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The Geotechnical education in Bulgaria

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ABSTRACT: The processes of urbanization we observe and the growing of the big cities in the past years in Bulgaria, as well as the large infrastructural projects place the challenge of solving a number of complex geotechnical problems. This inevitably reflects over the education in the field of geotechnical engineering and the necessity of preparing qualified personnel. Greater is the wish among young people to study and practice engineering specialties, against the popular in the past years economic specialties. This and the admission of Bulgaria in the EU impose reconsideration and actualization of the approach and the educational system in order to put them at a competitive level.

1 INTRODUCTION

The territory of Bulgaria is characterized by compound soil conditions for construction. Except the present particular soils like loess, slime, bog, a number of regions are threatened by landslides. The seismic activity is also a problem. The construction in urban areas lays the application of constructive measures regarding the protection of the present infrastructure. Construction for preservation of the environment is built in the past years (dung-hills, depots for waste). These features impose a special preparation of the engineers in the field of geotechnical engineering.

The university admission for engineering education according to the Bulgarian law becomes legal after passing an examination in mathematics, taking into account the average high school grades. The students who passed the examination with the highest marks enter the university, considering the primary definite number of students. At the present moment each institution offering engineering education is called a university.

There are four universities in Bulgaria that are specialized in the field of the geotechnical design and construction and one university specialized in the field of the mining engineering and engineering geology. The oldest one is the University of Civil Engineering in Sofia, which was founded in 1942 and is recognized as the bearer of the traditions of the education in constructional engineering.

2 THE PRESENT SITUATION

The education in the Bulgarian universities is at three levels after graduating the bachelor's degree- the first one, is the master's degree- the second one and the third is the doctor's degree. The University of Civil Engineering consists of 2000 students in 6 specialties. The bachelor's degree continues 3 years. The master's degree continues 5 years and the last 10th term is supposed to be the time for the preparation and defense of a graduation work before a State Exam Commission. The positive decision of the Commission gives the right for the student to project buildings and constructional installations. In addition the Bulgarian chamber of the civil engineers legalizes that right through giving a license.

According to the university programs, the geotechnical education is organized at the third, fifth and sixth term of the education.

At the third term the geotechnical education starts with engineering geology, which includes lectures 45 hours and 30 hours practical work (ECTS 5, 0). Also during the summer there is a one week practice in the mountain.

The fifth term is devoted to the Soil mechanic which includes lectures 45 hours (ECTS 5, 0). The main issues are:

- Physical and mechanical characteristics of the soil- laboratory and field methods for determination;
- Stress and strains of the soil(including consolidation)

- Soil stability

At the same time it is provided a practical part for 15 hours a week. It consists of laboratory work and it corresponds to the geotechnical projecting- defining the characteristics of the soil - plasticity and consistence, strain and strength characteristics. We use contemporary methods of investigation, but not so contemporary installations and equipment. The students work in small groups - each of them does the experimental research and then by themselves they process the results and define the exact characteristics. Each step of the research is according to the Bulgarian standards. The term is finished through the defense of the graduation work.

The sixth term education continues with the support constructions and foundations. The lectures are 30 hours (ECTS 6, 0) for the term and the main are as follow:

- Support constructions: support walls; geotextile walls; Diaphragm and pile walls; classical and prestress anchors.
- Foundation: flat, strip and raft foundation; foundation under dynamic loads; pile foundation; foundation pit; foundation in special soils; foundation reconstruction.

The practical work in the sixth term requires the preparation of project- support constructions. It covers the following elements: flat and pilot fundaments and support and diaphragm walls.

The results of the project are shown in constructional designs and the level of development does not include the reinforcement of different constructions elements.

The geotechnical education finishes with an exam-recognized as a classical sketch with discussion. The last part is very important as the knowledge of the students is highly estimated.

One of the specialties (Road engineering) at the university introduces the Rock mechanic. It is studied in the sixth term and consists of 30 hours (ECTS 5, 0):

- Characteristics of rocks
- Rock slope stability. Hardening.
- Movement of rock blocks on slopes.
- Rock foundation

The practical work of that discipline includes 15 hours per term and prepares matters about the characteristics and the stability of the swaths.

Two new subjects in the field of geotechnical education were opened, which are studied as elective subjects in the ninth semester. Those two disciplines "Applied geomechanic" and "Geotechnical design" are elective for the students of all building specialties. "Applied geomechanic" consists of 30 hours lectures per term (ECTS 2,0) and "Geotechnical design according Euro code" consists of 30 hours lectures per term (ECTS 2,0).

The geotechnical education finally goes to its end with the student's practical work in summer when they are introduced to building sites.

We should not forget and consider the fact that a lecturer from the University of Civil Engineering in Sofia founded a scholarship at the name of the founder of the Department B.Balushev which is motivating for the best students. We should consider in a positive aspect the master's degree program in geotechnical engineering for civil engineers. It emerged just one year ago, so we shall not include in this report any results.

