

Main Criteria: Forward Education
Secondary Criteria: Kansas Academic Standards
Subjects: Mathematics, Science, Technology Education
Grades: 11, 12, Key Stage 4

Forward Education

Autonomous Electric Vehicles of the Future

Kansas Academic Standards
Mathematics
Grade 11 - Adopted: 2017

STANDARD	MP.	Standards for Mathematical Practice
BENCHMARK	MP.1.	Make sense of problems and persevere in solving them.
BENCHMARK	MP.2.	Reason abstractly and quantitatively.
BENCHMARK	MP.3.	Construct viable arguments and critique the reasoning of others.
BENCHMARK	MP.4.	Model with mathematics.
BENCHMARK	MP.7.	Look for and make use of structure.
BENCHMARK	MP.8.	Look for and express regularity in repeated reasoning.

STANDARD		Algebra
BENCHMARK	A.CED.	Creating Equations
INDICATOR / PROFICIENCY LEVEL		Create equations that describe numbers or relationships.

INDICATOR A.CED.2. (all) Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

STANDARD		Algebra
BENCHMARK	A.REI.	Reasoning with Equations and Inequalities
INDICATOR / PROFICIENCY LEVEL		Understand solving equations as a process of reasoning and explain the reasoning.

INDICATOR A.REI.1. (all) Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

STANDARD		Functions
BENCHMARK	F.IF.	Interpreting Functions
INDICATOR / PROFICIENCY LEVEL		Analyze functions using different representations.

INDICATOR F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

INDICATOR	F.IF.7a.	(9/10) Graph linear, quadratic and absolute value functions and show intercepts, maxima, minima and end behavior.
STANDARD		Functions
BENCHMARK	F.IF.	Interpreting Functions
INDICATOR / PROFICIENCY LEVEL		Analyze functions using different representations.
INDICATOR	F.IF.8.	Write a function in different but equivalent forms to reveal and explain different properties of the function.

INDICATOR	F.IF.8a.	(9/10) Use different forms of linear functions, such as slope-intercept, standard, and point-slope form to show rate of change and intercepts.
STANDARD		Functions
BENCHMARK	F.LQE.	Linear, Quadratic, and Exponential Models
INDICATOR / PROFICIENCY LEVEL		Construct and compare linear, quadratic, and exponential models and solve problems.
INDICATOR	F.LQE.1.	Distinguish between situations that can be modeled with linear functions and with exponential functions.

INDICATOR F.LQE.1a. (11) Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STANDARD		Geometry
BENCHMARK	G.GPE.	Expressing Geometric Properties with Equations
INDICATOR / PROFICIENCY LEVEL		Use coordinates to prove simple geometric theorems algebraically.

INDICATOR G.GPE.7. (9/10) Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g. find the equation of a line parallel or perpendicular to a given line that passes through a given point).

**Kansas Academic Standards
Mathematics
Grade 12 - Adopted: 2017**

STANDARD	MP.	Standards for Mathematical Practice
BENCHMARK	MP.1.	Make sense of problems and persevere in solving them.
BENCHMARK	MP.2.	Reason abstractly and quantitatively.
BENCHMARK	MP.3.	Construct viable arguments and critique the reasoning of others.
BENCHMARK	MP.4.	Model with mathematics.
BENCHMARK	MP.7.	Look for and make use of structure.
BENCHMARK	MP.8.	Look for and express regularity in repeated reasoning.

STANDARD		Algebra
BENCHMARK	A.CED.	Creating Equations
INDICATOR / PROFICIENCY LEVEL		Create equations that describe numbers or relationships.

INDICATOR A.CED.2. (all) Apply and extend previous understanding to create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

STANDARD		Algebra
BENCHMARK	A.REI.	Reasoning with Equations and Inequalities
INDICATOR / PROFICIENCY LEVEL		Understand solving equations as a process of reasoning and explain the reasoning.

