



RADNOR HIGH SCHOOL
Course Overview



*Project Lead The Way(PLTW)
Principles of Engineering (POE)
Course # - 1261(H)*

General Information

Credits: 1
Weighted: Yes
Prerequisite: 1250 Introduction to Engineering

Length: Full Year
Format: meets daily
Grade: 10-12

Course Description

Principles Of Engineering (POE) is a high school-level survey course of engineering. The course exposes students 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 career POE gives students the opportunity to develop skills and understanding of course concepts through activity-, project-, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB learning challenges students to continually hone their interpersonal skills, creative abilities, and problem solving skills based upon engineering concepts. It also allows students to develop strategies to enable and direct their own learning, which is the ultimate goal of education.

To be successful in POE, students should be concurrently enrolled in college preparatory mathematics and science. Students will employ engineering and scientific concepts in the solution of engineering design problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges. Students will also learn how to document their work and communicate their solutions to their peers and members of the professional community.

Principles Of Engineering is the second of three foundation courses in the Project Lead The Way high school engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

The course of study includes:

- Mechanisms**
- Energy Sources**
- Energy Applications**
- Machine Control**
- Fluid Power**
- Statics**
- Material Properties**
- Material Testing**
- Statistics**
- Kinematics**

Pennsylvania Academic & Common Core Standards

SCIENCE AND TECHNOLOGY AND ENGINEERING EDUCATION

3.4.10.A2. Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

- 3.4.10.C1. Apply the components of the technological design process.
- 3.4.12.C2. Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly
- 3.4.10.D1. Refine a design by using **prototypes** and modeling to ensure quality, efficiency, and productivity of a final product.
- 3.4.10.D2. Diagnose a malfunctioning **system** and use tools, materials, and knowledge to repair it
- 3.4.12.D2. Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.
- 3.4.10.D3. Synthesize data, analyze trends, and draw conclusions regarding the effect of **technology** on the individual, society, and the environment.
- 3.4.12.E3. Compare and contrast energy and power **systems** as they relate to pollution, renewable and non-renewable resources, and conservation
- 3.4.10.E5. Analyze the development of transportation services and methods and their impact on society.
- 3.4.12.E5. Explain how the design of intelligent and non-intelligent transportation **systems** depends on many processes and innovative techniques
- 3.4.10.E6. Illustrate how manufacturing **systems** may be classified into types such as customized production, batch production, and continuous production.
- 3.4.12.E6. Compare and contrast the importance of science, **technology**, engineering and math (**STEM**) as it pertains to the manufactured world.
- 3.4.10.E7. Evaluate structure design as related to function, considering such factors as style, convenience, safety, and efficiency.
- 3.4.12.E7. Analyze the **technologies** of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

COMMON CORE STANDARDS FOR READING IN SCIENCE AND TECHNOLOGY

Reading Informational Text

- CC.3.5.9-10.A.Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions
- CC.3.5.9-10.B.Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- CC.3.5.9-10.C.Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- CC.3.5.9-10.D.Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- CC.3.5.9-10.E.Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force*, *friction*, *reaction force*, *energy*).
- CC.3.5.9-10.F.Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
- CC.3.5.9-10.G.Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- CC.3.5.9-10.H.Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- CC.3.5.9-10.I.Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. (4,8,9,10)
- CC.3.5.11-12.A.Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- CC.3.5.11-12.B.Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- CC.3.5.11-12.C.Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- CC.3.5.11-12.D.Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and*

topics.

CC.3.5.11-12.E.Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CC.3.5.11-12.F.Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

CC.3.5.11-12.G.Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CC.3.5.11-12.H.Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CC.3.5.11-12.I.Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible

Writing

CC.3.6.9-10.B. *Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

CC.3.6.9-10.C.Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.9-10.D.Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CC.3.6.9-10.E.Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CC.3.6.9-10.F.Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.9-10.G.Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

CC.3.6.9-10.H.Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.9-10.I.Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

CC.3.6.11-12.B. *

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- Introduce a topic and organize complex ideas, concepts, and information so that each new

element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

- Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CC.3.6.11-12.D. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

CC.3.6.11-12.E. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CC.3.6.11-12.F. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

CC.3.6.11-12.I. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.