THE MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
National Research
TOMSK STATE UNIVERSITY

APPROVED BY:
Rector
E. V. Galazhinskiy
«22» 09 2017 г.

Registration number _____

BASIC EDUCATIONAL PROGRAMME OF HIGHER EDUCATION

subject area

02.03.02 Fundamental Computer Science and Information Technology

Specialization:

Software engineering

Degree:

Bachelor of Software Engineering (B.SE.)

Mode of study
full-time

Tomsk – 2017

CONTENTS

1. General provisions

1.1. The Basic Educational Programme (BEP) of Bachelor Programme **Fundamental Computer Science and Information Technology** delivered by National Research Tomsk State University (TSU) in subject area **02.03.02 Fundamental Computer Science and Information Technology** is a system of documents developed and approved by the University in accordance with the Regulations of TSU on Basic Educational Programmes of Higher Education in view of the labour market demand. The Programme is based on the Federal State Educational Standard of Higher Education (FSES HE) and takes into account the recommended model of a basic educational programme.

The BEP is a set of general features of learning process (workload, content, and outcome), organisational and pedagogical conditions, and forms of assessment. The set is represented as an overview of the educational programme, curriculum, academic calendar, syllabi of disciplines (modules), programmes of practical trainings, assessment tools, teaching and learning materials, and other components included into the educational programme by the decision of the institution.

1.2. The BEP of the Bachelor's Programme relies on the following laws and regulations:

- The Federal Law No. 273-FZ On Education in the Russian Federation of 29 December 2012 (as amended on 31 December 2014);
- The Federal Law No. 122-FZ On Amendments to the Labor Code of the Russian Federation and Articles 11 and 73 of the Federal Law On Education in the Russian Federation of 2 May 2015;
- The Federal State Educational Standard No. 224 in subject area 02.03.02 Fundamental Computer Science and Information Technology (Bachelor) approved by the Decree of the Ministry of Education and Science of the Russian Federation of 12 March 2015;
- The Decree of the Ministry of Education and Science of the Russian Federation No. 1061 On the Approval of the List of Specialties and Subject Areas in Higher Education of 12 September 2013;
- The Regulation of organisation and delivery of education in Bachelor, Specialist, and Master Programmes (approved by Decree of the Ministry of Education and Science of the Russian Federation No. 301 of 5 April 2017);
- The Decree of the Ministry of Education and Science of the Russian Federation No. 636 On Final State Examination in Bachelor, Specialist, Master Programmes of 29 June 2015 (as amended by the Decree of the Ministry of Education and Science of the Russian Federation No. 86 of 9 February 2016);
- Statute on the Practice of Students Learning the Basic Educational Programs of Higher Education, established by the Decree No. 1383 of the Ministry of Education and Science of the Russian Federation of 27 November 2015;
- The Statute of the Tomsk State University (approved by Decree of the Ministry of Education and Science of the Russian Federation No. 564 of 20 May 2014).
- The Programme of development of Federal State Autonomous Educational Institution of Higher Education National Research Tomsk State University in 2013-2020.
- internal policies and procedures of TSU.

2. Educational standard in the subject area

See Annex 3.

3. Overview of the Basic Educational Programme

3.1. Entry requirements

for the subject area **02.03.02 Fundamental Computer Science and Information Technology**:

- an applicants must have a state diploma of the secondary (complete) general education or secondary vocational education or higher education;
- foreign education documents if corresponds to recognized levels of education in Russia.

3.2. Duration

Duration of the programme is 4 years.

3.3. Workload

The workload of the BEP is 240 ECTS.
Training and education process for the program include:

- face-to-face work of students and university teachers and (or) persons involved in the educational process on other terms;
- self directed work of students;
- other forms.

