Forward Education

Autonomous Electric Vehicles of the Future

Maryland College and Career-Ready Standards
Mathematics
Grade **11** - Adopted: **2022**

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	**A.CED.**	**Algebra (A) - Creating Equations**
INDICATOR / PROFICIENCY LEVEL	**A.CED.A.**	**CREATE EQUATIONS THAT DESCRIBE NUMBERS OR RELATIONSHIPS.**

OBJECTIVE	A.CED.A.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	**A.REI.**	**Algebra (A) - Reasoning with Equations and Inequalities**
INDICATOR / PROFICIENCY LEVEL	**A.REI.A.**	**UNDERSTAND SOLVING EQUATIONS AS A PROCESS OF REASONING AND EXPLAIN THE REASONING.**

OBJECTIVE	A.REI.A.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.

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	**F.IF.**	**Functions (F) - Interpreting Functions**
INDICATOR / PROFICIENCY LEVEL	**F.IF.C.**	**ANALYZE FUNCTIONS USING DIFFERENT REPRESENTATIONS.**
OBJECTIVE	**F.IF.C.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**

EXPECTATION	a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	**F.LE.**	**Functions (F) - Linear, Quadratic, and Exponential Models**
INDICATOR / PROFICIENCY LEVEL	**F.LE.A.**	**CONSTRUCT AND COMPARE LINEAR, QUADRATIC, AND EXPONENTIAL MODELS AND SOLVE PROBLEMS.**

OBJECTIVE	F.LE.A.1.	Distinguish between situations that can be modeled with linear functions and with exponential functions.
EXPECTATION	a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND / TOPIC / STANDARD		Algebra II
TOPIC / INDICATOR	A.REI.	Algebra (A) - Reasoning with Equations and Inequalities
INDICATOR / PROFICIENCY LEVEL	A.REI.A.	UNDERSTAND SOLVING EQUATIONS AS A PROCESS OF REASONING AND EXPLAIN THE REASONING.

OBJECTIVE	A.REI.A.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.

STRAND / TOPIC / STANDARD		Algebra II
TOPIC / INDICATOR	F.IF.	Functions (F) - Interpreting Functions
INDICATOR / PROFICIENCY LEVEL	F.IF.C.	ANALYZE FUNCTIONS USING DIFFERENT REPRESENTATIONS.
OBJECTIVE	F.IF.C.7.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

EXPECTATION	a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

STRAND / TOPIC / STANDARD		Geometry
TOPIC / INDICATOR	G.GPE.	Expressing Geometric Properties with Equations
INDICATOR / PROFICIENCY LEVEL	G.GPE. B.	USE COORDINATES TO PROVE SIMPLE GEOMETRIC THEOREMS ALGEBRAICALLY

OBJECTIVE	G.GPE.B. 5.	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).

Maryland College and Career-Ready Standards
Mathematics
Grade **12** - Adopted: **2022**

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	A.CED.	Algebra (A) - Creating Equations
INDICATOR / PROFICIENCY LEVEL	A.CED.A.	CREATE EQUATIONS THAT DESCRIBE NUMBERS OR RELATIONSHIPS.

OBJECTIVE	A.CED.A. 2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	A.REI.	Algebra (A) - Reasoning with Equations and Inequalities
INDICATOR / PROFICIENCY LEVEL	A.REI.A.	UNDERSTAND SOLVING EQUATIONS AS A PROCESS OF REASONING AND EXPLAIN THE REASONING.

OBJECTIVE	A.REI.A.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.

