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SATISFACTION OF QUALIFICATION REQUIREMENTS OF EMPLOYERS APPLIED TO SOFTWARE ENGINEERS IN THE PROCESS OF TRAINING AT HIGHER EDUCATIONAL INSTITUTIONS

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In the article, based on the analysis of the problems of the professional training of software engineers in higher educational institutions, was shown that the contents of the curricula for the training of software engineers in basic IT specialties in higher education institutions generally meet the requirements to them at the labor market.

It is stated that at the present time there are certain changes in the job market not only in the increasing demand for IT professionals but also in the requirements settled for future specialists. To scientists' opinion, at present there is a gap between the level of expectation of employers and the level of education of graduates of IT-specialties of universities. Due to the extremely fast pace of IT development, already at the end of the studies, students' knowledge may become obsolete. We are talking about a complex of competencies offered by university during training of specialist for their relevance and competitiveness at the labor market.

At the same time, the practical training of students does not fully correspond to the current state of information technology. Therefore, it is necessary to ensure the updating of the contents of the academic disciplines with the aim of providing quality training of specialists.

Keywords: *higher professional education; software engineer; manufacturing practice; practical training; competencies, training disciplines, market requirements for engineers-programmers.*

Introduction. One of indicators of professional training effectiveness of the future software engineers at the higher educational institutions is their demand and competitiveness at the labor market. We can tell about the qualitative training of specialists in case if the available complex of competencies possessed by the graduates of higher educational institutions meets the requirements of employers. Such accordance can be achieved under the condition when the content of curricula, the structure of educational process and the methods of practical skills formation are built considering the current status of the informatics development and the features of information technology area.

As a subject of market relations any higher educational institution, with the aim of maintenance of their competitiveness at the market of educational services, is interested in making its educational programs appropriate for the requirements of the labor market and its graduates to master enough the proper program. Thus, the research of the target labor market and the requirements of employers to the professional training of future software engineers is, to our opinion, an important task, which needs the detailed study.

The analysis of the research and publications in the investigated area.

The actual problems of professional training of software engineers at higher educational institutions were researched by P. Dening, D. Knut, M. Kolyada, T. Morozova, N. Negraponte, Y. Nikolskuy, F. Novikov, V. Osadchyj, V. Pavlov, S. Papper, V. Perekatov, V. Pasichnyk, S. Rusakov, M. Sidorov, Z. Seidametova, I. Semakin, S. Semerikov, V. Sukhomlin, A. Terekhov, S. Sharov, Y. Shcherbyna and other scietists. The requirements of the employers to software engineers

are researched by O. Kucheruk, N. Misichenko, O. Naumuk, O. Rusanova, I. Shpolyanska, D. Schedrolosiev and others.

The formulation of the aims of this article (setting the task). To analyze the requirements settled to the software engineers, which function at the modern labor market, and to determine the level of accordance of the content of curricula of specialists' training in the information technologies at the higher educational institutions to these requirements.

The main part. The higher educational institutions make the training of the future software engineers according to the curricula and educational characteristics. The qualification requirements to the specialists are formed by the customers of their training – employers, namely the enterprises in the information technology industry. Nowadays the thesis about the disparity between the level of specialists' training and the requirements to them is heard more often. It is necessary to determine the level of this disparity for overcoming of the problem. The qualification requirements to software engineers and their realization in the content of curricula of training according to the main IT-specialties ought to be analyzed.