Classes on subjects (modules), med-term examination and the final state examination of students are conducted face-to-face and in form of self directed work of students, practice is conducted face-to-face or in other forms.
Face-to-face work can be conducted in and out of classroom, and using digital information and educational technologies.
Classroom face-to-face work of students and teachers is the work on mastering the BEP by students performed in the classrooms of TSU (lecture halls, laboratories, computer classes, etc.) with the direct participation of teachers, including the use of distance learning technologies and according to schedule.
Out of classroom face-to-face work of teachers and students is the work on mastering the BEP not included to the schedule of classroom activities.
Face-to-face work can include other types of training and education and involve teamwork and self directed work of teachers and students.
The amount of face-to-face work from the total amount of time for the mastering of this BEP are determined by educational content, ways of work, classes, educational technologies, distance learning technologies and cannot exceed 60 % of the total volume of BEP.

3.4 Awarded degree

Graduates of the Bachelor's Programme are awarded Bachelor of Software Engineering.

3.5 Overview of graduates' professional expertise

3.5.1 Spheres of graduates' professional expertise

involve intellectual systems, bioinformatics, cognitive information technologies, computer technologies, computer science, database technologies, computer graphics, information theory, information and business management technologies, software architecture, parallel and distributed programming.

3.5.2. Objects of graduates' professional expertise

- projects in the field of fundamental computer science and applied mathematics, as well as in the development of new information technologies;
- mathematical, information, simulation models of systems and processes;
- software and information support of computer facilities, networks, information systems;

- algorithms, libraries and software packages;
- systems, products and services of information technologies, including databases and knowledge, information content, electronic collections, network applications, products of system and application software;
- means, technologies, resources and services of e-learning, mobile and ubiquitous learning;
- standards, profiles, open specifications, architectural methodologies for the specification of information technology systems and services;
- programming languages, information resource description languages, specification languages, as well as tools for designing and creating systems, products and services of information technology;
- documentation on systems, products and services of information technology systems, documentation of algorithms and programs;
- systems of digital image processing and computer-aided design;
- standards, procedures and tools for administering and managing the security of information technology;
- projects for the creation and implementation of information technologies, relevant project documentation, standards, processes, procedures and tools to support the life cycle of information technology;
- sets of assessments to establish the conformity of systems, products and services of information technology to the original standards and profiles, as well as to analyze the performance and other characteristics of the implementation of information technology.

3.5.3. Types of graduates' professional activities

Scientific and research activity:

- the study of new scientific results, scientific literature and research projects in accordance with the profile of the object of future professional activity;
- research and development of models, algorithms, methods, software solutions, tools connected with conducted research projects;
- development of scientific and technical reports and explanatory notes;
- giving scientific reviews and summaries of abstracts and bibliographies on the subject of conducted research;
- participation in the work of scientific seminars, scientific and technical conferences;
- writing publications for scientific and technical magazines.

Project and engineering activities:

- development and research of algorithms, protocols, software solutions, computational models and data models for the implementation of functions and services of information technology systems;
- development of architecture, algorithmic and software solutions for system and application software;
- development and research of mathematical, information and simulation models prototyping and engineering projects;
- development and implementation of processes and procedures for the life cycle of information systems, software, information technology system services;
- development and creation of information resources of global networks, learning content, application databases;
- development and use of tools and environments, automated systems in scientific and practical activities;
- development of methods and tools for testing information technology for compliance with standards and baseline requirements;
- development of project and program documentation;
- managing activities:

- development and implementation of quality management processes of production activities associated with the creation and use of information technology;
- planning of processes and resources for solving problems in the field of information technologies;
- development of methods and techniques for monitoring and evaluating the quality of production processes connected with the creation and use of information technology;
- participation in the processes of controlling of production activities in compliance with the requirements for environmental protection and labor safety.

3.6 Specialty (profile)

Software engineering.

