**High School Integrated Science Course 2**

The 10th grade high school science course, based on an integrated grouping of Next Generation Science Standards will introduce students to the following concepts (arranged topically)

**Physical Science**

### [Definitions of Energy](http://www.nap.edu/openbook.php?record_id=13165&page=120)

* [At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PS3-2) (HS-PS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=120)

### [Conservation of Energy and Energy Transfer](http://www.nap.edu/openbook.php?record_id=13165&page=124)

* [Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1),(HS-PS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=124)
* [Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=124)

### [Relationship Between Energy and Forces](http://www.nap.edu/openbook.php?record_id=13165&page=126)

* [When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PS3-5)](http://www.nap.edu/openbook.php?record_id=13165&page=126)

### [Energy in Chemical Processes](http://www.nap.edu/openbook.php?record_id=13165&page=128)

* [Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (HS-PS3-3),(HS-PS3-4)](http://www.nap.edu/openbook.php?record_id=13165&page=128)

### [Defining and Delimiting an Engineering Problem](http://www.nap.edu/openbook.php?record_id=13165&page=204)

* [Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (secondary to HS-PS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=204)

### [Energy in Chemical Processes](http://www.nap.edu/openbook.php?record_id=13165&page=128)

* [Solar cells are human-made devices that likewise capture the sun’s energy and produce electrical energy. (secondary to HS-PS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=128)

### [Wave Properties](http://www.nap.edu/openbook.php?record_id=13165&page=131)

* [Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PS4-2),(HS-PS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=131)
* [Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (HS-PS4-3)](http://www.nap.edu/openbook.php?record_id=13165&page=131)

### [Electromagnetic Radiation](http://www.nap.edu/openbook.php?record_id=13165&page=133)

* [Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PS4-3)](http://www.nap.edu/openbook.php?record_id=13165&page=133)
* [When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (HS-PS4-4)](http://www.nap.edu/openbook.php?record_id=13165&page=133)
* [Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (HS-PS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=133)

### [Information Technologies and Instrumentation](http://www.nap.edu/openbook.php?record_id=13165&page=136)

* [Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PS4-5)](http://www.nap.edu/openbook.php?record_id=13165&page=136)

**Life Science**

### [Structure and Function](http://www.nap.edu/openbook.php?record_id=13165&page=143%22)

* [Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=143)
* [All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)](http://www.nap.edu/openbook.php?record_id=13165&page=143)
* [Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=143)
* [Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=143)

### [Organization for Matter and Energy Flow in Organisms](http://www.nap.edu/openbook.php?record_id=13165&page=147)

* [The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)](http://www.nap.edu/openbook.php?record_id=13165&page=147)
* [The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)](http://www.nap.edu/openbook.php?record_id=13165&page=147)
* [As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7)](http://www.nap.edu/openbook.php?record_id=13165&page=147)
* [As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HS-LS1-7)](http://www.nap.edu/openbook.php?record_id=13165&page=147)

### [Cycles of Matter and Energy Transfer in Ecosystems](http://www.nap.edu/openbook.php?record_id=13165&page=152)

* [Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)](http://www.nap.edu/openbook.php?record_id=13165&page=152)
* [Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)](http://www.nap.edu/openbook.php?record_id=13165&page=152)
* [Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)](http://www.nap.edu/openbook.php?record_id=13165&page=152)

**Energy in Chemical Processes**

* The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. (secondary to HS-LS2-5)

### [Growth and Development of Organisms](http://www.nap.edu/openbook.php?record_id=13165&page=145)

* [In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=145)

### [Inheritance of Traits](http://www.nap.edu/openbook.php?record_id=13165&page=158)

* [Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species’ characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)](http://www.nap.edu/openbook.php?record_id=13165&page=158)

### [Variation of Traits](http://www.nap.edu/openbook.php?record_id=13165&page=160)

* [In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)](http://www.nap.edu/openbook.php?record_id=13165&page=160)
* [Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)](http://www.nap.edu/openbook.php?record_id=13165&page=160)