As noted by Rusanova O. I., nowadays at the market of vacancies the certain changes are notified not only in the growth of demand in specialists in the IT field, but also in the requirements, which are settled to the future specialists [4, 224]. Shpolyanska I. Y. and Misichenko N. Y. suppose that the employers' requirements to the level of IT-professionals will grow all the time, that is connected first of all to the rapid implementation of information technologies in business, finances, production and in other spheres of activity. Also, the amount of knowledge, which IT-professionals should acquire, to stay highly sought at the labor market, will be increasing constantly. To the scientists' opinion, the rupture between the employers' level of expectations and the level of education of the graduates of IT-specialties at the higher educational institutions is noted nowadays. Due to the extreme fast tempo of IT development the knowledge of the students can become too obsolete before the moment of their graduation [5, C. 333]. In the result of the conducted research of the modern Russian employers' requirements to IT-specialists based on the results of the application analysis of the employment agencies through the internet Shpolyanska I. Y. and Misichenko N. Y. defined the significant list of the requirements to every application for a specialist according to the subject of his activity. Among them the special place is determined for the knowledge of the certain methodologies, principles and standards: the object-oriented programming and design, the methodology of the ERP-systems implementation, the principles of IT management (ITIL, Cobit, ISO 9000, ISO 20000), the principles of formation of CRM-systems, the standards of design of IC (IDEF, UML), the principles of development of the object-oriented and web-oriented additions. More diversified requirements are settled by the employers to the mastering of the programmatic facilities technologies development (*DBMS* SQL Server, DBMS Oracle, AJAX, .NET, Visual Studio, DirectX/OpenGL, ASP, Active Directory, SQL Developer , Smarty) and the web applications (HTML, DHTML, CSS JavaScript, VBScript, XML), the programming languages (SQL, MySQL, VB, VBA, C#, C++, Java, Pascal, Perl, PHP, SAP, 1C, J2EE, ABAP), the professional software, (OS - Linux, MS Windows NT/2000/XP, Unix; OPP - MS Office); the design and modeling tools IC – BPWIN, ERWIN, Oracle Designer, MS Visio, RUP, Rational Rose, ARIS; the test programs of software - Bug Tracking, ClearQuest, Rational Robot, Silk Performer; the systems of control for software versions – CVS, Subversion, VSS, Bug-tracking systems; servers – Apache, IIS).

Held by Schedrolosiev D. E. in 2011, the analysis of the requirements of the modern employer and the system of grades for IT-companies represents the components of the professional competence (experience (knowledge, skills, abilities), qualities, orientation, reflection) in the structure of an engineer-programmer personality, necessary on various stages of the professional growth (probationer, beginner, developer, leading developer, manager/ leader of the team, customer service specialist, architect, analyst, project manager) [6]. Among the competences distinguished by Schedrolosiev D. E. as important for the employers, the special role occupy such as: the knowledge and experience of work in the certain technology of programming, the skill to apply and combine the well-known programming techniques and the typical algorithms, the ability to see the project

wholly; the knowledge of the quality standards of the documentation accompaniment; the ability to define the architecture of a program; the skill of formalization, the knowledge of system analysis, the skill to form the demands and evaluate the possibilities; persistence, attentiveness, initiatives, responsibility; the capacity for the new information search; the ability to work in a team; critical and operative thinking; high efficiency and diligence in work; the orientation for further professional development; the capacity for analysis, synthesis, comparison, assessment, evaluation of information; the ability to analyze own errors; adequate self-esteem and others.

Naumuk O.V. analyzed the requirements for the post of an engineer-programmer at the commercial structures of Ukraine (firms, companies, trading branches and others) which are located on the vacancies' site (0564.ua/job, rabota.ua, work.ua, trud.gov.ua; hh.ua), and defined such responsibilities as: the installation, configuration and administration of the mail, proxy server and web server; the database administration; the control of the rules violation of local area networks usage and taking measures for problems elimination; the implementation of the antivirus protection of the local network and server; the ability to program the network equipment (routers, modems, gateways); the knowledge of the principles of TCP / IP operation and the administration of IP networks; the knowledge of HTML, XML, XSLT, XHTML, WebServices, CSS, * nix systems; the mastering of the client-server technologies, etc. [2, p. 355].

To Kucheruk, O.Y.'s opinion, nowadays the IT-market in Ukraine defines such requirements to engineer-programmers: to know how to clearly set tasks and find non-standard solutions; to know how to solve problems of design, selection and transformation of algorithms and mathematical models, in order to effectively implement a software product; to know how to use the modern information technology and the computer technology for the construction and maintenance of information computerized systems in various fields of science and the national economy; to know how to build and use the models for the description and forecasting of various phenomena, to make their qualitative and quantitative analysis; to know how to organize and conduct the research; to have a high level of logical thinking, the ability to abstract and the understanding of the interconnections between elements, flexibility and criticism of thinking, the analytical abilities; to be ready for constant updating of knowledge, continuous self-education and self-improvement [1].

Further on we will illustrate how the above-mentioned requirements are realized during the training of engineer-programmers at high educations institutions in different specialties.

