

 ASTANA IT UNIVERSITY	MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN "ASTANA IT UNIVERSITY"	F-AITU-8
Graduate Model «Astana IT University»		Editorial Board 1

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GRADUATE MODEL "ASTANA IT UNIVERSITY"
Bachelor of Educational Programme 6B06102 "Software Engineering"

Nur-Sultan, 2019

INTRODUCTION

The development of a competence model of a graduate becomes an unconditional condition for the implementation of the main directions of the Bologna process and a requirement of the modern labor market. The competency model of a graduate (bachelor's degree) is designed to answer the question of what professional tasks a specialist of a certain rank (position), this or that profile should be able to solve. The formation of a modern graduate model that meets the needs of stakeholders and all interested parties is the main strategic goal of "Astana IT University" and is provided with the necessary resources for the educational process, including staff, educational and methodological, information and material and technical support. The university pursues a targeted staff policy and systematic improvement of the material and technical base of the university to ensure the quality of training a graduate - bachelor, in demand in the labor market.

The normative-legal base of the model of the graduate - bachelor on specialities of the University is based on the following documents:

- The Law of the Republic of Kazakhstan "About Education" № 319-III of July 27, 2007 (as amended and supplemented on 11.07.2017).

- The government program of education development of RK for 2011-2020, approved by the Decree of the President of RK № 1118 from 07.12.2011.

- GMSHE № 604 from 31. 10. 2018.

- Rules "Organization of educational process on credit technology of education" (№ 152 from 20.04.2011 with amendments and additions № 563 from 12. 10. 2018)

- Typical rules of activity of educational organizations that implement educational programs of higher education. Resolution No. 181 of the Government of the Republic of Kazakhstan dated 7 April 2017. Qualification directory of positions of managers, specialists and other employees, approved by Order of the Minister of Labor and Social Protection of the Republic of Kazakhstan from May 21, 2012 № 201-p-m as amended on 17.04.2013).

1. Software Engineering direction, current state, as well as development and prospects of this direction.

The modern world is so computerized that it is almost impossible to find an industry where information and communication technologies and systems are not used. Each year there is a rapid development of various technologies, where the main elements are software systems, respectively, a large number of highly qualified professionals for this industry. One of the most popular educational programs is "Software Engineering".

The field of software engineering is a young but at the same time serious industry, which requires the involvement of a team of professionals. Their main competence is building software systems. A specialist of the direction should not only have a solid luggage of knowledge and practical experience, but also constantly improve, delving into the topic and getting acquainted with new developments and achievements in computer technology.

The main task of Software Engineering is to achieve the strategic goals of different organizations through the use of information and communication technologies, in particular through the development, testing and maintenance of software products. Also, another important task of Software Engineering direction is to achieve compliance with various external and internal requirements. Advanced organizations should strive to meet quality requirements, international and local standards, requirements of regulatory authorities, legislation, generally accepted approaches and methodologies in the field of information and communication technologies. The number of such requirements has increased significantly in recent years. Many of the international requirements are also becoming relevant for Kazakhstan.

Skills that encompass technical knowledge can provide a graduate with long-term career security, high earning potential and jobs that offer interesting and diverse jobs. At the same time, a young specialist with a bachelor's degree can solve a whole range of tasks. He will be able to develop specific software products and engage in research activities. It should be noted that "Software systems developer" is a fascinating profession, which includes also a certain creative component. It implies the ability to cover a problem in a complex, considering all the ways of solving a complex problem. After all, professional realization implies not only creation of new programs but also improvement of old software systems.

It is expected that within the next few years professions in the field of information and communication technologies will grow rapidly, in particular professions related to software development, as there is active automation of large organizations. According to the U.S. Bureau of Labor Statistics (BLS), vacancies in the information and communications technology sector are expected to grow by 13% over the period 2016-2026, approximately twice as fast as the overall labor market growth of 7%.