The University of Civil Engineering in Sofia offers a master's degree for 2 years now. This specialty is mainly connected with the problems of geotechnical engineering. The subjects which are studied in the one-year course of master's degree education are the following:

- Laboratory and field investigations of soil and rocks – 30 hours lectures and 30 hours practical work (ECTS 5, 0).
- Special foundation – 30 hours lectures and 30 hours practical work (ECTS 5, 0).
- Slope stability and retaining constructions – 30 hours lectures and 60 hours practical work (ECTS 6, 0).
- Environmental geotechnical problems – 30 hours lectures and 15 hours practical work (ECTS 4, 0).
- Geotechnical design in seismic regions – 30 hours lectures and 30 hours practical work (ECTS 5, 0).
- Numerical methods in geotechnical design – 30 hours lectures and 30 hours practical work (ECTS 5, 0).
- Rock mechanic – 30 hours lectures and 30 hours practical work (ECTS 5, 0).
- Embankment – 30 hours lectures and 30 hours practical work (ECTS 5, 0).
- Applied engineering geology – 30 hours lectures and 30 hours practical work (ECTS 5, 0).

The master's degree education ends with the preparation and defense of a graduation work. The latter consists of information and analysis from the practical work and scientific examples.

The third part of the education is the doctor's degree (PhD). According to Bulgarian law there are two forms of education- the regular one and a free one. The regular form of the doctor's degree is financed by a state scholarship and it is time-limited-up to 3 years. The free doctor's degree is time-unlimited, as it starts with a defense of a thesis before a specialized council and is appointed by a professor of studies. Each doctor's degree is defended in

public before a specialized scientific council consisting of 25 people.

3 INTERNATIONAL ACTIVITY

It is interesting to be mentioned the cooperation between the University of Civil Engineering in Sofia and the TU in Vienna about the elaboration of a cooperate education in the transport engineering and the hydro engineering, which is working successfully for 6 years now. The education system is at three levels as follows: bachelor's degree- 3 years, master's degree- 2 years and the doctor's degree- 3 years (for a doctor's degree in Bulgaria). The bachelor's degree education is performed in German language in Sofia, and the master's degree in TU Vienna.

In the past years great opportunities are opened up for students who want to study in different foreign universities in programs like: ERASMUS, Leonardo Da Vinci, Socrates, etc. Those programs grant scholarships for education within the framework of one or two semesters, as well as for the preparation of the graduation works.

Different organizations such as DAAD, OAD and others, offer the opportunity for post-graduate students and young scientists to specialize in plenty of universities in Germany and Austria.

The admission of Bulgaria to the EU gives the opportunity to the students and lecturers to participate in a number of the Community projects. The integration of working groups with international participation puts a larger point of view over the problems, such as the geotechnical engineering in particular, and more of the engineering specialties. These opportunities for exchange of experience and knowledge at the time of all the levels and degrees of education and practice are one of the leading trends, which should continue to develop in the education in Bulgaria.

4 ESTIMATION OF THE GEOTECHNIAL EDUCATION

The mentioned scheme of education showed vitality and reliability in the past years. There are about 35000 civil engineers in Bulgaria now who are capable of resolving most of the matters of the building and undoubtedly the most common of the geotechnical problems.

As a result of the economic and political changes, after the crises in the last 15 years, when a great part of the civil engineers were made to work in other fields of the economy, the number of the students wishing to study civil engineering has decreased about three times and more than one million young people (ambitious, decisive and progressive) has emigrated, now the situation is much better. Those re-

sulted in the general quality of the civil engineering education. The great opportunities of West Europe universities attract more and more young people to continue their education in the same prestigious universities. That increases the competition outside and decreases the competition inside the country. This will not lead to negative results in future as a great number of the students studying in Bulgaria will have to compete with those who are coming back to Bulgaria trying to find prestigious and prospective job. At the present market economy conditions partially some of the problems will go deeper to their natural solution.

We may conclude the main problems in the geotechnical education in Bulgaria-it includes the following matters:

- the fifth and sixth terms are a quite early level for a deep study of the geotechnical knowledge.
- the lack of access to contemporary geotechnical software.
- the necessity of adaptation of the Bulgarian education to the strengthening world trend for emphasizing on the independent work of the students related to the great and necessary services of the world net.
- here we should mention also the aging of the university lecturers which is in close connection with the lack of financial interest and motivation for development in the filed of the science among the notable young engineers.

5 PERSPECTIVES

The implementing of some reforms and the inevitable harmonizing of the education with the European directives would lead to an overcome of a great part of the latter problems. This includes an increase of the payment of the university lecturers which could lead to an attraction of young specialists. The transformation to paid education including possibilities for bank loans, scholarships from companies, state administration and foundations will also increase the responsibility of the students, the control level and the possibilities for later realization.

A high quality education in the field of geotechnical science is impossible without contemporary research equipment. The opening of masters programs in relation with prestigious European universities and the increase of the opportunities of students and lecturers exchange will increase the level of the education. The necessity of target financing, the application for a number of projects of the European Union and the cooperation in that aspect of the universities in general and especially those from South East Europe are the right way of the future development.

6 CONCLUSION

The extremely high level of science and the technique in particular, as well as the unprecedented accelerated rates of development impose a new point of view and approach in the educational system. The content of the educational material in a number of main engineering disciplines should be actualized continuously regarding the latest news and discoveries, in order to prepare not only able and aware, but rival young specialists. The processes of globalization, together with the opportunities for traveling and work at the European and why not at the world market impose the requirements to the level of preparation of the students on a completely different level.