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	F.IF.	Functions (F) - Interpreting Functions
INDICATOR / PROFICIENCY LEVEL	F.IF.C.	ANALYZE FUNCTIONS USING DIFFERENT REPRESENTATIONS.
OBJECTIVE	F.IF.C.7.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

EXPECTATION	a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

STRAND / TOPIC / STANDARD		Algebra I
TOPIC / INDICATOR	F.LE.	Functions (F) - Linear, Quadratic, and Exponential Models
INDICATOR / PROFICIENCY LEVEL	F.LE.A.	CONSTRUCT AND COMPARE LINEAR, QUADRATIC, AND EXPONENTIAL MODELS AND SOLVE PROBLEMS.
OBJECTIVE	F.LE.A.1.	Distinguish between situations that can be modeled with linear functions and with exponential functions.

EXPECTATION	a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND / TOPIC / STANDARD		Algebra II
TOPIC / INDICATOR	A.REI.	Algebra (A) - Reasoning with Equations and Inequalities
INDICATOR / PROFICIENCY LEVEL	A.REI.A.	UNDERSTAND SOLVING EQUATIONS AS A PROCESS OF REASONING AND EXPLAIN THE REASONING.

OBJECTIVE	A.REI.A.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.

STRAND / TOPIC / STANDARD		Algebra II
TOPIC / INDICATOR	F.IF.	Functions (F) - Interpreting Functions
INDICATOR / PROFICIENCY LEVEL	F.IF.C.	ANALYZE FUNCTIONS USING DIFFERENT REPRESENTATIONS.
OBJECTIVE	F.IF.C.7.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

EXPECTATION	a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

STRAND / TOPIC / STANDARD		Geometry
TOPIC / INDICATOR	G.GPE.	Expressing Geometric Properties with Equations
INDICATOR / PROFICIENCY LEVEL	G.GPE. B.	USE COORDINATES TO PROVE SIMPLE GEOMETRIC THEOREMS ALGEBRAICALLY

OBJECTIVE	G.GPE.B. 5.	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).

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Maryland College and Career-Ready Standards
Science
Grade **11** - Adopted: **2013**

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

OBJECTIVE	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.

STRAND / TOPIC / STANDARD	NGSS.HS -PS.	PHYSICAL SCIENCE
TOPIC / INDICATOR	HS-PS3.	Energy
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

OBJECTIVE	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.

STRAND / TOPIC / STANDARD	NGSS.HS -PS.	PHYSICAL SCIENCE

TOPIC / INDICATOR	HS-PS4.	Waves and Their Applications in Technologies for Information Transfer
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

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

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

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

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

OBJECTIVE	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.

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

OBJECTIVE	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.
OBJECTIVE	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
OBJECTIVE	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
OBJECTIVE	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
OBJECTIVE	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.

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

OBJECTIVE	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.

OBJECTIVE	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.

OBJECTIVE	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.

Maryland College and Career-Ready Standards
Science
Grade **12** - Adopted: **2013**

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

OBJECTIVE	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.

STRAND / TOPIC / STANDARD	NGSS.HS -PS.	PHYSICAL SCIENCE
TOPIC / INDICATOR	HS-PS3.	Energy
INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:

OBJECTIVE	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.

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

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

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

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

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

OBJECTIVE	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.

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

OBJECTIVE	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.
OBJECTIVE	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
OBJECTIVE	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
OBJECTIVE	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
OBJECTIVE	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.

STRAND / TOPIC / STANDARD	NGSS.HS-ETS.	ENGINEERING DESIGN
TOPIC / INDICATOR	HS-ETS1.	Engineering Design

INDICATOR / PROFICIENCY LEVEL		Students who demonstrate understanding can:
OBJECTIVE	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.
OBJECTIVE	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.
OBJECTIVE	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.

Maryland College and Career-Ready Standards
Technology Education
Grade **11** - Adopted: **2018**

STRAND / TOPIC / STANDARD		Maryland's K-12 Computer Science Standards
TOPIC / INDICATOR		Concept: Algorithms and Programming
INDICATOR / PROFICIENCY LEVEL		Subconcept: Algorithms

OBJECTIVE	12.AP.A.04.	Analyze and refine classic algorithms to solve problems.

