Forward Education

Autonomous Electric Vehicles of the Future

Pennsylvania Core and Academic Standards
Mathematics
Grade **11** - Adopted: **2014**

SUBJECT / STANDARD AREA	PA.CC.MP.	Standards for Mathematical Practice
STANDARD AREA / STATEMENT	CC.MP.1.	Make sense of problems and persevere in solving them.
STANDARD AREA / STATEMENT	CC.MP.2.	Reason abstractly and quantitatively.
STANDARD AREA / STATEMENT	CC.MP.3.	Construct viable arguments and critique the reasoning of others.
STANDARD AREA / STATEMENT	CC.MP.4.	Model with mathematics.
STANDARD AREA / STATEMENT	CC.MP.8.	Look for and express regularity in repeated reasoning.

SUBJECT / STANDARD AREA	PA.CC.2.2.HS.	Algebraic Concepts
STANDARD AREA / STATEMENT	CC.2.2.HS.D.	Algebra
STANDARD	CC.2.2.HS.D.7.	Create and graph equations or inequalities to describe numbers or relationships.
STANDARD	CC.2.2.HS.D.9.	Use reasoning to solve equations and justify the solution method.
STANDARD	CC.2.2.HS.D.10.	Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Pennsylvania Core and Academic Standards
Mathematics
Grade **12** - Adopted: **2014**

SUBJECT / STANDARD AREA	PA.CC.MP.	Standards for Mathematical Practice

STANDARD AREA / STATEMENT	CC.MP.1.	Make sense of problems and persevere in solving them.
STANDARD AREA / STATEMENT	CC.MP.2.	Reason abstractly and quantitatively.
STANDARD AREA / STATEMENT	CC.MP.3.	Construct viable arguments and critique the reasoning of others.
STANDARD AREA / STATEMENT	CC.MP.4 .	Model with mathematics.
STANDARD AREA / STATEMENT	CC.MP.8 .	Look for and express regularity in repeated reasoning.

SUBJECT / STANDARD AREA	PA.CC.2. 2.HS.	Algebraic Concepts
STANDARD AREA / STATEMENT	CC.2.2. HS.D.	Algebra
STANDARD	CC.2.2.H S.D.7.	Create and graph equations or inequalities to describe numbers or relationships.
STANDARD	CC.2.2.H S.D.9.	Use reasoning to solve equations and justify the solution method.
STANDARD	CC.2.2.H S.D.10.	Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Pennsylvania Core and Academic Standards
Science
Grade **11** - Adopted: **2010**

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.3.	Earth and Space Sciences
STANDARD	3.3.A.	Earth Structure, Processes and Cycles
DESCRIPTOR / STANDARD	3.3.12.A2 b.	Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system.
DESCRIPTOR / STANDARD	3.3.12.A7 b.	(CONSTANCY/CHANGE) Infer how human activities may impact the natural course of Earth's cycles.

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.A.	The Scope of Technology

DESCRIPTOR / STANDARD	3.4.12.A3.	Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.B.	Technology and Society

DESCRIPTOR / STANDARD	3.4.12.B1.	Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.C.	Technology and Engineering Design

DESCRIPTOR / STANDARD	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.
DESCRIPTOR / STANDARD	3.4.12.C3.	Apply the concept that many technological problems require a multi-disciplinary approach.

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.E.	The Designed World

DESCRIPTOR / STANDARD	3.4.12.E5.	Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.
DESCRIPTOR / STANDARD	3.4.12.E6.	Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

SUBJECT / STANDARD AREA	PA.4.	Environment and Ecology
STANDARD AREA / STATEMENT	4.1.	Ecology

STANDARD	4.1.12.C.	Research how humans affect energy flow within an ecosystem.

DESCRIPTOR / STANDARD	4.1.12.C.1.	Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem.

SUBJECT / STANDARD AREA	PA.4.	Environment and Ecology
STANDARD AREA / STATEMENT	4.3.	Natural Resources
STANDARD	4.3.12.A.	Evaluate the advantages and disadvantages of using renewable and nonrenewable resources.

