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

Forward Education

Autonomous Electric Vehicles of the Future

Missouri Learning Standards
Mathematics
Grade **11** - Adopted: **2016**

STRAND: BIG IDEA / STANDARD	**MO.A1.**	**Algebra 1**
CONCEPT: GLE / BENCHMARK	**A1.CED.**	**Creating Equations**
GLE / COMPONENT	**A1.CED.A.**	**Create equations that describe linear, quadratic and exponential relationships.**
INDICATOR / PROFICIENCY	A1.CED.A.2.	Create and graph linear, quadratic and exponential equations in two variables.

STRAND: BIG IDEA / STANDARD	**MO.A1.**	**Algebra 1**
CONCEPT: GLE / BENCHMARK	**A1.REI.**	**Reasoning with Equations and Inequalities**
GLE / COMPONENT	**A1.REI.A.**	**Understand solving equations as a process, and solve equations and inequalities in one variable.**
INDICATOR / PROFICIENCY	A1.REI.A.1.	Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original.

Missouri Learning Standards
Mathematics
Grade **12** - Adopted: **2016**

STRAND: BIG IDEA / STANDARD	**MO.A1.**	**Algebra 1**
CONCEPT: GLE / BENCHMARK	**A1.CED.**	**Creating Equations**
GLE / COMPONENT	**A1.CED.A.**	**Create equations that describe linear, quadratic and exponential relationships.**
INDICATOR / PROFICIENCY	A1.CED.A.2.	Create and graph linear, quadratic and exponential equations in two variables.

STRAND: BIG IDEA / STANDARD	**MO.A1.**	**Algebra 1**
CONCEPT: GLE / BENCHMARK	**A1.REI.**	**Reasoning with Equations and Inequalities**
GLE / COMPONENT	**A1.REI.A.**	**Understand solving equations as a process, and solve equations and inequalities in one variable.**

INDICATOR / PROFICIENCY	A1.REI.A.1.	Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original.

Missouri Learning Standards

Science

Grade **11** - Adopted: **2016**

STRAND: BIG IDEA / STANDARD	**MO.9-12.PS.**	**Physical Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.PS1.**	**Matter and Its Interactions**
GLE / COMPONENT	**9-12.PS1.A.**	**Structure and Properties of Matter**
INDICATOR / PROFICIENCY	9-12.PS1.A.5.	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. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.]
STRAND: BIG IDEA / STANDARD	**MO.9-12.PS.**	**Physical Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.PS3.**	**Energy**
GLE / COMPONENT	**9-12.PS3.A.**	**Definitions of Energy**
INDICATOR / PROFICIENCY	9-12.PS3.A.3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.]
STRAND: BIG IDEA / STANDARD	**MO.9-12.ESS.**	**Earth and Space Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.ESS2.**	**Earth's Systems**
GLE / COMPONENT	**9-12.ESS2.A.**	**Earth Materials and Systems**
INDICATOR / PROFICIENCY	9-12.ESS2.A.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.
STRAND: BIG IDEA / STANDARD	**MO.9-12.ESS.**	**Earth and Space Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.ESS3.**	**Earth and Human Activity**

GLE / COMPONENT	**9-12.ESS3.A.**	**Natural Resources**
INDICATOR / PROFICIENCY	9-12.ESS3.A.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. [Clarification Statement: Examples of key natural resources include access to fresh water, regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather. Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]
STRAND: BIG IDEA / STANDARD	**MO.9-12.ESS.**	**Earth and Space Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.ESS3.**	**Earth and Human Activity**
GLE / COMPONENT	**9-12.ESS3.C.**	**Human Impacts on Earth's Systems**
INDICATOR / PROFICIENCY	9-12.ESS3.C.1.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.]
INDICATOR / PROFICIENCY	9-12.ESS3.C.2.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems in order to restore stability and or biodiversity of the ecosystem as well as prevent their reoccurrences. [Clarification Statement: Examples of human activities could include forest fires, acid rain, flooding, urban development, pollution, deforestation, and introduction of an invasive species.]
STRAND: BIG IDEA / STANDARD	**MO.9-12.ESS.**	**Earth and Space Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.ESS3.**	**Earth and Human Activity**
GLE / COMPONENT	**9-12.ESS3.D.**	**Global Climate Change**
INDICATOR / PROFICIENCY	9-12.ESS3.D.2.	Predict how human activity affects the relationships between Earth systems in both positive and negative ways. [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere.]
STRAND: BIG IDEA / STANDARD	**MO.9-12.ETS.**	**Engineering, Technology, and Application of Science**
CONCEPT: GLE / BENCHMARK	**9-12.ETS1.**	**Engineering Design**
GLE / COMPONENT	**9-12.ETS1.A.**	**Defining and Delimiting Engineering Problems**

