



Science of Technology (PLTW)

Primary Career Cluster:	Science, Technology, Engineering, and Mathematics (STEM)
Consultant:	Deborah Knoll, (615) 532-2844, Deborah.Knoll@tn.gov
Course Code:	0891
Prerequisite(s):	None
Credit:	N/A
Grade Level:	8
Graduation Requirement:	N/A
Coursework and Sequence:	This is a course in the <i>Project Lead the Way (PLTW)</i> middle school sequence of coursework.
Necessary Equipment:	Visit www.pltw.org for more information.
Aligned Student Organization(s):	Technology Student Association (TSA): http://www.tntsa.org Tracy Whitehead, (615) 532-2804, Tracy.Whitehead@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://tn.gov/education/topic/work-based-learning
Available Student Industry Certifications:	N/A
Dual Credit or Dual Enrollment Opportunities:	N/A
Teacher Endorsement(s):	001, 007, 013, 014, 015, 016, 017, 018, (042 and 043), (042 and 044), (042 and 045), (042 and 046), (042 and 047), (042 and 077), (042 and 078), (042 and 079), (043 and 044), (043 and 045), (043 and 046), (043 and 047), (043 and 077), (043 and 078), (043 and 079), (044 and 045), (044 and 046), (044 and 047), (044 and 077), (044 and 078), (044 and 079), (045 and 046), (045 and 047), (045 and 077), (045 and 078), (045 and 079), (046 and 047), (046 and 077), (046 and 078), (046 and 079), (047 and 077), (047 and 078), (047 and 079), (077 and 078), (077 and 079), (078 and 079), 070, 081, 105, 121, 122, 123, 124, 125, 126, 127, 128, 129, 144, 145, 147, 157, 210, 211, 212, 213, 214, 230, 231, 232, 233, 400, 401, 402, 407, 413, 414, 415, 416, 417, 418, 440, 460, 461, 470, 477, 480, 481, 482, 483
Required Teacher Certifications/Training:	Teachers who have never taught this course MUST attend the training provided by PLTW and receive PLTW certification. This course has an associated fee through the vendor.
Teacher Resources:	https://tn.gov/education/article/cte-cluster-middle-school-cte-coursework

Course Description

This is a course in the series of *Project Lead the Way (PLTW)* curriculum. For more information, visit the PLTW website at <http://www.pltw.org/>.

Program of Study Application

These courses build knowledge and skills related to the following career clusters:

- 1) Architecture & Construction
- 2) Information Technology (IT)
- 3) Manufacturing
- 4) Science, Technology, Engineering & Mathematics (STEM)
- 5) Transportation, Distribution, & Logistics

Course Standards

The course standards outlined below are the copyrighted property of *Project Lead the Way*. Teachers must participate in *Project Lead the Way* training in order to be able to teach this course. This course is one in a series of PLTW middle school courses. The lesson numbers below reflect the recommended sequence.

Lesson 5.1 Applied Chemistry (6 days)

Understandings

- 1) Chemical engineering is concerned with design, construction and operation of machines that perform chemical reactions, separations or mixes, and fluid flow to solve problems and make useful products.
- 2) Chemical engineers apply the knowledge and discoveries of a chemist to solve real life problems.
- 3) Chemical engineers work in many industries including manufacturing, pharmaceuticals, healthcare, environmental, materials, and alternative energy.
- 4) Chemical engineers often work on teams with other engineers, scientists, and technologists

Knowledge and Skills

It is expected that students will:

- Describe the difference between a chemist and a chemical engineer.
- Describe how salt affects the melting point of ice.
- Describe how an adhesive bond holds two items together.
- Outline the steps required to clean up an oil spill.
- Apply science and engineering skills to make ice cream.
- Utilize the steps of the design process to create product.
- Work as a part of a team to solve an oil spill engineering simulation problem.

Lesson 5.2 Nanotechnology (10 days)

Understandings

- 1) Nanotechnology is building innovative tools to study and manipulate objects at the nanometer scale, one billionth of a meter.

- 2) Properties of materials, such as strength, color, and resistance can be changed by nanotechnology.
- 3) Molecules can be arranged using nanotechnology in a way that they do not normally occur in nature.
- 4) Nanotechnology will have an impact on many areas, including but not limited to electronics and computing, materials, manufacturing, energy, environment, health, medicine, national security, and space exploration.
- 5) Scanning Probe and Atomic Force microscopes are used to see and move individual atoms.
- 6) Engineers, designers, and engineering technologists are needed in high demand for the development of future technology to meet societal needs and wants.

Knowledge and Skills

It is expected that students will:

- Identify facts regarding nanotechnology including properties of materials at nanoscale.
- Describe the relative size of a nanometer.
- Describe how nano-products are used in society today.
- Identify tools and processes used to see and manipulate matter at the nanoscale.
- Discuss the impact that nanotechnology has on their lives today and will have in the future.
- Identify examples of nanotechnology-enhanced products.
- Describe engineering and engineering technology careers related to the advancement of nanotechnology.

Lesson 5.3 Applied Physics (29 days)

Understandings

- 1) Simple machines can make work easier by increasing mechanical advantage.
- 2) Mechanical advantage is the ratio of the force produced by a machine to the force applied to the machine.
- 3) Compound machines are made from a combination of several simple machines.
- 4) Energy cannot be created or destroyed but may be transferred into different types of energy.
- 5) Humans use their energy, along with simple machines, to do work by changing the state of energy of an object from potential to kinetic.
- 6) Prototyping is an important step in the design process and provides the designer with a scaled working model that can be used for testing.

Knowledge and Skills

It is expected that students will:

- Identify the six simple machines: the lever, pulley, wheel and axle, inclined plane, wedge, and screw.
- Identify a machine as something that helps use energy more efficiently.
- Describe work as the force applied over a distance.
- Explain the applications of the six simple machines.
- Distinguish between the three classes of levers.
- Determine mechanical advantage from assembled simple machines.
- Compare and contrast kinetic and potential energy.
- Predict the relative kinetic energy based on the mass and speed of the object.

- Recognize and demonstrate safety rules for using lab tools and machines.
- Build, test, and evaluate a model of a design problem.
- Analyze a product through testing methods and make modifications to the product.