## 🌌 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)

### 🧩 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

### 🌐 21st Century Skills Emphasized

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