CHAPTER 1 – LECTURE-02
Introducing Physical Geography

I. Introducing Geography: Geography is the study of the evolving character and organization of the Earth's surface. It is about how, why, and where human and natural activities occur and how these activities are interconnected. The two sides of geography include:

1. Regional geography is concerned with how the Earth's surface is differentiated into unique places.

2. Systematic geography is concerned with the processes that differentiate places in time and space.

II. Realms of Geography: Systematic geography can be divided into human geography and physical geography.

1. *Human geography* deals with social, economic, and behavioral processes that differentiate places.

2. *Physical geography* examines the natural processes occurring at the Earth's surface that provide the physical setting for human activities. The five fields of physical geography are climatology, geomorphology, coastal and marine geography, geography of soils, and biogeography.

   Climatology is the science that describes and explains the variability in space and time of the heat and moisture states of the Earth's surface, especially its land surfaces. We can think of climate as a description of average weather and its variation at places around the world. Climatology is also concerned with climate change, both past and future. Global climate modeling is one of the most rapidly expanding and challenging areas of climatology. This field attempts to predict how human activities will change global climate.

   Geomorphology is the science of the Earth's surface processes and landforms. The Earth is constantly being altered under the combined influence of human and natural factors. The work of gravity as well as flowing water, blowing wind, breaking waves, and moving ice act to remove and transport soil and rock and to sculpt a surface that is constantly being renewed through volcanic and tectonic activity.

   Physical geography includes climatology, geomorphology, coastal and marine geography, geography of soils and biogeography. Hazard assessment and water resources bring together both human and physical geography by studying how humans affect and are affected by the natural world.

III. Tools in Geography: Geographers use unique tools including maps, geographical information systems (GIS), remote sensing, mathematical modeling and statistics to represent spatial information.

IV. Systems in Physical Geography: A systems approach helps in understanding the interconnections in natural processes.

V. Understanding Physical Geography: Physical geography is also concerned with the natural world around us – the human environment.

VI. Physical Geography, Environment and Global Change: Environmental change is produced by both natural processes and human activity. Some important topics of global change that physical geographers are studying are:

1. global climate change
2. the carbon cycle
3. biodiversity
4. pollution
5. extreme events

CHAPTER 2 – LECTURE-02
Spheres, Scales, Systems, and Cycles

I. The Four Great Realms: The natural systems encountered in physical geography operate within the four great realms, or spheres, of the Earth. These are the atmosphere; the lithosphere, the hydrosphere, and the biosphere.

Atmosphere **-** The gaseous layer that surrounds the Earth. It receives heat and moisture from the surface and redistributes them, returning some heat and all of the moisture to the surface. It supplies vital elements needed to sustain life forms.

Lithosphere **-** This outermost solid layer of the Earth provides a platform for most life-forms. The solid bedrock bears a shallow layer of soil in which nutrient elements become available to organisms. The surface of the lithosphere is sculpted into landforms which provide varied habitats for plants, animals, and humans.

Hydrosphere **-** The liquid realm of the Earth is principally the mass of water in the world's oceans. It also includes solid ice in mountain and continental glaciers. Water occurs as a gaseous vapour, liquid droplets, and solid ice crystals. In the lithosphere, water is found in the uppermost layers in soils and in ground water reservoirs.

Biosphere **-** Most of the biosphere is contained in the shallow surface zone called the life layer. It includes the surface of the lands and the upper 100 meters of the ocean. On land, the life layer is the zone of interactions among the biosphere, lithosphere, and atmosphere.

II. Scales in Physical Geography: The processes of the life layer and the four great realms operate on various scales. These scales range from global to individual scales.

Global scale - The sun is the power source that powers most of the phenomena that occurs within the life layer. At this scale, Earth-sun relationships are very important.

Continental scale - The sun's energy is not evenly absorbed by the Earth's land and water surface. Unequal solar heating produces currents of air and water and constitute the global atmospheric and oceanic circulation system.

Regional scale - This smaller scale observes the cloud patterns of weather systems, and their regular movements over time. These movements, along with solar control of surface temperature, form the basis of the climates of the world.

Local scale - Factors at this scale are important in determining the exact patterns of vegetation and soils.

Individual scale - Individual landforms and their associated plant and animal communities are produced by unique activities of wind or water, and develop distinctive biological communities and soil properties.

III. Systems in Physical Geography: A helpful way to understand the relationships among the four realms and the life-layer is to study them as systems.

A. Flow systems - This is a system in which matter, energy, or both, move from one location to another.

1. Pathways: The structure of a flow system that allows for movement.
2. Structure: The pattern of pathways and their interconnections.
3. Inputs and outputs: Flow systems may have matter, energy, or both entering and leaving the system.
4. Power source: Each flow system needs some type of power source. Natural systems are powered largely or completely by natural power sources.

Examples of flow systems in physical geography are river systems, a food chain in an ecosystem, and the global energy balance system.

B. Open and Closed Flow Systems

1. Open Flow System - This is a flow system where there are inputs and outputs of matter and energy.
2. Closed Flow System - This is a flow system with no input or output flows of matter. The flow of materials in the system moves endlessly in a series of interconnected paths or loops. This is also known as a cycle, or a material cycle. Any global material flow system must be closed, since only a minute amount of matter flows from Earth to space or from space to the Earth. The global carbon, nitrogen, and oxygen cycles are all closed matter flow systems. Energy flow systems are always open. All objects that are warmer than the depths of space emit radiant energy, and some fraction of that energy ultimately leaves the Earth.

C. Feedback and Equilibrium in Flow Systems

1. Feedback - Occurs when the flow in one pathway acts to either reduce or to increase the flow in another pathway.
    a. Positive feedback- Where the feedback reinforces the flow of matter or energy in the system.
    b. Negative feedback - Where the feedback reduces the flow of matter or energy in the system.

2. Equilibrium- This is a steady state in which the flow rates in the various pathways of a system remain about the same.

D. Time Cycles - Any system can undergo a change in the rates of flow energy or matter within its pathways. Flow rates may grow faster or may slow down. These changes in activity can be reversed at intervals of time – that is, a rate can

alternately speed up and slow down during a time cycle. In many natural systems, there is a rhythm of increasing and decreasing flow. The annual revolution of the Earth around the Sun generates a time cycle of energy flow in many natural systems.