**Earth Science**

### [The Universe and Its Stars](http://www.nap.edu/openbook.php?record_id=13165&page=173)

### [The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1)](http://www.nap.edu/openbook.php?record_id=13165&page=173)

* [The study of stars’ light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=173)
* [The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=173)
* [Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2),(HS-ESS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=173)

[**Energy in Chemical Processes and Everyday Life**](http://www.nap.edu/openbook.php?record_id=13165&page=128)

* [Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. *(secondary to HS-ESS1-1)*](http://www.nap.edu/openbook.php?record_id=13165&page=128)

### [Electromagnetic Radiation](http://www.nap.edu/openbook.php?record_id=13165&page=133)

* [Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (secondary to HS-ESS1-2)](http://www.nap.edu/openbook.php?record_id=13165&page=133)

**[Earth and the Solar System](http://www.nap.edu/openbook.php?record_id=13165&page=175)**

* [Cyclical changes in the shape of Earth’s orbit around the sun, together with changes in the tilt of the planet’s axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (HS-ESS2-4 ) (secondary)](http://www.nap.edu/openbook.php?record_id=13165&page=175)

[**Earth Materials and Systems**](http://www.nap.edu/openbook.php?record_id=13165&page=179)

* [The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun’s energy output or Earth’s orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.](http://www.nap.edu/openbook.php?record_id=13165&page=179) (HS-ESS2-4 )
* [Earth’s systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-1),*(Note: This Disciplinary Core Idea is also addressed by HS-ESS2-2.)*](http://www.nap.edu/openbook.php?record_id=13165&page=179)
* [Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth’s surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth’s interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3)](http://www.nap.edu/openbook.php?record_id=13165&page=179)

### [Weather and Climate](http://www.nap.edu/openbook.php?record_id=13165&page=186)

* [The foundation for Earth’s global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy’s re-radiation into space.](http://www.nap.edu/openbook.php?record_id=13165&page=186)  (HS-ESS2-2, HS-ESS2-4)
* [Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7)](http://www.nap.edu/openbook.php?record_id=13165&page=186)
* [Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6)](http://www.nap.edu/openbook.php?record_id=13165&page=186)

[**Plate Tectonics and Large-Scale System Interactions**](http://www.nap.edu/openbook.php?record_id=13165&page=182)

* [Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth’s surface and provides a framework for understanding its geologic history. *(ESS2.B Grade 8 GBE) (secondary to HS-ESS1-5)*,(HS-ESS2-1)](http://www.nap.edu/openbook.php?record_id=13165&page=182)
* [Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth’s crust. *(ESS2.B Grade 8 GBE)* (HS-ESS2-1)](http://www.nap.edu/openbook.php?record_id=13165&page=182)
* [The radioactive decay of unstable isotopes continually generates new energy within Earth’s crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3)](http://www.nap.edu/openbook.php?record_id=13165&page=182)

[**Natural Resources**](http://www.nap.edu/openbook.php?record_id=13165&page=191)

* [Resource availability has guided the development of human society. (HS-ESS3-1)](http://www.nap.edu/openbook.php?record_id=13165&page=191)

[**Natural Hazards**](http://www.nap.edu/openbook.php?record_id=13165&page=192)

* [Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)](http://www.nap.edu/openbook.php?record_id=13165&page=192)

**Engineering and Design**

### [Defining and Delimiting Engineering Problems](http://www.nap.edu/openbook.php?record_id=13165&page=204)

* [Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1,](http://www.nap.edu/openbook.php?record_id=13165&page=204) secondary to HS-PS3-3)
* [When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)](http://www.nap.edu/openbook.php?record_id=13165&page=206)
* [Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4)](http://www.nap.edu/openbook.php?record_id=13165&page=206)

