**2016-2017 GS 2 Instructional Guide**rev April 28, 2016



**FALL 2016 OVERVIEW**

To be updated annually until the California Framework is released.

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| **MS GS 2 Performance Expectations (Potential Sequence of Instruction)** |
| **SEMESTER 1 OVERVIEW Bold:** Science and Engineering Practice *Italics:* Cross Cutting Concepts |
| **NGSS** – Please see the Instructional Guide for scope of each of these standards. Focus on the Disciplinary Core Ideas (DCI) as well as the Clarification Statement to determine *what* to teach. The Science & Engineering Practices (SEP) will help you determine *how* to teach and the Cross Cutting Concepts (CCC) are themes that help link different domains of science. |

How does science **describe**, **model** and **explain** the motions of objects such as an asteroid or our planet?

How can we investigate phenomena related to motions and collisions?

Click [here for Background Information from Framework](https://drive.google.com/open?id=0B9ik8f3wYi6pS1R2Z0ZuSWo1TXM) for each Instructional Segment. Click [here for GS 2 Resources](https://drive.google.com/folderview?id=0B9ik8f3wYi6pfnRTaDd2bWlhd2lCRE42Ujc4UDdPUlY4SV9td29GelpWWXhJTjV3YVg2R3M&usp=sharing).

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| **INSTRUCTIONAL SEGEMENT 1 (IS 1):** Up Close: Objects Move and Collide | NGSS MS-LS4-1 (Introduce), MS-PS2-1; MS-PS2-2; MS-PS2-4 & MS-PS3-1, ETS 1-1, ETS 1-2, ETS 1-3 & ETS 1-4. |
| Students who demonstrate understanding can: (**Bold:** Science and Engineering Practice *Italics:* Cross Cutting Concepts) |
| **^LS****4-1** | **Analyze and interpret** *data for patterns in* the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. | **Natural Selection & Adaptations** |
| **\*PS****2-1** | **Apply** Newton’s Third Law **to design** *a solution to a problem involving* the motion of *two colliding objects*.**\***  | **Forces and Interactions** |
| **PS****2-2** | **Plan on investigation to provide evidence that** *the change in* an objects’ motion depends on the sum of the forces on the object and the mass of the object. |
| **PS****2-4** | **Construct and present arguments using evidence** **to support the claim that** gravitational interactions are attractive and depend on the masses of *interacting objects*. |
| **PS****3-1** | **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. | **Energy** |
| **\*\*\*ETS 1-1** | **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*. | **Engineering & Technology** |
| **\*\*\*ETS****1-2** | **Evaluate competing design solutions** using a systematic process to determine how well they meet the criteria and constraints of the problem. |
| **\*\*\*ETS 1-3** | **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. |
| **\*\*\*ETS 1-4** | **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. |

**\***This performance expectation integrates traditional science content with engineering through a disciplinary core idea.

**\*\*\***ETS placement is only a suggestion. NGSS does not specify where and when.

^ MS-LS 4-1 will be repeated in Semester 2. The focus here is to introduce one of the year’s major topics (the history of life on Earth) with the asteroid impact which leads into many key concepts related to forces, motion and gravity.

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| **INSTRUCTIONAL SEGEMENT 2:** Noncontact Forces Influence Phenomena | NGSS MS-ESS1-1 (Moon Phases); MS-ESS1-2; MS-ESS 1-3, MS-PS2-3, MS-PS2-4, MS-PS2-5 & MS-PS3-2 |
| Students who demonstrate understanding can: (**Bold:** Science and Engineering Practice *Italics:* Cross Cutting Concepts) |
| **^ESS****1-1** | **Develop and use a model** of the Earth-sun-moon system **to describe** *the cyclic patterns of* lunar phases, eclipses of the sun and moon, and seasons. | **Space Systems** |
| **ESS****1-2** | **Develop and use** *a model to describe* the role of gravity in the motions within galaxies and the *solar system*. |
| **ESS****1-3** | **Analyze and interpret** data to determine *scale properties* of objects in the solar system. |
| **PS****2-3** | **Ask questions about data** *to determine the factors that affect* the strength of electrical and magnetic forces. | **Forces and Interactions** |
| **PS****2-4** | **Construct and present arguments using evidence** **to support the claim that** gravitational interactions are attractive and depend on the masses of *interacting objects*. |
| **PS****2-5** | **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. |
| **PS****3-2** | **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*. | **Energy** |

^ MS-ESS 1-1 will be repeated in Semester 2. Focus in IS 2 is on Moon Phases.

