ANEXO IV

Em separado

1.1. Unidades Curriculares

1.1.1. Unidade curricular:

Slope Stability, Excavation and Retaining Structures

1.1.2. Docente responsável (preencher nome completo):

Tiago Filipe da Silva Miranda

1.1.3. Outros docentes que lecionam a unidade curricular:

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1.1.4. Objetivos de aprendizagem da unidade:

(1000 carateres)

Understand and know how to apply the different methods of assessment of slope stability in soils and rocks. Identify the different failure modes in embankments and apply the appropriate methodology to each one of them. Interpret the results of the application of analytical and numerical methods in the evaluation of slope stability. Understand the methods of stability analysis of excavations and different types of support structures. Develop skills of advanced stability analysis calculations and design of these different structures.

1.1.5. Conteúdos programáticos:

Introduction to Eurocode 7 (EC7). Slope stability. Evaluation of slope stability in rocks and soils. Limit equilibrium and numerical methods. Probabilistic methods. Slope stabilization techniques. Use of software for stability analysis. Stresses transmitted by soils: Rankine and Coulomb theories. Gravity walls. Ultimate limit states and safety check. Stresses transmitted by the soils under seismic conditions. Freestanding walls. Flexible support structures. Safety criteria and calculation methods. Mono anchored walls. Rowe method. Walls supported with various levels of anchors. Stress calculation in the anchors and wall. Walls supported at various levels of anchors: sheet piles, diaphragm walls and "Berlin". Stress calculations in anchors and wall. External stability

of flexible retaining structures: stability of the bottom of the excavation. Excavations in clays and sands. Kranz method.

1.1.6. Demonstração da coerência dos conteúdos programáticos com os objetivos de aprendizagem da unidade curricular.

This course is intended to convey to the student a set of concepts, models and tools related to advanced analysis of geotechnical structures such as embankments, excavations and retaining structures, in order that the students acquire design skills related to geotechnical works. The program presents these concepts, models and tools theoretically and through practical applications, frequently with case studies, exercises and use of software, leading to a better understanding of the mechanisms and behavior of rocks and soils and way how they influence the behavior of geotechnical works.

To obtain skills in the subject of slope stability analysis different types of slopes and failure modes will be addressed specifying the most appropriate approach analyze each case.

In the scope of excavations and support works the different typologies will be explained and presented and analytical and numerical calculation methodologies will be presented using practical examples.

1.1.7. Metodologias de ensino (avaliação incluída):

In the theoretical-practical courses the concepts of each subject are introduced using fundamentally the expository method with a set of practical examples and active discussion of the contents with the students. In these classes students will also have to solve a set of exercises. In practical-laboratorial classes students perform numerical modeling work related to geotechnical stability assessment which is carried out in groups. The exercises and works are solved by the students with the active support of the Professor. The instruments used for the learning assessment are as follows: one written test with theoretical and practical parts and one practical work. The test correspond to 60% of the final grade while the practical work 40%. The test consists of a theoretical part and a practical part worth 10 values each, with a minimum grade of 4 values in each part.

1.1.8. Demonstração da coerência das metodologias de ensino com os objetivos de aprendizagem da unidade curricular.

In the theoretical-practical courses a dynamic teaching methodology is adopted that allows the student to understand the key issues related to the themes present in the program. Besides the presentation of theories/models/concepts practical examples and case studies are often presented and discussed providing the students the opportunity to actively participate in the learning process. A set of exercises are also solved for practical application of the theoretical concepts.

In the practical-laboratorial classes students develop a set of activities that enable the consolidation of knowledge by conducting a work using software, and sometimes the search for knowledge results is based on research that is also a key element.

In the courses it is intended that the students are able to carry out a set of activities:

- learn the theoretical concepts related to slope stability, excavations and support construction;
- carry out a number of practical exercises to apply the theoretical concepts;
- carry out a practical work related to the assessment of the geotechnical stability of a structure.

These activities will enable the development of the skills as predicted in the program with special focus on advanced stability analysis calculations and design of these different structures.

1.1.9. Bibliografia principal:

Wyllie, D., Foundations on Rock, E & FN SPON, 2nd Edition, 1999.

Bowles, J. E., Foundation Analysis and Design, 5th ed., McGraw-Hill, 1996

Fang, H. Y., Foundation Engineering Handbook, 2nd ed., New York, Van Nostrand Reinhold, 1991.

Poulos, H. G. and Davis, E. H., Elastic Solutions for Soil and Rock Mechanics, Centre for Geotechnical Research, University of Sidney, 1991.

Nota: este anexo é preenchido tantas vezes quantas as necessárias para descrever as diferentes unidades curriculares.