The specialty "Computing engineering" covers wide fields of informatics and electrical engineering in the academic sphere. In the Curriculum Guidelines for Undergraduate Degree Programs in Computer Engineering (Computer Engineering 2004.) [7] it is defined as a subject, which studies the technologies of design, construction, implementation and maintenance of software and hardware components of modern computing systems and computer equipment. Computing engineering is traditionally considered as the unity of informatics and electrical engineering. The students study the design of digital hardware systems, including communicational systems, as well as computers and the equipment containing computers. They study the methods of the software development, which has direct connection to digital equipment, as well as the issues of usage of digital devices by users and their building in other equipment (for example, mobile phones, digital audio players, digital video, recording equipment, time systems, X-ray machines, etc.) This specialty has the technical orientation, in particular, let's pay attention to greater extend to hardware support more than software.

"Information systems" as the knowledge field makes the significant contribution if a few spheres, containing business and government. Information systems are complicated systems, which demand technical and organizational experience for their design, development and management. They influence not only the operations but also strategies of the commercial and governmental organizations. Association for Computing Machinery (ACM) defines the specialists of informational technologies as those who realize the integration of solutions in informational technologies sphere and business processes for satisfaction of informational business demands and various enterprises [12].

"Informational technologies" (IT) in the widest sense cover all aspects of computer technologies. IT, as an academic subject, deals with issues connected with users' protection and satisfaction of their needs in organizational and social context with the help of choice, creation, usage, integration and administration of computing technologies. IT programs are oriented on giving to IT-graduates the knowledge and skills so that they could get relevant posts of specialists in IT field after finishing of their studies and grow to management positions or make researches during the postgraduate studies. In particular, during five years after the graduation the student should know how to: explain and apply appropriate IT and use appropriate methodologies for assistance for people or organizations in achievement of set goals and tasks; act as a protector of a user; manage the informational resources of individual or organization; predict changeable direction of IT and evaluate possible usefulness of new technologies for individuals or organizations; understand and in some cases to be able to make his own contribution in the scientific, mathematic and theoretical bases, of which IT are built; live and work in cooperation with other members of the society [10, C. 9-10].

Let's stop in detail on the specialty of "Informatics" and "Software Engineering" as those which are more corresponding to the profession of a programmer as a software developer of different purpose.

"Informatics" is based on the range of subjects. University training of informatic requires from the students the usage of competences from many various fields. All students, who study informatics, need to learn how to combine the theory and practice, understand the importance of generalization and abstractions and also value good engineering solutions [3, C. 190]. The set of knowledge in informatics consists of 14 spheres, namely: Discrete structures (DS), Programming Fundamentals (PF), Algorithms and theory of complexity (AL), Computer architecture and organization (AR), Operating systems (OS), Distributed computing (NC), Programming languages (PL), Human-computer interaction (HC), Graphics and visualization (GV), Intelligent systems (IS), Information management (IM), Social and professional programming issues (SP), Software engineering (SE), Computing methods (CN). It is carefully written about each of them in the Recommendations of the programmatic engineering and informatics training at universities [3]. Also in this document, the general and professional characteristics of graduates of Faculties of Informatics are mentioned.

The first ones include such qualities:

1. The systemic view on the discipline. The aims of the studies, connected with the specific knowledge modules, have the tendency to focus on the separate conceptions and themes, what can lead consequently to the fragmentary mastering of the discipline. Those, who study need to develop in themselves high-level understanding of the systems in general. This perception should overcome the details of separate realizations of various components and give the general understanding of computer system structure and the processes of their design and analysis.

The understanding of the connection of the theory and practice. The fundamental aspect of informatics – is the balance between theory and practice, their tight connection between each other. The graduates should understand clearly not only the theoretical part of the material, but the influence of the theory on the practice.

2. The steady mastering of the main methods of informatics. In the course of the studies the students run into many general methods, such as abstraction, recursion and evolutional changes. The graduates should realize the width of usage of those methods in the field of informatics and not let their usage the related only to that material within the framework of which they were presented.

3. The experience of participation in a big project. For that graduating students were able to use correctly the received knowledge, they necessarily must participate at least in one real project. Such kind of experience teaches students to use their skills in practice and makes the students integrate the material, learnt at different courses.

4. The capacity is for adaptation. One of the main characteristics of the informatics during all its relatively short history is the very fast tempo of changes. Thus the graduates have to master the

profound, fundamental knowledge which helps them to form new necessary skills as the area evolves.

