

## **XII. MEZINÁRODNÍ VĚDECKÁ KONFERENCE XII<sup>th</sup> INTERNATIONAL SCIENTIFIC CONFERENCE**

u příležitosti

**110. výročí založení FAST VUT v Brně**

a

**XIV. výročí založení Stavebních veletrhů Brno**

on the Occasion of the

**110<sup>th</sup> Anniversary of the Founding of the Faculty of Civil Engineering  
of Brno University of Technology**

and the

**XIV<sup>th</sup> Anniversary of Building Fairs Brno**

sekce 11 / section 11

## **GEODÉZIE A KARTOGRAFIE GEODESY AND CARTOGRAPHY**

### **SBORNÍK PŘÍSPĚVKŮ PROCEEDINGS**

**20. – 22. duben 2009**

**April 20 - 22, 2009**

**Brno, Czech Republic**

# MODEL OF UNIVERSITY EDUCATION OF CADRES FOR GEODESY, SURVEING AND CARTOGRAPHY IN POLAND

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*Abstract: Main principles of model of education of engineers geodesists and cartographers on university level in Poland were presented in the paper. Present demand for engineers as well as economic conditioning of Polish system of higher education were described generally first of all. New standards of geodesy and cartography education on the engineering level, introduced by decree of Ministry of Sciences and Higher Educations in 2007 year, were presented then. Standards of education contain general requirements, qualifications of graduates, frame contents of educations, practices and different requirements and recommendations for both levels of studies. Qualifications and professional authorizations of graduates were described at the end.*

## Introduction

Polish firms and offices of public administration already at the present moment have problem with finding of suitable engineers - experts, in this of geodesists and surveyors. In the future deficit of engineering personnel will be growing up. It turns out, that foreign migrations as well as diminishing number of people interested in technical studies generate deficit, which effects will be more and more perceptible by employers [2]. Among the causes of shortage of engineers it were been possible to list the changes in education system in last years, particularly liquidation technical secondary and high schools and removal of mathematics from list of secondary-school final exams. Last years strengthens portrait of engineer studies as difficult and not interesting, and profession of engineer as non-attractive and out of prestige. Education of engineer costs considerably more then marketing or management expert. Only expensive in maintenance laboratory base guarantees suitable quality of didactic process. Private universities do not get involved into education of engineers (maybe with except of computer science).

In Poland we forget, that modern society in more and more larger degree is dependent on technological infrastructure. Its development and survival it demands highest qualities of engineering staff, not only programmers, but also engineers of different specialties. Unfortunately, onto 1000 occupants we have only 11,1 of graduates of natural and technical directions, in comparison to 12,9 on average in European Union, which and so it complains, onto lack of engineers. Worse what, experts observed fall of interest of technical studies - only in 2007 year answered on about 6 percent candidates less. Onto results no one should to wait, employers align into queue for engineers - in last year it lacked over 30 thousand of experts in field of technique [1]. Ministry of Sciences and Higher Educations ordered in OBOP (Centre of Investigation of Public Opinion) researches disclosing great lack of workers of following technical specialty (table 1).

In the face of constantly still large interest of studying on direction of geodesy and cartography (number of candidates onto first year of studies on public universities in 2008 year carried out ca 5 persons on one place as average in country) as well as strengthens in medias of conviction about easiness's of finding of employment through school-leaving pupils number of universities opening study in this direction grows as mushrooms after the rain. Especially private universities, treating education often only in business categories.

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Tab. 1 Prognosed lack of engineers of different specialty in closest years (source: Polityka, 29 August 2008)			
specialisation	for 1 year	for 2 years	for 5 years
1. Mechanics	11.760	16.440	18.520
2. Civil and environmental engineers	7.780	8.850	9.630
3. Electricians	4.760	5.440	5.770
...	...	...	...
11. Geodesists and cartographers	730	980	1.220
...	...	...	...
Other engineers	17.220	18.230	22.680
Total:	55.290	67.210	76.170