INDICATOR A.REI.1. (all) Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

STANDARD		Functions
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INDICATOR / PROFICIENCY LEVEL		Analyze functions using different representations.

INDICATOR F.IF.7. **Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**

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STANDARD		Functions
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INDICATOR / PROFICIENCY LEVEL		Construct and compare linear, quadratic, and exponential models and solve problems.

INDICATOR F.LQE.1. **Distinguish between situations that can be modeled with linear functions and with exponential functions.**

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STANDARD		Geometry
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BENCHMARK	G.GPE.	Expressing Geometric Properties with Equations
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INDICATOR G.GPE.7. (9/10) Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g. find the equation of a line parallel or perpendicular to a given line that passes through a given point).

**Kansas Academic Standards
Science
Grade 11 - Adopted: 2013**

STANDARD	KS.HS-PS.	PHYSICAL SCIENCE
BENCHMARK	HS-PS1.	Matter and Its Interactions
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

STANDARD	KS.HS-PS.	PHYSICAL SCIENCE
BENCHMARK	HS-PS3.	Energy
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

STANDARD	KS.HS-PS.	PHYSICAL SCIENCE
BENCHMARK	HS-PS4.	Waves and Their Applications in Technologies for Information Transfer
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.

STANDARD	KS.HS-LS.	LIFE SCIENCE
BENCHMARK	HS-LS2.	Ecosystems: Interactions, Energy, and Dynamics
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

STANDARD	KS.HS-ESS.	EARTH AND SPACE SCIENCE
BENCHMARK	HS-ESS2.	Earth's Systems
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

STANDARD	KS.HS-ESS.	EARTH AND SPACE SCIENCE
BENCHMARK	HS-ESS3.	Earth and Human Activity
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

INDICATOR HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

INDICATOR HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

INDICATOR HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

INDICATOR HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

STANDARD	KS.HS-ETS.	ENGINEERING DESIGN
BENCHMARK	HS-ETS1.	Engineering Design
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

INDICATOR HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

INDICATOR HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

INDICATOR HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Grade 11 - Adopted: 2010

STANDARD	KS.RST.1-12.	Reading Standards for Literacy in Science and Technical Subjects
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BENCHMARK		Key Ideas and Details
INDICATOR / PROFICIENCY LEVEL	RST.11-12.2.	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.
INDICATOR / PROFICIENCY LEVEL	RST.11-12.3.	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.
STANDARD	KS.RST.11-12.1.	Reading Standards for Literacy in Science and Technical Subjects
BENCHMARK		Craft and Structure
INDICATOR / PROFICIENCY LEVEL	RST.11-12.4.	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.
INDICATOR / PROFICIENCY LEVEL	RST.11-12.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
STANDARD	KS.RST.11-12.1.	Reading Standards for Literacy in Science and Technical Subjects
BENCHMARK		Integration of Knowledge and Ideas
INDICATOR / PROFICIENCY LEVEL	RST.11-12.9.	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.
STANDARD	KS.RST.11-12.1.	Reading Standards for Literacy in Science and Technical Subjects
BENCHMARK		Range of Reading and Level of Text Complexity
INDICATOR / PROFICIENCY LEVEL	RST.11-12.10.	By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.
STANDARD	KS.WHST.11-12.	Writing Standards for Literacy in Science and Technical Subjects
BENCHMARK		Text Types and Purposes
INDICATOR / PROFICIENCY LEVEL	WHST.11-12.2.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
INDICATOR	WHST.11-12.2(d)	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.
STANDARD	KS.WHST.11-12.	Writing Standards for Literacy in Science and Technical Subjects
BENCHMARK		Production and Distribution of Writing

INDICATOR / PROFICIENCY LEVEL	WHST.11-12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
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INDICATOR / PROFICIENCY LEVEL	WHST.11-12.6.	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.
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INDICATOR / PROFICIENCY LEVEL	WHST.11-12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

INDICATOR / PROFICIENCY LEVEL WHST.11 -12.6 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.

