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

Forward Education

Autonomous Electric Vehicles of the Future

Florida Standards
Mathematics
Grade **11** - Adopted: **2020**

BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 1: Actively participate in effortful learning both individually and collectively.**
BENCHMARK	**MA.K12.MTR.1.1**	**Mathematicians who participate in effortful learning both individually and with others:**
INDICATOR	MA.K12.MTR.1.1a	Analyze the problem in a way that makes sense given the task.
INDICATOR	MA.K12.MTR.1.1b	Ask questions that will help with solving the task.
INDICATOR	MA.K12.MTR.1.1c	Build perseverance by modifying methods as needed while solving a challenging task.
INDICATOR	MA.K12.MTR.1.1d	Stay engaged and maintain a positive mindset when working to solve tasks.
INDICATOR	MA.K12.MTR.1.1e	Help and support each other when attempting a new method or approach.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 2: Demonstrate understanding by representing problems in multiple ways.**
BENCHMARK	**MA.K12.MTR.2.1**	**Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:**
INDICATOR	MA.K12.MTR.2.1a	Build understanding through modeling and using manipulatives.
INDICATOR	MA.K12.MTR.2.1b	Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
INDICATOR	MA.K12.MTR.2.1d	Express connections between concepts and representations.
INDICATOR	MA.K12.MTR.2.1e	Choose a representation based on the given context or purpose.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**

BIG IDEA		**Standard 3: Complete tasks with mathematical fluency.**
BENCHMARK	**MA.K12.MTR.3.1**	**Complete tasks with mathematical fluency.Mathematicians who complete tasks with mathematical fluency:**
INDICATOR	MA.K12.MTR.3.1a	Select efficient and appropriate methods for solving problems within the given context.
INDICATOR	MA.K12.MTR.3.1d	Adapt procedures to apply them to a new context.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 4: Engage in discussions that reflect on the mathematical thinking of self and others.**
BENCHMARK	**MA.K12.MTR.4.1**	**Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:**
INDICATOR	MA.K12.MTR.4.1a	Communicate mathematical ideas, vocabulary and methods effectively.
INDICATOR	MA.K12.MTR.4.1b	Analyze the mathematical thinking of others.
INDICATOR	MA.K12.MTR.4.1c	Compare the efficiency of a method to those expressed by others.
INDICATOR	MA.K12.MTR.4.1e	Justify results by explaining methods and processes.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 5: Use patterns and structure to help understand and connect mathematical concepts.**
BENCHMARK	**MA.K12.MTR.5.1**	**Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:**
INDICATOR	MA.K12.MTR.5.1a	Focus on relevant details within a problem.
INDICATOR	MA.K12.MTR.5.1c	Decompose a complex problem into manageable parts.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 7: Apply mathematics to real-world contexts.**
BENCHMARK	**MA.K12.MTR.7.1**	**Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:**
INDICATOR	MA.K12.MTR.7.1a	Connect mathematical concepts to everyday experiences.
INDICATOR	MA.K12.MTR.7.1b	Use models and methods to understand, represent and solve problems.

INDICATOR	MA.K12.MTR.7.1c	Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.
BODY OF KNOWLEDGE		**Algebraic Reasoning**
BIG IDEA		**Standard 2: Write, solve and graph linear equations, functions and inequalities in one and two variables.**
BENCHMARK	MA.912.AR.2.3	Write a linear two-variable equation for a line that is parallel or perpendicular to a given line and goes through a given point.
BENCHMARK	MA.912.AR.2.4	Given a table, equation or written description of a linear function, graph that function, and determine and interpret its key features.
BENCHMARK	MA.912.AR.2.5	Solve and graph mathematical and real-world problems that are modeled with linear functions. Interpret key features and determine constraints in terms of the context.
BODY OF KNOWLEDGE		**Logic and Discrete Theory**
BIG IDEA		**Standard 4: Develop an understanding of the fundamentals of propositional logic, arguments and methods of proof.**
BENCHMARK	MA.912.LT.4.7	Identify and give examples of undefined terms; axioms; theorems; proofs, including proofs using mathematical induction; and inductive and deductive reasoning.

Florida Standards

Mathematics

Grade **12** - Adopted: **2020**

BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 1: Actively participate in effortful learning both individually and collectively.**
BENCHMARK	**MA.K12.MTR.1.1**	**Mathematicians who participate in effortful learning both individually and with others:**
INDICATOR	MA.K12.MTR.1.1a	Analyze the problem in a way that makes sense given the task.
INDICATOR	MA.K12.MTR.1.1b	Ask questions that will help with solving the task.
INDICATOR	MA.K12.MTR.1.1c	Build perseverance by modifying methods as needed while solving a challenging task.
INDICATOR	MA.K12.MTR.1.1d	Stay engaged and maintain a positive mindset when working to solve tasks.
INDICATOR	MA.K12.MTR.1.1e	Help and support each other when attempting a new method or approach.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 2: Demonstrate understanding by representing problems in multiple ways.**