3.7 Learning outcomes

The graduates in subject area **02.03.02 Fundamental Computer Science and Information Technology** must have the following competencies:
General competencies (GC):

- the ability to use the basics of philosophical knowledge to form a worldview (GC-1);
- the ability to analyze the main stages and patterns of historical development of society for the development of a civic position (GC-2);
- the ability to use the basics of economic knowledge in various spheres of life (GC-3);
- the ability to use the basic legal knowledge in various spheres of life (GC-4);
- ability to communicate in oral and written forms in Russian and foreign languages for solving problems of interpersonal and intercultural interaction (GC-5);
- ability to work in a team, tolerating social, ethnic, confessional and cultural differences (GC-6);
- the ability to manage self-education (GC-7);
- the ability to use methods and means of physical culture to ensure full social and professional life (GC-8);
- ability to use first aid techniques, methods of protection in emergency situations (GC-9).

The graduates in subject area **02.03.02 Fundamental Computer Science and Information Technology** must have the following general professional competencies (GPC):

- ability to use basic knowledge of natural sciences, mathematics and computer science, basic facts, concepts, principles of theories related to fundamental computer science and information technologies (GPC-1);
- the ability to apply modern programming languages and database languages, system engineering methods, design automation systems, digital libraries and collections, network technologies, libraries and software packages, modern professional standards of information technologies (GPC-2) in professional activity;
- the ability to develop algorithmic and software solutions in the field of system and application programming, mathematical, information and simulation models, the creation of information resources of global networks, learning content, application databases, assessments and means of testing systems and facilities for compliance with standards and baseline requirements (GPC-3);
- ability to solve standard problems of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic information security requirements (GPC-4).

The graduates in subject area **02.03.02 Fundamental Computer Science and Information Technology** must have professional competencies corresponding to the type of professional activity for which the Bachelor program is aimed:
scientific activities:

- the ability to collect, process and interpret the data of modern scientific research necessary for drawing conclusions on relevant scientific research (PC-1);

- the ability to understand, improve and apply modern mathematical tools, fundamental concepts and system methodologies, international and professional standards in the field of information technology (PC-2);
- the ability to use modern instrumental and computing tools (PC-3);
- ability to solve professional tasks in teams for scientific and project purposes (PC-4);
- the ability to critically reconsider the accumulated experience, change, if necessary, the type and nature of their professional activities (PC-5);

project and engineering activities:

- ability to effectively apply basic mathematical knowledge and information technologies in solving design and engineering problems connected with the development and use of information technology (PC-6);
- the ability to develop and implement the life cycle processes of information systems, software, services of information technology systems, as well as methods and techniques for assessing and analyzing the function of information technology tools and systems (PK-7);
- the ability to apply international and professional information technology standards, modern paradigms and methodologies, instrumental and computing tools (PC-8);
- organizational and managerial activity: the ability to develop, evaluate and implement the life cycle processes of information systems, software, information technology services, and implement methods and techniques for assessing and analyzing the functioning of tools and information technologies; to develop project and program documentation that meets regulatory requirements (PC-9);
- ability to implement quality management processes of production activities associated with the development and use of information technology, monitor and evaluate the quality of production processes (PC-10);
- the ability to compile and monitor the work plan, plan the resources necessary to perform the work, evaluate the results of their own work (PC-11).

A graduate who has mastered the undergraduate program **Fundamental Computer Science and Information Technology** must have special professional competencies:

- ability to compile and monitor the work plan, plan the resources necessary for the performance of work, evaluate the results of one's own work (CPK-1).

3.8. Teaching staff

Implementation of undergraduate programme **Fundamental Computer Science and Information Technology** in subject area **03.02.02 Fundamental Computer Science and Information Technology** provided guidance and teachers of TSU, as well as persons involved in the educational process on contract terms.

The percent of teaching staff (with full-time employment) with education corresponding to the taught discipline (module) to the total number of teaching staff involved in the undergraduate program is 88.1.

The percent of teaching staff (with full-time employment) with a academic degree and academic rank to the total number of teaching staff involved in the undergraduate program is 65.

The percent of the staff (with full-time employment) among the managers and employees whose activity is related to the subject area of the implemented programme (with work experience not less than 3 years) to the total number of staff involved in the undergraduate program is 15.6 percent.

