Matrices of goals and modules of the specialty 8D07103 "Materials Science and Engineering", 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 advanced knowledge in the field of materials science and engineering	The content of the educational program 8D07103 "Materials Science and Engineering" is aimed at forming systematic knowledge of modern trends in materials science, physics of low-dimensional systems, methods of structural modification of materials, and modern technologies for obtaining new functional materials. Doctoral students must possess knowledge of the	Basic Training Module

	regularities of structure formation and properties of materials at the micro- and nano-level.	
possess a critical understanding of modern scientific research in the field of materials science	Doctoral students must know modern scientific approaches to the development of new materials, methods of scientific data analysis, as well as current directions in the development of materials science and nanotechnology.	Basic Training Module
Engineering analysis		
Graduates are able to analyze complex scientific and engineering tasks	Doctoral students must be able to apply modern physico-chemical methods of materials research, analyze the structure and properties of materials, and use analytical and computational methods to solve scientific problems.	Profile Training Module
Graduates are able to formulate and solve scientific problems of global level	Doctoral students must be able to formulate scientific tasks, develop scientific hypotheses, and conduct comprehensive analysis of research results.	Profile Training Module
Engineering Design and Innovation		
Graduates have special competencies in:		
developing new materials and technologies	Doctoral students must master modern methods of materials design, be able to develop new materials with specified functional characteristics, and implement innovative technologies in the field of materials science.	Profile Training Module
Scientific Research and Evaluation		
Graduates have special competencies to:		
conduct independent scientific research	Doctoral students must master research methodology, be able to plan and conduct experimental research, and analyze and interpret the obtained results.	Research Module
Graduates are able to critically evaluate scientific results	Doctoral students must be able to conduct scientific analysis of experimental data, apply data processing methods, and formulate scientifically substantiated conclusions.	Research Module
Pedagogical and Professional Activity		
Graduates are able to		
transfer knowledge and participate in the educational process	Doctoral students must possess pedagogical competencies, be able to conduct classes, and participate in the training of specialists in the field of materials science.	Practice-Oriented Module
Practical Activity		
Graduates		

are able to apply scientific results in industry and scientific organizations	Doctoral students must be able to apply research results to solve applied problems, participate in the development of innovative technologies and scientific projects.	Practice-Oriented Module
Communication and Scientific Cooperation		
Graduates are able to present research results at the international level	Doctoral students must be able to publish research results in international scientific journals, participate in international conferences and scientific projects.	Research Module
Completion of the Educational Program		
Graduates demonstrate the ability to conduct original scientific research	Doctoral students must prepare and defend a doctoral dissertation containing new scientific results in the field of materials science and engineering.	Final Certification Module