

Education on Civil Engineering Branch of Study in Silesian University of Technology according to Polish Ministry of Science and Higher Education Requirements

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Abstract — *The faculty of Civil Engineering at University of Technology takes pride in many years of tradition of higher education and high position of the graduates entering the job market. It was made possible both due to the close cooperation with civil engineering industry and meeting their demand for employees as well as due to the adjustment of the teaching methods to the requirements of the superior body – the Ministry of Science and Higher Education. In order to meet the demand of the constantly changing present job market the curricula of studies have been prepared in such a way so that they give the possibility to study on European universities within the Erasmus program – international student exchange system. Enabling the students to study partially on the foreign universities significantly broadens their possibilities of entering the open European the job market.*

At present the Faculty offers the possibilities to study on 3 stages of studies (according to Bologna Declaration) both of full-time and part-time type. Additionally the Faculty offers studies conducted in English, which raises the prestige of the faculty and makes the mutual international exchange of students easier. The curricula of studies are adjusted to the standards prepared by the Ministry and the positive opinion of the State Accreditation Committee guarantees the high level of education for the future graduates.

Index Terms — *Higher education, Civil Engineering Branch, Bologna Process, Polish requirement.*

1. Short history of Civil Engineering Faculty creation

Faculty of Civil Engineering on Silesian University of Technology was created as a one of first four university faculties in 1945 (Faculty of Mechanical Engineering, Electrical Engineering, Metallurgy Engineering, Sanitary and Civil Engineering). The name of faculty was changed over the years and the previous name Faculty of Sanitary and Civil Engineering was used to 1955, next it was called Faculty of Civil Engineering for Industrial and Building Structure (1955-1969), Faculty of Civil Engineering and Architecture (1969-1977) up to the present name which has been used since 1977. The academic staff of faculty and new university was recruited from Lvov University of Technology (Politechnika Lwowska) which was moved from former eastern part of Poland to western part, to Krakow and Gliwice. It happened in the first years after World War II. First academic year was lectured by 198 academic workers (including 32 Professors) and 2750 students were educated. Present structure of university consists of 13 faculties with more than 30000 students.

The Faculty of Civil Engineering structure consists of eight departments and laboratory (up to May 1st, 2010). The structure of faculty and heads of units are presented below:

- Laboratory of Civil Engineering Faculty – A. Tyczewski, MSc. (Eng)
- Department of Building Structures – Prof. A. Zyburka, PhD, DSc (Eng)
- Department of Road and Bridges – K. Kłosek, PhD, DSc (Eng), Assoc. Prof.
- Department of Material Engineering and Building Processes – J. Gołaszewski, PhD, DSc (Eng), Assoc. Prof.
- Department of the Theory of Building Structures – Prof. A. Wawrzynek, PhD, DSc (Eng)
- Department of Structural Engineering – J. Kubica, PhD, DSc (Eng), Assoc. Prof.
- Department of Geotechnical Engineering – J. Sękowski, PhD, DSc (Eng), Assoc. Prof.
- Department of Theoretical Mechanics – J. Skrzypczyk, PhD, DSc (Eng), Assoc. Prof.
- Department of Building and Building Physics – Prof. J. Ślusarek, PhD, DSc (Eng).

The Faculty of Civil Engineering employs about 190 academic staff (including 9 professors) and presently teaches 2500 students.

2. Bologna Declaration - general assumptions

Rapid development of science, particularly information technologies, caused uneven scientific potential growth in various parts of the world. Europe was significantly left behind by scientific centres from the USA and Far East. Because of that fact Bologna Declaration [1] was created in 1999 and signed by Poland and other European countries. The basis of the declaration is the creation of a process towards harmonic higher education system in Europe, raising the prestige of European universities in comparison to the American universities, approving the comparable marking and academic titles system. The declaration assumes the introduction of higher education based on three cycles of education: minimum 3-year-long studies of first stage (with a diploma of an engineer or a bachelor), 2-year-long studies of second stage (which finish with an MA or MSc title) and 4-year-long studies of third stage, which finish with the PhD title [2]. According to the assumptions of the Bologna Process the unification of higher education systems is to occur due to the following reasons:

- introduction of credit points system ECTS;
- division to two stages of studies;
- monitoring of education quality (accreditation and certification systems etc.)
- promoting the mobility programs of students and lecturers;
- promoting the lifelong education.

Thanks to the adequately early introduction of changes in the educational process by the former board of the Faculty, the requirements of the Bologna Process are being realised in the present educational process. The changes in the methods of teaching started to be introduced in the year 2000 and due to that fact the transformation process was fluent.

3. Higher education on Civil Engineering Branch according to Polish requirements

In order to provide the unified educational level to students on Civil Engineering Faculty, the Ministry of Science and Higher Education introduced the so-called educational standards (the educational standards are created for all the faculties of studies, independently from the faculties). The standards define first and foremost the educational effects which should be reached on each level of education and the subjects together with the necessary number of hours required to achieve a certain goal. For the first stage of studies the Studies Plan should include at least 7 semesters of education with a number of minimum 2500 hours, including 315 hours of basis knowledge and 660 hours of faculty type knowledge [3]. Additionally, it is assumed that a student should be taught a foreign language, humanistic subjects, physical education and IT education. The remaining hours may then be used for education in the field of specialised training.