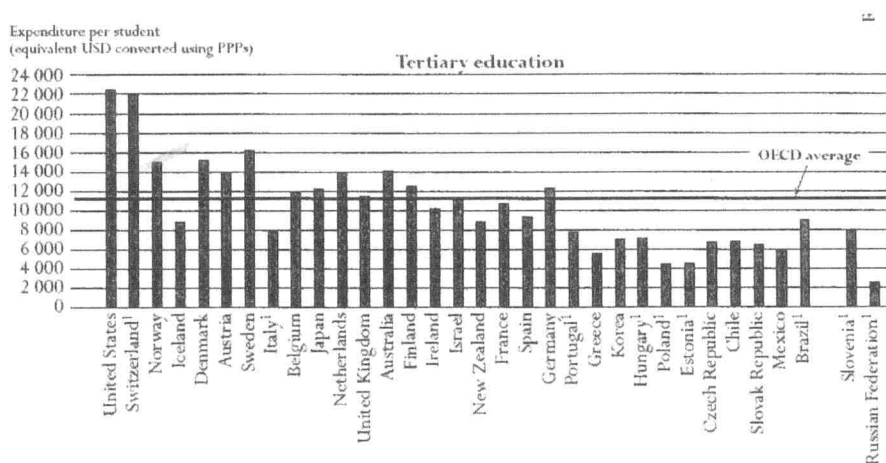
From here apart from six public universities, where teaching of geodesy has already at least of several tenths years of tradition (Warsaw University of Technology, University of Mining and Metallurgy in Cracow, Warmian and Mazurian University in Olsztyn, Wrocław University of Environmental and Life Sciences, Agricultural University in Cracow, Military Technical University in Warsaw) education on direction of geodesy and cartography had begun on 10 additional universities (in this two public and eight unpublic). As much as five from them came into being in last two years. Assurance of suitable quality of education stands up a problem not only for universities themselves, which have to pass procedure of accreditation, but also for whole professional environment.

### Economic conditions of Polish system of higher education

In Poland already from ten years successively grows number of students, what is visible in values of schooling coefficient [5]. Still in academic year 1990/1991 this coefficient carried out 13,1%, and already in academic year 2003/2004 it carried out 46,4% and it keeps to on approximate level today. It is passed height triple. Development of higher education became called out vigorously, at minimum contribution of the state. This is visible particularly in size of expenditures on higher education, which kept always below 1% PKB (national gross product) despite so considerable height of number of students. Demand onto studies became caused by escape from unemployment and hopes onto best work after finishing of university. Demand onto diplomas they answered private and national organizers of paid higher studies, and students covered costs themselves.

Ministry of Sciences and Higher Educations announces, that relative height of public outgoings onto higher education in Poland achieves approximate scale to many countries - members of European Union. In light of data based on source "Education at a Glance of OECD Indicators 2006", outgoings onto education in selected European countries, as percentage PKB, according to sources of origin of funds, in 2003 be valued in the range of public outgoings (together with public subsidiaries for private schools) on level: France - 1,1; Germany - 1,0; Spain - 0,9; Great Britain - 0,8; Italy - 0,7. In Poland part of public outgoings in PKB in 2003 carried out 0,84, but in next years he grew up significantly to level: in 2004 - 0,96 and in 2005 - 0,99, then gradually decreased to level of 0,88, in 2008. Sum coefficient of expenditures looks completely differently onto formation of one student (Fig. 1). It results from him that Poland and Estonia possesses lowest value of this coefficient among countries of OECD (beyond Russian Federation). Considerably higher isolated expenditures onto higher education intend Czech Republic, Hungary or Slovakia.

Taking under consideration proportional coefficient of national income intended onto 1 million students, this from year 1995 systematically he diminishes, from value 0,95 (1995) to 0,47 (2007). Therefore increase of national income caused by economic development in last years does not translate itself onto enlargement of outgoings onto higher education.



1. Public institutions only.

Countries are ranked in descending order of expenditure per student in primary education.

Source: OECD, Table B1.1a, See Annex 3 for notes ([www.oecd.org/edu/eag2007](http://www.oecd.org/edu/eag2007)).

