

Main Criteria: Forward Education
Secondary Criteria: North Dakota Content Standards
Subjects: Mathematics, Science, Technology Education
Grades: 11, 12, Key Stage 4

Forward Education

Autonomous Electric Vehicles of the Future

North Dakota Content Standards
Mathematics
 Grade 11 - Adopted: 2017

CONTENT STANDARD		Standards for Mathematical Practice
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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.8	Look for and express regularity in repeated reasoning.

CONTENT STANDARD		High School—Algebra
BENCHMARK		Creating Equations and Inequalities
GRADE LEVEL EXPECTATION		Create equations that describe numbers or relationships

INDICATOR	HS.A-CED.2	Create equations in two or more variables to represent relationships between quantities. Graph equations on coordinate axes with appropriate labels and scales.
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CONTENT STANDARD		High School—Algebra
BENCHMARK		Reasoning with Equations and Inequalities
GRADE LEVEL EXPECTATION		Understand solving equations as a process of reasoning and explain the reasoning

INDICATOR	HS.A-REI.1	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.
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CONTENT STANDARD		High School—Functions
BENCHMARK		Interpreting Functions
GRADE LEVEL EXPECTATION		Analyze functions using different representations

INDICATOR	HS.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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INDICATOR	HS.F-IF.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima where appropriate.
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CONTENT STANDARD		High School—Functions
BENCHMARK		Linear, Quadratic, and Exponential Models
GRADE LEVEL EXPECTATION		Construct and compare linear, quadratic, and exponential models and solve problems

INDICATOR	HS.F-LE.1	Identify situations that can be modeled with linear, quadratic, and exponential functions. Justify the most appropriate model for a situation based on the rate of change over equal intervals. Include situations in which a quantity grows or decays.
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**North Dakota Content Standards
Mathematics
Grade 12 - Adopted: 2017**

CONTENT STANDARD		Standards for Mathematical Practice
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BENCHMARK	MP.1	Make sense of problems and persevere in solving them.
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BENCHMARK	MP.2	Reason abstractly and quantitatively.
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BENCHMARK	MP.3	Construct viable arguments and critique the reasoning of others.
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BENCHMARK	MP.4	Model with mathematics.
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BENCHMARK	MP.8	Look for and express regularity in repeated reasoning.
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CONTENT STANDARD		High School—Algebra
BENCHMARK		Creating Equations and Inequalities
GRADE LEVEL EXPECTATION		Create equations that describe numbers or relationships

INDICATOR	HS.A-CED.2	Create equations in two or more variables to represent relationships between quantities. Graph equations on coordinate axes with appropriate labels and scales.
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CONTENT STANDARD		High School—Algebra
BENCHMARK		Reasoning with Equations and Inequalities
GRADE LEVEL EXPECTATION		Understand solving equations as a process of reasoning and explain the reasoning

INDICATOR	HS.A-REI.1	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.
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CONTENT STANDARD		High School—Functions
BENCHMARK		Interpreting Functions

GRADE LEVEL EXPECTATION		Analyze functions using different representations
INDICATOR	HS.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 HS.F-IF.7.a. Graph linear and quadratic functions and show intercepts, maxima, and minima where appropriate.

CONTENT STANDARD		High School—Functions
BENCHMARK		Linear, Quadratic, and Exponential Models
GRADE LEVEL EXPECTATION		Construct and compare linear, quadratic, and exponential models and solve problems

INDICATOR HS.F-LE.1 Identify situations that can be modeled with linear, quadratic, and exponential functions. Justify the most appropriate model for a situation based on the rate of change over equal intervals. Include situations in which a quantity grows or decays.

**North Dakota Content Standards
Science**

Grade 11 - Adopted: 2019

CONTENT STANDARD		Science and Engineering Practices
BENCHMARK	2	Developing and using models

GRADE LEVEL EXPECTATION Modeling in K-12 builds on prior experiences and progresses to include using and developing models (i.e., diagrams, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

CONTENT STANDARD		Science and Engineering Practices
BENCHMARK	6	Constructing explanations and designing solutions

GRADE LEVEL EXPECTATION Constructing explanations and designing solutions in K-12 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

CONTENT STANDARD		Life Science (LS)
BENCHMARK	HS-LS2.	ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

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

CONTENT STANDARD		Physical Science (PS)
BENCHMARK	HS-PS1.	MATTER AND ITS INTERACTIONS

GRADE LEVEL EXPECTATION 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.