During studying of informatics, the students should develop the wide range of professional qualities, in particular: cognitive qualities, which are related to the specific for informatics kinds of intellectual activity; the practical knowledge connected to the informatics; additional qualities maybe developed in the context of the informatics but have the general character and are used also in other contexts.

To the cognitive skills, which are connected to the informatics are included such as:

1. The knowledge and understanding. The demonstration of knowledge and understanding of the main factors, conceptions, principles and theories, connected to the informatics.
2. The design. The usage of received skills in design and planning of the informative systems with the demonstration of a capacity to choose the correct comprising decisions.
3. The demands. The detection and analysis of the criteria and requirements, which are settled to the definite tasks, planning strategies and their solutions.
4. The critical estimation and testing. The analysis of extend to which the specific information system meets the criteria, defined for its usage and the future development.
5. The methods and means. The usage of the appropriate theoretical knowledge, practical skills and instruments for the planning, realization and evaluation of the computer systems.
6. The professional responsibility. The observance of the professional, social and ethic norms, what is related to the field of computer technologies.

The practical skills, connected to the informatics related to the specification, planning and realization of the computer systems; the assessment of systems and their qualitative characteristics, possible compromising ways of solution of a particular task; applying the principles of effective information management to various types of information, including text, graphical, video and audio; applying human-computer interaction principles for the evaluation and creation of the wide range of products, including the users' interfaces, the web pages and multimedia systems; the definition of risks and related to the safety issues aspects of the operation of computer equipment in the given context; the effective use of the adequate tools in the development and software documentation, with an emphasis on the full understanding of the process of solving practical tasks with the help of a computer; the efficient exploitation of computer equipment and software.

Besides, the future graduate of specialty "Informatics" should have additional qualities: the capability to speak publicly in front of different audiences with lectures / reports about the technical problems and the ways of their solution; the ability to work efficiently in the industrial environment; the ability to quantitatively thinking (understanding and explanation of quantitative characteristics of the issue); the ability to manage own studies, development and time; the organizational qualities; the wish to be always aware of the current state of affairs in the discipline, to continue his/her professional development.

The most modern document, regulating the creation of curricula for software engineering, is the recommendations for the development of curricula of training of Bachelors and Associates in software engineering, worked out by the international organizations Association for Computing Machinery (ACM) and IEEE Computer Society (IEEE CS) in frames of Computing Curricula 2014 [11], in which the structure and content of knowledge amount is defined, the core of basic knowledge is distinguished. The recommendations are the logical continuation and adaptation of the already existing recommendations of 2004 and 2009 and serve as the base of educational standards for training specialists in software engineering in countries around the world.

The developers of the document ground their choice of the structure and content of the curriculum on the fact that software engineering has undergone some evolution and fundamental changes since the beginning of its existence. The authors underline that the specialists' training in software engineering should embrace computer science, engineering, mathematics and statistics, psychology and social sciences, management, and include professional practice and the code of honor.

“Software engineering” is defined as the systematic usage of the scientific and technological knowledge, methods and experience for design, implementation, testing and documentation of the software [8]. The more modern definition of software engineering can be considered the interpretation of software engineering as "the usage of the systematic, disciplined, quantitatively measurable approach to the development, functioning and maintenance of the software, that is, the use of engineering for software" [9]. The software engineering according to the definition of a joint committee ACM i IEEE Computer Science [3], qualitatively differs from other engineering disciplines with the immateriality of software and the discrete nature of its functioning. The software engineering aims to integrate the principles of mathematics and informatics with the engineering approaches, created for the production of the material artefacts. Based on mathematics and computing, the software engineering is developing the systematic models and reliable methods of the producing of the high-quality software, and this approach extends to all levels – from the theory and principles to real software development practices that is best noticeable for exterior observers. The software engineering is based on the whole range of disciplines. The theoretical and conceptual principles of the software engineering teaching lie first of all in various areas of the informatics (the computer science), however, students should to be familiar with a range of concepts from other areas such as math, engineering, project management, and one or more specific subject areas in order to receive the full-fledged education. All students studying the software engineering must be able to integrate the theory and practice, understand the importance of abstraction and modeling, be able to deal with new subject areas that are not directly related to the computer science, and understand the importance of good designing.