After graduation from studies of first stage a graduate should possess knowledge from the following areas:

- constructing objects connected with apartment construction, municipal type constructions, industrial estate type and transportation buildings;
- designing the basic objects and construction elements, technology and organisation of building procedures;
- managing a team and a construction company;
- manufacturing, choosing and applying of the construction materials and computer technologies and other modern technologies in engineering practice.

A graduate is also prepared for:

- management of construction process of all types of building objects;
- co-operation in designing of public buildings, industrial and transportation buildings;
- organisation of production of construction elements;
- supervision of construction process and continuing self-education and skill upgrading.

A graduate is prepared to work in:

- executive enterprises;
- building inspection;
- concrete and construction elements factories;
- building materials industry;
- public administration units and councils connected with constructing and architecture.

A graduate should have the knowledge of foreign language on B2 advancement level of the Common European Framework of Reference for Languages of Council of Europe and used the technical language within the faculty of studies. A graduate is prepared to start studies of the second stage. The list of basic education subjects and faculty education subjects for the studies of the first stage are presented in Table 1.

Second stage of studies should include Plan of Studies which consists of minimum 3 semesters of learning with 900 hours of education divided into 30 hours of basic education subjects and 150 hours of faculty education subjects. The number of subjects suggested by the Ministry of Science and Higher Education is much shorter in this case – see Table 2.

TABLE 1.
MINISTRY OF SCIENCE AND EDUCATION LIST OF REQUIRED SUBJECTS FOR THE FIRST STAGE OF STUDIES ON CIVIL
ENGINEERING BRANCH

No.	Basic education subjects	No.	Faculty education subjects
1.	Mathematics	1.	Drawing & geometry
2.	Applied physics	2.	Surveying
3.	Applied chemistry	3.	Buildings materials
4.	Engineering geology	4.	Mechanics of materials
5.	Mechanics	5.	Structural mechanics
6.	Computer science & com. methods	6.	Buildings
		7.	Soil mechanics
		8.	Foundation engineering
		9.	Structural concrete
		10.	Metal structures
		11.	Building installation (system)
		12.	Transportation infrastructure
		13.	Physics of buildings
		14.	Fluid Mechanics and Hydraulics
		15.	Organisation of building process
		16.	Technology of building process
		17.	Managing an investment process
		18.	Economics of building process

TABLE 2.
MINISTRY OF SCIENCE AND EDUCATION LIST OF REQUIRED SUBJECTS FOR THE SECOND STAGE OF STUDIES ON CIVIL
ENGINEERING BRANCH

No.	Basic education subjects	No.	Faculty education subjects
1.	Advanced aspects of Mathematics	1.	Elasticity and Plasticity Theory
		2.	Computer methods
		3.	Complex concrete constructions
		4.	Complex metal constructions
		5.	Management of construction undertaking

The number of required hours to teach the suggested subjects (both basic and faculty type) does not comprise the total number of teaching hours in this stage of studies, and therefore gives a possibility to each of the faculty to implement its own programme of specialised education. The completion of each semester should be based on the rules of ECTS points (European Credits Transfer System), whereas the level of education should be based on the appropriate procedures of supervision and verification. It is also recommended to co-operate with related units (faculties) in Europe in order to allow for unlimited student exchange.

4. Education system on Faculty of Civil Engineering of Silesian University of Technology

Faculty of Civil Engineering of Silesian University of Technology actively participates in the works towards defining the unified education system on the faculty of civil engineering all over Europe. A network of faculties within the EUCEET organisation (European Civil Engineering Education and Training) worked out the basis of the so-called root of subjects which should be taught on the faculties of civil engineering in European universities. Professor S. Majewski, the former Dean of this faculty was an active participant of this organisation and constructed new programmes of studies based on the stage system. First group of students who studied according to the new system started to study in academic year 1999/2000. The education of students on one-stage type studies finished in academic year 2004/2005. Currently the studies consist of three stages:

- stage I – lasts 8 semesters, 2880 hours of teaching (full-time studies) finished with an Final project – wining a BSc title (in Poland – Engineer title);
- stage II – lasts 3 semesters, 1080 hours of teaching fished with MSc thesis and wining an MSc title;
- stage III – lasts 8 semesters and is finished with a PhD thesis and a defence of doctoral thesis – winning a title of PhD in Science (PhD Engineer in Poland).

Besides the introduction of education in full-time system (free of charge) the offer of the studies on the Faculty includes also part-time studies. At present the part-time studies are conducted only in the extramural system. There are no studies of evening-classes type or external type. The part-time studies are conducted during 12 weekend meetings (from Friday to Sunday) in each semester. The number of didactic hours is limited to 60% in reference to full-time studies but

the curriculum of the subjects includes the same teaching materials. It was achieved by putting an emphasis on individual work of students outside classes and that is why the titles won on both types of studies of first and second stage have the same value after both full- and part-time studies. So far, there are no part-time studies of the third stage – PhD studies.

