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| Technology Engineering Syllabus |
| (Gateway To Technology) |
| STEAM |
| (Science, Technology, Engineering, Arts Mathematics) |
| 2015-2016 |
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| **Gateway To Technology® Program**  |
| The PLTW® Gateway To Technology® program(GTT) is divided into six independent courses |
| developed for grades six through eight. GTT is taught in conjunction with a rigorous academic curriculum |
| and is designed to challenge and engage the natural curiosity of students. The program harnesses the |
| enthusiasm and energy of middle school students. The program focuses on showing, not telling, students |
| how to use engineering skills to solve everyday problems. Students won’t ask, "will I ever use this in |
| real life?”, because they will be applying their skills as they learn them. The primary focus is using applied  |
| math and science to build stronger math, science, and technology inquiry skills. |
| **Gateway To Technology® Modules** |
| * Science of Technology
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| * Magic of Electrons
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| * Automation Robotics
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| * Flight and Space
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| * Design and Modeling
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| * Energy & Environment
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| ***Grading Scale****: (all daily work, projects, & semester projects)* |
| A | 90% - 100% |
| B | 80% - 89% |
| C | 70% - 79% |
| D | 60% - 69% |
| F | 0% - 59% |
| *Weighted Categories:* |
| Daily Work: | 45% |
| Projects: | 45% |
| Semester Projects/ Final: | 10% |
| ***Instruction Methods and Techniques:*** |
| 1. Lecture |
| 2. Independent inquiry and research |
| 3. Individual/Group Activities and Projects |
| 4. Guest Presentations |
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**Year 1 and 2 Introduction Unit - Lesson 1.1 What is Engineering?** **Lesson 1.1 What is Engineering? (7 days)****Understandings**1. An engineering notebook is used to record original ideas or designs and to document the design process related to an invention or innovation.
2. A portfolio is an organized collection of best works.
3. Science is the study of the natural world, while technology is the study of how humans develop new products to meet needs and wants.
4. Teams of people can accomplish more than one individual working alone.
5. Technological change is seen through inventions, innovations, and the evolution of technological artifacts, processes, and systems.
6. Technology can have positive and negative social, cultural, economical, political, and environmental consequences.
7. 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:** Utilize standard procedures to use and maintain an engineering notebook.
* Use guidelines for developing and maintaining an engineering notebook to evaluate and select pieces of one’s own work for inclusion in a portfolio.
* Describe the relationship between science, technology, engineering, and math.
* Identify the differences between invention and innovation.
* Operate as an effective member of a team to complete an investigation.
* Describe engineering and explain how engineers participate in or contribute to the invention and innovation of products.
* Describe impacts that technology has had on society.

**Lesson 1.2 Design Process (5 days)****Understandings**1. Many different design processes are used to guide people in developing solutions to problems.
2. The design brief is a tool for defining the problem; it is an agreement between the engineer and client.
3. Engineers use design briefs to explain the problem, identify solution expectations, and establish project constraints.
4. Design teams use brainstorming techniques to generate large numbers of ideas in a short amount of time, striving for quantity, not quality.
5. A decision matrix is a tool used to compare solution ideas to the criteria so that you can select the best solution.

**Knowledge and Skills***It is expected that students will:** Describe the design process and how it is used to aid in problem solving.
* Describe the elements of design.
* Recognize design criteria and constraints.
* Describe the purpose and importance of working in a team.
* Use the design process to solve a technical problem.
* Apply the elements of design to the design process.
* Explain a design brief and apply the concept when using the design process.
* Operate effectively as a member of a team to complete a design project.
* Use a decision matrix to select the best solution to a design.

**Lesson 1.3 Measurement (5 days)****Understandings**1. In the United States, we use both Standard and Metric systems of measurement.
2. Being able to measure accurately is important at school and at home, at work and when pursuing hobbies.
3. Precision measuring tools are needed for accuracy, but tools must be used correctly to ensure accurate measurements are taken.
4. Quality workmanship and accurate measurements with precise instruments are necessary to successfully solve problems.

**Knowledge and Skills**It is expected that students will:* Select the appropriate value from a conversion chart to convert between standard and metric units.
* Convert between standard and metric measurements including inches, feet, yards, millimeters, centimeters, and meters.
* Demonstrate the ability to measure accurately with different devices and scales using both the standard and metric systems.
* Explain how to measure in different contexts.

