Next Generation Science Standards:
Physics
12th Grade

SCI 601(2) Physics I and II

1 credit
5 days per week; 1 year
Taught in English

This is a required class for all 12th grade students in the Mexican program and/or U.S. diploma program. Content areas will include kinematics (analysis of forces and motion); work, power, and simple machines; conservation and types of energy; behavior of different states of matter; and waves (especially sound and light). Students will learn mathematical calculations and problem-solving skills, as well. Students will have a number of opportunities for hands-on application of textbook theory, including labs on straight-line motion, conservation of energy, electrostatics, electricity, magnetism and the speed of sound.

Textbook: Tippens, Paul, et.al. Physics (6th Edition). Glencoe/McGraw/Hill (2001 Edition)
Prerequisite: SCI 501/502

Strand 1 = Structure and Properties of Matter
Strand 2 = Forces and Interactions
Strand 3 = Energy
Strand 4 = Earth Waves and Electromagnetic Radiation
Strand 5 = Space Systems
Strand 6 = Earth's System
Strand 7 = History of Earth
Strand 8 = Weather and Climate
Strand 9 = Engineering Design

Strand 1: Structure and Properties of Matter

Standard 1: Structure and Properties of Matter	
Benchmark Code	Benchmark
HS-PS2-6	The student will communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Strand 2: Forces and Interactions

Standard 2: Forces and Motion	
Benchmark Code	Benchmark
HS-PS2-1	The student will analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS-PS2-2	The student will 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.

HS-PS2-3	The student will apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

Standard 3: Types of Interactions	
Benchmark Code	Benchmark
HS-PS2-4	The student will 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 Repeat	The student will 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.

Strand 3: Energy

Standard 1: Definitions of Energy	
Benchmark Code	Benchmark
HS-PS3-2	The student will 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 positions of particles (objects).

Standard 2: Relationship Between Energy and Forces	
Benchmark Code	Benchmark
HS-PS3-5	The student will develop and use a model of two objects interacting through electric or magnetic field to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

Strand 4: Waves and Electromagnetic Radiation

Standard 1: Wave Properties	
Benchmark Code	Benchmark
HS-PS4-1	The student will use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-2	The student will evaluate questions about the advantages of using a digital transmission and storage of information.

Standard 2: Electromagnetic Radiation	
Benchmark Code	Benchmark
HS-PS4-3 Repeat	The student will 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	The student will evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
Standard 3: Information Technology and Instrumentation	
Benchmark Code	Benchmark
HS-PS4-5 Repeat	The student will 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.
Strand 5: Space Systems	
Standard 1: The Universe and Its Stars	
Benchmark Code	Benchmark
HS-ESS1-1	The student will use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-ESS1-2 Repeat	The student will construct an explanation of the Big Bang theory based on astronomical evidence of light-spectra, motion of distant galaxies, and composition of matter in the universe.
HS-ESS1-3	The student will communicate scientific ideas about the way stars, over their life cycle, produce elements.
Standard 2: Earth and the Solar System	
Benchmark Code	Benchmark
HS-ESS1-4	The student will use mathematical or computational representations to predict the motion off orbiting objects in the solar system.
Strand 6: Earth Systems	
Standard 1: Earth's Materials and Systems	
Benchmark Code	Benchmark
HS-ESS2-2	The student will analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS2-3 Repeat	The student will develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

Strand 7: History of Earth

Standard1: The History of Planet Earth	
Benchmark Code	Benchmark
HS-ESS2-1 Repeat	The student will develop a model to illustrate how Earth's internal and surface processes operate at different spatial temporal scales to form continental and ocean-floor features.

Strand 9: Engineering Design

Standard 1:	
Benchmark Code	Benchmark
HS-EST1-1 Repeat	The student will analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-EST1-2 Repeat	The student will design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-EST1-3 Repeat	The student will 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.
HS-EST1-4 Repeat	The student will 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.