MINISTRY OF EDUCATION OF THE REPUBLIC OF AZERBAIJAN

Approved by Order No. 1463 of the Ministry of Education of the Republic of Azerbaijan dated August 31, 2012.

STATE STANDARD OF HIGHER EDUCATION

EDUCATION PROGRAM FOR THE MASTER'S LEVEL

IN THE RELEVANT SPECIALTY

Code and Title of the Specialty (Program): 060632 – Information Technologies and Systems Engineering

BAKU – 2012

1. General Provisions

1.1. The Education Program for the master's level specialty **060632 – Information Technologies and Systems Engineering** has been developed in accordance with the *Law of the Republic of Azerbaijan on Education*, the *State Standard and Program of Higher Education* approved by relevant decisions of the Cabinet of Ministers of the Republic of Azerbaijan, the *Requirements on the Content, Organization, and Awarding of the "Master" Degree of Master's Education*, the *Classification of Specialties (Specializations) at the Master's Level of Higher Education*, and other legislative acts.
1.2. Regardless of their subordination, type of ownership, or organizational-legal form, all higher education institutions operating in the Republic of Azerbaijan shall implement master's degree training in the specialty **060632 – Information Technologies and Systems Engineering** based on this Education Program.
1.3. Symbols used in the structure:
GC – General Cultural Competencies
PC – Professional Competencies

2. Characteristics of the Specialty 060632 – Information Technologies and Systems Engineering

2.1. Standard duration of the Education Program and the academic degree awarded to graduates:

Code and Title of the Specialty	Awarded Academic Degree	Duration of Full-Time Education	Number of Credits
060632 – Information Technologies and Systems Engineering **Specializations:** - *Information Protection and Security* - *Multichannel Systems and Network Protocols* - *Information Technologies and Telecommunication Systems* - *Information Systems in Management* - *Automated Flight Control Systems* - *Information Technologies in the Oil, Petrochemical, and*	Master	2 years (the duration of module education is 6 months longer.)	120

Chemical Industries - *Automated Systems for Information Processing and Management* - *Applied Software Engineering* - *Economic Informatics* - *Bioinformatics* - *Aerospace Information Systems*			

3. Graduate's Specialty Profile and Competencies

3.1. Specialty Profile of the Master's Graduate

The master's graduate should possess a broad knowledge and general understanding of theoretical principles and research methods, be prepared to conduct scientific research and engage in pedagogical activities requiring professional training, and be capable of solving unexpected and complex problems within the scope of their professional activity.

3.2. Competency Requirements for the Graduate upon Completion of the Program

3.2.1. The graduate must acquire the following general cultural competencies (GC):

- Ability to work in a team (GC-1);
- Ability to communicate with specialists from other fields (GC-2);
- Active social mobility (GC-3);
- Ability to work in the international arena (GC-4);
- Possession of legal knowledge and adherence to ethical standards (GC-5);
- Ability to generate new ideas (GC-6);
- Ability to work independently (GC-7);
- Skills and experience in organizing scientific research and scientific-production activities, and managing a team (GC-8);
- Ability to serve as a role model in terms of knowledge, skills, and personal initiative (GC-9);
- Ability to organize and plan work effectively (GC-10).

3.2.2. The graduate must acquire the following professional competencies (PC):

In the field of scientific research, the graduate must be able to:

- Use mathematical modeling methods based on deep knowledge of fundamental sciences and computer subjects (PC-1);
- Apply mathematical and algorithmic methods in the analysis of information technology problems (PC-2);
- Conduct scientific research and exploratory work using information technologies (PC-3);

- Independently analyze classical problems in the field from their physical aspects (PC-4);
- Present the results of their own scientific investigations (PC-5);
- Independently construct an overall picture of the discipline (PC-6).

In the production-technological field, the graduate must be able to:

- Be familiar with modern algorithms of computer mathematics and use them to improve and develop the theoretical aspects of computer science (PC-7);
- Possess knowledge and skills in building and applying computer models of systems and processes (PC-8);
- Develop and implement algorithms in modern software suites (PC-9).