INDICATOR / PROFICIENCY	9-12.ETS1.A.1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
INDICATOR / PROFICIENCY	9-12.ETS1.A.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.
STRAND: BIG IDEA / STANDARD	**MO.9-12.ETS.**	**Engineering, Technology, and Application of Science**
CONCEPT: GLE / BENCHMARK	**9-12.ETS1.**	**Engineering Design**
GLE / COMPONENT	**9-12.ETS1.B.**	**Developing Possible Solutions**
INDICATOR / PROFICIENCY	9-12.ETS1.B.1.	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**

STRAND: BIG IDEA / STANDARD	**MO.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONCEPT: GLE / BENCHMARK		**Key Ideas and Details**
GLE / COMPONENT	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.
GLE / COMPONENT	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.
STRAND: BIG IDEA / STANDARD	**MO.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONCEPT: GLE / BENCHMARK		**Craft and Structure**
GLE / COMPONENT	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.
GLE / COMPONENT	RST.11-12.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
STRAND: BIG IDEA / STANDARD	**MO.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONCEPT: GLE / BENCHMARK		**Integration of Knowledge and Ideas**

GLE / COMPONENT	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.

STRAND: BIG IDEA / STANDARD	**MO.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONCEPT: GLE / BENCHMARK		**Range of Reading and Level of Text Complexity**

GLE / COMPONENT	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.

STRAND: BIG IDEA / STANDARD	**MO.WHST.11-12.**	**Writing Standards for Literacy in Science and Technical Subjects**
CONCEPT: GLE / BENCHMARK		**Text Types and Purposes**
GLE / COMPONENT	**WHST.11-12.2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**

INDICATOR / PROFICIENCY	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.

STRAND: BIG IDEA / STANDARD	**MO.WHST.11-12.**	**Writing Standards for Literacy in Science and Technical Subjects**
CONCEPT: GLE / BENCHMARK		**Production and Distribution of Writing**

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

GLE / COMPONENT	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.

Missouri Learning Standards

Science

Grade **12** - Adopted: **2016**

STRAND: BIG IDEA / STANDARD	**MO.9-12.PS.**	**Physical Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.PS1.**	**Matter and Its Interactions**
GLE / COMPONENT	**9-12.PS1.A.**	**Structure and Properties of Matter**

INDICATOR / PROFICIENCY	9-12.PS1.A.5.	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. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.]

STRAND: BIG IDEA / STANDARD	**MO.9-12.PS.**	**Physical Sciences**
CONCEPT: GLE / BENCHMARK	**9-12.PS3.**	**Energy**
GLE / COMPONENT	**9-12.PS3.A.**	**Definitions of Energy**
INDICATOR / PROFICIENCY	9-12.PS3.A.3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.]

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GLE / COMPONENT	**9-12.ESS2.A.**	**Earth Materials and Systems**
INDICATOR / PROFICIENCY	9-12.ESS2.A.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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GLE / COMPONENT	**9-12.ESS3.C.**	**Human Impacts on Earth's Systems**

INDICATOR / PROFICIENCY	9-12.ESS3.C.1.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.]
INDICATOR / PROFICIENCY	9-12.ESS3.C.2.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems in order to restore stability and or biodiversity of the ecosystem as well as prevent their reoccurrences. [Clarification Statement: Examples of human activities could include forest fires, acid rain, flooding, urban development, pollution, deforestation, and introduction of an invasive species.]
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CONCEPT: GLE / BENCHMARK		Integration of Knowledge and Ideas
GLE / COMPONENT	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.

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CONCEPT: GLE / BENCHMARK		**Production and Distribution of Writing**
GLE / COMPONENT	WHST.11-12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
GLE / COMPONENT	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.

Missouri Learning Standards

Technology Education

Grade **11** - Adopted: **2019**

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Algorithms**
INDICATOR / PROFICIENCY	11-12.AP.A.02.	Implement an artificial intelligence algorithm to interact with a human or solve a problem.

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Variables**
INDICATOR / PROFICIENCY	11-12.AP.V.01.	Create problem solutions that utilize data structures (e.g., lists, arrays, ArrayLists).

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Modularity**

INDICATOR / PROFICIENCY	11-12.AP.M.01.	Construct solutions to problems using student-created components (e.g., procedures, modules, objects).

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Program Development**

INDICATOR / PROFICIENCY	11-12.AP.PD.02.	Plan and develop programs using a development process (e.g., waterfall, iterative, spiral, rapid application development, agile).

Missouri Learning Standards

Technology Education

Grade **12** - Adopted: **2019**

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Algorithms**

INDICATOR / PROFICIENCY	11-12.AP.A.02.	Implement an artificial intelligence algorithm to interact with a human or solve a problem.

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Variables**

INDICATOR / PROFICIENCY	11-12.AP.V.01.	Create problem solutions that utilize data structures (e.g., lists, arrays, ArrayLists).

STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Modularity**

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STRAND: BIG IDEA / STANDARD		**Computer Science Performance Standards**
CONCEPT: GLE / BENCHMARK		**Algorithms & Programming**
GLE / COMPONENT		**Program Development**
INDICATOR / PROFICIENCY	11-12.AP.PD.02.	Plan and develop programs using a development process (e.g., waterfall, iterative, spiral, rapid application development, agile).