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**SPRING 2017 OVERVIEW**

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| **MS GS 2 Performance Expectations (Potential Sequence of Instruction)** |
| **SEMESTER 2 OVERVIEW Bold:** Science and Engineering Practice *Italics:* Cross Cutting Concepts |
| **NGSS** – Please see the Instructional Guide for scope of each of these standards. Focus on the Disciplinary Core Ideas (DCI) as well as the Clarification Statement to determine *what* to teach. The Science & Engineering Practices (SEP) will help you determine *how* to teach and the Cross Cutting Concepts (CCC) are themes that help link different domains of science. |

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| **INSTRUCTIONAL SEGMENT 3 (IS 3):** Evolution Explains Life’s Unity and Diversity | NGSS MS-ESS1-4, MS-LS3-1, MS-LS4-1, MS-LS4-2, MS-LS4-3, MS-LS4-4, MS-LS4-5 & MS-LS4-6.  |
| Students who demonstrate understanding can: (**Bold:** Science and Engineering Practice *Italics:* Cross Cutting Concepts) |
| **ESS****1-4** | **Construct a scientific explanation** **based on evidence** from rock strata for how the geologic *time scale is used* to organize Earth’s 4.6- billion-year-old history. | **History of Earth** |
| **LS****3-1** | **Develop and use a model** **to describe why** structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects *to the structure and function* of the organism.  | **Growth, Development, & Reproduction of Organisms** |
| **LS****4-1** | **Analyze and interpret** *data for patterns in* the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. | **Natural Selection and Adaptations** |
| **LS****4-2** | **Apply scientific ideas to construct** *an explanation for the anatomical similarities and differences among* modern organisms and between modern and fossil organisms *to infer evolutionary relationships*. |
| **LS****4-3** | **Analyze displays of** *pictorial data to compare patterns of similarities* in embryological development across multiple species to identify relationships not evident in the fully formed anatomy. |
| **^LS****4-4** | **Construct an explanation** **based on evidence** *that describes how* genetic variations of traits in a population *increase* some individuals’ probability of surviving and reproducing in a specific environment. |
| **LS****4-5** | **Gather and synthesize information about** *the technologies that have changed the way humans influence* the inheritance of desired traits in organisms.  |
| **^LS****4-6** | **Use mathematical representations to support explanations of how** natural selection *may lead to increases and decreases* of specific traits in populations over time. |

^ MS-LS4-4 & MS-LS4-6 will be repeated in Instructional Segment 4. Focus in IS 3 is introductory to fully understand concept of natural selection.

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| **INSTRUCTIONAL SEGMENT 4 (IS 4):** Sustaining Local and Global Biodiversity | NGSS MS-PS4-1, MS-PS4-2, MS-PS4-3, MS-ESS3-4, MS-ESS1-1 (seasons), MS-LS4-4 (applied), MS-LS4-6 (applied), ETS 1-1, ETS 1-2 |
| Students who demonstrate understanding can: (**Bold:** Science and Engineering Practice *Italics:* Cross Cutting Concepts) |
| **PS****4-1** | **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.  | **Waves & Electromagnetic Radiation** |
| **PS****4-2** | **Develop and use a model** **to describe**that waves are reflected, absorbed, or transmitted *through various materials*. |
| **PS****4-3** | **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.  |
| **ESS****3-4** | **Construct an argument supported by evidence for how** increases in human population and per-capita consumption of natural resources *impact Earth’s systems*.  | **Human Impacts** |
| **^ESS****1-1** | **Develop and use a model** of the Earth-sun-moon system **to describe** *the cyclic patterns of* lunar phases, eclipses of the sun and moon, and seasons. | **Space Systems** |
| **^LS****4-4** | **Construct an explanation** **based on evidence** *that describes how* genetic variations of traits in a population *increase* some individuals’ probability of surviving and reproducing in a specific environment. | **Natural Selection and Adaptations** |
| **^LS****4-6** | **Use mathematical representations to support explanations of how** natural selection *may lead to increases and decreases* of specific traits in populations over time. |
| **\*\*\*ETS 1-1** | **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*. | **Engineering &** **Technology** |
| **\*\*\*ETS 1-2** | **Evaluate competing design solutions** using a systematic process to determine how well they meet the criteria and constraints of the problem. |

^ MS-LS4-4 & MS-LS4-6 is re-visited in IS 4. Changes in environmental conditions alter populations of organisms and can cause extinction.