In the organizational-administrative field, the graduate must be able to:

- Identify general patterns and laws within subject groups (PC-10);
- Use mathematical and algorithmic modeling methods in the analysis of economic and social processes (PC-11);
- Present knowledge in the field of computer engineering and adapt it to work conditions (PC-12);
- Lead scientific research work in teams (PC-13);
- Express non-mathematical knowledge (including humanities) concisely and accurately (PC-14);
- Solve unexpected and complex problems within the scope of professional activity (PC-15);
- Propose and plan relevant activities and methods, and analyze their short- and long-term results (PC-16);
- Creatively identify and formulate problems related to professional or educational activities and solve them within specific time frames and limited information (PC-17);
- Select and apply appropriate technologies and methods when solving problems related to professional or educational activities, and determine and/or evaluate potential outcomes (PC-18);
- Critically evaluate personal behaviors when solving problems related to professional or educational activities (PC-19);
- Present and justify problems related to professional or educational activities orally and in writing in Azerbaijani and one foreign language, and participate in relevant discussions with specialists and non-specialists (PC-20);
- Act independently in complex and unexpected situations requiring innovative approaches (PC-21);
- Take responsibility for the strategic activities of organizations or groups (PC-22);
- Behave ethically in complex situations, understand ethical aspects, opportunities, limitations, and social roles of personal behavior, and conduct well-reasoned evaluations on issues related to professional and educational activities (PC-23);

- Assess personal and others' needs for continuous learning and professional development, and effectively use methods necessary for independent education (PC-24).

In the pedagogical field, the graduate must be able to:

- Teach practical and theoretical knowledge on the application of information technologies at general education, technical-vocational, secondary specialized institutions, and the bachelor's level of higher education (PC-25);
- Obtain current scientific and technical information from electronic libraries and abstract journals (PC-26);
- Transfer their knowledge to others through teaching, training, or other methods (PC-27).

4. Minimum Requirements for the Level of Professional Training and the Content of Education

4.1. Characteristics of Professional Activity

4.1.1. Main Directions of Professional Activity for Masters in Specialty **060632 – Information Technologies and Systems Engineering:**

- Scientific research;
- Pedagogical;
- Production-technological;
- Organizational-administrative, etc.

4.1.2. Requirements for the Level of Preparation:

In the scientific research field, the graduate must be able to:

- Use computer modeling methods to solve scientific, organizational, and applied problems in the study of real processes and objects;
- Analyze scientific research conducted in computer engineering by utilizing achievements in science and technology, as well as advanced experiences from Azerbaijan and foreign countries, and summarize the results;
- Prepare and conduct conferences, seminars, and symposiums;
- Prepare and edit scientific publications.

In the pedagogical field, the graduate must be able to:

- Deliver lectures;
- Conduct seminars, etc.

In the production-technological field, the graduate must be able to:

- Use modern computing technology and software;
- Apply fundamental knowledge in the development and production of measurement technology;

- Utilize modern methods in automatic data collection and processing.

In the organizational-administrative field, the graduate must be able to:

- Organize the work of scientific research groups;
- Apply scientific innovations to forecast the outcomes of activities;
- Evaluate the results of decisions both quantitatively and qualitatively.

4.2. Minimum Requirements for the Content of Education

□ Specialty-specific course sections, course credits, expected learning outcomes (in terms of knowledge, skills, and abilities), and the codes of competencies to be acquired.