DESCRIPTOR / STANDARD	4.3.12.A.2.	Evaluate the advantages and disadvantages of using renewable resources such as solar power, wind power, and biofuels.

SUBJECT / STANDARD AREA	PA.4.	Environment and Ecology
STANDARD AREA / STATEMENT	4.5.	Humans and the Environment
STANDARD	4.5.12.C.	Analyze the costs and benefits of means to control pollution.

DESCRIPTOR / STANDARD	4.5.12.C.1.	Analyze the role of technology in the reduction of pollution.

Grade **11** - Adopted: **2014**

SUBJECT / STANDARD AREA	PA.CC.3.5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Key Ideas and Details

STANDARD	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.

STANDARD	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.

SUBJECT / STANDARD AREA	PA.CC.3.5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Craft and Structure

STANDARD	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.

STANDARD	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.

SUBJECT / STANDARD AREA	PA.CC.3.5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Integration of Knowledge and Ideas
STANDARD	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.

SUBJECT / STANDARD AREA	PA.CC.3.5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Range and Level of Complex Texts
STANDARD	CC.3.5.11-12.J.	By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

SUBJECT / STANDARD AREA	PA.CC.3.6.11-12.	Writing: Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.
STANDARD AREA / STATEMENT		Text Types and Purposes
STANDARD	CC.3.6.11-12.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
DESCRIPTOR / STANDARD	CC.3.6.11-12.B.4.	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.

SUBJECT / STANDARD AREA	PA.CC.3.6.11-12.	Writing: Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.
STANDARD AREA / STATEMENT		Production and Distribution of Writing
STANDARD	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.
STANDARD	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.

Pennsylvania Core and Academic Standards
Science
Grade **12** - Adopted: **2010**

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.3.	Earth and Space Sciences
STANDARD	3.3.A.	Earth Structure, Processes and Cycles

DESCRIPTOR / STANDARD	3.3.12.A2 b.	Evaluate the impact of using renewable and nonrenewable energy resources on the Earth's system.

DESCRIPTOR / STANDARD	3.3.12.A7 b.	(CONSTANCY/CHANGE) Infer how human activities may impact the natural course of Earth's cycles.

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.A.	The Scope of Technology

DESCRIPTOR / STANDARD	3.4.12.A3.	Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.B.	Technology and Society

DESCRIPTOR / STANDARD	3.4.12.B1.	Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.C.	Technology and Engineering Design

DESCRIPTOR / STANDARD	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.

DESCRIPTOR / STANDARD	3.4.12.C3.	Apply the concept that many technological problems require a multi-disciplinary approach.

SUBJECT / STANDARD AREA	PA.3.	Science and Technology and Engineering Education
STANDARD AREA / STATEMENT	3.4.	Technology and Engineering Education
STANDARD	3.4.E.	The Designed World

DESCRIPTOR / STANDARD	3.4.12.E5.	Explain how the design of intelligent and non-intelligent transportation systems depends on many processes and innovative techniques.

DESCRIPTOR / STANDARD	3.4.12.E6.	Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

SUBJECT / STANDARD AREA	PA.4.	Environment and Ecology
STANDARD AREA / STATEMENT	4.1.	Ecology
STANDARD	4.1.12.C.	Research how humans affect energy flow within an ecosystem.

DESCRIPTOR / STANDARD	4.1.12.C.1.	Describe the impact of industrial, agricultural, and commercial enterprises on an ecosystem.

SUBJECT / STANDARD AREA	PA.4.	Environment and Ecology
STANDARD AREA / STATEMENT	4.3.	Natural Resources
STANDARD	4.3.12.A.	Evaluate the advantages and disadvantages of using renewable and nonrenewable resources.

DESCRIPTOR / STANDARD	4.3.12.A.2.	Evaluate the advantages and disadvantages of using renewable resources such as solar power, wind power, and biofuels.

SUBJECT / STANDARD AREA	PA.4.	Environment and Ecology
STANDARD AREA / STATEMENT	4.5.	Humans and the Environment
STANDARD	4.5.12.C.	Analyze the costs and benefits of means to control pollution.

