Matrices of goals and modules of the specialty 6B07109 "Engineering physics and material science", based on professionally significant competencies of skills and abilities

Guidance for developing the Objectives and Modules Matrix

The goal matrix allows you to build a specialty in two directions:

1. A simple "Matrix of Objectives and Modules" maps the expected learning outcomes (competency profile) of the program to the modules through which these competencies can be acquired.

2. The "Matrix of goals and modules" based on professionally significant skills and abilities is also a tool for building expected competencies with models of established learning outcomes (as close as possible) similar to ASIIN professionally significant skills and abilities (PSS) from the point of view of the university. They are available for engineering and natural sciences, as well as for typical interdisciplinary programs.

First of all, this method of "matching" helps to determine how the learning outcomes of the specialty are similar to the models of the established learning outcomes of the PSS, or complement them or deviate from them.

Thus, the established learning outcomes of the PSS represent the ideal goals and objectives of the program in the relevant subject area. In case of rejection of program orientation or interdisciplinary educational programs, it would be useful to include additional learning outcomes. Deviations from the PSS depending on the profile and orientation of the program are possible and can be explained by the university.

Secondly, the university must present to what extent each module of the program contributes to the achievement of one or more goals and objectives of the specialty. The stated expected learning outcomes should be reflected in the relevant module descriptions according to the program level. Thus, it is possible to evaluate performance horizontally in two directions. This can be analyzed when all learning objectives are covered by the modules. In addition, it is possible to assess whether the main task of learning at the program level is reflected appropriately in the objectives of the module at the module level.

The matrix of goals and models can also be used by the university as a tool in the development and further development of goals and learning outcomes.

Table 1: Goal Matrix

PSS ASIIN	Expected learning outcomes of the specialty	Relevant Modules
	Knowledge and understanding	
graduates, in particular:		
possess fundamental knowledge of scientific and engineering principles in the field of engineering physics and materials science	The content of the educational program 6B07109 "Engineering Physics and Materials Science" is aimed at forming fundamental knowledge in the field of solid-state physics, structure and properties of materials, modern technologies for obtaining and processing materials. Graduates must know the main types of structural and functional materials, methods of controlling their	Engineering Physics Module

	properties and modern directions of materials science development.	
possess an understanding of modern scientific research and technologies	Graduates must know modern methods of materials research, methods of computer modeling of materials and technologies for creating new materials and nanomaterials.	Nanotechnology Module
Engineering analysis		
Graduates are able to analyze engineering tasks based on scientific methods	Graduates must be able to analyze the structure and properties of materials, apply physico-chemical analysis methods and use modern analytical methods of materials research.	Engineering Physics Module
Graduates are able to formulate and solve complex engineering tasks	Graduates must be able to analyze the properties of materials for various operating conditions, select optimal materials and predict their performance characteristics.	R&D Module
Engineering design		
Graduates have special competencies in:		
the development of engineering solutions and solutions for fundamentally oriented and partially non-ordinary problems, considering them in relation to a wide coverage of other disciplines	Graduates must possess knowledge of modern methods of materials processing and be able to design technological processes for obtaining materials with specified properties.	Engineering Physics Module
the development of new materials and technologies	Graduates must know the main directions of nanotechnology development and be able to apply modern methods of obtaining nanomaterials and nanostructures.	Nanotechnology Module
Scientific research and evaluation		
Graduates have special competencies to:		
conduct scientific research	Graduates must possess methods of scientific research, be able to conduct experiments, analyze and interpret the results of scientific research.	Research module (R&D)
critically evaluate scientific data and draw conclusions	Graduates must possess methods of analyzing technological processes of obtaining materials, conduct testing and diagnostics of materials, as well as apply modern methods of nanomaterials research.	Research module (R&D)
research and evaluate the application of new and emerging technologies in their discipline.	- the ability to identify new areas of research, new problems in the field of nanotechnology and diagnostics of nanomaterials, the possibilities of creating new functional materials with their subsequent use in practice; - the ability to formulate technical specifications, develop and use technical means in carrying out technological processes for	Research module Practice-oriented module

	obtaining and processing nanomaterials, and compose the necessary set of technical documentation; - skills in the development, commissioning and operation of science-intensive technological and analytical equipment; - the ability to solve applied engineering and technical and economic problems with the help of application software packages.	
Engineering practice		
Graduates are able to		
apply knowledge in practice	Graduates must possess skills of working with research equipment and apply engineering knowledge in solving practical tasks in the field of materials science.	Practice-oriented module
Graduates are able to evaluate the efficiency of technological processes	Graduates must be able to analyze technological processes of obtaining materials and choose optimal technologies.	Practice-oriented module
Broad application skills		
Graduates		
are able to integrate knowledge from various fields	Graduates must be able to apply interdisciplinary knowledge in solving complex engineering tasks and take into account technological and economic aspects of materials production.	Engineering Physics Module
are able to work effectively in a team and communicate	Graduates must possess scientific communication skills, be able to present research results and work in interdisciplinary teams.	Practice-oriented module
are able to work at the national and international level	Graduates must possess fundamental professional training and be able to participate in scientific and technical projects and research.	Practice-oriented module