The faculty offers only one type of studies – Civil Engineering. Qualifications of scientific and didactic staff enable the conduction, in the main building in Gliwice, of three main specialisations on the first stage of studies:

- Structural Engineering;
- Building Processes Engineering;
- Transportation Building and Infrastructure.

Studies of stage II offer further directions within specialisations and students may choose more detailed profiles of diploma studies. Among such profiles a student finds:

- Structural Engineering (specialisation)
 - City and Industrial Structures;
 - Bridges;
 - Geotechnical and Underground Structures;
- Construction Processes Engineering (specialisation)
 - Ecological Buildings;
 - Building Technology and Management;
- Transportation Building and Infrastructure (specialisation)
 - Road Buildings

Studies on the third stage (PhD studies) do not divide into specialisations, but each of the students cooperates with a particular department of the faculty, which determines the field in which a given student specialises in order to reach the PhD title. The didactic classes include only the general subjects such as foreign language, advanced issues from material mechanics, doctoral seminars etc. The emphasis is put on the individual research and co-operation with the PhD thesis promoter. PhD students are not workers of the university, they are on a scholarship basis – they receive a scholarship in the form of money in the course of studies. It is not defined, however, if after those studies and after winning the title of the PhD in Science the graduates will have the possibility to be employed at the university or not.

The university has also a daughter faculty in Rybnik (called in Polish CKI) – it is a Centre for Teaching future Engineers (Bachelors in Science). Because of the fact that most lecturers are employed in the parent university in Gliwice the studies in CKI Rybnik are conducted only within one stage. The specialisations in Rybnik are different than those in Gliwice and include:

- Construction-architectural (only full-time studies);
- City Engineering (only part-time studies – weekend sessions).

Students from the Construction-architectural specialisation have the possibility to receive a “double diploma” due to the bilateral agreement with Vitus Bering Denmark University College in Horsens (Denmark). They have the possibility to attend half of the classes in Poland and half in Denmark and the course of such studies finishes with a BSc Final project written and defended in two languages – Polish and English.

With the introduction of a new system of studies a new type of practical classes, partially based on the British system, has been introduced. It involves the consolidation of the whole time intended for practical classes in one period of time. Due to such a solution a student receives 13 weeks, within which such student is required to find independently a company or enterprise connected with civil engineering and find employment there on the basis of labour contract or mandatory agreement or other type of employment agreement for this period of time. The students receive the period of time for practical classes in the seventh semester of studies. During the last two weeks of such semester (which lasts 15 weeks in total) the students make their presentations and the so-called “acceptance of the practical classes” which is a time for presentation of the projects, structures and processes they worked on during their employment period. The presentation of the practical classes is limited to presentation of a poster, a diary of practices and a short oral presentation explaining the course of such period. Presentations are presented to the workers of the faculty and the representatives of the companies which employed the students. It gives a huge range of possibilities to compare the conditions in which the students worked and creates a possibility of exchange of experience between the unit which educates the students and the industry which would employ the graduates in the future.

It should be pointed out that a system of studies with 90% of classes in English has been introduced – both on the first and second stage. Currently there is only one specialisation conducted in English – Structural Engineering. Due to their excellent knowledge of technical language the graduates are particularly well-prepared to enter both the national and foreign job market. Students of all the faculties and all types of studies have the possibility to take part in international exchange Socrates-Erasmus. The program includes one-semester-long visits and education periods to European universities on the similar faculties to the one the student studies. Because of classes conducted in English in the offer of our university we also enable the students from other European countries to study on our Faculty.

The Teaching Standards for the Faculty of Civil Engineering appeared later than the introduction of the new type of education on the whole university and that is why the process of evolution into full assimilation with the new Plan of Studies continues, so as to meet the requirements of the Standards. In order to achieve the required education results on the whole university and on each of the faculties, a System of Education Quality Assurance has been introduced and

according to it the methods used in the didactic process, the marks and the methods of control of the conducted classes have been unified. It was possible with the introduction of the proper instructions and operating procedures for particular cases.

The State Accreditation Committee is the statutory body which controls if the didactic process is conducted in the right way. The Faculty of Civil Engineering has received a positive opinion from the Committee in 2003. Another visit is expected this year and we are convinced that the positive opinion will be prolonged.

5. Summary

The faculty of Civil Engineering at University of Technology takes pride in many years of tradition of higher education and high position of the graduates entering the job market. It was made possible both due to the close cooperation with civil engineering industry and meeting their demand for employees as well as due to the adjustment of the teaching methods to the requirements of the superior body – the Ministry of Science and Higher Education. In order to meet the demand of the constantly changing present job market the curricula of studies have been prepared in such a way so that they give the possibility to study on European universities within the Erasmus program – international student exchange system. Enabling the students to study partially on the foreign universities significantly broadens their possibilities of entering the open European the job market.

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Thanks to the constant development of the staff of science experts and their devotion to the didactic process the education should remain on a high level. Close connections with the industry enable to create such plans of studies, so that the knowledge and the abilities of the graduates met the needs of the industry of today.

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