## 🌌 Module 3: Planetary & Space Sciences - Earth, Systems, and the Cosmos

### *(Science – Earth & Space Systems)*

### 🌌 Core Focus

**From molecules to mountains, and atoms to asteroids, this module explores our planet as a system within a vast and dynamic universe.**  
Learners will investigate Earth’s systems, its place in the solar system, and the larger structures of the universe, continuing the systems-of-systems approach.

### 🧠 Key Concepts & Learning Goals

| Theme | Topics |
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| **1. Earth’s Structure** | - Layers of the Earth (crust, mantle, core)- Plate tectonics and earthquakes- Rock cycle and land formation |
| **2. Atmosphere & Weather** | - Layers of the atmosphere- Weather vs. climate- Water cycle, clouds, and storm systems |
| **3. Earth’s Systems & Cycles** | - Geosphere, hydrosphere, atmosphere, biosphere- Carbon and nitrogen cycles- Interconnectivity and feedback loops |
| **4. The Solar System** | - Sun, planets, moons, asteroids, comets- Orbits and gravitational interactions- Earth’s unique conditions for life |
| **5. The Moon & Tides** | - Moon phases and eclipses- Tidal forces- Lunar exploration and its scientific impact |
| **6. Space Science & Exploration** | - Telescopes, satellites, probes- History of space exploration- International Space Station and future missions |
| **7. The Universe Beyond** | - Stars, galaxies, black holes- The Big Bang and cosmic background radiation- Scales of distance and time in space |
| **8. Earth in Context** | - Earth’s fragility and habitability- Space weather and planetary defense- The search for extraterrestrial life- **Humanization of the Solar System (colonization, Mars, lunar bases)**- **Near Earth Orbit Economy (satellites, space mining, tourism)** |

### 🧪 Hands-On Activities

* **Rock Cycle Simulation**
* **Weather Mapping Project**
* **Solar System Scale Walk**
* **Crater Formation Lab**
* **Build a Sundial**
* **Constellation Mapping with Stellarium**

### 🧩 STEAM Integration

* **Science**: Planetary science, astronomy, geology, meteorology
* **Technology**: Space tools, weather instruments, modeling software
* **Engineering**: Designing satellites, rovers, and environmental sensors
* **Arts**: Planetary diagrams, cosmic timelines, astronomy photography
* **Math**: Orbital math, scales, temperature modeling

### 🌐 21st Century Skills Emphasized

* Spatial Thinking
* Data Modeling
* Interdisciplinary Connections
* Environmental Awareness
* **Future-Oriented Problem Solving**