CONTENT STANDARD		Physical Science (PS)
BENCHMARK	HS-PS3.	ENERGY

GRADE LEVEL EXPECTATION	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.
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CONTENT STANDARD		Earth and Space Science (ESS)
BENCHMARK	HS-ESS2.	Earth's Systems

GRADE LEVEL EXPECTATION	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.
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CONTENT STANDARD		Earth and Space Science (ESS)
BENCHMARK	HS-ESS3.	EARTH AND HUMAN ACTIVITY

GRADE LEVEL EXPECTATION	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.
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GRADE LEVEL EXPECTATION	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
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GRADE LEVEL EXPECTATION	HS-ESS3-3.	Analyze the relationships among management of natural resources, the sustainability of human populations, and biodiversity through the use of a computational simulation.
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GRADE LEVEL EXPECTATION	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
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GRADE LEVEL EXPECTATION	HS-ESS3-6.	Use data from computational representations to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
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CONTENT STANDARD		Engineering and Technology (ET)
BENCHMARK	HS-ET1.	Engineering & Technology

GRADE LEVEL EXPECTATION	HS-ET1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
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GRADE LEVEL EXPECTATION	HS-ET1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
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GRADE LEVEL EXPECTATION	HS-ET1-3.	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.
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**North Dakota Content Standards
Science
Grade 12 - Adopted: 2019**

CONTENT STANDARD		Science and Engineering Practices
BENCHMARK	2	Developing and using models

GRADE LEVEL EXPECTATION		Modeling in K-12 builds on prior experiences and progresses to include using and developing models (i.e., diagrams, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
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CONTENT STANDARD		Science and Engineering Practices
BENCHMARK	6	Constructing explanations and designing solutions

GRADE LEVEL EXPECTATION		Constructing explanations and designing solutions in K-12 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
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CONTENT STANDARD		Life Science (LS)
BENCHMARK	HS-LS2.	ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

GRADE LEVEL EXPECTATION	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
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CONTENT STANDARD		Physical Science (PS)
BENCHMARK	HS-PS1.	MATTER AND ITS INTERACTIONS

GRADE LEVEL EXPECTATION	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.
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CONTENT STANDARD		Physical Science (PS)
BENCHMARK	HS-PS3.	ENERGY

GRADE LEVEL EXPECTATION	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.
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CONTENT STANDARD		Earth and Space Science (ESS)
BENCHMARK	HS-ESS2.	Earth's Systems

GRADE LEVEL EXPECTATION	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.
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CONTENT STANDARD		Earth and Space Science (ESS)
BENCHMARK	HS-ESS3.	EARTH AND HUMAN ACTIVITY

GRADE LEVEL EXPECTATION	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.
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GRADE LEVEL EXPECTATION	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
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GRADE LEVEL EXPECTATION	HS-ESS3-3.	Analyze the relationships among management of natural resources, the sustainability of human populations, and biodiversity through the use of a computational simulation.
GRADE LEVEL EXPECTATION	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
GRADE LEVEL EXPECTATION	HS-ESS3-6.	Use data from computational representations to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

CONTENT STANDARD		Engineering and Technology (ET)
BENCHMARK	HS-ET1.	Engineering & Technology

GRADE LEVEL EXPECTATION	HS-ET1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
GRADE LEVEL EXPECTATION	HS-ET1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
GRADE LEVEL EXPECTATION	HS-ET1-3.	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.

**North Dakota Content Standards
Technology Education
Grade 11 - Adopted: 2019**

CONTENT STANDARD		Computer Science and Cybersecurity Standards
BENCHMARK		Computational Thinking
GRADE LEVEL EXPECTATION		Problem Solving & Algorithms
INDICATOR		Strategies for understanding and solving problems.

INDICATOR	11.PSA.1.	Demonstrate ways a given algorithm applies to problems across disciplines and explain the benefits and drawbacks of choices made.
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CONTENT STANDARD		Computer Science and Cybersecurity Standards
BENCHMARK		CS Extension Standards
GRADE LEVEL EXPECTATION		Computational Thinking
INDICATOR		Algorithms & Programming

INDICATOR	ES.AP.1.	Design algorithms to solve computational problems using a combination of original and existing algorithms.
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**North Dakota Content Standards
Technology Education
Grade 12 - Adopted: 2019**

CONTENT STANDARD		Computer Science and Cybersecurity Standards
BENCHMARK		Computational Thinking

GRADE LEVEL EXPECTATION		Problem Solving & Algorithms
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INDICATOR		Strategies for understanding and solving problems.
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INDICATOR 12.PSA.1. Use and adapt common algorithms to solve computational problems.

CONTENT STANDARD		Computer Science and Cybersecurity Standards
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BENCHMARK		CS Extension Standards
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GRADE LEVEL EXPECTATION		Computational Thinking
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INDICATOR		Algorithms & Programming
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INDICATOR ES.AP.1. Design algorithms to solve computational problems using a combination of original and existing algorithms.