StatLink <http://dx.doi.org/10.1787/068176572003>

Fig. 1. Expenditures of state onto education of one student in chosen countries of OECD (source: Report OECD: EDUCATIONS AT A GLANCE 2007)

Situation of funding of science looks still bad and yet development of science into direct way influence onto level of higher education. In year 1990 outgoings of budget of state onto science carried out ca 1,2% PKB. They diminished in turn to 0,74% in 1991, 0,64% in 1992, 0,57% in 1993, 0,55% in 1994. Unfortunately, trend this he stayed and he deepened, outgoings of budget onto science in Poland in 2007 carried out ca 0,33% PKB (given from www service of Ministry of Science and Higher Education), that is similar to average African countries, and repeatedly lower from average European countries. This situation has row of results; most obvious are emigration of Polish scholars as well as decrease of level of Polish research projects. Different, less perceived result is pathology of relation: science - higher education, about many aspects and symptoms. Because pays in education are low, most of lecturers of every rungs works on some vacancies, in national universities and private ones and practically does not have time onto leadership of research activity. Phenomenon of negative selection of young workers of science follows outright: bests of they go to private firms, and if they want to deal with science, then emigrate [4]. Geodesy and cartography, as all technical disciplines, it is this problem touched particularly.

## Standards of education

Realization in Polish higher education so-called "Bologna Process" forced changes of way of organization of course of studies as well as changes of standards of education. This found his reflection in law "Law about higher education" from 27th of July 2005, which introduced new conceptions and solutions in range of higher education. They are this of notion such as: public universities and unpublic, studies I (engineer), II (master) and III (doctor) degree, stationary studies and non-stationary, interdirectional, interfaculty, interuniversity studies, macro-direction of studies, rules of accreditation of direction of studies, standards of educations, payment for studies etc. One from legal records is introduction by Minister of Science and Higher Education, on the way of decree, the standards of education for individual directions and levels of studies [3].

Decree in matter of standards of education contains row of general settlements, related to plans and programs of studies on everybody directions. They are settlements, among others, related to : assurance of quality of education (internal system of assurance of quality), minimum number of hours of occupations on stationary and non-stationary studies, range of realized education content on stationary and non-stationary studies, plan of studies and programs of teaching (among others



choice of content of education in dimension no smaller than 30 % of hours of occupations), number of semesters as well as numbers of points ECTS (European Credit Transfer System), numbers of hours of occupations of realized without of direct participation of university teachers (no more than 10 %), part of technical objects in plan of engineering studies (no less than 50 % of general number of hours of occupations), part of auditorium practices, laboratories', project and field practices, (at least 50 % of occupations), rules of realization of practices, occupations of physical education, acquaintances of foreign language, occupations of informative technology.

Standards of education for every direction and level of studies contain general requirements, qualifications of school-leaving pupil, frame contents of educations, practices, different requirements as well as recommendations. Range of content hugged by standard hugs 885 hours of occupations and 86 points ECTS on required minimum, total number of 2500 hours as well as 210 points ECTS for first level education, what state ca 35% of range of hours and ca 40% of range of points. But basic and direction objects do not exhaust requirements of standards of education. Standards oblige still to introduction to programs of studies: foreign language, physical educations, informative technology, objects of law, economy and humanistic contents, content in the field of safety and hygiene of work. So it gives together minimum of 1170 hours, what state about half (47%) general, minimum number of hours of studies of first degree. Remaining part of plan of study university can shape in own range, assuring to part of practices and field occupations has to be not smaller than 50% and part of content chosen by students themselves has to be not lower than 30% of hours of required standard.

## Summary

The main aim of studies on direction of geodesy and cartography is preparation of graduates to independent activity in geodesy of cartography field as well as to creative and scientific work. In process of education one turns attention onto attitude school-leaving pupil, skill of communication with environment, making of opinions and taking of decision. Achieved in time of studies of first degree formation state basis to passing oneself about professional authorizations in everybody ranges (after performance of suitable practice).

From attention on economic conditions of whole sector of higher education as well as constantly reduced number of hours of occupations in new standards of education preparation of graduates, in many incidents, can not fulfill requirements of present market of work. After undertaking of work graduates demand still purchase of knowledge and practical skills, which universities are not assured in state. However universal formation in range of basic contents and most important directions' contents, as well as bases of general formation permit them to assimilate themselves of lacking skill in comparatively short time. Meaningful example of this is fact of employing of many graduates of direction geodesy and cartography onto positions of engineers in foreign firms.

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