Soil mechanics

Titulaire
Alessia Cuccurullo (Coordonnateur)

Mnémonique du cours
CNST-H302

Crédits ECTS
5 crédits

Langue(s) d'enseignement
Anglais

Période du cours
Premier quadrimestre

Campus
Solbosch

Contenu du cours

This course introduces the basic concepts of soil mechanics and foundation engineering. It covers the following fundamentals :

- Soil constituents (three-phase material, soil structure and fabric, volumetric and mass ratios, soil-water interaction);
- Soil classification (size of soil fraction, grain size distribution, clay fraction/minerals and properties, soil classification, clay activity and liquidity index);
- Soil compaction (compaction process, Proctor compaction test, compaction curves of different soils, characteristics of compacted soils);
- Groundwater and seepage ((soil permeability, rate of water flow and velocity, darcy's law, steady state flow, internal erosion, flownet sketching, capillarity, etc.)
- Stresses in soil (total stress, effective stress and pore water pressure, Mohr circle and stress state in soil);
- Process of consolidation (types of settlement during consolidation, soil consolidation in practice, one-dimensional consolidation, oedometer test, Terzaghi's theory of consolidation);
- Shear strength of soil (direct shear tests, triaxial compression tests);
- In-situ testing (boring, sampling, CPT, pressuremeter tests, etc.);
- Shallow foundation (bearing capacity and settlement);
- Pile foundation (introduction to pile foundation design).

Objectifs (et/ou acquis d'apprentissages spécifiques)

Provide the basic theoretical and experimental notions of Soil Mechanics focusing on the elaboration, the choice and the interpretation of classical experimental tests in the laboratory and the field.

On completion of this course, the student will be able to:

1. Master soil mechanics notions which are useful for the design of geotechnical elements in a construction project;
2. Develop an appreciation of soil as construction material, with soil mechanics being essential in the engineering of civil infrastructure;
3. Develop an understanding of the relationships between physical characteristics and mechanical properties of soils;
4. Experience experimental measurement of the physical and mechanical soil properties commonly used in engineering practice;
5. Demonstrate ability to explain theoretical and experimental notions of soil mechanics;
6. Apply Darcy's Law; consolidation models for load-time-deformation responses of soils; Mohr-Coulomb models for shear strength behaviour of soils, etc;
7. Demonstrate ability to apply the effective stress concept to solve elementary geotechnical problems;
8. Design shallow foundations;
9. Develop good technical reporting and data presentation skills;
10. Understand both the applications and limits of engineering methods commonly used to solve soil mechanics problems in civil engineering.

Pré-requis et co-requis

Cours pré-requis

CNST-H2001 | Mécanique des solides et des structures | 5 crédits

Cours ayant celui-ci comme co-requis

PROJ-H305 | Projet de conception des structures | 5 crédits

Méthodes d'enseignement et activités d'apprentissages

Theoretical lectures (24h)

Exercises (24h):

Tutorial exercises are given with supervised tutorial classes. The aim is to give the students opportunities to develop skills in applying the theories and methods learned to solve elementary geotechnical engineering problems. The exercises cover a great variety of elementary geotechnical problems with varying degrees of difficulty.

Laboratory sessions:

Laboratory experiences are designed to clarify lecture material. Laboratory classes are undertaken in the Soil Mechanics Laboratories. The students work in groups under the supervision of a laboratory demonstrator. The aim is to train the student in proper laboratory test techniques, including the analysis of results and the evaluation of relevant properties. 3 laboratory sessions

will be organised by a group of around 6 students. Attendance of those sessions is mandatory and a report will be requested after each session. Those 3 reports will be evaluated and will count for 10% of the final mark.

Références, bibliographie et lectures recommandées

B. François "Soil Mechanics". Course Syllabus

Support(s) de cours

Syllabus et Université virtuelle

Autres renseignements

Lieu(x) d'enseignement

Solbosch

Contact(s)

Alessia CUCCURULLO Av. A. Buyl, 87 - 1050 Bruxelles Bât. C, niveau 4, C4100

Méthode(s) d'évaluation

Examen écrit, Présentation orale et Autre

Méthode(s) d'évaluation (complément)

Written exam (exercises) + Oral exam (theory) + 3 Laboratory reports

Construction de la note (en ce compris, la pondération des notes partielles)

The final grade is calculated as follow:

- If the written exam (exercises) grade is equal to or above 8/20

The 3 reports from the laboratory sessions will count for 10% of the final mark.Oral exam (theory) will count for 50% of the final mark.Written exam (exercises) will count for 40% of the final mark.- If the written exam (exercises) grade is below 8/20

The final grade will be equal to the written exam (exercises) grade.

In case of failure during the first session, only the mark corresponding to the laboratory sessions can be kept for the second exam session. Marks assigned to written exams (exercises) and oral exams (theory) will not be kept for further exam sessions.

Langue(s) d'évaluation principale(s)

Anglais

Programmes

Programmes proposant ce cours à l'école polytechnique de Bruxelles

BA-IRAR | Bachelier en sciences de l'ingénieur, orientation ingénieur civil architecte | bloc 3, BA-IRCI | Bachelier en sciences de l'ingénieur, orientation ingénieur civil | option Bruxelles/ bloc 3 et MA-IRAR | Master : ingénieur civil architecte | finalité Spécialisée/bloc 1