

PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
SCHOOL OF ENGINEERING
DEPARTMENT OF STRUCTURAL AND GEOTECHNICAL ENGINEERING
ABET COURSE SYLLABI

ICE2614 SOIL MECHANICS

Credits and contact hours: 10 UC credits / 10 hours (3 h. Lectures and 7 h. Independent learning experiences)

Instructor's name: Carlos Ovalle

Course coordinator's name Carlos Ovalle

Textbook:

- Muir Wood, D. (1990): Soil behavior and critical state. Cambridge University Press.
- Apuntes del curso Mecánica de Suelos ICE2614, PUC, Carlos Ovalle, 2014

Course Catalog Description:

The purpose of this course is to train students to understand the mechanical behavior of granular and cohesive soils, as well as basic soil modeling in elasticity and plasticity. The general framework of the Critical State theory is reviewed, in order to study the effect of the effective stress path, including drained and undrained behavior. Emphasis is put on soil mechanical characterization according to the analysis of standard laboratory and in-situ testing. Therefore, the main methodologies for soil and rock geotechnical exploration, sampling and testing are covered. Additionally, classical methods for foundation settlements in elastic media are studied, according to Winkler's theory.

Prerequisite Courses: ICE2604 Fundamentals of geotechnical engineering

Co-requisite Courses: None

Status in the Curriculum: Required

Course Learning Outcomes:

1. Understand the mechanical behavior of soils and the interpretation in the stress-volume space.
2. Analysis and identification of mechanical parameters from laboratory and in-situ testing, and from geotechnical explorations.
3. Basic tools for constitutive modeling of soils.
4. Evaluate settlements and internal stresses in flexible and rigid foundations on elastic media.

Relation of Course to ABET Criteria:

- a. Knowledge of mathematics, science and engineering
- b. Design and conduct experiments: analyze and interpret data

- c. Multidisciplinary teams
- d. Identify, formulate, and solve engineering problems
- e. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. Importance of soil classification for the mechanical behavior of soils.
2. 3D stress interpretation in solid mechanics and failures criteria (Tresca, Von Mises, Mohr-Coulomb).
3. Mechanical laboratory tests for soils (isotropic, oedometric and triaxial compression).
4. Stress path relevance in soil mechanics and use of the stress invariants: deviatoric and mean effective stresses.
5. Relevance of volume changes in soil mechanics and analysis based on the volume (specific volume or void ratio).- stress (deviatoric and mean effective stresses) space.
6. Critical state soil mechanics.
7. Drained and undrained behavior of soils.
8. Elastic modeling in soil mechanics.
9. Introduction to plasticity theory (yielding and plastic potential)
10. Perfect elastic-plastic model of Mohr-Coulomb
11. Cam Clay model
12. Geotechnical explorations (pits, drillings, sampling (Shelby, RQD))
13. In-situ testing (SPT, CPTU, Vane, Ménard presiometer, Seismic Refraction, Load Plate, Permeability Lefranc and Lugeon)
14. Winkler's theory, beams in elastic media, subgrade reaction modulus in soils.
15. Limit values for foundation settlements.
16. Swelling and collapse of cohesive soils and its importance in foundations design.