

**Wollo University**  
**College of Natural Science**  
**Department of Biology**  
**Semester Lesson Plan**

**Course Title\_ Soil Science Course code: Biol.409**

**Course Objective**

At the end of the course students should be able to:

- describe the basic terms used in the description, study, and management of soils
- identify physical, chemical and biological properties of soil
- discuss characteristics of soil best suited for maximum agricultural output

**Course content**

1. Introduction (1 hr)
  - 1.1. What is soil?
  - 1.2. Why we study soil?
2. Soil formation (2 hrs)
  - 2.1. Soil genesis, soil profile development.
  - 2.3. Factors of soil formation, pedological processes
  - 2.4. Soil horizon differentiation
  - 2.5. Horizon nomenclature, soil profile description
3. Physical properties of soil (2 hrs)
  - 3.1. Soil texture, structure and consistency.
  - 3.2. Compaction, volume and mass relationships in soil.
  - 3.3. Soil aeration, renewal of soil air.
  - 3.4. Aeration in relation to soil management.
4. Chemical properties of soil (2 hrs)
  - 4.1. Weathering of rocks and minerals.
  - 4.2. Colloidal properties of soils.
  - 4.3. Structure of clay minerals.
  - 4.4. Origin of the net negative charge in soils.
  - 4.5. Cation exchange, base saturation and buffering capacity of soils.
  - 4.6. Soil acidity and alkalinity.
5. Soil Water (2 hrs)
  - 5.1. Movement of water in soil.
  - 5.2. Soil moisture availability, irrigation principles.
  - 5.3. The hydrological cycle.

- 5.4. Effect of management practices on soil moisture regime.
6. Biological properties of soils (2 hrs)
  - 6.1. Composition and distribution of organic matter in soils.
  - 6.2. Decomposition of soil organic matter.
  - 6.3. The forest floor, the plow layer
  - 6.4. Microbial populations of the soil.
7. Soil Classification (2 hrs)
  - 7.1. Fundamentals of soil classification.
  - 7.2. Distribution and origin of soil orders.
  - 7.3. Systems of soil classification.
8. Soil-Plant nutrient relationships (2 hrs)
  - 8.1. Nutrient cycling in relation to chemical and biological properties of soils.
  - 8.2. Chemistry of plant nutrients, soil fertility, soil testing.
  - 8.3. Soil sustainability, shifting cultivation, agroforestry
9. Adaptation of plants to adverse soil conditions (2 hrs)
  - 9.1. Soil acidity
  - 9.2. Soil salinity
  - 9.3. Soil alkalinity
  - 9.4. Waterlogged soils
10. Conservation status of soil in Ethiopia (2 hrs)
  - Practical Content
    - Session 1. Soil physical properties
    - Session 2. Chemical properties (pH and Electrical conductivity)
    - Session 3. Organic matter
    - Session 4. Available phosphors
    - Session 5. Total Nitrogen
    - Session 6. Available potassium
    - Session 7. Cation exchange capacity
  - Recommended Mode of Delivery
 

Lectures, practical sessions, field work, individual or group projects, demonstrations group
  - Recommended Mode of Assessment
 

Continuous assessment 50% and 50% final examination
  - References
 

Landon, J.R. (ed.) (1990). Booker Tropical Soil Manual: A Handbook for Soil Survey and Agricultural Land Evaluation in the Tropics and Subtropics. Booker Tate Limited, Harlow.

Singer, M.J and Munns, D.N. (1999). Soils: An Introduction. (4th ed.) Prentice-Hall, Inc. New Jersey.