Whereas virtually every industry today requires software developers who not only develop and maintain software systems, but also process large amounts of data and secure the systems under development in various sectors of the economy, such as:

- Healthcare
- Finance and banking

- Production
- Government

In the career of a software systems developer they will need to improve constantly, as technologies are developing rapidly, and what was relevant today will not be relevant tomorrow. Also, for the developer of software systems, or software engineer it is important to have an idea of the work of the business structure to understand the strategic goals of this development, which is provided through analysis of business needs and development of technological solutions that meet these needs. In addition, these specialists can specialize in areas of ICT with high requirements, such as system security or data analysis.

Working in the field of information and communication technologies gives the opportunity to solve problems and work with teams of technology specialists. Employers also offer high growth rates and the potential for high salaries.

Below are a few career paths available for bachelor's degree graduates in Software Engineering:

1. A back-end developer is a specialist who handles the software and administrative part of a web application;

2. Front end developer is a programmer who develops the user interface, i.e. the external public part of a website in a browser. Frontend developer makes websites and templates for CMS, develops user interface and implements scripts responsible for animation and logic on web pages;

3. Web programmer is a programmer who develops web applications, websites and web information systems;

4. Mobile developer is a programmer who develops applications for mobile devices (smartphones, tablets, smart clocks);

5. Java developer is a programmer whose competence includes development of platform solution architecture, software modules and integration applications;

6. The Python programmer is a programmer who develops, supports, integrates and optimizes web applications and web services using the Python programming language;

7. Android Programmer is a programmer who develops, tests and supports applications for Android operating system;

8. The iOS Programmer is a programmer who develops, tests and supports applications for Apple devices;

9. Game developer is a creator of program code that visualizes the game world and the player's interaction with it;

10. Ruby Programmer is a programmer who creates software development language, applications, including server, cloud systems, web interfaces, platforms and modules, their architecture and logic using the same language;

11. C# developer is a programmer who creates applications, games and websites using the C# programming language;

12. A PHP programmer is a specialist who is responsible for creating the server side of a website. The quality of his work largely determines the speed, reliability, functioning and successful development of the resource as a whole.

2. Components when forming the model of a graduate of the educational program "Software Engineering"

The key components of the model formation of the graduates of the educational program include information about the goals and objectives of the educational program, objects, types and directions of professional activity, specialist competence model (Attachment 1), including descriptors, a variety of competencies in accordance with the educational program, the results of the educational program.

2.1 Purpose of the educational programme

The goal of the educational program is to provide practice-oriented training of highly qualified specialists in the field of software development for enterprises with general cultural and professional competence in the development of software solutions, as well as to create conditions for continuous professional self-improvement, development of social and personal competencies of specialists, expansion of social mobility and competitiveness in the labor market.

2.2 Objectives of the Educational Programme

The objectives of the educational program "Software Engineering" are:

- 1) Providing highly qualified specialists in the field of software development in private and public companies.
- 2) Providing students with a wide range of competencies in the field of software development based on the results of the educational program, necessary to start working as a Junior Software Developer in various companies, including small businesses up to 10 people, and ending with large national and private organizations, where more than 1000 people work.
- 3) Developing in students the flexible (soft) qualities required to develop in them leadership and patriotic parties necessary to form them as successful and committed leaders in their industry.

2.3 General and professional competences of the Educational Program

General and professional competences as learning outcomes are the knowledge, skills and abilities acquired at the end of a discipline or course and reflecting the requirements.

The list of General Competences (GC) and Professional Competences (PC) of the educational program "Software Engineering":

GC1. Ability to understand the driving forces and regularities of the historical process, a person's place in the historical process and ability to understand philosophy as a methodology of

human activity, readiness for self-knowledge, self-activity, mastering cultural wealth as a factor of harmonization of personal and interpersonal relations.

GC2. Ability to form and develop skills and competences in the field of organization, planning and production management, ability to apply the acquired knowledge for understanding of environmental reality, ability to generalize, analyze, predict when setting goals in the professional sphere and choose the ways of their achievement with the use of scientific methodology of research

GC3. Ability for written and oral communication in the state language and language of international communication, as well as in foreign (English) language. Ability to use foreign sources of information, possess communication skills, to make public speeches, argue, debate and debate in a foreign language.

