



Module 1: The Physical World - Atoms, Energy, and Systems of Systems

(Science – Physics & Chemistry Fundamentals)



Core Focus

Everything is made of atoms and shaped by physical forces.

Introduce students to the foundational building blocks of matter and the core physical laws that govern the universe. Frame science as the study of systems interacting with other systems.

Key Concepts & Learning Goals

Theme	Topics
1. Atoms & Matter	- What are atoms? - Atomic structure (protons, neutrons, electrons) - Elements, compounds, and mixtures - States of matter (solid, liquid, gas, plasma)
2. Forces & Motion	- Newton's laws of motion - Gravity, friction, magnetism - Balanced vs. unbalanced forces
3. Forms of Energy	- Kinetic and potential energy - Thermal, light, sound, chemical, and electrical energy - Energy transformation and conservation
4. Systems Thinking	- What is a system? (input, process, output, feedback) - Natural and man-made systems - Interconnectedness in the environment and technology
5. Measurement & Observation	- Scientific tools and SI units - Measuring length, mass, volume, and temperature - Accuracy, precision, and data collection
6. Materials Science	- Properties of metals, plastics, ceramics, and composites - Conductivity, flexibility, strength, and insulation - Real-world applications and selection of materials
7. Simple Machines	- Levers, pulleys, inclined planes, wheels and axles - How machines use forces to do work - Designing with mechanical advantage in mind
8. Real-World Design Integration	- How engineers harness materials, energy, and forces - Case studies: bridges, wind turbines, prosthetic limbs - Collaborative problem-solving and prototyping

Hands-On Activities

- **Build an Atom** (model making with beads or software)
 - **Material Test Lab** (compare strength, flexibility, conductivity)
 - **Energy Transfer Maze** (explore types and transformations)
 - **Marble Run Challenge** (forces and motion)
 - **Simple Machine Prototypes** (mini design and test projects)
 - **Systems Web** (connect natural and manmade systems visually)
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STEAM Integration

- **Science:** Atomic theory, energy systems, laws of motion, materials
 - **Technology:** Digital simulations, sensors, energy applications
 - **Engineering:** Design using physical principles and materials
 - **Arts:** Infographics, system mapping, creative machine design
 - **Math:** Graphing energy use, calculating force, ratios in machines
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21st Century Skills Emphasized

- Systems Thinking
- Scientific Reasoning
- Design & Innovation
- Collaboration & Communication