Course section code	Course sections and their learning outcomes (in terms of knowledge, skills, and abilities)	Number of credits by course sections	Course code and title	Number of credits for the course	Codes of competencies to be acquired
Educational component					
MHC – B00	**Humanities Section** As a result of studying the courses included in this section, the master's graduate should be able to: understand the peculiarities of neutral speech information and rhythm in a foreign language, the main features of pronunciation style typical for the field of information technologies, a lexical minimum of about 4000 teaching lexical units including general and terminological vocabulary, the main features of scientific style, the culture and traditions of the countries of the studied language, and rules of speech etiquette; *In higher education pedagogy:* Understand the higher education system in Azerbaijan, the roles and duties of universities, students, and teachers, the educational process and content at higher education institutions, didactics and its modern problems, the lecture and its contemporary requirements, education and self-education, leadership and management issues, and the methodology of scientific research work for teachers and students; *In psychology:* know the object, subject, and methods of psychology, main directions of	14	**MHC – B01** *Foreign Language* **MHC – B02** *Higher Education Pedagogy* **MHC – B03** *Psychology* **MHC – B04** *Elective Course**	**6** **4** **2** **2**	**GC-1** **GC-2** **GC-3** **GC-4** **GC-5** **GC-6** **GC-7** **GC-8** **GC-9** **GC-10** **PC-3**

	psychology, the structure of the psyche, the interaction between consciousness and unconsciousness, student psychology, and related topics. ***<u>In the field of foreign languages:</u>*** The graduate should be able to read texts related to the field of computer engineering, translate subject-specific texts obtained from the Internet, and write annotations, summaries, theses, CVs, etc. ***<u>In the field of higher education pedagogy:</u>*** The graduate should be able to prepare and deliver lecture materials, plan and conduct seminars, carry out scientific research in their field of specialization, formulate relevant hypotheses, conduct experiments, and apply the results in practice. ***<u>In the field of psychology:</u>*** The graduate should be able to approach each student individually from a psychological perspective, involve students in experimental activities, and more. ***<u>The graduate must acquire the following skills and competencies:</u>*** The ability to read and write in a foreign language with the help of a dictionary, to conduct teaching and research activities in higher education institutions, and to apply appropriate psychological approaches in working with students.				
MSC – B00	**Specialization Courses Section** **Knowledge Requirements:** As a result of studying the subjects included in this section, the graduate must be knowledgeable in the following areas: - Methods and tools for applying computer technologies in science and education; - Software packages used in scientific research and in the automation of computational practices; - Modern technologies for data analysis; - Computer modeling of systems	76	**MSC – B01** *Current Issues in Information Technologies* **MSC– B02** *History and Methodology of Information Technologies* **MİF – B03** *Course Defined by the Higher Education Institution*	**4** **2** **4**	**GC-1** **GC-2** **GC-4** **GC-6** **GC-7** **GC-8** **GC-9** **GC-10** **PC– 1** **PC – 4** **PC – 5** **PC – 6** **PC – 7** **PC – 8** **PC – 9** **PC– 10** **PC– 11**

	and processes; - Analysis and design of digital systems. - The mathematical foundations of decision-making theory; - Internet technologies; - Object-oriented programming; - Intelligent systems; - Systems for the collection and processing of aerospace information; - Aerospace computing complexes; - Methods of optimal control and optimization in aerospace systems; - Methods and tools for modeling aviation training systems and simulators - Develop models of various systems and processes; - Conduct analyses based on software modules; - Apply information technologies in other scientific fields; - Gather information from various sources, analyze and process it; - Be familiar with the methods and tools of modern information technologies; - Apply informatics and programming to solve various problems. The student must **acquire**: - Skills in using mathematical modeling methods, computing technologies, and software tools, as well as modern methods for collecting and processing information.		**MSC – B04** *Specialization-Oriented Courses* **MSC – B05** *Elective Course**	**42** **24**	**PC– 12** **PC– 13** **PC– 14** **PC– 15** **PC– 16** **PC– 17** **PC– 18** **PC– 19** **PC– 20** **PC– 21** **PC– 22** **PC– 23** **PC– 24** **PC– 25** **PC– 26** **PC– 27**
MET – B00	**Research Activities** By conducting research work, the master's student must be knowledgeable and capable in the following areas: - planning scientific research activities; - selecting a research topic; - compiling a bibliography; - conducting scientific research; - analyzing the results of the research and comparing them with the results of other authors; - identifying the practical significance and potential		Scientific Research Internship Scientific-Pedagogical Internship Preparation and Defense of the Master's Thesis	**6** **6** **18**	**GC-6** **GC-7** **GC-8** **GC-9** **GC-10** **PC – 1** **PC – 2** **PC – 3** **PC – 4** **PC – 5**