BENCHMARK	**MA.K12.MTR.2.1**	**Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:**
INDICATOR	MA.K12.MTR.2.1a	Build understanding through modeling and using manipulatives.
INDICATOR	MA.K12.MTR.2.1b	Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
INDICATOR	MA.K12.MTR.2.1d	Express connections between concepts and representations.
INDICATOR	MA.K12.MTR.2.1e	Choose a representation based on the given context or purpose.
BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 3: Complete tasks with mathematical fluency.**
BENCHMARK	**MA.K12.MTR.3.1**	**Complete tasks with mathematical fluency.Mathematicians who complete tasks with mathematical fluency:**
INDICATOR	MA.K12.MTR.3.1a	Select efficient and appropriate methods for solving problems within the given context.
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BENCHMARK	**MA.K12.MTR.5.1**	**Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:**

INDICATOR	MA.K12.MTR.5.1a	Focus on relevant details within a problem.
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BIG IDEA		**Standard 2: Write, solve and graph linear equations, functions and inequalities in one and two variables.**
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BODY OF KNOWLEDGE		**Logic and Discrete Theory**
BIG IDEA		**Standard 4: Develop an understanding of the fundamentals of propositional logic, arguments and methods of proof.**
BENCHMARK	MA.912.LT.4.7	Identify and give examples of undefined terms; axioms; theorems; proofs, including proofs using mathematical induction; and inductive and deductive reasoning.

Florida Standards

Science

Grade **11** - Adopted: **2008**

BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**

BIG IDEA	**SC.912.N.1.**	**The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.**
BENCHMARK	**SC.912.N.1.1.**	**Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:**
INDICATOR	SC.912.N.1.1.6.	Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)
INDICATOR	SC.912.N.1.1.7.	Pose answers, explanations, or descriptions of events

BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.1.**	**The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.**
BENCHMARK	SC.912.N.1.3.	Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
BENCHMARK	SC.912.N.1.7.	Recognize the role of creativity in constructing scientific questions, methods and explanations.

BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.4.**	**Science and Society - As tomorrows citizens, students should be able to identify issues about which society could provide input, formulate scientifically investigable questions about those issues, construct investigations of their questions, collect and evaluate data from their investigations, and develop scientific recommendations based upon their findings.**
BENCHMARK	SC.912.N.4.2.	Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

BODY OF KNOWLEDGE	**FL.SC.912.E.**	**Earth and Space Science**
BIG IDEA	**SC.912.E.6.**	**Earth Structures - The scientific theory of plate tectonics provides the framework for much of modern geology. Over geologic time, internal and external sources of energy have continuously altered the features of Earth by means of both constructive and destructive forces. All life, including human civilization, is dependent on Earth's internal and external energy and material resources.**
BENCHMARK	SC.912.E.6.6.	Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.

BODY OF KNOWLEDGE	**FL.SC.912.E.**	**Earth and Space Science**

BIG IDEA	**SC.912.E.7.**	**Earth Systems and Patterns - The scientific theory of the evolution of Earth states that changes in our planet are driven by the flow of energy and the cycling of matter through dynamic interactions among the atmosphere, hydrosphere, cryosphere, geosphere, and biosphere, and the resources used to sustain human civilization on Earth.**
BENCHMARK	SC.912.E.7.7.	Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.

BODY OF KNOWLEDGE	**FL.SC.912.P.**	**Physical Science**
BIG IDEA	**SC.912.P.10.**	**Energy - A. Energy is involved in all physical and chemical processes. It is conserved, and can be transformed from one form to another and into work. At the atomic and nuclear levels energy is not continuous but exists in discrete amounts. Energy and mass are related through Einstein's equation E=mc 2 . B. The properties of atomic nuclei are responsible for energy-related phenomena such as radioactivity, fission and fusion. C. Changes in entropy and energy that accompany chemical reactions influence reaction paths. Chemical reactions result in the release or absorption of energy. D. The theory of electromagnetism explains that electricity and magnetism are closely related. Electric charges are the source of electric fields. Moving charges generate magnetic fields. E. Waves are the propagation of a disturbance. They transport energy and momentum but do not transport matter.**
BENCHMARK	SC.912.P.10.16.	Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

BODY OF KNOWLEDGE	**FL.SC.912.L.**	**Life Science**
BIG IDEA	**SC.912.L.17.**	**Interdependence - A. The distribution and abundance of organisms is determined by the interactions between organisms, and between organisms and the non-living environment. B. Energy and nutrients move within and between biotic and abiotic components of ecosystems via physical, chemical and biological processes. C. Human activities and natural events can have profound effects on populations, biodiversity and ecosystem processes.**
BENCHMARK	SC.912.L.17.4.	Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
BENCHMARK	SC.912.L.17.8.	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
BENCHMARK	SC.912.L.17.15.	Discuss the effects of technology on environmental quality.
BENCHMARK	SC.912.L.17.16.	Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
BENCHMARK	SC.912.L.17.20.	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Florida Standards

Science

Grade **12** - Adopted: **2008**

BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.1.**	**The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.**

