FIRST TECH CHALLENGE

Next Generation Science Standards

Middle School Engineering Design

Grade 6-8

Concept	Indicator	Indicator Statement	Activity
Engineering Design	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.	Team plan and robot plan, Iteration and Redesign
	MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Team plan and robot plan, Sprint to Compete, Iteration and Redesign
	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.	Team plan and robot plan, Sprint to Compete, Iteration and Redesign
	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.	Team plan and robot plan, Sprint to Compete, Iteration and Redesign
Forces and Interactions	MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	Robot Systems, Iteration and Redesign, Advanced Automation
	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.	Robot Systems, Iteration and Redesign, Advanced Automation
	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.	Robot Systems, Iteration and Redesign, Advanced Automation

FIRST TECH CHALLENGE

Next Generation Science Standards

High School Engineering Design

Grade 9-12

Concept	Indicator	Indicator Statement	Activity
Engineering Design	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.	Robot Systems, Iteration and Redesign, Advanced Automation
	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.	Robot Systems, Iteration and Redesign, Advanced Automation
	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.	Robot Systems, Iteration and Redesign, Advanced Automation
	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.	Robot Systems, Iteration and Redesign, Advanced Automation
Forces and Interactions	HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among net force on a macroscopic object, its mass, and its acceleration.	Robot Systems, Iteration and Redesign, Advanced Automation
	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.	Robot Systems, Iteration and Redesign, Advanced Automation
	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,	Robot Systems, Iteration and Redesign, Advanced Automation
	HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.	Robot Systems, Iteration and Redesign, Advanced Automation