AFRL NM STEM Academy
Middle School Standards Alignment
for Spring TECH Mission (Satellites)

			Intro to Satellites	Intro to Electric Circuits	Solar Power	Satellite Comm (Binary)	micro:bit: Physical Computing w/ Python	Intro Electromagnetic Spectrum	Exploring Spectra	Optics: Lasers vs. Regular Light	Optics: Lenses, Reflection / Refraction	Optics: Color	microbit: Sensors	Soldering LED Badge	Space Weather	Satellite Control
			Day 1					Day 2						Day 3		
Common Core Standards for English Language Arts (Grades 6-8)																
Reading Standards for Informational Text																
	Craft and Structure															
Grade 6	4.	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 7	4.	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 8	4.	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Integration of Knowledge and Ideas															
Grade 6	7.	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Writing Standards																
	Research to Build and Present Knowledge															
Grade 6	7.	Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.		X			X		X	X	X	X	X		X	X
Grade 7	7.	Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.		X			X		X	X	X	X	X		X	X
Grade 8	7.	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.		X			X		X	X	X	X	X		X	X
Speaking and Listening Standards																
	Comprehension and Collaboration															
Grade 6	1.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on *grade 6 topics and texts* , building on others' ideas and expressing their own clearly.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 7	1.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on *grade 7 topics, texts, and issues,* building on others' ideas and expressing their own clearly.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 8	1.	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-lead) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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		c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant observations and ideas.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Language Standards																
	Vocabulary Acquisition and Use															
Grade 6	4.	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 6 reading and content* , choosing flexibly from a range of strategies.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	6.	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 7	4.	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 7 reading and content* , choosing flexibly from a range of strategies.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	6.	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grade 8	4.	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 8 reading and content* , choosing flexibly from a range of strategies.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	6.	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reading Standards for Literacy in Science and Technical Subjects																
	Key Ideas and Details															
Grades 6-8	3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.	X				X		X	X	X	X	X	X		
	Craft and Structure															
Grades 6-8	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 6-8 texts and topics* .	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Integration of Knowledge and Ideas															
Grades 6-8	7.	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).				X	X	X	X	X	X	X	X	X		
	9.	Compare and contrast the information gained from experiment, simulation, video, or multimedia sources with that gained from reading a text on the same topic.					X		X				X			

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Common Core Standards for Mathematics (Grades 6-8)																
Mathematical Practices																
1.		Make sense of problems and persevere in solving them.				X	X						X			
2.		Reason abstractly and quantitatively.				X	X						X			
6.		Attend to precision.		X		X	X	X	X				X			
7.		Look for and make use of structure.				X	X	X	X				X			
The Number System																
Grade 8	◆	**Know that there are numbers that are not rational, and approximate them by rational numbers.**														
	3.	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as* 3×10^8 *and the population of the world as* 7×10^9*, and determine that the world population is more than 20 times larger.*				X		X									
	4.	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.				X		X								
Expressions and Equations																
Grade 6	◆	**Apply and extend previous understandings of arithmetic to algebraic expressions.**														
	1.	Write and evaluate numerical expressions involving whole-number exponents.				X										
Grade 6	◆	**Reason about and solve one-variable equations and inequalities.**														
	6.	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.					X									
	7.	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.					X									
Geometry																
Next Generation Science Standards (Grades 6-8)																
Performance Expectations																
Physical Science																
MS-PS1		**Matter and Its Interactions**														
	1.	Develop models to describe the atomic composition of simple molecules and extended structures.							X							
	Disciplinary Core Ideas															
	PS1.A: Structure and Properties of Matter															
	◆	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3)							X							

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	PS3.A: Definitions of Energy															
	◆	The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MSPS1-4)						X								
MS-PS2	**Motion and Stability: Forces and Interactions**															
	3.	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.													X	
	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	
	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.													X	
	Disciplinary Core Ideas															
	PS2.B: Types of Interactions															
	◆	Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)													X	
	◆	Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (MS-PS2-4)	X												X	
	◆	Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MS-PS2-5)													X	
MS-PS4	**Waves and Their Applications in Technologies for Information Transfer**															
	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.						X								
	2.	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.							X	X	X	X				
	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.				X	X						X			
	Disciplinary Core Ideas															
	PS4.A: Wave Properties															
	◆	A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)						X								
	◆	A sound wave needs a medium through which it is transmitted. (MS-PS4-2)						X								
	PS4.B: Electromagnetic Radiation															
	◆	When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2)							X	X	X	X				
	◆	The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2)									X					
	◆	A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2)								X	X	X				
	◆	However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2)						X								