The level of human resource of the BEP has the following features, that meet the requirements to the availability and qualification of the teaching in accordance with the current legal and regulatory framework:

- education of teachers corresponds to the subject area of the taught disciplines (modules);
- teachers are systematically engaged in scientific and (or) methodological activities in the subject area of the taught disciplines (modules);

- percent of teachers with full-time employment in TSU to the total number of teachers involved in the undergraduate program, no less than the criterial value approved by the Decree of the Ministry of Education and Science of the Russian Federation.

Head of the BEP:
Oleg Alekseevich Zmeev, Doctor of Sciences in Physics and Mathematics, Professor, Head of Department of Software Engineering at the Computer Science Department of the Tomsk State University, since 2014 - Head of Department of IT Development, Vice-Rector for IT Development.
O.A. Zmeev has a deep knowledge both in the field of mathematics and the field of computer science. The field of scientific interests of O. A. Zmeev: in the field of mathematics - mathematical modeling of insurance processes, in the field of computer science - object technologies of software development. He is the author of about 100 scientific works, including 2 monographs published in collaboration, methodological materials for students on a number of academic subjects. O.A. Zmeev is a participant in many international, CIS, Russian, republican and regional scientific conferences, symposia, meetings, schools. For the last five years he has written 3 articles and made 15 speeches at conferences.
O.A. Zmeev is a member of doctoral dissertation council D 212.267.08 at TSU (subject areas: 05.13.11 - Mathematics and software for computers and computer networks; 05.13.18 - Mathematical modeling, calculus and software systems), since 2007 - member of the editorial board of the scientific journal "Bulletin of Tomsk State University. Management, Computer Science and Informatics ".
O.A. Zmeev was awarded the medal "For Merit to TSU".

3.9. The language of the programme

The Bachelor's program Fundamental Computer Science and Information Technology is taught in English.

4. Programme curriculum

The curriculum of the programme is in Annex 2.
It is possible to study at the programme following an individual curriculum. Individual curricula are developed based on curricula approved by the Student Unit and the Regulations of developing individual curricula.

5. Competencies

See Annex 4.

6. Academic Calendar

See Annex 1.

7. Syllabi

7.1 Syllabi of disciplines (modules)
See Annex 5.
7.2 Programmes of practical trainings
In accordance with the FSES HE for subject area **02.03.02 Fundamental Computer Science and Information Technology** training and practices are compulsory and is a kind of training sessions directly focused on the vocational and practical training of students. Practices reinforce knowledge and skills acquired by students as a result of mastering theoretical courses, develop practical skills and contribute to the integrated formation of general cultural and professional competencies of students.
During the implementation of this BEP, the following practices are proposed:

1. training practice - such as the practice of obtaining primary skills and research activities,
2. practical training of two types:
   - research work;
   - pre-graduation practical training.

7.2.1. Programme of educational research practice
During the implementation the BEP the following type of training practice are proposed: practice in obtaining primary research skills.
The method of conducting the practice is stationary.
Practice can be carried out at sub-departments of the Computer Science Department: the Department of Theoretical Foundations of Computer Science, the Department of Applied Computer Science, the Department of Software Engineering; in companies, research institutes, TSU divisions researching and developing software systems commissioned by companies and organizations.
See Annex 6.
7.2.2. Programme of research work
The research work of the bachelor ensures the consolidation and deepening of the theoretical training of the student, the acquisition of practical skills and competences, as well as the experience of independent professional activity in the process of scientific research.
The method of conducting the practice is stationary.
Research work can be carried out at sub-departments of the Computer Science Department: the Department of Theoretical Foundations of Computer Science, the Department of Applied Computer Science, the Department of Software Engineering; in companies, research institutes, TSU divisions researching and developing software systems commissioned by companies and organizations.
See Annex 7.
7.2.3. The program of pre-diploma practice
Pre-diploma practice is conducted to perform final qualification work.
The method of conducting the practice is stationary.
Practice can be carried out at sub-departments of the Computer Science Department: the Department of Theoretical Foundations of Computer Science, the Department of Applied Computer Science, the Department of Software Engineering; in companies, research institutes, TSU divisions researching and developing software systems commissioned by companies and organizations.
See Annex 8.

