Legend
X The standard is clearly addressed by program activities.
- This standard potentially could be addressed as part the program either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Concept	Indicator	Indicator Statement	FIRST TECH CHALLENGE Team	FIRST ROBOTICS COMPETITION	FIRST TECH CHALLENGE Class Pack
Engineering Design *Grades 6-8*	MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	x	X	X
	MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	X	X	x
	MS-ETS1-3	Analyze data from test to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	x	X	X
	MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	X	X	x
Engineering Design *Grade 9-12*	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.	-	-	X
	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.	X	x	X
	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.	x	x	X
	HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	X	x	x
Forces and Interactions *Grades 6-8*	MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	-	x	X
	MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of forces on the object and the mass of the object.	-	x	x
	MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.			
	MS-PS2-4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	-	x	X
	MS-PS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.			
F o rc e s	HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship	-	x	x

		among net force on a macroscopic object, its mass, and its acceleration.			
	HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.	-	-	X
	HS-PS2-3	Apply science and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision,	-	-	x
	HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. [			
	HS-PS2-5	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.			
Waves and Electromagnetic Radiation *Grades 6-8*	MS-PS4-1	. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.			
	MS-PS4-2.	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.			
	MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.			
Waves and Electromagnetic Radiation *Grades 9-12*	MS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.			
	MS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.			
	HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.			
	HS-PS4-4.	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter			
	HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy			
Energy *Grades 6-8*	MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.			
	MS-PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.			
	MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.			
	MS-PS3-4	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample			

	MS-PS3-5.	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object			
Energy *Grades 9-12*	HS-PS3-1.	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.			
	HS-PS3-2.	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).			
	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.*			
	HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).			
	HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.			