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		PS4.C: Information Technologies and Instrumentation														
	◆	Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)				X	X						X			
Engineering Design																
MS-ETS1		**Engineering Design**														
	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		X						X			
	3.	Analyze data from tests 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						X			
	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						X			
		Disciplinary Core Ideas														
		ETS1.B: Developing Possible Solutions														
	◆	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)	X	X			X						X	X		
	◆	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)	X	X	X		X						X			
	◆	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)	X	X	X		X						X			
	◆	Models of all kinds are important for testing solutions. (MS-ETS1-4)	X	X			X		X				X			
		ETS1.C: Optimizing the Design Solution														
	◆	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)	X	X			X						X			
	◆	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4)	X	X			X						X			
Science and Engineering Practices																
Engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice.																
	1.	Asking questions (for science) and defining problems (for engineering)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	2.	Developing and using models	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	3.	Planning and carrying out investigations		X		X	X		X	X	X	X	X		X	X
	4.	Analyzing and interpreting data		X		X	X		X	X	X	X	X		X	X
	5.	Using mathematics and computational thinking				X	X						X			
	6.	Constructing explanations (for science) and designing solutions (for engineering)	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	7.	Engaging in argument from evidence		X		X	X		X	X	X	X	X		X	X
	8.	Obtaining, evaluating, and communicating information	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Cross Cutting Concepts															
Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.															
•	Macroscopic patterns are related to the nature of microscopic and atomic-level structure.							X							
•	Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.				X	X	X	X				X		X	
•	Patterns can be used to identify cause and effect relationships.				X	X	X	X	X	X	X	X		X	
•	Graphs, charts, and images can be used to identify patterns in data.				X	X	X	X	X	X	X	X		X	
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.															
•	Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.							X						X	
•	Cause and effect relationships may be used to predict phenomena in natural or designed systems.		X	X	X	X	X	X	X	X	X	X		X	X
Scale, Proportion, and Quantity: In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.															
•	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.	X					X	X						X	
•	The observed function of natural and designed systems may change with scale.					X						X			X
•	Proportional relationships (e.g., speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.						X							X	
•	Scientific relationships can be represented through the use of algebraic expressions and equations.						X							X	
Systems and System Models: A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.															
•	Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.	X	X	X		X						X	X		X
•	Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.	X	X			X						X		X	
•	Models are limited in that they only represent certain aspects of the system under study.	X	X												X
Energy and Matter: Flows, Cycles, and Conservation: Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.															
•	Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.		X			X						X		X	
•	Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).		X	X		X	X					X	X	X	X
•	The transfer of energy can be tracked as energy flows through a designed or natural system.		X	X		X	X					X	X	X	X
Structure and Function: The way an object is shaped or structured determines many of its properties and functions.															
•	Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.	X	X	X		X						X	X		
•	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	X	X	X		X						X	X		

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Stability and Change: For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.															
◆	Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.													X	
◆	Small changes in one part of a system might cause large changes in another part.	X	X			X						X	X	X	
◆	Stability might be disturbed either by sudden events or gradual changes that accumulate over time.		X			X						X		X	X
◆	Systems in dynamic equilibrium are stable due to a balance of feedback mechanisms.		X			X						X			X
Computer Science Standards (Grades 6-8)															
Computing Systems															
2-CS-02	Design projects that combine hardware and software components to collect and exchange data.					X						X			
2-CS-03	Systematically identify and fix problems with computing devices and their components.					X						X			
Data and Analysis															
2-DA-08	Collect data using computational tools and transform the data to make it more useful and reliable.					X						X			
Algorithms and Programming															
2-AP-11	Create clearly named variables that represent different data types and perform operations on their values.					X						X			
2-AP-12	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.					X						X			
2-AP-13	Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.					X						X			
2-AP-14	Create procedures with parameters to organize code and make it easier to reuse.					X						X			
2-AP-15	Seek and incorporate feedback from team members and users to refine a solution that meets user needs.					X						X			
2-AP-16	Incorporate existing code, media, and libraries into original programs, and give attribution.					X						X			
2-AP-17	Systematically test and refine programs using a range of test cases.					X						X			
2-AP-19	Document programs in order to make them easier to follow, test, and debug.					X						X			
International Society for Technology Education Standards															
Computational Thinker															
◆	**Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.**														
5d	Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.					X						X			