

Degree programme	Type	Course
Geology	OP	3

Contact lecturer

Name : Aline Concha Dimas

Email : aline.concha@uab.cat

Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

Though there are not official requirements to take this class is highly convenient that the students have basic knowledge of classical mechanics from Physics, stress and deformation concepts from Structural Geology, and water flow from Hidrogeology, classes.

Objectives

The general objective is to give students the theoretical-practical knowledge of soil mechanics and geological engineering. Special emphasis will be given on applied geological research to solve various geotechnical problems.

Specific objectives aim for students to acquire skills on:

- The use of geotechnical characterization techniques, both "in-situ" and in the laboratory.
- The integration of various geological disciplines for a multidisciplinary and synthesis work, focused on solving geotechnical problems.
- The organization and planning of tasks as well as the development of interpersonal skills that allow team-working.
- Expose their team-work activities in class.
- Present oral and written exams.

Learning outcomes

- CM37 (Develop specialised geotechnical reports to characterise the subsoil in construction and civil works areas.) Develop specialised geotechnical reports to characterise the subsoil in construction and civil works areas.
- CM38 (Quantify the degree of potential instability of a natural or anthropic terrain for proper planning and land management.) Quantify the degree of potential instability of a natural or anthropic terrain for proper planning and land management.
- KM43 (Describe the areas of geology with special economic interest in today's industrialised societies.) Describe the areas of geology with special economic interest in today's industrialised societies.

- SM43 (Evaluate the feasibility of exploiting natural geological resources for commercial use.) Evaluate the feasibility of exploiting natural geological resources for commercial use.

Contents

1. Basic concepts.

1.1 What is soil mechanics and Geological and Geotechnical engineering.

1.2 Concept of soil in geotechnics

1.3 Soil phases

1.4 Soil phase relationships

2. Index Parameters of soils

2.1 Granulometry

2.2 Atterberg limits

2.3 Soil classification systems

3. Soil Compaction

3.1 Concept.

3.2 Laboratory and in-situ tests for quality control

3.4 Applications on PG-3

4. Soil exploration

4.1 Geotechnical investigations: methods and levels

4.2 SPT, DPSH, CPT tests

4.3 Registers and interpretation

5. Water flow.

5.1 Hydraulic properties of the soil. permeability

5.2 Darcy's Law. Bernoulli's law 1D flow.

5.3 Flow network. 2D flow.

6. Distribution of stresses

6.1 Total and effective stresses

6.2 Main stresses in soil mechanics. Mohr's circle

6.3 Resistance tests: uniaxial, triaxial and direct shear

6.4 Correlation of lab measured resistance with field tests

6.5 Modifications of the vertical stress due to the application of puntual and distributed loads to the ground

7. Consolidation

7.1 Consolidation test and consolidation parameters.

7.2 Calculation of settlements

7.3 Settlement time.

7.4. Triaxial tests: CD, CU, UU and interpretation of the results

8. Foundations

8.1 Factor of Safety (FS) concept

8.2 Shallow foundations: footings.

8.3 Deep foundations: piles.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Field trip	7	0.28	
Tutoring	11	0.44	
Master classes	22	0.88	
Study, problem solving, practical report writing and final project	82	3.28	
Lab work	22	0.88	

Lectures

The theoretical part will be taught through lectures. Along with the selected bibliography, the students will have diversified material for complementing the classes that will be available in the virtual classroom and at the library. The theoretical knowledge acquired by the students will be evaluated with written tests.

Laboratory practices / Constructive projects

The students will work on the geotechnical laboratory where they will obtain practical experience on the management of soil samples, acquisition of data and its processing to characterize several soil aspects according to the tests standards most commonly used in soil mechanics: ASTM and UNE-ISO. There are supporting videos that explain the performing of the most significant lab tests to characterize the properties of the soils. Students will be provided with a series of exercises on a real exploration case to learn how geotechnical information is organized, processed, analyzed and synthesized it. Real laboratory and field data will be used to build a geotechnical model on which foundations will be proposed (Laboratory Practical Project)

Field trip

The field trip will take place in the Vallès, Barcelonès area to geotechnical laboratories or construction projects where the student will obtain information on conducting field or laboratory tests.

