Course Description

Principles of Engineering is an introduction to some of the major concepts that they will encounter in a postsecondary engineering course of study. Students have an opportunity to investigate engineering and high tech careers. PoE gives students the opportunity to develop skills and understanding of course concepts through activity-, project-, and problem-based learning. Used in combination with a teaming approach, learning challenges students to continually hone their interpersonal skills, creative abilities, and problem solving skills based upon engineering concepts.

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<th>Core Code</th>
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<tr>
<td>Units of Credit</td>
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<td>Intended Grade Level</td>
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<tr>
<td>Prerequisite</td>
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<td>Skill Certification Test Number</td>
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<td>License Type</td>
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<td>Required Endorsement(s)</td>
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PLTW PRINCIPLES OF ENGINEERING (POE)

STRAND 1
Students will learn about the world of engineering and basic mechanisms.

Standard 1
Identify and differentiate among different engineering disciplines.
  - Differentiate between engineering and engineering technology.
  - Conduct a professional interview and reflect on it in writing.

Standard 2
Distinguish between the six simple machines, their attributes, and components.
  - Measure forces and distances related to mechanisms.
  - Calculate mechanical advantage and drive ratios of mechanisms.

Standard 3
Design, create, and test gear, pulley, and sprocket systems.
  - Calculate work and power in mechanical systems.
  - Determine efficiency in a mechanical system.

STRAND 2
Students will learn about energy sources.

Standard 1
Identify and categorize energy sources as nonrenewable, renewable, or inexhaustible.
  - Create and deliver a presentation to explain a specific energy source.
  - Summarize and reflect upon information collected during a visit to a local utility company.

Standard 2
Define the possible types of power conversion.
  - Calculate work and power.
  - Calculate power in a system that converts energy from electrical to mechanical.
  - Determine efficiency of a system that converts an electrical input to a mechanical output.

Standard 3
Understand the advantages and disadvantages of parallel and series circuit design in an application.
  - Demonstrate the correct use of a digital multimeter.
  - Calculate circuit resistance, current, and voltage using Ohm’s law.

STRAND 3
Students will learn about energy applications.
Standard 1
Experiment with a solar hydrogen system to produce mechanical power.
  • Test and apply the relationship between voltage, current, and resistance relating to a photovoltaic cell and a hydrogen fuel cell.

Standard 2
Design, construct, and test recyclable insulation materials.
  • Test and apply the relationship between R-values and recyclable insulation.
  • Complete calculations for conduction, R-values, and radiation.

STRAND 4
Students will learn about statics.

Standard 1
Create free body diagrams of objects, identifying all forces acting on the object.
  • Mathematically locate the centroid of structural members.
  • Calculate moment of inertia of structural members.
  • Differentiate between scalar and vector quantities.
  • Identify magnitude, direction, and sense of a vector.
  • Calculate the X and Y components given a vector.
  • Calculate moment forces given a specified axis.
  • Use equations of equilibrium to calculate unknown forces.

STRAND 5
Students will learn about material properties.

Standard 1
Investigate specific material properties related to a common household product.
  • Conduct investigative non-destructive material property tests on selected common household product including testing for continuity, ferrous metal, hardness, and flexure.
  • Calculate weight, volume, mass, density, and surface area of selected common household product
  • Identify the manufacturing processes used to create the selected common household product.
  • Identify the recycling codes.

Standard 2
Promote recycling using current media trends.
  • Insert indicator text
  • Insert indicator text
  • Insert indicator text
STRAND 6
Students will learn about material testing.

Standard 1
Obtain measurements of material samples.
  • Tensile test a material test sample.
  • Identify and calculate test sample material properties using a stress strain curve.

STRAND 7
Students will learn about machine controls.

Standard 1
Design and create a control system based on given needs and constraint.
  • Create detailed flow charts that utilize a computer software application.
  • Create control system operating programs that utilize computer software.
  • Create system control programs that utilize flowchart logic.
  • Choose appropriate input and output devices based on the need of a technological system.
  • Differentiate between the characteristics of digital and analog devices.
  • Judge between open and closed loop systems in order to choose the most appropriate system for a given technological problem.

STRAND 8
Students will learn about fluid power.

Standard 1
Identify devices that utilize fluid power.
  • Identify and explain basic components and functions of fluid power devices.
  • Differentiate between the characteristics of pneumatic and hydraulic systems.
  • Distinguish between hydrodynamic and hydrostatic systems.

Standard 2
Design, create, and test a hydraulic device.
  • Calculate flow rate, flow velocity, and mechanical advantage in a hydraulic system.

Standard 3
Design, create, and test a pneumatic device.
  • Calculate values in a pneumatic system utilizing the perfect gas laws.

Standard 4
Calculate values in a fluid power system utilizing Pascal’s Law.
  • Distinguish between pressure and absolute pressure and between temperature and absolute temperature.
STRAND 9
Students will learn about statistics.

Standard 1
Calculate the theoretical probability that an event will occur.

Standard 2
Calculate the experimental frequency distribution of an event occurring.

Standard 3
Apply the Bernoulli process to events that only have two distinct possible outcomes.

Standard 4
Apply AND, OR, and NOT logic to probability.

Standard 5
Apply Bayes’ theorem to calculate the probability of multiple events occurring.

Standard 6
Create a histogram to illustrate frequency distribution.
- Calculate the central tendency of a data array, including mean, median, and mode.
- Calculate data variation, including range, standard deviation, and variance.

STRAND 10
Students will learn about kinematics.

Standard 1
Design, build, and test a vehicle that stores and releases potential energy for propulsion.
- Calculate distance, displacement, speed, velocity, and acceleration from data.
- Calculate acceleration due to gravity given data from a free fall device.

Standard 2
Determine the needed angle to launch a projectile a specific range given the projectile’s initial velocity.
- Calculate the X and Y components of a projectile motion.