NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ENVIRONMENTAL ENGINEERING

ENVIRONMENTAL ENGINEERING PROGRAM

GE111 – EDAPHOLOGY

I. GENERAL INFORMATION

CODE	**:**	GE111 – Edaphology
SEMESTER	**:**	5
CREDITS	**:**	03
HOURS PER WEEK	**:**	04 (Theory – Practices – Laboratory)
PREREQUISITES	**:**	GE102 – Geography
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

Concept and importance of edaphological soil and its interest for Engineering. Detailed knowledge of the components, physical and chemical properties, genesis, classification and principles of cartography, of natural soils and anthropogenic urban soils. Principle of soil evaluation, as a starting point in studies of environmental planning, territorial planning and environmental impact assessment. Finally, it is intended that students understand the importance of soil as a non-renewable resource and the degradations to which its inappropriate use leads; It is also intended to train in the corrective and rehabilitating measures of degraded soils.

III. COURSE OUTCOMES

At the end of the course the student will:

- Organizes data for proper analysis and interpretation and calculations (soil densities, physical chemical and biological properties).
- Explains and determines the genesis of the soil, the physical properties of the soil, geo reference, physiographic units.
- Understand and apply densities, to determine the consistency of the soil, the probability of resistance in an earthquake.
- Interpret and perform types of soil sampling to take to the laboratory to determine their physical, chemical, and biological characteristics.
- Build models to determine the degree of contamination, is determined by the parameters, using the LMOs, ECAs, In soils.

IV. LEARNING UNITS

1. SOIL GENESIS / 4 HOURS

Objective of soil science: Interest in Engineering. Genesis. Pedological and edaphological approach. Factors of soil formation. Climate action. Properties of the soil affected by the climate. The parent material or / and mother as a factor of soil formation. Origin of the parent material. Meteorological components Characteristics of the soils inherited from the parent

material. The organisms. The man and his Impact. Time as a factor of soil formation. The soil as part of the landscape.

2. EDAFIZATION PROCESSES / 4 HOURS

The pedogenetic processes of the soil. Phases of soil formation: Edafization. The global processes. The specific processes. Comulization. Transformations Mineralization. Gleization, Rubification, Oxisols. Translocation processes. Melanization Leaching. Andolization. Humic compounds. Physiography, soil morphology.

3. SOIL AND ITS APPLICATION EM ENVIRONMENTAL ENGINEERING / 4 HOURS

The soil its application in Environmental Engineering. Soil components Soil formation processes. Mechanical physical processes, chemical processes, biological processes. The profile of the soil. Formation of the Horizon. Identification of soil formation processes. Sampling of soils.

4. PHYSICAL PROPERTIES OF THE SOIL / 4 HOURS

Physical properties of the soil. Composition and characteristics of the mineral fraction of the soil. Soil texture, Soil structure. Consistency Determination of its properties. Exercises.

5. SOIL DENSITY / 4 HOURS

Density of the soil. Particle Density Apparent density. The porous space. Soil air, soil temperature, soil thermal balance, temperature fluctuation, soil temperature regime. Relationship with the growth of plants. Color of the soil. Origin of the color. Determination of meanings in Peruvian soil. Exercises.

6. WATER IN THE SOIL / 4 HOURS

Water in the soil. Nature of water in the soil. Water retention Capillarity. The potential of water in the soil. Ratio of water pressure in the soil. The Neutron probe. Humidity coefficient. Water plant relationship. Moistening profile. Hydromorphism Removal of water from the soil by the plants. The efficient use of water.

7. ORGANIC MATTER / 4 HOURS

Organic matter of the soil. Constituents and Decomposition of Organic Matter. The humus, characteristics and properties. Carbon Nitrogen ratio and the decomposition of Organic Waste. Content and distribution of organic matter in soils. Effect of organic matter on the soil. Sources of organic matter. Solid waste and its use.

8. SOIL CHEMISTRY / 4 HOURS

Soil chemistry. Important elements in soil chemistry. Cations and anions in the soil. Changeable cation, the phenomenon of change. Ionic affinity. Exchange and retention of anions. Cation capacity of soil change. Calculations with exchangeable ions. Percentage of base saturation.