It is advisable to consider how the results for students who study software engineering, are determined in the recommendations. The students should be able to demonstrate the following qualities: the professional knowledge (mastering of the knowledge of the software engineering and skills, as well as the professional standards necessary for the beginning of the activity in the quality of a software engineer); the technical knowledge (the understanding and use of relevant theories, models and technologies for the problem identification and its analysis, the software design, its development, implementation, verification and documentation); work in a team (work individually and in a team for the development and implementation of the quality software products); getting acquainted with the end-user (understanding of the importance of negotiations, the habits of effective work, the leadership and communication with interested people in the typical software development environment; the ability to compromise (bringing the conflicting project goals into compliance, finding of the compromises in the limitations of the cost, time, knowledge, existing systems and organizations); continuing of the professional development (studying new models, technologies and understanding the need of continuing of the professional development).

As you can see, much attention is paid in the recommendations not only to the professional and technical knowledge of students, but also to interpersonal relations, communication, decision-making.

The general principles of the computer science were lied in the basis of the recommendations, as well as the special principles that reflect the specifics of software engineering:

1. The software engineering in the field of the computer science. The recommendations relate specifically to the software engineering, but refer to other computer disciplines, as well as suggest the ways of implementation in other disciplines.
2. The reference disciplines. A student must study not only the computer disciplines, but also others, such as mathematics, engineering, project management, both theoretically and practically.
3. The evolution of curricula. Due to the rapid progress of the software engineering, the components of the curriculum can be updated and improved.
4. The organization of curricula. The curriculum models combine the knowledge elements into the simple educational blocks, what makes them easy for implementation for teachers, as well as for textbook publishers.
5. The core of software engineering. The recommendations define the general themes of the discipline, skills and knowledge that all students must master.

6. The inclusion of software engineering knowledge. The description of the key knowledge should be concise and relevant; the key set of topics for all the degrees should be defined. The study should begin with introductory courses, continue during the course of studies and be supplemented by the additional courses that may be various depending on the institution, program or an individual student.

Let's consider the structure of the knowledge core, which in the recommendations is defined as Software Engineering Education Knowledge (SEEK). The knowledge is organized hierarchically in three levels: the branch of knowledge (higher level); the block / module (middle level); the theme (lowest level).

SEEK provides the basis for the development, implementation and providing of the educational blocks that form the curriculum. In the table 1 the knowledge fields are presented that form SEEK and the relevant educational blocks with the recommended number of hours.

Table 1

The fields of knowledge in the software engineering and the educational blocks

The title	**Hours**	**The title**	**Hours**
Fundamentals of informatics	**152**	**Software design**	**48**
Fundamentals of informatics	120	Principles of design	3
Constructional technologies	20	Strategies of design	6
Constructional instruments	12	Architectural design	12
		Design of interaction “human-computer”	10
		Working project	14
		Design evaluation	3
Fundamentals of Mathematics and Engineering	**80**	**Verification and validation of software**	**37**
Fundamentals of Mathematics	50	Terminology and basics of verification and validation of software	5
Fundamentals of engineering and software	22	Expertize and statistical analysis	9
Engineering economics for software	8	Testing	18
		Analysis of problems and notification of them	5
Professional practice	**29**	**Process of software**	**33**
Group dynamics and psychology	8	Principles of processes	3

Communicative skills (specific for program engineering)	15	Realization of processes	8
Professionalism	6	Planning and tracking of projects	8
		Software configuration management	6
		Evolutionary processes and activity	8
Modeling and analysis of software	**28**	**Quality of software**	**10**
Fundamentals of modeling	8	Principles and culture of software quality	2
Types of models	12	Guarantee of the process	4
Analysis basics	8	Guarantee of the product	4
Analysis and specification of technical requirements	**30**	**Safety**	**20**
Basics of technical requirements	6	Basics of safety	4
Detection of technical requirements	10	Computer and network safety	8
Specification and documentation of technical requirements	10	Development of safe software	8
Verification of technical requirements	4		

The authors of the document emphasize that during the development of curricula and the individual courses in the software engineering based on SEEK the methods of teaching of the software engineering should be taken into account as well as the content filling, in particular:

1. The developers should preserve the balance connected to the studying materials and innovation flexibility.
2. Many concepts, principles and problems of the software engineering should be taught as the themes that are periodically repeated in the curriculum to help students in the development of their software engineering way of thinking.
3. The study of the software engineering themes should be held from the simple one to the complex one, that is, the themes that require certain maturity should be studied at the end of the semester.
4. It is necessary to focus on the basic principles of the software engineering, and not on the details of the latest or the specific tools.
5. The training should take place in such a way that students gain the experience using the relevant and modern tools, even when the details of the tools are not the focus of training.
6. The material that is taught in the course of the software engineering should be based on the empirical studies and the mathematical or scientific theory or the widely accepted practice.
7. The curriculum should have the significant real basis (case study, project activity, practical experience, students' working experience).