STRAND / TOPIC / STANDARD		Maryland's K-12 Computer Science Standards
TOPIC / INDICATOR		Concept: Algorithms and Programming
INDICATOR / PROFICIENCY LEVEL		Subconcept: Modularity

OBJECTIVE	12.AP.M.01.	Construct solutions to problems using student-created components, such as procedures, modules, and objects to implement abstractions.
OBJECTIVE	12.AP.M.02.	Analyze a large-scaled computational problem and identify generalizable patterns that can be applied to a solution.

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

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Advanced Technology Grades 10-12
TOPIC / INDICATOR		Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.
INDICATOR / PROFICIENCY LEVEL		Apply knowledge of core technologies in the development of solutions to problems.
OBJECTIVE		Transportation Technologies

EXPECTATION	Analyze how systems (e.g. structural, suspension) in vehicles, aircrafts and other means of transportation impact passenger and cargo safety.
EXPECTATION	Utilize a variety of systems for controlling distance and direction of a vehicle, hovercraft, or other means of transportation.
EXPECTATION	Develop a model of an intelligent transportation system.
EXPECTATION	Design systems to modify the speed, torque, or direction of power.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Advanced Technology Grades 10-12
TOPIC / INDICATOR		Standard Five: Computational Thinking and Computer Science Applications – Students will be able to apply computational thinking skills and computer science applications as tools to develop solutions to engineering problems.
INDICATOR / PROFICIENCY LEVEL		Analyze and/or design algorithms necessary for developing solutions to problems.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard One: The Nature of Technology – Students will develop an understanding of the nature of technology.
INDICATOR / PROFICIENCY LEVEL		1. The characteristics and scope of technology. This includes but is not limited to how products and systems are developed to solve problems, how demand is created for a product by marketing and advertising, and how goal-directed research can result in invention and innovation. 2. The core concepts of technology. This includes but is not limited to systems, resources, requirements, optimization, trade-offs, processes, and controls. 3. The connections between technology and other fields of study. This includes understanding how technological systems interact with each other, how technology can be repurposed, how other fields of study can impact technological products, and how technological ideas are protected.
OBJECTIVE		Core Concepts of Technology
EXPECTATION		Employ constraint-based modeling to describe a biological system.
EXPECTATION		Demonstrate how trade-offs can impact a design product.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard One: The Nature of Technology – Students will develop an understanding of the nature of technology.
INDICATOR / PROFICIENCY LEVEL		1. The characteristics and scope of technology. This includes but is not limited to how products and systems are developed to solve problems, how demand is created for a product by marketing and advertising, and how goal-directed research can result in invention and innovation. 2. The core concepts of technology. This includes but is not limited to systems, resources, requirements, optimization, trade-offs, processes, and controls. 3. The connections between technology and other fields of study. This includes understanding how technological systems interact with each other, how technology can be repurposed, how other fields of study can impact technological products, and how technological ideas are protected.
OBJECTIVE		Connections Between Technology and Other Fields of Study
EXPECTATION		Correlate technological advances to progress in other fields of study such as science and mathematics (STL, 3J).