At the end of the semester, 15 minutes will be allocated for the students to answer the teacher evaluation surveys

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Practical Case and Lab	45%	0	0	CM37, CM38
Partial Exams and Final Exam	30 %	6	0.24	CM37, CM38
Exercices theory	25%	0	0	CM37, KM43, SM43

1.Continuous Evaluation

For continuous evaluation the student must attend,at least,70% of classes.

Aspects to be evaluated:

- Exercises (25%)
- Two partial exams: 1st partial exam (15%) i 2nd Partial exam (15%)
- Reports from practical work at lab (by lab groups) (15%)
- Practical Laboratory Project (30%)
- Mandatory assistance to the field trip. We might visit a geotechnical private laboratory or a construction site.

2. Re-evaluation:

- Only exams will be re-evaluated.
- Students must have delivered 2/3 of exercises and the Practical Laboratory Project to have the right to be re-evaluated.
- Re-evaluation can be partial or total, this is: present only one first or second half of the course content to be re-evaluated or both halves.
- The best obtained grade obtained in re-evaluation test will substitute the one in the corresponding partial exam grade. Final grade will be re-evaluated with the new grade..

3. Unique evaluation.

- The student who choose this single evaluation option during has to communicate it to the lecturer professor during the first two weeks after the beginning of the semester. He/She has to formalize it with Academic Management Area of the Faculty of Sciences infilling a form to ask for this modality.
- The single evaluation will take place the date of the second partial exam and it will consist on:

a) Theory exam(30%)

b) Practical exam (30%)

c) A geotechnical investigation project (40%) that will be defined with the professors at the beggining of the course.

- The student with single evaluation can be re-evaluated only in the exams part as in continous evaluation.

4. Non- Avaluable

The student will be grade as NON-AVALUABLE when he/she delivered less than 50% of deliverable tasks (sum of exercicis (aprox. 11), practicalproject (2), exams (2), or lab portafoli (1))

5. Use of Artificial Intelligence, AI

The use of Artificial Intelligence technologies are allowed exclusively in support tasks such as searching for bibliography or information, proofreading texts or translations. The student will have to specify and clarify which parts have been generated with this technology, also specify the tools used and include a critical reflection on how these have influenced the process and result of the activity. Failure to specify these aspects will be considered academic dishonesty and may have a total or partial penalty in the activity grade or higher penalties in cases of fraud.

Bibliography

BOOKS:

Guerra Torralbo, J.C. (2018). Mecànica de Suelos: Conceptos básicos y aplicaciones. Ed. Dextra.

Olivella Pastallés., García-Tornel Josa A., Valencia Vera F.J. (2003) Geotecnia. Problemas Resueltos. Mecánica de Suelos. Ediciones UPC.

Gonzalez de Vallejo, L.I., et. al. (2002) "Ingeniería Geológica". Prentice Hall.

CONSTRUCTION CODES AND MANUALS:

"EUROCÓDIGO 7 - PROYECTO GEOTÉCNICO" UNE-ENV 1997-1 Norma Experimental Europea adaptada por AENOR. (Asociación Española de

Normalización y Certificación). (Març 1999).

https://www.mitma.gob.es/recursos_mfom/guia_proyecto_cimentaciones_con_eurocodigo_7_cimentacione_super

"CTE. Documento Básico SE-C (Seguridad Estructural - Cimentaciones)". Aprovat per R. D. 314/2006 de 28 de març. <http://www.codigotecnico.org/web/recursos/documentos/>

"Pliego de prescripciones técnicas generales para obras de carreteras y puentes" (PG-3). Ministerio de Fomento. Dirección General de Carreteras. (Modificació aprovada per O.C. al 2000 - 2001).<https://apps.fomento.gob.es/CVP/handlers/pdfhandler.ashx?idpub=ICW020>

Software

- QGIS/ArcGIS Pro. For maps.
- Excel
- Word
- Python/R for graphics and visualitation plots

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan	second semester	afternoon
(PCAM) Field practices	1	Catalan	second semester	morning-mixed