8. The program of the final state examination

Final state examination is compulsory for graduating the BEP **Fundamental Computer Science and Information Technology** the and is implemented after the mastering of the educational program in full. Final state examination includes protection of final qualifying work.
See Annex 9.

9. Assessment tools

See the syllabi of disciplines.

10. Quality assurance

In order to improve the quality of evaluation in the implementation of the Bachelor programme **02.03.02 Fundamental Computer Science and Information Technology** taking into account the positive results of the experiment conducted at the Faculty of Computer Science within the framework of adaptation to the Bologna process the academic council of the faculty (Minutes No. 115 of 09 June 2016) set the following rules of mid-term assessment and the extended grading system:

10.1. Rules of mid-term assessment

1. The teacher, who conducts the discipline, has the right to independently establish the terms and forms of the mid-term assessment, which he is obliged to publish in the syllabus of the discipline and to explain to the students at the beginning of classes.
2. Mid-term assessment is usually conducted during the weeks established by the dean at the beginning of term.
4. Non-attendance of the mid-term assessment in due time without a justifiable reason constitutes failure.
5. If the reason for the non-attendance of the student during the mid-term assessment is justified, the teacher changes the time of assessment to a different time.
6. The assessment of a subject is carried out using an extended scale of assessments.

10.2 Mid-term assessment

1. The mid-term assessment may be conducted in the form of a test or examination. The forms of mid-term assessment for subjects are established by the BEP curriculum.
2. The mid-term assessment in the form of a test is usually in a form of a graded test in the traditional scale of assessments. For the table translating the scores of the extended scale into the traditional scale see 10.3. The list of ungraded subjects ("pass" - "no pass") is established by the BEP curriculum.
3. The mid-term assessment of a subject with examination is in graded form in the traditional scale of assessments. For the table translating the scores of the extended scale into the traditional scale see 10.3.

10.3. Extended scale of grading the progress

1. The following extended grading scale is established:

Grade	In writing	Numeric representation	Grading criteria	ECTS	Russian grading framework
5+	Excel+	5,3	Outstanding level of knowledge of the subject (knowledge and skills), exceeding the compulsory material, with a creative approach to the discipline	A	Excellent
5	Excel	5,0	Excellent level of mastery of the subject within the bounds of the material, possibly with some errors	B	

5-	Excel-	4,7			
4+	Good+	4,3	Basic good level of mastery of an object with distinct errors	C	Good
4	Good	4,0			
4-	Good-	3,7			
3+	Sat+	3,3	The level of mastery of the subject is below average, with significant errors	D	Satisfactory
3	Sat	3,0			
3-	Sat-	2,7	The minimum possible level of knowledge of the	E	

			subject allowed		
2+	Fail+	0	Unsatisfactory level of mastery of the subject, but with the possibility of retaking the exam	F X	Fail
2	Fail	0	Unsatisfactory level of mastery of the subject, it is required to retake the discipline	F	

2. Negative grades are "2", "2+", as well as "no pass", "not attended"; the remaining grades are considered positive.
3. Grades in writing in the Russian grading framework are presented by the teacher in the record book and examination (test) sheet, negative marks are not shown in the record book.
4. A traditional rating scale is used to form statistical reports on academic performance, to decide on the awarding of a scholarship, when issuing attachments to a Russian diploma, or when solving other questions that depend on the traditional interpretation of academic performance.
5. In order to ensure international comparability of assessments, the recommended distribution of positive grading is established in the ECTS scale: A - 10%, B - 25%, C - 30%, D - 25%, E - 10%. This recommendation is of a general nature and should not be considered a norm for a specific grading procedure.
6. In accordance with the Regulation on the final certification, the results of any of the types of attestation tests included in the final state examination are assessed by Russian grading system "excellent", "good", "satisfactory", "unsatisfactory".

Director of the BEP O.A. Zmeev

Approved by
Vice-Rector for Academic Affairs V.V.Dyomin