC-DES.1-8, 9.3.12.AR.1,2 &5, 9.3.12.AR-PRF.1, 9.3.12.AR-TEL.3, 9.3.MN.1, 9.3.MN.4, 9.3.MN-HSE.1, 9.3.ST.1, 3-6, 9.3.ST-ET.1-6, 9.3.ST-SM.1,2, 9.4.12.CI.1-3, 9.4.12.CT.1-2

Indicators:
Students will be able to identify the difference between
- Mechanical
- Electrical
- Pneumatic
- Hydraulic

Students will be able to identify Inputs, Process and Outputs in systems
Students will understand mechanisms are built from the 6 simple machines

Understandings:
Students will understand that…

Machines are devices that make work easier/ increase abilities.

Systems are a series of interconnected parts that act together to control or perform a task on an object.

All systems have Inputs, Processes and Outputs

Systems use processes to modify the inputs to create a desired output.

Essential Questions:

What's the difference between a machine and a system?

What parts do systems have?

What is the point of a system?

Assessment Evidence

Performance Tasks:
Differentiate between natural and technological systems
Explain the difference between a machine and a system
List the 6 simple machines
Name the 7 resources of Technology
Identify the inputs, processes, controls and outputs by dissecting a technological system
Create a technological system to meet a need

Other Evidence:
Teacher observations
Informal checks for understanding
Independent reading/student conferences
Independent writing/student conferences
Class discussions
Collaboration with others
Group work
Classwork
Teacher-created tests and quizzes
Teacher-created multimedia project

Benchmarks:
Students will document their design process following the 7-step problem solving model
Students will create an artifact that incorporates an engineering system to solve a real world problem
Designed systems will function and include processes, inputs, and outputs

Learning Plan

Learning Activities:

Lecture
1. Machines/ Simple machines
1. Systems
2. Inputs
3. Processes / Controls
4. Outputs
5. Technological Systems

Demonstration
1. Leverage & Mechanical advantage
1. Simple Technological Systems
2. Creation of a system
3. Processes

Learning Activity
1. Dissection of objects looking at systems
2. Marble Machines
3. Lego Pneumatics
4. A World in Motion
5. Rube Goldberg Device

Resources:

Computers LCD projectors and presentation software
Examples of systems
-clock
-toaster
-toys
Lego Kits
A World in Motion kits
Assorted Materials
Tools

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16. Innovation skills
17. Thinking skills

Unit Title: 5 Principals of Engineering

Unit Description:
This Unit will Introduce students to the field of Engineering. Students will explore what engineers do, the types of things they design and the subspecialties of engineering. The class will focus on structural / civil engineering enabling the students to investigate structures and the forces that hold structures up and can cause them to fail.

Unit Duration: 15 days

Desired Results

Standard(s): 8.2.8.ED.1-7, 8.2.8.ITH.1-5, 8.2.8.NT.1-4, 8.2.8.ETW.1-4, 8.2.8.EC1-2, 9.2.12.CAP.2-6, 9.3.12.AC.1-7, 9.3.12.AC-CST.1-7 & 9, 9.3.12.AC-DES.1-8, 9.3.12.AR.1,2 &5, 9.3.12.AR-PRF.1, 9.3.12.AR-TEL.3, 9.3.MN.1, 9.3.MN.4, 9.3.MN-HSE.1, 9.3.ST.1, 3-6, 9.3.ST-ET.1-6, 9.3.ST-SM.1,2, 9.4.12.CI.1-3, 9.4.12.CT.1-2

Indicators:
Students will design a solution to a real-world problem on paper or using 3d design software
Students will construct their design in scale
Students will understand that structures are affected by forces and an imbalance of forces causes failure

Understandings:
Students will understand that…

1. Engineering is the use of mathematic and scientific principles to solve complex problems.
2. Engineers use their science and math backgrounds to figure out how to design solutions to these problems.
1. Engineers solve problems with their designs.
2. Different engineers design different things.
3. There are multiple types of engineers that design everything from software to ships
1. Structures are anything built from a building to a bridge that's designed for a specific purpose.
2. Structures rely on forces to hold them together and the interplay of these forces can give them strength or if not balanced can cause them to fail.

