



Park Hill School District

Building Successful Futures • Each Student • Every Day

Seventh Grade PLTW: Design and Modeling/Automation and Robotics

Course Description: Design and Modeling (DM) allows students to apply the design process to solve problems and understand the influence of creativity and innovation in their lives. They work in teams to design a playground and furniture, capturing research and ideas in their engineering notebooks. Using Autodesk® design software, students create a virtual image of their designs and produce a portfolio to showcase their innovative solutions. © 2020 Project Lead The Way. *This course is copyrighted by Project Lead The Way, Inc. All rights are reserved to Project Lead The Way. This course outline can be found at www.PLTW.org.*

Course Description: Automation and Robotics (AR) allows students to trace the history, development, and influence of automation and robotics as they learn about mechanical systems, energy transfer, machine automation, and computer control systems. Students use the VEX Robotics® platform to design, build, and program real-world objects such as traffic lights, toll booths, and robotic arms. © 2014 Project Lead The Way

Scope and Sequence:

Time Frame	Unit	Instructional Topics
2 weeks	Introduction to Design	Topic 1: Introduction to Design
3 weeks	Solid Modeling	Topic 1: Solid Modeling
4 weeks	Design Challenge	Topic 1: Design Challenge
9 Weeks	Automation and Robotics	Topic 1: What is Automation and Robotics Topic 2: Mechanical Systems Topic 3: Automated Systems

Curriculum Revision Tracking

Summer 2020

- Although many components of the previous curriculum are included, this was an overall complete revision of the course.

Fall 2018

- Design Modeling
 - Course description updated to reflect changes to Project Lead The Way curriculum.
 - Topic 1
 - Title changed from “Introduction” to “Introduction to Design” to reflect changes to Project Lead The Way
 - Topic 2
 - Title changed from “Measurement” to “Modeling and Statistical Analysis” to reflect changes to Project Lead The Way
 - Topic 3
 - Title changed from “Sketching and Dimensioning” to “Design Challenge” to reflect changes to Project Lead The Way
 - Topic 4 eliminated to reflect changes to Project Lead The Way
- Automation and Robotics
 - Topic 4 eliminated to reflect changes to Project Lead The Way

Essential Learning Outcomes:

- ELO 1: Students engage in problem-solving, inquiry, and process thinking mindsets while working within their teams to define problems, pursue viable and ethical solutions, and/or optimize systems.
- ELO 2: Students will learn what skills are needed for diverse career opportunities in design and modeling and how failures can become positive outcomes.
- ELO 3: Students will articulate how failures can effectively develop a solution to a problem or a need.
- ELO 4: Students will demonstrate what effective teamwork looks like for the purpose of design and modeling.

Unit 1: Introduction to Design

Subject: PLTW Design and Modeling

Grade: 7th Grade

Name of Unit: Introduction to Design

Overview of Unit: In this unit students discover the design process as they complete an instant design challenge to create an ankle foot orthosis. They learn thumbnail, orthographic, isometric, and perspective sketching as methods for communicating design ideas effectively without the use of technology. The use of a common measurement system is essential for communicating and fabricating designs. Students use both measurement systems and apply measurement skills while dimensioning sketches. They create and launch paper air skimmers and complete statistical analysis on their results. Students conduct a mechanical dissection in the lesson project to better understand how objects and parts interact while using sketches to communicate and document their findings.

Topic 1: Introduction to Design

Activity	Title	ELO
Activity 1.1	Foot Orthosis Instant Design Challenge	1, 3
Activity 1.2	Picture is Worth a Thousand Words	1, 3
Activity 1.3	Measuring Matters	1, 3
Activity 1.4	Skimmer Statistics	1, 3
Activity 1.5	Dialed In	1, 3
Project 1.6	Investigate the Inside	1,2,3

Unit 2: Solid Modeling

Subject: PLTW Design and Modeling

Grade: 7th Grade

Name of Unit: Solid Modeling

Overview of Unit: Students discover the design process as they complete an instant design challenge to create an ankle foot orthosis. They learn thumbnail, orthographic, isometric, and perspective sketching as methods for communicating design ideas effectively without the use of technology. The use of a common measurement system is essential for communicating and fabricating designs. Students use both measurement systems and apply measurement skills while dimensioning sketches. They create and launch paper air skimmers and complete statistical analysis on their results. Students conduct a mechanical dissection in the lesson project to better understand how objects and parts interact while using sketches to communicate and document their findings.

Topic 1: Solid Modeling

Activity	Title	ELO
Activity 2.1	Taking Modeling to Another Dimension	1, 2
Activity 2.2	For Good Measure	1, 2
Activity 2.3	For the Birds	1, 2
Project 2.4	Puzzle Cube Design Challenge	1, 2, 3

Unit 3: Design Challenge

Subject: PLTW Design and Modeling

Grade: 7th Grade

Name of Unit: Design Challenge

Overview of Unit: In this unit students work within teams to brainstorm and select a design solution to the Therapeutic Toy Design Challenge problem based on design requirements. They establish team norms, collaborate, and recognize that solving authentic problems involves interdisciplinary skills such as engineering and biomedical science. Using the design process, students create a solid model of their design, build a prototype for design testing, and make necessary design modifications based on testing results.

Topic 1: Design Challenge

Activity	Title	ELO
Problem 1.1	Therapeutic Toy Design	1, 2, 3