**Lesson 1.4 Sketching and Dimensioning Techniques (6 days)****Understandings**1. The ability to create a rapid, accurate sketch is an important skill to communicate ideas.
2. Orthographic drawings of an object are used to provide information that a perspective drawing may not be able to show.
3. Engineers apply dimensions to drawings to communicate size information.

**Knowledge and Skills***It is expected that students will:** Summarize the reasoning for using sketching as a communication tool.
* Use visualization, spatial reasoning, and geometric shapes to sketch two and three dimensional shapes.
* Recognize thumbnail, perspective, isometric, and orthographic sketches.
* Recognize one and two point perspective drawings.
* Create thumbnail, perspective, isometric, and orthographic sketches.
* Accurately interpret one and two point perspective drawings.
* Communicate ideas for a design using various sketching methods, notes, and drafting views.
* Dimension an orthographic sketch following the guidelines of dimensioning.

**Lesson 1.5 Designing For Production (22 days)****Understandings**1. Simple geometric shapes are combined and joined to create a representation of an object.
2. Engineers use computer-aided design (CAD) modeling systems to quickly generate and annotate working drawings.
3. Three-dimensional computer modeling uses descriptive geometry, geometric relationships, and dimensions to communicate an idea or solution to a technological problem.
4. As individual objects are assembled together, their degrees of freedom are systematically removed.
5. Engineers use a design process to create solutions to existing problems.
6. Teamwork requires constant communication to achieve the goal at hand.
7. The fabrication of a prototype is the opportunity for the designer to see the product as a three-dimensional object.

**Knowledge and Skills***It is expected that students will:** Describe the coordinate system and how geometric shapes work together to create objects.
* Create a three-dimensional (3D) model of an object.
* Apply geometric and dimension constraints to design CAD-modeled parts.
* Assemble the product using the CAD modeling program.
* Demonstrate the ability to produce various annotated working drawings of a 3D model.
* Identify the difference between a prototype, a model and a mock-up.
* Analyze what circumstances call for the use of a prototype, a model, and a mock-up.
* Describe why teams of people are used to solve problems.
* Brainstorm and sketch possible solutions to an existing design problem.
* Create a decision-making matrix.
* Use a decision making matrix to select an approach that meets or satisfies the constraints given in a design brief.

[Add Assignment to Introduction Unit - Lesson 1.1 What is Engineering?](https://pltw.instructure.com/courses/179254/assignments) * [Activity 1.1.1 PLTW Gateway Dividers](https://pltw.instructure.com/courses/179254/assignments/2392816)
* [Activity 1.1.1.a Engineering Notebook Templates](https://pltw.instructure.com/courses/179254/assignments/2392817)
* [Activity 1.1.2 Introduction to Engineering](https://pltw.instructure.com/courses/179254/assignments/2392819)
* [Project 1.1.3 STEM Investigation](https://pltw.instructure.com/courses/179254/assignments/2392821)
* [Activity 1.1.4 What is Technology?](https://pltw.instructure.com/courses/179254/assignments/2392823)
* [Activity 1.1.5.a Engineering Careers - Scavenger Hunt](https://pltw.instructure.com/courses/179254/assignments/2392825)
* [Activity 1.1.5.b Engineering Careers - Interview](https://pltw.instructure.com/courses/179254/assignments/2392827)
* [Activity 1.1.5.c Engineering Careers - Brochure](https://pltw.instructure.com/courses/179254/assignments/2392828)
* [Activity 1.1.5.d Engineering Careers - Book](https://pltw.instructure.com/courses/179254/assignments/2392829)
* [Activity 1.1.5.e Engineering Careers - Skit](https://pltw.instructure.com/courses/179254/assignments/2392830)
* [Activity 1.1.5.f Engineering Careers - Online Magazine](https://pltw.instructure.com/courses/179254/assignments/2392831)
* [Activity 1.1.5.g Engineering Careers - Glog](https://pltw.instructure.com/courses/179254/assignments/2392832)
* [Activity 1.1.5.h Engineering Careers - Flowchart](https://pltw.instructure.com/courses/179254/assignments/2392833)
* [Lesson 1.1 What Is Engineering - Key Terms](https://pltw.instructure.com/courses/179254/assignments/2392815)