**Kansas Academic Standards
Technology Education
Grade 11 - Adopted: 2019**

STANDARD		Computer Science Standards - Secondary Grades L1 (All Students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Algorithms

INDICATOR L1.AP.A.0 1. Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.

STANDARD		Computer Science Standards - Secondary Grades L1 (All Students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Variables

INDICATOR L1.AP.V.0 1. Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.

STANDARD		Computer Science Standards - Secondary Grades L1 (All Students)
BENCHMARK		Impacts of Computing
INDICATOR / PROFICIENCY LEVEL		Culture

INDICATOR L1.IC.C.0 2. Test and refine computational artifacts to reduce bias and equity deficits.

INDICATOR L1.IC.C.0 3. Demonstrate how a given algorithm applies to problems across disciplines.

STANDARD		Computer Science Standards - Secondary Grades L2 (Students who wish to pursue computer science beyond what is expected of all students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Algorithms

INDICATOR L2.AP.A.0 1. Describe how artificial intelligence algorithms drive many software and physical systems (e.g., digital advertising, autonomous robots, computer vision, pattern recognition, text analysis).

INDICATOR L2.AP.A.0 5. Use and adapt classic algorithms to solve computational problems.

INDICATOR L2.AP.A.0 6. Evaluate algorithms in terms of their efficiency, correctness, and clarity.

STANDARD		Computer Science Standards - Secondary Grades L2 (Students who wish to pursue computer science beyond what is expected of all students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Modularity

INDICATOR L2.AP.M.01. Construct solutions to problems using student-created components, such as procedures, modules and/or objects.

INDICATOR L2.AP.M.02. Analyze a large-scale computational problem and identify generalizable patterns that can be applied to a solution.

STANDARD		Computer Science Standards - Secondary Grades L2 (Students who wish to pursue computer science beyond what is expected of all students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Program Development

INDICATOR L2.AP.PD.08. Compare multiple programming languages and discuss how their features make them suitable for solving different types of problems.

**Kansas Academic Standards
Technology Education
Grade 12 - Adopted: 2019**

STANDARD		Computer Science Standards - Secondary Grades L1 (All Students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Algorithms

INDICATOR L1.AP.A.01. Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.

STANDARD		Computer Science Standards - Secondary Grades L1 (All Students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Variables

INDICATOR L1.AP.V.01. Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.

STANDARD		Computer Science Standards - Secondary Grades L1 (All Students)
BENCHMARK		Impacts of Computing
INDICATOR / PROFICIENCY LEVEL		Culture

INDICATOR L1.IC.C.02. Test and refine computational artifacts to reduce bias and equity deficits.

INDICATOR L1.IC.C.0 Demonstrate how a given algorithm applies to problems across disciplines.
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BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Algorithms

INDICATOR L2.AP.A.0 Describe how artificial intelligence algorithms drive many software and physical systems (e.g., digital advertising, autonomous robots, computer vision, pattern recognition, text analysis).
1.

INDICATOR L2.AP.A.0 Use and adapt classic algorithms to solve computational problems.
5.

INDICATOR L2.AP.A.0 Evaluate algorithms in terms of their efficiency, correctness, and clarity.
6.

STANDARD		Computer Science Standards - Secondary Grades L2 (Students who wish to pursue computer science beyond what is expected of all students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Modularity

INDICATOR L2.AP.M. Construct solutions to problems using student-created components, such as procedures, modules and/or objects.
01.

INDICATOR L2.AP.M. Analyze a large-scale computational problem and identify generalizable patterns that can be applied to a solution.
02.

STANDARD		Computer Science Standards - Secondary Grades L2 (Students who wish to pursue computer science beyond what is expected of all students)
BENCHMARK		Algorithms and Programing
INDICATOR / PROFICIENCY LEVEL		Program Development

INDICATOR L2.AP.PD Compare multiple programming languages and discuss how their features make them suitable for solving different types of problems.
.08.