GC4. Ability to be competent at a choice of methods of ICT and mathematical modelling for the decision of concrete engineering problems, ability to be ready to reveal naturally scientific essence of problems arising in the course of professional activity, and ability to involve for its decision the corresponding mathematical device.

PC1. Ability to understand modern standards, regulatory framework, basics of economic knowledge, scientific ideas about project management and technological entrepreneurship.

PC2. Ability to professionally operate modern computer equipment, network components, computer programs and complex computer systems (in accordance with the objectives of the program), as well as to use the rules of safety, industrial sanitation, fire safety and health standards.

PC3. Ability to possess skills in using and applying algorithms, data structures and modern methods to create (develop) and further support various software systems.

PC4. Ability to use basic regulations and methods to solve management tasks, the ability to perform project documentation in a software environment using computer graphics for various types of projects.

PC5. Ability to be competent at a choice of methods of mathematical modelling for the decision of concrete applied program problems, including readiness to reveal naturally scientific essence of the problems arising in the course of professional activity, and ability to involve for its decision the corresponding mathematical device.

PC6. Ability to design architectures of components of information systems, including man-machine interface of hardware-software complexes, to choose operating systems and methods of information protection.

PC7. Ability to develop information and software of information system on the basis of modern methods and development means.

PC8. Ability to collect, process and analyze data using existing in the organization methodological and technological infrastructure.

PC9. Ability to manage stages of life cycle of a methodological and technological infrastructure of software working out, the analysis of the data, designing of IT infrastructure in the various organizations.

PC10. Ability to use modern programming environments to design and implement software solutions and databases for information and communication technologies.

PC11. Ability to apply elements of the theory of probability and the mathematical statistics underlying models and methods of a science on the data, correctly to choose methods of the analysis of the data, machine learning and artificial intelligence for the decision of practical problems.

PC12. Ability to develop and implement safe and tested solutions based on new methods and technologies of information protection used in information and communication technologies.

2.4 Матрица соотнесения результатов обучения образовательной программы с формируемыми компетенциями
2.4 Matrix of correlation of educational program results with the competences to be formed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
НКРС 1	V	V								
НКРС 2	V	V								
НКРС 3			V							
НКРС 4		V				V				
НК-5PC 5							V			
НКРС 6				V	V			V		
НКРС 7			V							
НКРС 8						V		V	V	
PC 9					V			V		V
PC10				V					V	
PC11							V		V	
PC12										V

2.5 Personal qualities of a software developer

With the huge growth in the digitalization of organizations around the world, there is a high need for software developers. At the same time, there is already a large number of experienced software developers and this leads to fierce competition in the market. Below are some personal qualities, also often referred to as soft (flexible) qualities, which are additionally embedded in the graduate model of the student so that they can position themselves as competitive and ready for responsibility specialists in information and communication technologies:

1. Leadership skills - qualities that show that students have developed the skills of a leader.

This quality is determined by the behavior of the student, his communication with his classmates and can be developed in the same way as professional qualities;

2. Continuous self-development skills - qualities that show how well students have developed skills for continuous development and learning. This quality is determined by how much the student is interested in improving in the disciplines in addition to what is given during the lessons. In other words, what additional materials he or she uses, how he or she shapes the questions, etc.;

3. Time management skills - qualities that show the student's ability to manage their time. This quality is determined by when he or she submits lab work, how he or she comes to class, how he or she allocates time in class, and can be developed in the same way as professional skills;

4. Friendliness and manners skills - qualities that show the student's manners and friendly attitude. These qualities are defined in relation to students' attitudes towards teachers and their classmates and can be developed in the same way as professional qualities;

5. Enthusiasm and optimism - qualities which show a positive attitude of the student. These qualities are determined by the student's mood and attitude towards learning and can be developed in the same way as professional qualities;

6. Focus - qualities that determine how much a student focuses on a particular module. For example, if he or she constantly checks the phone or social network, then he or she is not focused on getting knowledge in a particular discipline. As in past cases, this quality can be developed as well as other professional qualities;

7. Teamwork skills - the qualities of teamwork. They are defined by the results of teamwork and show how much a student is a team player, which is a very important quality in our time;

8. Communication skills - qualities that show how well students have the skills to build a conversation properly, negotiation skills, persuasion skills, and listening to the interlocutor properly.