**Introduction Unit - Lesson 1.2 Design Process** [Add Assignment to Introduction Unit - Lesson 1.2 Design Process](https://pltw.instructure.com/courses/179254/assignments) * [Activity 1.2.2 Design Elements](https://pltw.instructure.com/courses/179254/assignments/2392836)
* [Activity 1.2.3 Furniture Design](https://pltw.instructure.com/courses/179254/assignments/2392837)
* [Activity 1.2.3.a Hobby Organizer Design](https://pltw.instructure.com/courses/179254/assignments/2392838)
* [Lesson 1.2 Design Process - Key Terms](https://pltw.instructure.com/courses/179254/assignments/2392834)

**Unit 1 Year 1: Design and Modeling - Lesson 1.3 Measurement** * [Lesson 1.3 Measurement - Overview](https://pltw.instructure.com/courses/139942/modules/items/2464320)
* [Lesson 1.3 Measurement - Key Terms](https://pltw.instructure.com/courses/139942/modules/items/2464322)
* [Activity 1.3.1 Standard and Metric Measuring](https://pltw.instructure.com/courses/139942/modules/items/2464324)
* [Activity 1.3.2 History of Measurement](https://pltw.instructure.com/courses/139942/modules/items/2464325)
* [Activity 1.3.3 Precision Measuring](https://pltw.instructure.com/courses/139942/modules/items/2464327)
* [Activity 1.3.3a Precision Measuring Worksheet](https://pltw.instructure.com/courses/139942/modules/items/2464330)
* [Activity 1.3.4 Measurement Lab - Skimmer](https://pltw.instructure.com/courses/139942/modules/items/2464332)
* [Lesson 1.3 Measurement - Teacher Resources](https://pltw.instructure.com/courses/139942/modules/items/2464334)

**Unit 1: Design and Modeling - Lesson 1.4 Sketching and Dimensioning** * [Lesson 1.4 Sketching and Dimensioning - Overview](https://pltw.instructure.com/courses/139942/modules/items/2464337)
* [Lesson 1.4 Sketching and Dimensioning - Key Terms](https://pltw.instructure.com/courses/139942/modules/items/2464340)
* [Activity 1.4.1 Sketching Techniques](https://pltw.instructure.com/courses/139942/modules/items/2464342)
* [Activity 1.4.2 Sketching Practice](https://pltw.instructure.com/courses/139942/modules/items/2464345)
* [Activity 1.4.3 Language of Sketching](https://pltw.instructure.com/courses/139942/modules/items/2464348)
* [Activity 1.4.4 Orthographic Projection](https://pltw.instructure.com/courses/139942/modules/items/2464349)
* [Activity 1.4.5 Dimensioning](https://pltw.instructure.com/courses/139942/modules/items/2464352)
* [Lesson 1.4 Sketching and Dimensioning - Teacher Resources](https://pltw.instructure.com/courses/139942/modules/items/2464354)

**Unit 1 Year 1: Design and Modeling - Lesson 1.5 Designing for Production** * [Lesson 1.5 Designing for Production - Overview](https://pltw.instructure.com/courses/139942/modules/items/2464357)
* [Lesson 1.5 Designing for Production - Key Terms](https://pltw.instructure.com/courses/139942/modules/items/2464360)
* [Activity 1.5.1 Descriptive Geometry and Coordinate System](https://pltw.instructure.com/courses/139942/modules/items/2464363)
* [Activity 1.5.2 Computer Modeling Fundamentals](https://pltw.instructure.com/courses/139942/modules/items/2464365)
* [Activity 1.5.3 Parametric Modeling](https://pltw.instructure.com/courses/139942/modules/items/2464366)
* [Activity 1.5.4 Sketch Plane Cube](https://pltw.instructure.com/courses/139942/modules/items/2464367)
* [Activity 1.5.5 Pegboard Toy](https://pltw.instructure.com/courses/139942/modules/items/2464369)
* [Activity 1.5.5a Pegboard Working Drawings](https://pltw.instructure.com/courses/139942/modules/items/2464371)
* [Activity 1.5.5b Pegboard Presentation Drawings](https://pltw.instructure.com/courses/139942/modules/items/2464373)
* [Activity 1.5.6 Bracket](https://pltw.instructure.com/courses/139942/modules/items/2464375)
* [Project 1.5.7 Switch Plate Design](https://pltw.instructure.com/courses/139942/modules/items/2464377)
* [Project 1.5.8 Hairbrush Design](https://pltw.instructure.com/courses/139942/modules/items/2464379)
* [Problem 1.5.9 Playground Design Problem](https://pltw.instructure.com/courses/139942/modules/items/2464381)
* [Lesson 1.5 Designing for Production - Teacher Resources](https://pltw.instructure.com/courses/139942/modules/items/2464383)

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