	applications of the obtained results; - determining the possibilities for further continuation of the research; - defending the completed research work; - preparing the research results for publication; - participating in scientific research and scientific-pedagogical internships, generalizing their results, and using them in the master's thesis, etc.				
	Total Number of Credits	**120**		**120**	

**In all sections, elective courses are determined by higher education institutions in accordance with the relevant competencies.*

***Competencies corresponding to specializations and the related courses are determined by higher education institutions.*

4.2. Duration of the Master's Program for the Specialty:

Total number of weeks – 94, including:

- Theoretical instruction – 45 weeks
- Practical training (scientific research and scientific-pedagogical) – 8 weeks
- Examination sessions – 15 weeks
- Preparation and defense of the master's thesis – 12 weeks
- Holidays – 14 weeks

5. Material and Technical Teaching Base and Human Resources Potential

5.1. The higher education institution must have a material and technical base equipped with relevant ICT (Information and Communication Technologies) resources, including classrooms, laboratories, computer labs, workshops, etc., for conducting courses, practical sessions, and scientific research work in accordance with the curriculum of the 060632 – Information Technologies and Systems Engineering specialty. Students must be provided access to the institution's local network, the Internet, databases, electronic libraries, and search systems.

5.2. Teaching of the courses is generally carried out by the faculty members of the higher education institution who hold academic degrees or titles. Specialists from other institutions and organizations who meet these requirements may also be involved in this activity.

5.3. Scientific supervision of master's theses is generally conducted by members of the faculty holding academic degrees or titles at the respective educational institution

or by qualified specialists from other institutions and organizations who meet these requirements.

6. Forms and Methods of the Teaching Process

6.1. The theoretical training and pedagogical preparation of the master's student are conducted in the form of lectures, practical sessions, seminars, consultations, independent work, pedagogical practice, and other formats.
6.2. In the teaching process of master's training, various methods such as oral explanations, interviews, interactive learning, independent work, discussions, round tables, illustrations, research activities, laboratory and practical work, and other methods may be employed.
6.3. In the master's training for the specialty 060632 – Information Technologies and Systems Engineering, scientific-research and scientific-pedagogical practices are envisaged (the purpose and tasks of these practices are determined depending on the specialty). Depending on the type of practice, they can be conducted in relevant organizations or in the departments and laboratories of higher education institutions.

7. Requirements and Assessment for the Final State Attestation

7.1. The final state attestation consists of the defense of the master's thesis. The requirements for the content, volume, structure of the thesis, and the rules of its defense are determined by the Ministry of Education of the Republic of Azerbaijan.

7.2. The assessment of students' knowledge is carried out based on the procedures approved by the Cabinet of Ministers of the Republic of Azerbaijan.

7.3. Upon successful completion of the final state attestation, graduates are awarded the master's academic degree and a state-standard diploma.

Approved by:

Director of the Institute the Republic of Azerbaijan of Educational Problems of the Republic of Azerbaijan

_____A.Mehrabov

«____» _____ 2012 year

Head of the Department of Higher and Secondary Specialized Education, Ministry of Education of the Republic of Azerbaijan.

_____I.Mustafayev

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Chairman of the working group preparing the State Education Standards on educational specialties group

_____Kh.Yahudov

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Chairman of the "Computer Science" section of the Scientific Methodological Council of the Ministry of Education of the Republic of Azerbaijan

_____ R.Mahmudzade

«___» _____ 2012 year