End-of-Course Assessment Blueprint

Principles of Engineering (POE)

PLTW offers summative End-of-Course (EoC) Assessments that measure both subject-matter knowledge and the real-world transportable skills students need to thrive, no matter which college and career paths they choose.

These assessments are designed to measure knowledge and skills covered in the course curriculum. The content for each EoC assessment is based on an assessment blueprint specifying the extent to which course content will be represented in the assessment. Assessment blueprints were thoughtfully designed by a panel of industry experts, faculty from higher education institutions, PLTW Teachers, and PLTW Curriculum and Assessment Team Members.

Skill clusters were developed for each blueprint to guide the assessment creation process. Skill clusters represent an overarching category of related course objectives measured by the assessment. Table 1 articulates the alignment between the skill clusters and course objectives. In addition, each skill cluster was assigned a weight to determine the degree to which course objectives are addressed in the assessment.

Table 1. Assessment Blueprint – Principles of Engineering

Skill Cluster	Framework Objectives	% Weight by Skill Cluster
Global Engineering Concepts	**ERM-A:** Assess an engineering ethical dilemma. **CCP-A:** Explain and justify an engineering design process. **CCP-B:** Collect, analyze, and interpret information relevant to the problem or opportunity at hand to support engineering decisions. **CCP-C:** Synthesize an ill-formed problem into a meaningful, well-defined problem. **CCP-D:** Generate multiple potential solution concepts. **CCP-E:** Develop models to represent design alternatives and generate data to inform decision making, test alternatives, and demonstrate solutions. **CCP-F:** Select a solution path from many options to successfully address a problem or opportunity. **CCP-G:** Plan and execute an investigation to collect valid quantitative data to serve as a basis for evidence and to inform decisions. **CCP-K:** Design and carry out an experiment that investigates a research question. **CCP-L:** Collect and analyze experimental data to draw conclusions.	**30–40%**

(Table continued on next page)

	AAP-A: Apply problem decomposition skills to break down data, problems, and processes into manageable parts. **AAP-D:** Apply abstraction to generalize problems and solutions. **ETT-D:** Apply system thinking to consider how an engineering problem and its solution fit into broader systems.	
Foundations of Math and Engineering Science	**FMS-B:** Measure forces and distances and calculate mechanical advantage, work, power, and efficiency in mechanical systems. **FMS-C:** Analyze parallel and series circuits resistance, current, and voltage using Ohm's law. **FMS-F:** Describe free-fall motion. **FMS-G:** Calculate distance, displacement, speed, velocity, and acceleration from data. **FMS-H:** Describe the location of a projectile in motion as a function of time. **MAS-A:** Draw free body diagrams of objects, identifying all forces acting on the object. **MAS-B:** Calculate moment of inertia, beam deflection, and moments or torques. **MAS-C:** Analyze and solve for the external and internal forces on a truss. **MAS-E:** Describe how the formulas are applied to material loaded with a tensile force. **AAP-B:** Use algorithms to create a solution with or without the use of a computer program. **AAP-C:** Formulate solutions that use automation and programming to solve a problem.	**30–40%**
Engineering Design Principles	**ETT-F:** Apply computational thinking to generalize and solve a problem using a computer. **FMS-A:** Identify appropriate applications and examples of each of the six simple machines. **CSY-B:** Describe differences and advantages of open- and closed-loop systems. **CSY-D:** Predict the behavior of a control system and use a variety of methods for finding, identifying, and correcting bugs in a program. **CSY-F:** Design a hydraulic and pneumatic device, calculating design parameters using Pascal's Law. **ESO-A:** Explore and document different energy sources and their uses. **RA-A:** Design a robotic system that solves an engineering design problem and meets required constraints and criteria. **RA-B:** Describe the purpose of automation and robotics and its effect on society. **PD-A:** Develop models and simulations to represent information, processes, and/or objects to an appropriate level of abstraction for the intended purpose.	**25–35%**