Geotechnical works:

Calendar: 1st Year 1st Semester

Contact Hours: 37h30 T/P + 7h30 P/L+7h30 EL/OT

Syllabus*:*
1. Ground investigation and testing. EC7: EN1997-part 2 (1 week).
2. Soil characterization. In-situ testing versus laboratory testing. Field tests and their importance in geotechnical design: SPT, CPT, CPTU, DP, FTV, CHST, PLT, MPT, CSBPT, MDT (2 weeks).
3. Shallow and spread foundations. Revisions. Types of foundations. Ultimate and serviceability limit state design (bearing resistance and settlements) checked under the NP-EN1997: EC7 part 1, assisted by laboratory and in situ testing. (3 weeks)
4. Deep or pile foundations. Application of the EC7-part 1 design methods. Strength of a single pile by analytical and in-situ testing methods. Pile group effect. (4 weeks).
5. Evaluation of soil liquefaction, according to the EC8: NP EN1998-part 5. (2 weeks)
6. Ground improvement and reinforcement foundations methods. (1 week)
7. Simplified methods for slope stability analysis. Survey and monitoring. (2 weeks)

Intended learning outcomes of the curricular unit:
The curricular unit in question aims the consolidation of knowledge acquired in the courses of engineering geology, soil mechanics and foundations and retaining walls, as well as the integration and linking of several factors and aspects that are related to the design of Geotechnical Works. Application of Portuguese standards based on the new European standards, EC7: NP EN 1997-part 1, NP EN 1997-part 2, EC8: NP EN 1998-part 5 and EC0: NP EN 1990, in the geotechnical design, with a particular emphasis on shallow and deep foundations, soil liquefaction and slope stability.
Skills and competences: organized and systematic thinking; capacity for analysis, critical spirit and innovative direction; inductive reasoning; use of data from technical and scientific literature; team work; search and selection of necessary information witch justified the design solutions; consistent and coherent proposals for the resolution of problems; implementation on civil engineering projects.

Demonstration of the syllabus coherence with the curricular unit's intended learning outcomes:
The subject Geotechnical Works, enable consolidation of knowledge acquired previously in other geotechnical courses, since now all aspects and factors will be remembered and integrated into practical problems. At the same time, the

student must acquire new scientific and technological knowledge, in order to be able to analyze and design more complex geotechnical structures, namely:

- Field in-situ testing and their applicability, geotechnical parameters obtained after correction of the results as well as correlated parameters according to EC7: EN 1997-part 2.
- Design approaches, and combinations to be taken into consideration, for the assessment of ultimate and serviceability limit states of shallow and deep foundations, retaining structures and slope stability, according to EC7: NP-EN1997-part 1 and EC0: NP EN1990, as well as the limits of acceptable deformations for the various types of structures.
- Verification of piles integrity, as well as pile resistance based on pile load test, proposed on EC7-part 1. Design methods and design considerations.
- Evaluation criteria of soil liquefaction based on the EC8: NP EN1998-part 5, and some techniques for ground improvement and foundation reinforcement.
- Simplified methods of slope stability and embankment analysis. Study of more complex situations using adequate software.

Whenever possible the classes will be complemented with photographs and video of tests and construction aspects, related to the implementation of this type of geotechnical works.

Teaching methodologies (including evaluation):

The curricular unit in question will have a strong practical component, never neglecting the theoretical concepts that underlie the application of design methodologies. Thus, this subject will have both theoretical and practical oriented classes (TP) (2,5h/week), supplemented by laboratory practices (PL) (0,5h/week), and courses in e-learning environment (EL) (0,5h/week). In the tutorials classes (1h/week), the students will have the opportunity to apply the concepts previously transmitted, with teacher supervision. At each student will be proposed the development of a practical solution of a real geotechnical problem (team work), as well as the study of a scientific paper (individual work), which correspond to 30% of the final mark. The remaining 70% will be achieved by conducting 2 tests during the semester, with a minimum of 9.5 in 20. The final classification will correspond only to the examinations, if the student does not meet the above requirements.

syllabus coherence with the curricular unit's intended learning outcomes:

The knowledge of the built heritage, the mechanisms of degradation of buildings, materials and intervention technologies are fundamental to the practice of engineering acts related to the maintenance and rehabilitation of buildings.

The syllabus of the course allow you to develop the skills of students in the areas considered essential under the maintenance and rehabilitation of buildings, including giving them the knowledge and skills required to describe and characterize the materials and construction processes, define the objetives and methodologies of assistance, select appropriate rehabilitation and maintenance techniques.