**Physical Science Components**

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| [**HS.WER** Waves and Electromagnetic Radiation](http://www.nextgenscience.org/hsps-wer-waves-electromagnetic-radiation) [HS-PS4-1. 2 🡪 Course 1] | | |
| EAE | [HS-PS4-3](http://www.nextgenscience.org/hs-ps4-3-waves-and-their-applications-technologies-information-transfer) | Waves and their Applications in Technologies for Information Transfer  [EMR wave/particle model] |
| OECE | [HS-PS4-4](http://www.nextgenscience.org/hs-ps4-4-waves-and-their-applications-technologies-information-transfer) | Waves and their Applications in Technologies for Information Transfer  [Effect of EMR has on absorbing matter] |
| OECE | [HS-PS4-5](http://www.nextgenscience.org/hs-ps4-waves-and-their-applications-technologies-information-transfer-0) | Waves and their Applications in Technologies for Information Transfer  [Principles of wave behavior and wave interactions with matter] |

**Life Science Component(s)**

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| [**HS.SF** Structure and Function](http://www.nextgenscience.org/hsls-sfip-structure-function-information-processing) | | |
| CEDS | [HS-LS1-1](http://www.nextgenscience.org/hs-ls1-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [Structure of DNA determines the structure of proteins] |
| OCI | [HS-LS1-2](http://www.nextgenscience.org/hs-ls1-2-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [Hierarchical organization of interacting multicellular systems] |
| DUM | [HS-LS1-3](http://www.nextgenscience.org/hs-ls1-3-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [How feedback mechanisms maintain homeostasis.] |

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| [**HS.MEOE** Matter and Energy in Organisms and Ecosystems](http://www.nextgenscience.org/hsls-meoe-matter-energy-organisms-ecosystems) - | | |
| DUM | [HS-LS1-5](http://www.nextgenscience.org/hs-ls1-5-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [How photosynthesis transforms light energy] |
| CEDS | [HS-LS1-6](http://www.nextgenscience.org/hs-ls1-6-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [How C, H, and O from sugar molecules combine to form large carbon-based molecules.] |
| DUM | [HS-LS1-7](http://www.nextgenscience.org/hs-ls1-7-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [Cellular respiration, a chemical process resulting in a net transfer of energy.] |
| CEDS | [HS-LS2-3](http://www.nextgenscience.org/hs-ls2-3-ecosystems-interactions-energy-and-dynamics) | Ecosystems: Interactions, Energy, and Dynamics  [Cycling of matter and flow of energy in aerobic and anaerobic conditions] |
| UMCT | [HS-LS2-4](http://www.nextgenscience.org/hs-ls2-4-ecosystems-interactions-energy-and-dynamics) | Ecosystems: Interactions, Energy, and Dynamics  [Cycling of matter and flow of energy among organisms in an ecosystem.] |
| DUM | [HS-LS2-5](http://www.nextgenscience.org/hs-ls2-5-ecosystems-interactions-energy-and-dynamics) | Ecosystems: Interactions, Energy, and Dynamics  [The role of photosynthesis and cellular respiration in the cycling of carbon] |

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| [**HS.IVT** Inheritance and Variation of Traits](http://www.nextgenscience.org/hsls-ivt-inheritance-variation-traits) | | |
| DUM | [HS-LS1-4](http://www.nextgenscience.org/hs-ls1-4-molecules-organisms-structures-and-processes) | From Molecules to Organisms: Structures and Processes  [Role of cellular division (mitosis) and differentiation] |
| AQDP | [HS-LS3-1](http://www.nextgenscience.org/hs-ls3-1-heredity-inheritance-and-variation-traits) | Heredity: Inheritance and Variation of Traits  [The role of DNA and chromosomes in coding the instructions] |
| EAE | [HS-LS3-2](http://www.nextgenscience.org/hs-ls3-2-heredity-inheritance-and-variation-traits) | Heredity: Inheritance and Variation of Traits [Inheritable genetic variations] |
| AQDP | [HS-LS3-3](http://www.nextgenscience.org/hs-ls3-3-heredity-inheritance-and-variation-traits) | Heredity: Inheritance and Variation of Traits  [Variation and distribution of expressed traits in a population.] |

