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## PROGRAM DESCRIPTION

- **Program Level: Master degree**
- **Code and names of areas of training:** 7M015 - Teacher training in natural science subjects
- **Code and name of the programme:** 7M01522 - “Physics and computer science with the basics of STEM learning”
- **Typical period of study:** 2 years
- **Number of ECTS credits for the programme:** 120
- **Qualification level:** 7 National qualification framework, 7 European qualification framework
- **Aim/purpose with the programme:** Training of highly qualified competitive masters who meet modern principles of teaching in the field of STEM education, based on leadership and an integrative approach to teaching and research.
- **Learning outcomes for the programme**
  1. Deeply understand modern trends in education, features of STEM - training for the development of functional literacy of students.
  2. Effectively use psychological and pedagogical technologies in professional activities necessary for the training, development and education of students, including those with special educational needs
  3. Conduct training sessions professionally, actively using STEM technology to develop students' life skills.
  4. Integrate and apply science and engineering practices into teaching, learning materials and assessment, demonstrating skills in analyzing, selecting and transforming information.
  5. Reasonable to plan and manage projects at all stages of their life cycle, solving problems based on critical thinking, applying digital technologies and resources, using logical, systematic and sequential approaches
  6. In cooperation with colleagues, plan and conduct research in the field of natural and pedagogical sciences to improve the practice of

education, introducing the results of research into practical pedagogical activities.

7. Generate new ideas and solve professional problems, including interdisciplinary areas.

8. Critically determine the strategy of scientific, socio-pedagogical and communicative activities, making decisions and taking responsibility for the results.

- **Content of the programme**

The curriculum content of the Master's degree is divided into six modules, which is done so according to the main focus of the program. The next types of activities are used in education: Lecture(L), Lecture with practice(LP), Practice(P), Seminar(S), Research seminar(RS), Laboratory work (LW).

### **Module 1: Module of Scientific and pedagogical training**

It aims to provide a holistic overview of the history and philosophy of the development of science, problems and trends in higher education. The courses of this module are:

- History and philosophy of science (4ECTS,L,S);
- Foreign language (professional) (4ECTS,P);
- Higher School pedagogy (4ECTS,L, S);

### **Module 2: Methodology module**

Methodology module is aimed at examining various didactic strategies of pedagogy to foster the innovative engagement of diverse learners. The courses of this module are:

- Methods of teaching the basic principles of physics (4ECTS,LP);
- Methods of Teaching educational robotics (4ECTS,LP);
- Modern practices of STEM education in physics (5ECTS, LP);
- Modern practices of STEM education in computer science(5 ECTS, LP).
- Methods and technologies of STEM education (5 ECTS, LP).

### **Module 3: Technology module**

The Technology module is aimed at equipping future STEM teachers with

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conceptual knowledge of STEM approach in education and digital skills to be employed for teaching different STEM subjects. The courses of this module are:

- Introduction to STEM (4ECTS,LP,S);
- Concepts of modern natural science (4ECTS;L,S)
- Online Educational Platforms (6ECTS,L,S);
- Digital technologies in education (6ECTS,L,S).
- Design and development of digital educational resources (6ECTS,L,S).
- Pedagogical practice (4ECTS, P).

#### **Module 4: Leadership module**

Leadership module is aimed at fostering leadership skills to prepare future teachers for ongoing improvement of learning environment. The courses of this module are:

- Management Psychology (4 ECTS,L,S);
- Leadership and teamwork (6 ECTS, L,S);
- Project management (6 ECTS,L, S);

#### **Module 5: Physics of high technologies module**

Physics of high technologies module is aimed at equipping future STEM teachers with methodological, organizational, and research skills to be employed for teaching different STEM subjects.

- Technologies for converting solar and thermal energy into electrical energy(6ECTS,LP);
- Thermal radiation (6ECTS,LP);
- Physical foundations of high technologies (7ECTS,LP,S);
- Experimental physics (7ECTS,LP,)
- Intelligent robotic systems (7ECTS,LP,)
- Educational Robotics (7ECTS,LP,)
- Cloud technologies (7ECTS,LP,)
- Augmented reality (7ECTS,LP,)

#### **Module 6: Research work and final attestation module:**

Research module is aimed at enabling students to become informed consumers of research and to develop skills to prepare them to carry out action research in their schools and organizations. The content of this module are:

- Research work of a master student, including an internship and a master's thesis (24ECTS,RS)
- Execution and defense of the master's thesis (12ECTS,RS)

- **Educational profiles (if available)**
- Graduates of the program can work as teachers in schools, institutions of additional education, educational centers, interactive scientific museums and children's technology parks.
- Graduates of the program can continue their studies in PhD doctoral programs.

### **Teaching and working methods**

E-learning opportunities;

participation in design workshops under the supervision of experienced mentors;

lectures, trainings and master classes;

individual educational tracks, internships;

“production laboratory”;

public presentation of learning outcomes, protection of projects in the TED format

professional identity training

- **Entry requirements**

Requirements for applicants are established in accordance with the Model Regulations for Admission to study in educational organizations implementing educational programs of higher and postgraduate education Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018. The applicant should hold a bachelor’s degree in natural sciences or engineering. Applicants with degrees in other fields may be accepted, but may be required to take courses in preparation for graduate study in STEM education.

Individual achievements are desirable (scientific articles, participation in conferences, etc.)

*Entrance tests:*

a foreign language test;

test to determine readiness for learning: Critical thinking (elementary mathematics, interpretation of various forms of information);

test on the profile of a group of educational programs: Analytical thinking (analysis of academic and popular science texts, identification of hidden patterns, cause-and-effect relationships);

Methods of teaching physics;

General physics.

- **Degree thesis**

- A thesis for the Master's degree must show familiarity with previous work in the field and must demonstrate the ability to carry out research, organize results, and defend the approach and conclusions in a scholarly manner according to disciplinary norms.
- Master's thesis must be written by oneself in compliance with the principles of academic and scientific ethics.