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		**Standard Three: Engineering Design and Development – Students will demonstrate knowledge of and apply the engineering design process to develop solutions to problems.**
INDICATOR / PROFICIENCY LEVEL		**Engineering design and development includes but is not limited to research and development, invention and innovation, problem solving, and using and maintaining technological products and systems.**
OBJECTIVE		Apply design principles (e.g. flexibility, balance, function, proportion) to evaluate existing designs, to collect data, and to guide the design process (STL, 9I).
OBJECTIVE		Evaluate design solutions using software and other tools to develop conceptual, physical, and mathematical models at various intervals of the design process in order to ensure compliance with design requirements (STL, 11P).
OBJECTIVE		Assess how design requirements such as criteria, constraints, and efficiency can compete with each other (STL, 8K).
OBJECTIVE		Identify the capital and other resources needed to develop solutions to problems.
OBJECTIVE		Apply the research and development problem-solving approach to prepare devices and systems for the marketplace.
STRAND / TOPIC / STANDARD		**Maryland Technology Education Standards: Grades 9-12**
TOPIC / INDICATOR		**Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.**
INDICATOR / PROFICIENCY LEVEL		**Apply knowledge of core technologies in the development of solutions to problems.**
OBJECTIVE		**Transportation Technologies**
EXPECTATION		Assess the role of transportation in manufacturing, construction, communication, health, safety, recreation, entertainment, and agriculture.
EXPECTATION		Analyze intermodal travel of people and goods.
EXPECTATION		Investigate and propose solutions to issues associated with transportation such as cost, safety, environmental impact, energy, and government regulations.
STRAND / TOPIC / STANDARD		**Maryland Technology Education Standards: Grades 9-12**
TOPIC / INDICATOR		**Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.**
INDICATOR / PROFICIENCY LEVEL		**Apply knowledge of core technologies in the development of solutions to problems.**

OBJECTIVE		Manufacturing Technologies
EXPECTATION		Create machine code to manufacture a product.
STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.
INDICATOR / PROFICIENCY LEVEL		Apply knowledge of core technologies in the development of solutions to problems.
OBJECTIVE		Construction Technologies
EXPECTATION		Design and create models of a variety of structures.
STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard Five: Computational Thinking and Computer Science Applications – Students will be able to apply computational thinking skills and computer science applications as tools to develop solutions to engineering problems.
INDICATOR / PROFICIENCY LEVEL		Automate solutions through algorithmic thinking.

Maryland College and Career-Ready Standards
Technology Education
Grade **12** - Adopted: **2018**

STRAND / TOPIC / STANDARD		Maryland's K-12 Computer Science Standards
TOPIC / INDICATOR		Concept: Algorithms and Programming
INDICATOR / PROFICIENCY LEVEL		Subconcept: Algorithms
OBJECTIVE	12.AP.A.0 4.	Analyze and refine classic algorithms to solve problems.

STRAND / TOPIC / STANDARD		Maryland's K-12 Computer Science Standards
TOPIC / INDICATOR		Concept: Algorithms and Programming
INDICATOR / PROFICIENCY LEVEL		Subconcept: Modularity
OBJECTIVE	12.AP.M. 01.	Construct solutions to problems using student-created components, such as procedures, modules, and objects to implement abstractions.

OBJECTIVE	12.AP.M.02.	Analyze a large-scaled computational problem and identify generalizable patterns that can be applied to a solution.

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

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Advanced Technology Grades 10-12
TOPIC / INDICATOR		**Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.**
INDICATOR / PROFICIENCY LEVEL		**Apply knowledge of core technologies in the development of solutions to problems.**
OBJECTIVE		**Transportation Technologies**
EXPECTATION		Analyze how systems (e.g. structural, suspension) in vehicles, aircrafts and other means of transportation impact passenger and cargo safety.
EXPECTATION		Utilize a variety of systems for controlling distance and direction of a vehicle, hovercraft, or other means of transportation.
EXPECTATION		Develop a model of an intelligent transportation system.
EXPECTATION		Design systems to modify the speed, torque, or direction of power.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Advanced Technology Grades 10-12
TOPIC / INDICATOR		**Standard Five: Computational Thinking and Computer Science Applications – Students will be able to apply computational thinking skills and computer science applications as tools to develop solutions to engineering problems.**
INDICATOR / PROFICIENCY LEVEL		Analyze and/or design algorithms necessary for developing solutions to problems.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		**Standard One: The Nature of Technology – Students will develop an understanding of the nature of technology.**
INDICATOR / PROFICIENCY LEVEL		**1. The characteristics and scope of technology. This includes but is not limited to how products and systems are developed to solve problems, how demand is created for a product by marketing and advertising, and how goal-directed research can result in invention and innovation. 2. The core concepts of technology. This includes but is not limited to systems, resources, requirements, optimization, trade-offs, processes, and controls. 3. The connections between technology and other fields of study. This includes understanding how technological systems interact with each other, how technology can be repurposed, how other fields of study can impact technological products, and how technological ideas are protected.**
OBJECTIVE		**Core Concepts of Technology**
EXPECTATION		Employ constraint-based modeling to describe a biological system.
EXPECTATION		Demonstrate how trade-offs can impact a design product.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard One: The Nature of Technology – Students will develop an understanding of the nature of technology.
INDICATOR / PROFICIENCY LEVEL		1. The characteristics and scope of technology. This includes but is not limited to how products and systems are developed to solve problems, how demand is created for a product by marketing and advertising, and how goal-directed research can result in invention and innovation. 2. The core concepts of technology. This includes but is not limited to systems, resources, requirements, optimization, trade-offs, processes, and controls. 3. The connections between technology and other fields of study. This includes understanding how technological systems interact with each other, how technology can be repurposed, how other fields of study can impact technological products, and how technological ideas are protected.
OBJECTIVE		Connections Between Technology and Other Fields of Study
EXPECTATION		Correlate technological advances to progress in other fields of study such as science and mathematics (STL, 3J).