BENCHMARK	**SC.912.N.1.1.**	**Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:**
INDICATOR	SC.912.N.1.1.6.	Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)
INDICATOR	SC.912.N.1.1.7.	Pose answers, explanations, or descriptions of events
BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.1.**	**The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.**
BENCHMARK	SC.912.N.1.3.	Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
BENCHMARK	SC.912.N.1.7.	Recognize the role of creativity in constructing scientific questions, methods and explanations.
BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.4.**	**Science and Society - As tomorrows citizens, students should be able to identify issues about which society could provide input, formulate scientifically investigable questions about those issues, construct investigations of their questions, collect and evaluate data from their investigations, and develop scientific recommendations based upon their findings.**
BENCHMARK	SC.912.N.4.2.	Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.
BODY OF KNOWLEDGE	**FL.SC.912.E.**	**Earth and Space Science**
BIG IDEA	**SC.912.E.6.**	**Earth Structures - The scientific theory of plate tectonics provides the framework for much of modern geology. Over geologic time, internal and external sources of energy have continuously altered the features of Earth by means of both constructive and destructive forces. All life, including human civilization, is dependent on Earth's internal and external energy and material resources.**
BENCHMARK	SC.912.E.6.6.	Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.
BODY OF KNOWLEDGE	**FL.SC.912.E.**	**Earth and Space Science**
BIG IDEA	**SC.912.E.7.**	**Earth Systems and Patterns - The scientific theory of the evolution of Earth states that changes in our planet are driven by the flow of energy and the cycling of matter through dynamic interactions among the atmosphere, hydrosphere, cryosphere, geosphere, and biosphere, and the resources used to sustain human civilization on Earth.**
BENCHMARK	SC.912.E.7.7.	Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.
BODY OF KNOWLEDGE	**FL.SC.912.P.**	**Physical Science**

BIG IDEA	**SC.912.P.10.**	**Energy - A. Energy is involved in all physical and chemical processes. It is conserved, and can be transformed from one form to another and into work. At the atomic and nuclear levels energy is not continuous but exists in discrete amounts. Energy and mass are related through Einstein's equation E=mc 2 . B. The properties of atomic nuclei are responsible for energy-related phenomena such as radioactivity, fission and fusion. C. Changes in entropy and energy that accompany chemical reactions influence reaction paths. Chemical reactions result in the release or absorption of energy. D. The theory of electromagnetism explains that electricity and magnetism are closely related. Electric charges are the source of electric fields. Moving charges generate magnetic fields. E. Waves are the propagation of a disturbance. They transport energy and momentum but do not transport matter.**
BENCHMARK	SC.912.P.10.16.	Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.
BODY OF KNOWLEDGE	**FL.SC.912.L.**	**Life Science**
BIG IDEA	**SC.912.L.17.**	**Interdependence - A. The distribution and abundance of organisms is determined by the interactions between organisms, and between organisms and the non-living environment. B. Energy and nutrients move within and between biotic and abiotic components of ecosystems via physical, chemical and biological processes. C. Human activities and natural events can have profound effects on populations, biodiversity and ecosystem processes.**
BENCHMARK	SC.912.L.17.4.	Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
BENCHMARK	SC.912.L.17.8.	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
BENCHMARK	SC.912.L.17.15.	Discuss the effects of technology on environmental quality.
BENCHMARK	SC.912.L.17.16.	Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
BENCHMARK	SC.912.L.17.20.	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Florida Standards

Technology Education

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

BODY OF KNOWLEDGE	**FL.SC.912.CS-CS.**	**COMPUTER SCIENCE - COMMUNICATION SYSTEMS AND COMPUTING**
BIG IDEA	**SC.912.CS-CS.2.**	**Problem solving and algorithms**
BENCHMARK	SC.912.CS-CS.2.5	Evaluate a classical algorithm and implement an original algorithm.
BENCHMARK	SC.912.CS-CS.2.7	Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
BODY OF KNOWLEDGE	**FL.SC.912.CS-CP.**	**COMPUTER SCIENCE - COMPUTER PRACTICES AND PROGRAMMING**
BIG IDEA	**SC.912.CS-CP.1.**	**Data analysis**

BENCHMARK	SC.912.CS-CP.1.4	Collect real-time data from sources such as simulations, scientific and robotic sensors, and device emulators, using this data to formulate strategies or algorithms to solve advanced problems.

Florida Standards

Technology Education

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

BODY OF KNOWLEDGE	**FL.SC.912.CS-CS.**	**COMPUTER SCIENCE - COMMUNICATION SYSTEMS AND COMPUTING**
BIG IDEA	**SC.912.CS-CS.2.**	**Problem solving and algorithms**
BENCHMARK	SC.912.CS-CS.2.5	Evaluate a classical algorithm and implement an original algorithm.
BENCHMARK	SC.912.CS-CS.2.7	Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.
BODY OF KNOWLEDGE	**FL.SC.912.CS-CP.**	**COMPUTER SCIENCE - COMPUTER PRACTICES AND PROGRAMMING**
BIG IDEA	**SC.912.CS-CP.1.**	**Data analysis**
BENCHMARK	SC.912.CS-CP.1.4	Collect real-time data from sources such as simulations, scientific and robotic sensors, and device emulators, using this data to formulate strategies or algorithms to solve advanced problems.