Essential Questions:
1. What is Engineering?
2. What do Engineers do?
1. What do engineers design?
2. Are there different types of Engineers?

1. What is a structure?
2. How do structures work?

Assessment Evidence

Performance Tasks:
Students will understand that…
Most man-made objects were engineered
Engineers specialize in one or more types of design
Factors such as materials, costs and safety are important in the engineering process.
Most structures are made of the same elements
Forces must balance for a structure to be able to work
The way that elements and forces interact causes structures to be stable or not
Triangles and trusses are stable and strong shapes.

Other Evidence:
Teacher observations
Informal checks for understanding
Independent reading/student conferences
Independent writing/student conferences
Class discussions
Collaboration with others
Group work
Classwork
Teacher-created tests and quizzes
Teacher-created multimedia project

Benchmarks:
Student structures will be able to support a specific static load
Students will be able to demonstrate knowledge of design process

Learning Plan

Learning Activities:
Discussions,

1. What is engineering?
2. What things are engineered?
3. Different engineering specialties
4. Basic structures
5. 5 forces
6. Trusses

Demonstrations

1. Engineered vs. not engineered
2. Structures
3. 5 forces (Tension, compression, torsion, shear and bending)
4. Trusses

Activities

1. Engineering scavenger hunt
2. 5 forces
3. Microstructures
4. Trusses
5. Bridges, beams, or towers

Resources:
Computers, projectors and presentation software
Examples of engineered products
Assorted materials- wood, foam core, cardboard, etc.
Various hand and power tools
Testing apparatus

Unit Modifications for Special Population Students	
Advanced Learners	• Provide ample opportunities for creative behavior. • Create assignments that call for original work, independent learning, critical thinking, problem solving, and experimentation. • Show appreciation for creative efforts • Respect unusual questions, ideas, and solutions. • Encourage students to test their ideas. • Provide opportunities and give credit for self-initiated learning. • Avoid overly detailed supervision and too much reliance on prescribed curricula. • Allow time for reflection. • Resist immediate and constant evaluation. Avoid comparisons to other students
Struggling Learners	• Assist students in getting organized. • Give short directions. • Use drill exercises. • Give prompt cues during student performance. • Let students with poor writing skills use a computer. • Chunk Assignments • Demonstrate skills and have students model them. • Give prompt feedback. • Use continuous assessment to mark students' daily progress. Prepare materials at varying levels of ability
English Language Learners	• Use a slow, but natural rate of speech; speak clearly; use shorter sentences; repeat concepts in several ways. • When possible, use pictures, photos, and charts. • Corrections should be limited and appropriate. Do not correct grammar or usage errors in front of the class. • Give honest praise and positive feedback through your voice tones and visual articulation whenever possible. • Encourage students to use language to communicate, allowing them to use their native language to ask/answer questions when they are unable to do so in English. • Integrate students' cultural background into class discussions. Use cooperative learning where students have opportunities to practice expressing ideas without risking language errors in front of the entire class
Learners with an IEP	Each special education student has an Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process, or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that

	can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	Refer to page four in the Parent and Educator Resource Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators: Students will be making connections to Math (measuring, fractions, decimal conversions), Health (safety), Digital Literacy (computer software) and ELA (design loop paperwork)

Integration of 21st Century Skills

Indicators:

1. Critical thinking
2. Communication skills
3. Creativity
4. Problem solving
5. Perseverance
6. Collaboration
7. Information literacy
8. Technology skills and digital literacy
9. Media literacy
10. Global awareness
11. Self-direction
12. Social skills
13. Literacy skills
14. Civic literacy
15. Social responsibility
16. Innovation skills
17. Thinking skills