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard Three: Engineering Design and Development – Students will demonstrate knowledge of and apply the engineering design process to develop solutions to problems.
INDICATOR / PROFICIENCY LEVEL		Engineering design and development includes but is not limited to research and development, invention and innovation, problem solving, and using and maintaining technological products and systems.
OBJECTIVE		Apply design principles (e.g. flexibility, balance, function, proportion) to evaluate existing designs, to collect data, and to guide the design process (STL, 9I).
OBJECTIVE		Evaluate design solutions using software and other tools to develop conceptual, physical, and mathematical models at various intervals of the design process in order to ensure compliance with design requirements (STL, 11P).
OBJECTIVE		Assess how design requirements such as criteria, constraints, and efficiency can compete with each other (STL, 8K).
OBJECTIVE		Identify the capital and other resources needed to develop solutions to problems.
OBJECTIVE		Apply the research and development problem-solving approach to prepare devices and systems for the marketplace.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.
INDICATOR / PROFICIENCY LEVEL		Apply knowledge of core technologies in the development of solutions to problems.
OBJECTIVE		Transportation Technologies
EXPECTATION		Assess the role of transportation in manufacturing, construction, communication, health, safety, recreation, entertainment, and agriculture.
EXPECTATION		Analyze intermodal travel of people and goods.

EXPECTATION		Investigate and propose solutions to issues associated with transportation such as cost, safety, environmental impact, energy, and government regulations.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		**Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.**
INDICATOR / PROFICIENCY LEVEL		**Apply knowledge of core technologies in the development of solutions to problems.**
OBJECTIVE		**Manufacturing Technologies**

EXPECTATION		Create machine code to manufacture a product.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		**Standard Four: Core Technologies and The Designed World – Students will demonstrate knowledge of the core technologies that underpin the designed world and major enterprises that produce the goods and services of the designed world. Core technologies include but are not limited to biotechnology, electrical, electronics, fluid, material, mechanical, optical, structural, and thermal technologies. Major enterprises include medical, agriculture, biotechnology, energy and power, information and communication, transportation, and manufacturing and construction technologies.**
INDICATOR / PROFICIENCY LEVEL		**Apply knowledge of core technologies in the development of solutions to problems.**
OBJECTIVE		**Construction Technologies**

EXPECTATION		Design and create models of a variety of structures.

STRAND / TOPIC / STANDARD		Maryland Technology Education Standards: Grades 9-12
TOPIC / INDICATOR		**Standard Five: Computational Thinking and Computer Science Applications – Students will be able to apply computational thinking skills and computer science applications as tools to develop solutions to engineering problems.**

INDICATOR / PROFICIENCY LEVEL		Automate solutions through algorithmic thinking.