DESCRIPTOR / STANDARD	4.5.12.C.1.	Analyze the role of technology in the reduction of pollution.

Grade **12** - Adopted: **2014**

SUBJECT / STANDARD AREA	PA.CC.3.5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Key Ideas and Details

STANDARD	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.

STANDARD	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.

SUBJECT / STANDARD AREA	PA.CC.3.5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

STANDARD AREA / STATEMENT		Craft and Structure
STANDARD	CC.3.5.1 1-12.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.
STANDARD	CC.3.5.1 1-12.E.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
SUBJECT / STANDARD AREA	PA.CC.3. 5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Integration of Knowledge and Ideas
STANDARD	CC.3.5.1 1-12.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.
SUBJECT / STANDARD AREA	PA.CC.3. 5.11-12.	Reading Informational Text: Students read, understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.
STANDARD AREA / STATEMENT		Range and Level of Complex Texts
STANDARD	CC.3.5.1 1-12.J.	By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.
SUBJECT / STANDARD AREA	PA.CC.3.6 .11-12.	Writing: Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.
STANDARD AREA / STATEMENT		Text Types and Purposes
STANDARD	CC.3.6.1 1-12.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
DESCRIPTOR / STANDARD	CC.3.6.11 -12.B.4.	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.
SUBJECT / STANDARD AREA	PA.CC.3. 6.11-12.	Writing: Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.
STANDARD AREA / STATEMENT		Production and Distribution of Writing
STANDARD	CC.3.6.1 1-12.C.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
STANDARD	CC.3.6.1 1-12.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.

SUBJECT / STANDARD AREA	CST A.3B.	Level 3B (Ages 17-18)
STANDARD AREA / STATEMENT	3B-AP.	Algorithms & Programming
STANDARD		Algorithms

DESCRIPTOR / STANDARD	3B-AP-09.	Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem. (P5.3)

DESCRIPTOR / STANDARD	3B-AP-10.	Use and adapt classic algorithms to solve computational problems. (P4.2)

SUBJECT / STANDARD AREA	CST A.3B.	Level 3B (Ages 17-18)
STANDARD AREA / STATEMENT	3B-AP.	Algorithms & Programming
STANDARD		Modularity

DESCRIPTOR / STANDARD	3B-AP-14.	Construct solutions to problems using student-created components, such as procedures, modules and/or objects. (P5.2)

SUBJECT / STANDARD AREA	CST A.3B.	Level 3B (Ages 17-18)
STANDARD AREA / STATEMENT	3B-AP.	Algorithms & Programming
STANDARD		Program Development

DESCRIPTOR / STANDARD	3B-AP-17.	Plan and develop programs for broad audiences using a software life cycle process. (P5.1)

Pennsylvania Core and Academic Standards
Technology Education
Grade **12** - Adopted: **2017**

SUBJECT / STANDARD AREA	CST A.3B.	Level 3B (Ages 17-18)
STANDARD AREA / STATEMENT	3B-AP.	Algorithms & Programming
STANDARD		Algorithms

DESCRIPTOR / STANDARD	3B-AP-09.	Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem. (P5.3)

DESCRIPTOR / STANDARD	3B-AP-10.	Use and adapt classic algorithms to solve computational problems. (P4.2)

SUBJECT / STANDARD AREA	CSTA.3B.	Level 3B (Ages 17-18)
STANDARD AREA / STATEMENT	3B-AP.	Algorithms & Programming
STANDARD		Modularity

DESCRIPTOR / STANDARD	3B-AP-14.	Construct solutions to problems using student-created components, such as procedures, modules and/or objects. (P5.2)

SUBJECT / STANDARD AREA	CSTA.3B.	Level 3B (Ages 17-18)
STANDARD AREA / STATEMENT	3B-AP.	Algorithms & Programming
STANDARD		Program Development

DESCRIPTOR / STANDARD	3B-AP-17.	Plan and develop programs for broad audiences using a software life cycle process. (P5.1)