Panel discussion: Position and aims of teaching of geotechnicians at the University 'Mining Academy' in Freiberg

Débat de spécialistes: Etat actuel et objectifs de la formation des géotechniciens à l'académie des mines de Freiberg

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ABSTRACT: About 30 years ago a training specialization "Geotechnics" was created at the Freiberg University of Mining and Technology. In the following, the concept of the training course is introduced, and its requirements are explained, characterized by a wide base education, generally valid for technical specializations at universities.

RESUME: La filière "Géotechnique" a été créée il y a 30 ans à l'Université Technique de Freiberg. On exposera le programme d'études ainsi que les conditions nécessaires à son mise en place. Cette formation est caractérisée par une formation générale très importante. Le concept général devrait valoir pour les autres cursus d' enseignement technique.

1 REQUIREMENTS ON THE TRAINING SPECIALIZATION

The course of study of "Geotechnicians" originates back to 1968. At that time mining industry was recessive. For the existing educational and reseach capacity of the university a novel task was to be found. The education of engineers has been started, which were able to solve problems related to the following topics:

- Underground exploration;
- Description of the geological situation under task orientated technical aspects;
- Describing in the underground by quantitative parameters;
- Modelling of processes in the underground and such, emerging from the interaction between underground and structures,
  - both in case of subsurface construction,
  - and in case of construction on the surface or
  - when soils or rocks are used as construction materials themselves.

Within, the dimensioning of construction parts is also included.

There exist a number of additional requirements on the graduates. They do not only apply to geotechnicians, but to the education of all engineers. First to an increasing extent the co-operation with experts of other professional fields is necessary. Readiness as mental requirement and a broad knowledge as basis of mutual understanding are needed. Second approaches to leading of working teams and to qualities as a leader of workgroups must be developed.

Third leaving university the graduate starts working for an employer, which, by all understanding for peculiarities of passing from training to practice, expects his employees to be soon economically effective. Education must take this expectations into account. Fourth furthermore it must be considered, that a graduate leaving university faces a professional carreer of approximately 40 years, during which he should be able at least to follow the technical advance on his or her professional field and to utilize its developments. Training must deliver broad knowledge of long lifetime offering the graduate the chance of access, understanding and participation in development, and we would be glad, if many of our graduates also directly participated in latter indeed. The engineer should bear the ability to judge the scientific aspects of his work, and to find the best and most economic solution to given problems.

Recently there has been an increasing demand on acting with awareness of the environment and numerous training specializations orientated towards protection of the environment and sparing of ressources have emerged. A similar way has also shortly been followed in Freiberg, which has been left rapidly afterwards however, because we take the view, that it is the permanent duty of all engineers to act aware of the environment. Of course, the understanding and konwledge of measures in order to protect the environment and sparing of ressources must be communicated during training. Furthermore, the engineer should understand interconnections of his professional field with social processes in the broadest sense. At the same time, the training of technicians at universities should promote the insight into basic interdependences between technics and society.

2 SOME IDEAS ABOUT BASIC EDUCATION IN MATHEMATICAL, NATURAL SCIENTIFICAL AND TECHNICAL TRAINING

Engineers are actuated to solve their problems interdisciplinary. The co-operation between geologists, civil engineers, mechanical engineers and electrical engineers can be termed as classic. Meanwhile additional professional fields of natural and technical sciences are present. A fruitful collaboration is only imaginable, if through mutual view into neighbouring disciplines returned understanding is attained. This is a significant reason for emphasizing a broad basic education. A second argument emerges from the fact, that geotechnicians use progressively more abstract models to the description of physical and technical processes. For example, in geotechnical testing, controlling and automation science plays an important role above all, which motivates their inclusion into the basic education program. However, we are aware of the fact, that geotechnicians should not be required to master any of this fields, but they ought to know available methods, which can finally turn out to be relevant. They should be able to formulate their problems in the language of other professionals and to take advantage of elaborated results.

3 SCHEME OF THE COURSE

Main topics of the course are

- professional training in geosciences, geology, geophysics, engineering geology. Soil mechanics and rock mechanics are also included. Latter subjects are not restricted to classical methods, but being extended by treatments based on continuum mechanics.

- mathematical and natural scientifical basic education, for example mathematics, informatics, physics, chemistry,
- technical basic topics,
- technical subjects of civil engineering or mining optionally choosen by the students,
- subjects from the series of studium generale.

The structure of the course corresponds to this requirements in the following quantitative relations:

– geosciences:	25,6 %
– mathematical and natural scientifical education:	24,6 %
– technical basic education:	17,4 %
– mining and civil engineering sciences:	27,2 %
– studium generale, law, etc.:	5,1 %

After an initial period of practical instruction in industry of about 2 months duration, the training of geotechnicians at the university consists of 9 terms regular study time with an overall volume of lectures of 2925 hours. In the last terms a degree dissertation must be completed. We emphasize practical activity during studies and require the students to complete a period of 6 months parallel practical instruction until the final exam.

After about 30 years of training we can consider the university course "geotechnics" to be a success. Even in economically difficult times, graduates of the specialization have almost been able to find a job in an employment corresponding to their training.

4 SUMMARY AND OUTLOOK

Adapted to changing economical and technical developments, a scheme of the university course "geotechnics" at the Freiberg University of Mining and Technology (TU Bergakademie Freiberg) has been created, which, in our opinion, in the elements of its structure corresponds to the demands on geotechnicians in adequate proportions. Characteristic to the curriculum of the course is its orientation to a broad education in basic subjects. University studies should only claim a certain limited amount of time. The art of the design of a curriculum for university training courses means always to find a best compromise. On the one hand, the further adjustment of the contents of individual subjects will be discussed in future, concerning the choice of the topics and the form of presentation related to applications. On the other hand, in technical, professionally orientated lessons the expansion of their scientifical basis is essential.