CONCLUSION

The market economy of Kazakhstan is increasingly moving to the digital format of management, and the state programs "Digital Kazakhstan", the program of Industrial Development of Kazakhstan and other programs positively contribute to the development of information and communication technologies. The direction of "Software Engineering" as a whole, and development of software systems and means in particular, becomes the main and one of the most popular directions of development. Such concept as "digital culture" is formed, where the main idea is the need to introduce new information and communication technologies in various organizations. Many companies consider the digital "culture" as an important mechanism in the positive organizational environment of the company's development. In this regard, employers' attitude towards the company's personnel has also changed.

High competition for free vacancies has led to the fact that professional knowledge and experience are not the only requirements for a specialist to enter the company. The latter is particularly true for young graduates, whose knowledge acquired in universities has not been confirmed by experience in solving production or management tasks. The lack of such experience dramatically reduces the advantages for young people in hiring and determining the cost of their work. The risks for employers are too great. For such specialists, an important criterion for the successful completion of a job competition is the assessment of the personal potential of a young university graduate. In other words, it is important for the company how the specialist will grow and develop within the company, or what his or her potential is at the entrance. In this case, the following questions remain open: what is the concept of potential, which is the guarantor of investment in the formation of the personnel reserve, or what employers expect from young specialists who have just graduated, or what can make inexperienced graduates competitive in the eyes of employers. For employers at the stage of hiring young specialists it is important to use young energy, activity, openness to new things, dynamism, the possibility to use young potential at a lower cost and easy integration into the organizational culture of the company. Thus, despite all this, the graduate should possess basic knowledge on information technologies, in particular, possess good bases of knowledge in the field of development of program systems. In addition to professional skills, the graduate should have personal qualities, or soft (flexible) qualities that will allow him or her to develop his or her career and form the qualities of business etiquette and management skills.

Despite the recognition of the undoubted advantages of young specialists, employers are in no hurry to recruit them to their enterprises. There are many reasons for this, some of which may be imposed by general notions, such as: there is no stability and reliability in fresh graduates; young people lack responsibility; there is no ability to work for results (which means to "hold" the goal, find ways to overcome obstacles on the way to it, to show independence and perseverance); there is no adequacy in perceiving oneself as an employee: exaggerated expectations both in terms of salary and evaluation of one's work and the nature of the work one wants to do. Some of these

factors may occur, but if the students' reality is properly formed, these factors can be minimized.

On the basis of the above, it can be concluded that for employers, in addition to special knowledge, the personal qualities of a potential employee (receptivity, dynamism, willingness to learn, readiness to start small) are the principal moments in the question of whether or not to hire a young graduate. As for the availability of higher education, many employers consider it to be a sign that a priori distinguishes a university graduate from those who do not have higher education. Thus, employers consider a young graduate as a whole as a source of activity, dynamism and modern knowledge for the enterprise, on the one hand, and on the other hand, as an alarming combination of reduced responsibility with increased ambitions. When employers decide whether or not to hire a young graduate, they proceed in principle from one of two market advantages:

1. Special knowledge, for which the market demand is high and which cannot be compensated by personal qualities;
2. Special personal qualities, which are required in a market economy and which distinguish one graduate from a number of his own classmates. These qualities can make their carriers competitive, even if they have obtained a specialty for which the supply exceeds the demand, respectively, one of the goals of the educational program is to develop in students such qualities, which are modeled in graduates of the educational program.

Приложение Attachment 1

Компетентностная модель выпускника (бакалавр) Competent model of the graduate (Bachelor of "Software Engineering")

