Geology

Soil Mineralogy, Genesis and Classification (Soil 504)

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Geology

- studies the composition, structure, physical properties, history, and the processes that shape Earth's components.
- Planetary geology (sometimes known as Astrogeology) refers to the application of geologic principles to other bodies of the solar system.

Earth

- age of the Earth at about 4.6 billion (4.6x109) years,
- Earth's lithosphere, which includes the crust, is fragmented into tectonic plates that move over a upper mantle (asthenosphere) via processes that are collectively referred to as plate tectonics.
- Earth's natural resources, such as petroleum and coal, as well as metals such as iron, copper, and uranium.
- Many minerals such as asbestos, perlite, mica, phosphates, zeolites, clay, pumice, quartz, and silica, as well as elements such as sulfur, chlorine, and helium.

Geomorphology

- study of landforms and the processes that shape them.

Earth's lithosphere

- The lithosphere includes the crust and the uppermost mantle
- two types of lithosphere:
- Oceanic lithosphere, which is associated with Oceanic crust
- Continental lithosphere, which is associated with Continental crust

Lithosphere

- Oceanic lithosphere is typically about 50-100 km thick
- beneath the mid-ocean ridges
- Continental lithosphere :
- thickness from about 40 km to perhaps 200 km;
- upper ~30 to ~50 km of typical continental lithosphere is crust.

Theory

- Earth - structure and composition
- Scope of geology in soil studies – historical development
- Principles of geomorphology – geological formations of India and Tamil Nadu
- Pedology – concepts of pedogenesis
- Pedology and Edaphology – their relationships
- Rocks - formation and classification
- Minerals – classification and properties
- Weathering of rocks and minerals-types of weathering – physical, chemical and biological
- Weathering sequence and indices
- Silicate minerals – genesis, classification and properties
- Non silicate minerals – genesis, classification and properties
- Identification of minerals by DTA, X-ray diffraction, IR spectroscopy methods
- Soil formation - concepts and views
- Factors of soil formation – active & passive
- Soil forming processes

THEORY

- Soil profile development
- Profile description
- Soil classification - concepts and principles
- Types of soil classification – early and recent
- Soil taxonomy - salient features and recent trends
- Diagnostic epipedons
- Diagnostic endopedons
- Soil moisture and temperature regimes
- Hierarchy of soil taxonomy
- Differentiating characteristics of taxa
- Criticism and appreciation of soil taxonomy
- Description of soil orders - Alfisol, Aridisol, Vertisol, Mollisol and Inceptisol
- Description of soil orders - Histosol, Oxisol, Ultisol, Spodosol, Entisol, Andosol and Gelisol
- Soils of world – distribution of soil orders
- Soils of different agro-ecological regions of India
- Soils of Tamil Nadu – distribution of soil orders
- Soils of Tamil Nadu – constraints and scope for improvement
- World reference base for soil resources – correlation of WRB with other systems of soil classification

Practical

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- Identification and characterization of rocks and minerals
- Study of soil profile -1
- Study of soil profile -2
- Soil morphological feature identification
- Preparation of soil monolith -1
- Preparation of soil monolith - 2
- Particle size analysis
- Preparation of HCl extract
- Estimation of acid insolubles
- Clay separation
- Qualitative identification of clay minerals
- Estimation of iron and aluminium
- Estimation of calcium, magnesium, sodium and potassium
- Determination of molar ratios and weathering indices
- Preparation of clay for DTA / X - ray diffraction analysis
- Visit to NBSS & LUP, Nagpur

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