NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF CIVIL ENGINEERING

CIVIL ENGINEERING PROGRAM

EC513 – SOIL MECHANICS II

I. GENERAL INFORMATION

CODE	**:**	EC513 – Soil Mechanics II
SEMESTER	**:**	6
CREDITS	**:**	04
HOURS PER WEEK	**:**	05 (Theory – Practice)
PREREQUISITES	**:**	EC511 – Soil Mechanics I MA195 – Numerical Methods
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

The course provides basic knowledge about the soil behavior against load solicitations from the different Civil Engineering works. To perform laboratory practices to determine the physical-mechanical properties of the soil, as well as the parameters of shear resistance and compressibility that govern the behavior of the soil. Problems of application of practical cases of engineering works design are developed.

III. COURSE OUTCOMES

At the end of the course the student will:

- Check the stress and strain properties of the floors.
- Understand the behavior of soils before load solicitations.
- Calculate stresses and deformations of the soil subjected to different types of loads: punctual and distributed.
- Verify the overall stability of containment structures.
- Analyze and solve slope stability problems, static conditions and static pseudo conditions.
- Calculate the bearing capacity of superficial and deep foundations.
- Obtain knowledge and criteria for the design of deep foundations.

IV. LEARNING UNITS

1. **EFFORTS TRANSMITTED IN A MASS OF SOILS**
   Concept of effective efforts / Increase of vertical effort due to various types of load.

2. **UNIDIMENSIONAL CONSOLIDATION**
   Fundamentals of consolidation / Consolidation test in laboratory / Calculation of settlement settlements / General considerations of pre compression.

3. **CUTTING SOIL RESISTANCE**
   Failure criteria Mohr - Coulomb / Direct cutting test / Triaxial compression test / Unconfined compression test.

4. **SOIL PUSHING AND RETAINING STRUCTURES**
   Ground pressure at rest / Active and passive ranking pressures / Friction retaining walls / Coulomb earth pressure theory / Containment Wall Design.

5. **STABILITY OF SLOPES**
   Stability of infinite slopes / Finite slopes / Slope stability analysis. Solution methods

6. **SURFACE FOUNDATIONS**
   General concepts / Theory of ultimate load capacity / Safety factor / Settlement of surface foundations / Allowable load capacity.

7. **DEEP FOUNDATIONS**
   Foundation with piles / Load capacity of piles / Excavated piles / Foundation drawers / Calculation of Settlements.

V. LABORATORIES AND PRACTICAL EXPERIENCES

- Unidimensional Consolidation Test
- Simple Compression Test
- Direct Cut Test
- Triaxial Compression Test

VI. METHODOLOGY

The course is developed in sessions of Theory, practice and laboratory. In the Theory sessions the concepts, demonstrations and applications are presented. In the practical sessions, various problems are analyzed and solved. In the laboratory sessions the obtaining of the parameters for resistance and deformation is observed and analyzed by means of appropriate equipment. At the end of the course, the student must prepare and present a work whose subject is delivered to the student in the 3rd week.

VII. EVALUATION FORMULA

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

- Partial Exam (PE): Weight 1
- Final Exam (FE): Weight 2
- Average of Practices (AP): Weight 1.

$$FA = \frac{PE + 2 * FE + AP}{4}$$

Besides,

- Structured Work: SW
- Classroom Practices: P, the practice with the lowest grade is eliminated.
- Laboratory Sessions: L, the laboratory with the lowest grade is eliminated.

$$FA = \frac{P1 + P2 + P3 + L1 + L2 + L3}{6} * 0.7 + 0.3 * SW$$

VIII. BIBLIOGRAPHY

- DAS M. Braja "Fundamentals of Geotechnical Engineering" International Thompson Editors S.A. (1999).

- Juárez R y Rico A. “Mecánica de Suelos Tomo I y II” Editorial Limusa, Wiley Mexico 1980.

- Lambe T. and Whitman R. " Mecánica de Suelos " Editorial Limusa, Mexico, 2001.