9. MINEROLOGY / 4 HOURS

Classification of soils. Natural soils. Anthropogenic urban soils. Study of soils Types. Soil maps Mapping units. Protocols Interpretation of soils. Classification of soils. Taxonomy of the soil. Lay FAO laws. Main problems. Soil conservation management. The cartographic topography. The coordinates. Use of GPS. Geodetic survey.

10. SOIL CLASSIFICATION / 4 HOURS

Classification of soils. Natural soils. Anthropogenic urban soils. Study of soils Types. Soil maps Mapping units. Protocols Interpretation of soils. Classification of soils. Taxonomy of the soil. Lay FAO laws. Main problems. Soil conservation management. The cartographic topography. The coordinates. Use of GPS. Geodetic survey.

11. SOIL EVALUATION / 4 HOURS

Soil evaluation Degree of contamination. Soil sampling method. Sampling plan Preparation of sample. Analysis. Measurement of radioactivity. Use of results. Chemical analysis. Fraction of pollutants.

12. ENVIRONMENTAL PLANNING / 4 HOURS

Environmental Planning Planning methods. Basins Watershed planning. Strategic plan. ZEE. Strategic analysis. View. Prospects of scenarios. Demographic projections. Evolution of infrastructure investments equipment. Consensus with the environment of environmental projects. Study of environmental impact in soils. Risk assessment of contaminated soils. Characterization of risks.

13. NATURAL RESOURCES / 4 HOURS

Renewable and non-renewable natural resources. Degradation. Main sources of soil degradation. Types of erosion. Soil conservation management. Management of soil contamination. Management of contaminant sources. Remediation of contaminated soils.

14. TREATMENTS OF CONTAMINATED SOILS / 4 HOURS

Known technologies to rehabilitate degraded soils. Physical confinement isolation. Solidification. Thermal desorption Washed. Electro remediation. Physical separation Application of amendments, chemical oxidation. Thermal destruction etc.

V. LABORATORIES AND PRACTICAL EXPERIENCES

- Soil laboratory practice: Soil formation factors: Mother Rock. Mother or Parental material, Soil formation.
- Laboratory Practice: Meteorization, Edaphicization of soil formation factors. Physiography in the study of Soils. Hierarchical Characterization in Physiography. The Physiography in the study of Soil.
- Field soil sampling, basic criteria for soil sampling, surface sampling and soil profile sampling (pit) - Will go with students prior agreement to the nearest field where there is an appropriate garden and where there is a pit (Practice area of Electrical Engineering)
- Laboratory practice: Soil Texture, determination of the texture of a soil with the Hydrometer method.
- Laboratory Practice: Apparent density and real soil density. Cylinder method, method of clod coated in fine, pycnometer method.
- Laboratory Practice: Organic Matter in the Soil - Soil pH, Polluting agents.
- Field Practice: Face I put - profile of edaphic soils and Horizons.
- Field practice: San Mateo: water erosion, wind from the Peruvian highlands.
- Field practice: Soil formation in the sierra region in the Callejón de Huaylas (colluvial, eluvial, etc.)
- Field practice: San Mateo, determination of mass, volume of soil on a slope. (Hillside).

VI. METHODOLOGY

The course is developed in theory sessions, laboratory and field practice. In the theory sessions, the teacher presents the concepts, theory and its applications. In practical sessions, samples are taken for analysis and analyzed. In the laboratory sessions, instruments such as analytical balance, muffle furnace, burette, pipettes, hygrometer, etc. are used to analyze the results. At the end of the course the student must present and present an integrating project or work. In all the sessions, the active participation of the student is promoted.

VII. EVALUATION FORMULA

The learning will be evaluated through the "F" system.

- Partial Exam: Weight 1
- Final Exam: Weight 2
- Qualified Practice: Weight 1, 2.

Calculation of the Final Average:

$$FA = \frac{PE + 2 * FE + QP1 + 2 * QP2}{6}$$

PE: Partial Exam; FE: Final Exam, QP: Qualified Practice

VIII. BIBLIOGRAPHY

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- Ayres, Q.C. 1960. La erosión del suelo y su control. Ed. Omega.
- Departamento de Agricultura de U.S.D.A. - 1960. Diagnóstico y Rehabilitación de Suelos Salinos y Sódicos. Manual Nº 60. Ed. Limusa.
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