Course file

Study cycle	BACHELOR IN CIVIL ENGINEERING		
Course	Soil Mechanics	Mandatory	☒
		Optional	☐
Course scientific area	CIVIL ENGINEERING	Category	C

Course category: B - Basic; C - Core Engineering; E - Specialization; P - Complementary.

Year: 2nd	Semester: 4th		ECTS: 5,5		Total: 149
Contact time	T:	TP: 52,5	PL: 15	S:	OT:

T - Lectures; TP - Theory and practice; PL - Lab Work; S - Seminar; OT - Tutorial Guidance.

Course Director	**Title**	**Position**
Maria da Graça D. Alfaro Lopes	Doutor	Professor Coordenador Principal

Learning objectives (knowledge, skills and competences to be developed by students)

(max. 1000 characters)

Learning objective: the main objective is (i) to provide an understanding of basic soils behavior through experience with common soil laboratory testing procedures and (ii) to provide an understanding of various geosynthetic products and their applications in civil engineering construction.

Learning outcomes: perform the common tests used to measure soils physical and mechanical properties and know how to interpret results from such tests; explain the difference between different types of soils in terms of both physical and mechanical characteristics; give an engineering classification of any soil, and on this basis predict how it will perform as an engineering material; understand the principle of effective stress, and be able to apply this to calculate the stresses causing soil deformation; calculate the settlements and rates of settlement; determine the strength parameters appropriate to a range of stability problems, and apply geosynthetics to common civil engineering applications.

Syllabus

(max. 1000 characters)

TP lessons:

INTRODUCTION;

CHAP 1- SOIL PROPERTIES AND SOIL CLASSIFICATION;

CHAP 2 - SOIL COMPACTION;

CHAP 3 - SOILS: STRESS ANALYSIS, COMPRESSIBILITY AND CONSOLIDATION;

CHAP 4 - SOIL SHEAR STRENGTH;

CHAP 5 - GEOSYNTHETICS.

LAB lessons:

Sieve Analysis, Hydrometer test, Atterberg Limits, Proctor test, CBR test, Oedometer test, Direct shear test, triaxial test (CU), unconfined compression test.

Demonstration of the consistency between the syllabus and the course objectives

(max. 1000 characters)

The course contents are consistent with the course objective because Chap 1, 2, 3 and 4 intend to realize the (i) point of the objective and Chap 5 intend to realize the (ii) point of the objective:

Chap 1: the understanding of soil genesis, composition and classification.

Chap 2: the knowledge why soil is sometimes compacted. Identify types of compactors and purpose for the Standard Proctor tests. Discuss in-field density measurements and techniques.

Chap 3: the understanding and the analytically prediction how much a soil will settle and how long it will take.

Chap 4: the determinatuion of the strength parameters appropriate to a range of stability problems, and the understanding of the difference between total and effective stress approaches.

Chap 5: the information on geosynthetic materials, functions and applications.

Teaching methodology (evaluation included)

(max. 1000 characters)

Teaching methodology

based on work done in class as well as on students work in a context where personal presence will not be required. During theoretical and practical sessions, the teacher will make a syllabus presentation and discussion, with application of acquired knowledge to specific situations. Students will be involved in the discussion of topics in analysis and in solving exercise.

Laboratory sessions: each lab starts with a lecturer or demonstrator explaining the experiment's objectives and procedures, and the technical records and report required.

Course booklet and lab procedures are available, together with selected reference material.

Reviews of written tests will help evaluate student performance and highlight weak and strong areas.

Student evaluation (written examination):

CONTINUOUS ASSESSMENT/ASSESSEMENT BY EXAM: knowledge based (40%) +problem solving (60%). A mark of more than 50% in the test/exams is required to pass the course.

Demonstration of the consistency between teaching methodology and the course learning objectives

(max. 3000 characters)

The theoretical contents of the curricular unit will be presented through lectures illustrated whenever possible with practical cases. Students are encouraged to apply the competences acquired through practical activities (exercises).

Field visits will be arranged if possible, depending on the convenience of external companies and bodies. Seminars may be held, some give byinternal lecturers, others by engineers and others from external companies and bodies.

The teaching methodologies are consistent with the objectives of the curricular unit as the methodology associated with expository lessons combined with the practice strategy and problem solving, enable the acquisition of knowledge that can be directly used in solving geotechnical problems. The assessment scheme (made by frequency or by taking ation) was designed to measure the extent to which competences were developed.

Main Bibliography

(max. 1000 characters)

Course booklet (developed by the Instructors)

- Aysen, A. “Soil Mechanics: Basic Concepts and Engineering Applications”. Lisse: A. A. Balkema, 2002

- Braja M. Das “Principles of Geotechnical Engineering”. USA: Thomson Learning, Inc, 2002

- Terzaghi, Peck e Mesri, “Soil Mechanics in Engineering Practice”, 3rd edition, John Wiley&Sons, 1995.

- Berry, P. L. & Reid, D., "An Introduction to Soil Mechanics", McGraw-Hill, 1987.

- Lambe, T. W. & Whitman, R. V., "Soil Mechanics - SI Version", John Wiley & Sons, 1969.

- Koerner, R.M., "Designing with Geosynthetics", Prentice Hall, 5th edition, 2005.

- Lopes, M.G., "Geotêxteis: principais funções e aplicações". LNEC Report 268/94, Procº 094/16/10722, October 1994.

- Lopes, M.G., "Geotêxteis: principais tipos, propriedades e ensaios". LNEC Report 208/94, Procº 094/16/10722, August 1994.