**Earth and Space Science Component(s)**

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| [**HS.SS** Space Systems](http://www.nextgenscience.org/hsess-ss-space-systems)  [HS-ESS1-4. 🡪 Course 1] | | |
| DUM | [HS-ESS1-1](http://www.nextgenscience.org/hs-ess1-1-earths-place-universe) | Earth's Place in the Universe [Illustrate the life span of the sun and the role of nuclear fusion.] |
| CEDS | [HS-ESS1-2](http://www.nextgenscience.org/hs-ess1-2-earths-place-universe) | Earth's Place in the Universe [Big Bang theory based on astronomical evidence] |
| OECE | [HS-ESS1-3](http://www.nextgenscience.org/hs-ess1-3-earths-place-universe) | Earth's Place in the Universe [The way stars, over their life cycle, produce elements.] |
| DUM | [HS-ESS2-4](http://www.nextgenscience.org/hs-ess2-4-earths-systems) | Earth's Systems [Flow of energy into and out of Earth’s systems result in changes in climate.]  \* Added to the this Topic Arrangement |

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| [**HS.HE** History of Earth](http://www.nextgenscience.org/hsess-he-history-earth) **[**HS-ESS1-5 Course 1, HS-ESS1-5, 6 🡪 Course 3] | | |
| DUM | [HS-ESS2-1](http://www.nextgenscience.org/hs-ess2-1-earths-systems) | Earth's Systems [Earth’s internal and surface processes operate at different spatial and temporal scales] |
| DUM | [HS-ESS2-4](http://www.nextgenscience.org/hs-ess2-4-earths-systems) | Earth's Systems [Flow of energy into and out of Earth’s systems result in changes in climate.]  \* Added to the this Topic Arrangement |

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| [HS.ES Earth’s Systems](http://www.nextgenscience.org/hsess-es-earth-systems) [HS-ESS2-5. 🡪 Course 1 and HS-ESS2-7. 🡪 Course 3] | | |
| AID | [HS-ESS2-2](http://www.nextgenscience.org/hs-ess2-2-earths-systems) | Earth's Systems [Changes to Earth's surface create feedbacks that cause changes Earth systems] |
| DUM | [HS-ESS2-3](http://www.nextgenscience.org/hs-ess2-3-earths-systems) | Earth's Systems [Earth’s interior, cycling of matter by thermal convection] |
| DUM | [HS-ESS2-6](http://www.nextgenscience.org/hs-ess2-6-earths-systems) | Earth's Systems [Cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.] |

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| [**HS.HS** Human Sustainability](http://www.nextgenscience.org/hsess-hs-human-sustainability) **[** HS-ESS3-2 🡪 Course 3, HS-ESS3-3,4,6 ] | | |
| CEDS | [HS-ESS3-1](http://www.nextgenscience.org/hs-ess3-2-earth-and-human-activity) | Earth and Human Activity [Developing, managing, and utilizing energy and mineral resources] |

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| [**HS.WC** Weather and Climate](http://www.nextgenscience.org/hsess-wc-weather-climate) **[**HS-ESS3-5. 🡪 Course 3] | | |
| DUM | [HS-ESS2-4](http://www.nextgenscience.org/hs-ess2-4-earths-systems) | Earth's Systems [Flow of energy into and out of Earth’s systems result in changes in climate.] |

**Engineering Design Component(s)**

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| [**HS.ED** Engineering Design](http://www.nextgenscience.org/hsets-ed-engineering-design) | | |
| AQDP | [HS-ETS1-1](http://www.nextgenscience.org/hs-ets1-1-engineering-design) | Engineering Design [Analyze major global challenge, find solution, account for societal needs and wants] |
| CEDS | [HS-ETS1-2](http://www.nextgenscience.org/hs-ets1-2-engineering-design) | Engineering Design [Design a solution to a complex real-world problem] |
| CEDS | [HS-ETS1-3](http://www.nextgenscience.org/hs-ets1-3-engineering-design) | Engineering Design  [Evaluate a complex real-world (trade-offs, cost, safety, reliability, and aesthetics social, cultural, and environmental impacts] |
| UMCT | [HS-ETS1-4](http://www.nextgenscience.org/hs-ets1-4-engineering-design) | Engineering Design [Use computer simulation to model the impact of proposed solutions] |