8. The courses and curricula should be regularly reviewed and be updated.

These recommendations can be adapted to the curricula composure of the discipline and separate courses depending on an educational institution, curriculum or students.

The conclusions and perspectives of the further research. On the basis of the held analysis, it can be concluded that the content of the educational curricula for the training of engineer-programmers according to the main IT specialties in higher education institutions in general meets the requirements to them, which are settled at the labor market. At the same time, one of the possible problems is that the content of the practical training of students does not fully correspond to the current state of information technology. Thus, it is necessary to ensure the updating of the contents of educational disciplines with the aim of ensuring of the quality training of specialists.

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ЗАДОВОЛЕННЯ КВАЛІФІКАЦІЙНИХ ВИМОГ РОБОТОДАВЦІВ ДО ІНЖЕНЕРІВ-ПРОГРАМІСТІВ У ПРОЦЕСІ ПІДГОТОВКИ У ВИЩИХ НАВЧАЛЬНИХ ЗАКЛАДАХ

У статті на основі аналізу проблем професійної підготовки інженерів-програмістів у вищих навчальних закладах показано, що зміст навчальних планів підготовки інженерів-програмістів за основними ІТ-спеціальностями у вищих навчальних закладах у цілому відповідає вимогам до них, які висуваються на ринку праці.

Констатується, що нині на ринку вакансій спостерігаються певні зміни не тільки у зростанні потреби у спеціалістах у галузі ІТ, але й також і у вимогах, що ставляться до майбутніх спеціалістів. На думку науковців, нині намітився розрив між рівнем очікування роботодавців і рівнем освіти випускників ІТ-спеціальностей вузів. У зв'язку з надзвичайно швидкими темпами розвитку ІТ вже до моменту закінчення навчання знання студентів можуть застарівати. Йдеться про комплекс компетентностей, що надає виш при підготовці фахівців для їх затребуваності та конкурентоспроможності на ринку праці.

Разом із тим практична підготовка студентів не повною мірою відповідає сучасному стану інформаційних технологій. Через це необхідно забезпечити оновлення змісту навчальних дисциплін з метою забезпечення якісної підготовки фахівців.

Ключові слова: вища професійна освіта; інженер-програміст; виробнича практика; практична підготовка; компетенції, навчальні дисципліни, вимоги ринку до інженерів-програмістів.

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УОВЛЕТВОРЕНИЕ КВАЛИФИКАЦИОННЫХ ТРЕБОВАНИЙ РАБОТОДАТЕЛЕЙ К ИНЖЕНЕРАМ-ПРОГРАММИСТАМ В ПРОЦЕССЕ ПОДГОТОВКИ В ВИСШИХ УЧЕБНЫХ ЗАВЕДЕНИЯХ

В статье на основе анализа проблем профессиональной подготовки инженеров-программистов в высших учебных заведениях показано, что содержание учебных планов подготовки инженеров-программистов по основным ИТ-специальностям в высших учебных заведениях в целом соответствует требованиям к ним, предъявляемым на рынке труда.

Констатируется, что в настоящее время на рынке вакансий наблюдаются определенные изменения не только в росте потребности в специалистах в области ИТ, но также и в требованиях, предъявляемых к будущим специалистам. По мнению ученых, в настоящее время наметился разрыв между уровнем ожидания работодателей и уровнем образования выпускников ИТ-специальностей вузов. В связи с чрезвычайно быстрыми темпами развития ИТ уже к моменту окончания обучения знания студентов могут устаревать. Речь идет о комплексе компетентностей, которые предоставляет вуз при подготовке специалистов для их востребованности и конкурентоспособности на рынке труда.

Вместе с тем практическая подготовка студентов не в полной мере соответствует современному состоянию информационных технологий. Поэтому необходимо обеспечить обновление содержания учебных дисциплин с целью обеспечения качественной подготовки специалистов.

Ключевые слова: высшее профессиональное образование; инженер-программист; производственная практика; практическая подготовка; компетенции, дисциплины, требования рынка к инженерам-программистам.