

The comparative analysis of master’s degree curriculums in the major of “Electronics and nanoelectronics” in TPU (Russia) and “Solid state systems” in Czech Technical University (Prague)

For the first time two-level Bachelor-Master system appeared in European universities in the XII–XIII centuries. At that time universities were connected with craft guilds. Faculty professors, who acquired a right to teach the students from the guild, were called Masters. Actually this degree was the professional certificate. A bachelor’s degree was an intermediate stage for the earning of a master’s degree and was conferred on the candidates, who studied the three-year and four-year course of education, which was called trivium (grammar, rhetoric, logic), and passed exams. In the second part of XII century a university in the Bologna (Italy) for the first time conferred a doctor’s civil law degree. Later the doctor’s degree began to be conferred in medicine, theology and philosophy in other European universities. Firstly master’s and doctor’s degrees were equal but with the course of time the term Doctor began to be used for the higher degree. Nowadays in Anglo-Saxon and some other countries either bachelor’s, or master’s, or doctor’s degrees are spread. The bachelor’s degree is the first academic degree and it is conferred after four years of education in the USA and after three or four years depending on the university in Great Britain (usually after four years in Scotland). The master’s degree requires one or two additional years of education in a university and the doctor’s degree, which is usually the degree of Doctor of Philosophy (PhD), requires the longer education and the research work¹.

Nowadays many Russian universities also participate in the Bologna process. National Research Tomsk Polytechnic University is among these universities. By now tremendous work on curriculum of two-level education system development has been done. In this article curriculums by similar directions of education in Russian and foreign universities are compared.

A master’s degree programs 11.04.04 (210100) “Electronics and nanoelectronics” of National Research Tomsk Polytechnic University and “Solid state systems” of Czech Technical University in Prague are used as an example. Table 1 shows all subjects of master’s degree programs, offered by current universities.

Table 1
Subjects of master’s degree programs the major of “Electronics and nanoelectronics” in TPU and “Solid state systems” in Czech Technical University

Subjects	Tomsk Polytechnic University	Czech Technical University in Prague
Diploma project	+	+
Research project	+	+
Compulsory subjects		
Advanced Analog Systems		+
Advanced Computer Architectures		+
Analog.Sig.Proc.&Digitalization		+
IC Design		+
IC Structures		+
Microsystems		+
Modern Sensors		+

¹ Chubik, P.S. The transition of Tomsk Polytechnic University to the multi-level system of higher education: practices, problems, prospects / Chuchalin A.I. // Tomsk Polytechnic. – 2010. – № 16: Levels training. – C. 8–15.

Subjects	Tomsk Polytechnic University	Czech Technical University in Prague
Nanoelectronics and Nanotechnology		+
Optoelectronics and Photonics		+
General scientific subjects		
Philosophical and methodological problems of science and technology	+	
Methods of mathematical modeling	+	
Actual problems of modern electronics and nanoelectronics	+	
Computer technologies in research	+	
Design and technology of electronic components	+	
Elective course		
Electronic industrial devices	+	
Interfaces of microprocessor systems	+	
Processing systems and display	+	
Microprocessor control and monitoring systems	+	
Electronic devices and equipment	+	
Hardware and software for processing analog signals	+	
Programmable logic integrated circuits	+	
Automation equipment and control techniques	+	
Humanities subjects		
History of science and technology 2		+
Managerial sociology		+
Philosophy II		+
Psychology		+
Physical Education		+
Theology		+
Language courses		
English	+ Technical English Course	+ Technical English Course Technical English for Pre-Intermediate Certificate of Advanced English CAE 1÷3 English Conversation English Grammar
French language	-	+ French language 0÷2 Multimedia French
German language	-	+ German language 0÷2 German Conversation German Grammar Preparation for zertifikat Deutsch Technical German Course
Rhetoric	-	+
Russian language	-	+ Russian language 0÷2 Russian conversation
Spanish language	-	+DELE Spanish language 0÷2
Professional Presentation		+
Physical Education	-	+ Physical Education 0÷2
student teaching	+	

As it is clear from the table, these two programs have many common things. A result of two-year education is the research scientific work and the master's on it. It is necessary to know professional English to write the master's thesis, because some parts of it must be translated into English, so both universities offer respective disciplines. Humanities are an important part too. TPU provides the huge option in this direction. In Czech university you can choose humanitarian subjects too, but their range is narrower.

Although curriculums have many common things, there is one important difference in Russian program. It is the teaching practice. Students have to teach simultaneously with the study and scientific effort. The other problem is a narrow option of technical subjects. The foreign curriculum includes a broad list of technical subjects. One more difference is that Russian students study not the nanoelectronics and concomitant subjects, but “philosophical and methodological” problem without delving into the problem heart. The Master superficially studies all branches without learning fundamentals. Such education doesn't provide a base for the further development of a student in the scientific field.

In Czech university electronics and nanoelectronics are divided into few branches and every scientific group is engaged into one branch of electronics. Actually the course “Solid state systems” is the part of a large program “Nanoelectronics”. But even such course has a large base and a variable part. Also there is physical education in a Czech university master's degree and there isn't in TPU. Much attention is paid to the learning of languages (there is a choice of three languages and the variation of the course difficulty).

Summarizing aforesaid, we can say that the education on this curriculum is organized better in Czech Technical University in Prague (it should be mentioned that we didn't pay attention to such aspects as the financial side and the receipt of visas). Also it is too early to say about the end of the Bologna process because many other reforms must be done. Innovations may affect different sides of education, for example, broadening of the curriculum (now there is opposite tendency) and probably the education into the narrower directions. There is one more important thing. It is the teaching practice. It provokes a question: “What can the person, who has recently superficially studied the subject, can teach the students? And does he need it in his future life?” It is necessary to study the chosen subject for many years and to know all novelties to teach the technical disciplines. Postgraduate course fits better for it. When people enter postgraduate course, they are going to pursue science and they get enough knowledge and the experience of performance to hand down information to junior students.

References

1. Chubik P.S. The transition of Tomsk Polytechnic University to the multi-level system of higher education: practices, problems, prospects / Chuchalin A.I. // Tomsk Polytechnic. – 2010. – № 16: Levels training. – C. 8–15.

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