

Grade 10th - 12th, 1 Credit
Elective Course
Prerequisites: Geometry and PLTW
Intro to Engineering Design



Park Hill School District

Building Successful Futures • Each Student • Every Day

High School PLTW Principles of Engineering Curriculum

Course Description: Explore how modern engineers are helping improve the world through diverse engineering fields such as product design, robotics, mechanical design, infrastructure, and sustainability. Learn the principles of engineering as well as the cutting-edge tools of robotics, 3-D modeling, programming, and prototyping that engineers are using to solve problems today and for the future! © 2023 Project Lead The Way

Scope and Sequence:

Timeframe	Unit
2 weeks	Introduction to Product Design and Development
4 weeks	Mechanical Design
4 weeks	Application of Robotics
4 weeks	Energy in Action
4 weeks	Designing Infrastructure and Developing Sustainability

Unit 0: Introduction to Product Design and Development

Subject: PLTW Principles of Engineering

Grade: 10 - 12

Name of Unit: Introduction to Product Design and Development

Length of Unit: 2 Weeks

Overview of Unit: This optional introductory unit creates space for schools who begin their PLTW Engineering pathway with Introduction to Engineering Design or Engineering Essentials to quickly review familiar topics and challenge students to reach new levels of understanding and application. It also allows schools that are new to the pathway to build upon strong fundamental skills. In the unit, students explore different careers while applying modern collaborative modeling tools to create new products that meet real needs. Student teams take on the role of a product development team using the engineering design process to solve problems and create value for others.

Students gain enduring understandings to key principles of engineering such as modeling, material selection, statistics, tolerance analysis, as well as testing design and analysis. Through these challenges, students apply and develop project management, communication, and other pivotal transportable skills to solve problems.

Topic 1: Introduction to Product Design and Development

Activity	Title
Lesson 0.1	Engineering Design Process
Lesson 0.2	Collaborative Modeling and Modern Product Design
Lesson 0.3	Material Choice and Testing
Lesson 0.4	Designing a Shoe for You

Unit 1: Mechanical Design

Subject: PLTW Principles of Engineering

Grade: 10 - 12

Name of Unit: Mechanical Design

Length of Unit: 4 Weeks

Overview of Unit: In Unit 1, students explore the foundational elements that make up complex mechanical devices and systems. They work collaboratively to solve real-world problems using their understanding of mechanical designs and motion to develop complex mechanisms. Students end the unit by working collaboratively and applying their knowledge to solve a real-world agricultural problem.

Students gain understanding of mechanical engineering concepts such as simple machines, energy, work, power, and mechanisms and apply them to solve engineering problems. Students continue to apply their project management, collaboration, communication, and additional key transportable skills throughout the unit. They continue to explore future career opportunities by conducting a professional interview of a professional of their choice.

Topic 1: Mechanical Design

Activity	Title
Lesson 1.1	Simple and Compound Machines
Lesson 1.2	Mechanisms
Lesson 1.3	Agricultural Solutions

Unit 2: Application of Robotics

Subject: PLTW Principles of Engineering

Grade: 10 - 12

Name of Unit: Application of Robotics

Length of Unit: 4 Weeks

Overview of Unit: In Unit 2, students explore the world of robotics and programming. They use their understanding of mechanical design, robotics, and programming to work collaboratively to develop solutions to real-world-problems. Students continue their career exploration through investigating different pathways to higher education and determine their best course of action to make themselves good candidates for postsecondary education opportunities.

Students learn concepts such as programming, using and applying sensors, and artificial intelligence. Students utilize their collaboration, communication, project management, and additional transportable skills throughout the unit to solve in-depth problems.

Topic 1: Application of Robotics

Activity	Title
Lesson 2.1	Introduction to Robotics
Lesson 2.2	Robotics in Action
Lesson 2.3	Artificial Intelligence
Lesson 2.4	An Electronic Ensemble

Unit 3: Energy in Action

Subject: PLTW Principles of Engineering

Grade: 10 - 12

Name of Unit: Energy in Action

Length of Unit: 4 Weeks

Overview of Unit: In this unit students explore energy more deeply and useful applications of it through electrical circuits, fluids, and kinematics. They begin the unit by exploring the relationships between circuit components, derive formulas, and apply their understanding to solve problems. Students then move into the world of fluids, the deep mathematical principles that govern them, and apply their knowledge to design their own fluid power system. They end the unit implementing their understanding of energy in motion through kinematics. Students also continue their career exploration journey by examining the financial aspects of attending a postsecondary institution.

Topic 1: Energy in Action

Activity	Title
Lesson 3.1	Electrical Circuits
Lesson 3.2	Fluid Power
Lesson 3.3	Kinematics
Lesson 3.4	Integration of Circuits, Fluid Power, and Kinematics

Unit 4: Designing Infrastructure and Developing Sustainability

Subject: PLTW Principles of Engineering

Grade: 10 - 12

Name of Unit: Designing Infrastructure and Developing Sustainability

Length of Unit: 4 Weeks

Overview of Unit: They investigate methods of designing infrastructure as well as various techniques to develop sustainable practices for the future. Students work collaboratively in teams to develop solutions to structural design problems, sustainable approaches, and transportation design needs that have a lasting impact on local and global communities.

Students gain an understanding of in-depth mathematical approaches to infrastructure design for static systems as well as apply statistical analysis and rigorous calculations to traffic and intersection design. They explore a variety of energy sources and a life cycle analysis to measure trade-offs in environmental dilemmas. Students continue to refine their project management, collaboration, communication, and additional key transportable skills to understand the impact of design choices on a large scale. Students conclude their career exploration by examining the future of different careers and how they will be affected by the adoption of artificial intelligence.

Topic 1: Designing Infrastructure and Developing Sustainability

Activity	Title
Lesson 4.1	Statics
Lesson 4.2	Renewable Energy
Lesson 4.3	Transportation
Lesson 4.4	Infrastructure Redesign