1 OPTIONAL COMPONENT OF THE CYCLE OF CORE COURSES

Optional component 1

Course: **Philosophical foundations of mathematics**

Intensity of the Course: 5 academic credits

Module Code: **RMOM-2**

Module Name: **Research methods of mathematics**

Prerequisites: basic knowledge of mathematics

Purpose: formation of skills to improve the effectiveness of education through pedagogical monitoring.

Short Description: The course "Philosophical Foundations of Mathematics" examines the elements of the theory of knowledge, the connection between philosophical and mathematical forms of knowledge, analyzes the problems of methodology and metaphysics of modern mathematics, outlines selected questions of didactics of mathematics that have a methodological background.

Learning Outcomes in EP (LOP):

LOP 5 – participates in scientific discussions with a critical assessment of all major types of research in the field of mathematical education;

LOP 6 – solves scientific and methodological problems in the field of mathematical education, taking into account global trends and strategies for the development of higher education and contributes to the expansion of the range of research;

LOP 9 – Possesses high-level critical and creative thinking skills, is capable of self-regulation and reflection to solve professional tasks.

Learning Outcomes in Course (LOC):

LOD 1 – he knows about the philosophical foundations of mathematics, the features of mathematical knowledge, the formation and development of mathematical science, the structures of mathematical knowledge, the features of mathematical cognition.

LOD 2 – differentiation of the main directions in the philosophy of mathematics: Pythagoreanism, Platonism (and its types), a priori, empiricism (and its types), fundamentalist and non-fundamentalist (socio-cultural) directions in the philosophy of mathematics.

LOD 3 – The philosophical and methodological analysis of mathematical theories can create a methodological basis for new research methods in modern mathematics of the culture of philosophical and mathematical thinking.

Post requisites: Doctoral student research work, including internship and doctoral dissertation.

Optional component 1

Course: **Modern methods of mathematical and graphical information processing**

Intensity of the Course: 5 academic credits

Module Code: **RMOM-2**

Module Name: **Research methods of mathematics**

Prerequisites: basic knowledge of mathematics

Purpose: formation of skills for choosing effective modern mathematical and graphical methods of information processing using computer technologies that help evaluate the results of the experiment.

Short Description: He is proficient in modern mathematical and graphical methods of information processing; is able to mathematically evaluate the results of an experiment and draw theoretical conclusions; is able to work in a team in the implementation of professional activities using modern methods of mathematical modeling.

Learning Outcomes in EP (LOP):

LOP 4 - uses information and communication and digital technologies in research and teaching activities;

LOP 7 – constantly expands methodological competence, deepening knowledge in the field of mathematics and mathematical education and improving research abilities.

LOP 9 – Possesses high-level critical and creative thinking skills, is capable of self-regulation and reflection to solve professional tasks.

Learning Outcomes in Course (LOC):

LOD 1 – It can use the capabilities of modern information and communication technologies in software, information retrieval systems and databases;

LOD 2 -can work independently on the Internet, on a computer with a basic set of application programs;

LOD 3 - the skills of using modern information technologies and telecommunications, global information resources in research, computational and analytical, design and technological activities are improved.

Post requisites: Doctoral student research work, including internship and doctoral dissertation.

Optional component 1

Course: **Teaching methods for solving boundary value problems**

Intensity of the Course: 5 academic credits

Module Code: **FPMM -3**

Module Name: **Fundamental problems of modern mathematics**

Prerequisites: differential equations.

Purpose: familiarization of doctoral students with modern teaching methods for solving differential equations, formation of skills for self-study of literature on methods of solving differential equations and their application, development of skills in choosing effective numerical methods for solving differential equations.

Short Description: knows analytical methods for solving differential equations; knows the method of choosing numerical methods and algorithms for solving differential equations using basic concepts and calculus methods; can analyze solutions of differential equations based on the results obtained during the study.

Learning Outcomes in EP (LOP):

LOP 5 – participates in scientific discussions with a critical assessment of all major types of research in the field of mathematical education.

LOP 7 – constantly expands methodological competence, deepening knowledge in the field of mathematics and mathematical education and improving research abilities.

LOP 9 – Possesses high-level critical and creative thinking skills, is capable of self-regulation and reflection to solve professional tasks.

Learning Outcomes in Course (LOC):

LOD 1 – knows analytical methods for solving boundary value problems;

LOD 2 – owns the method of choosing numerical methods and algorithms for solving boundary value problems using basic concepts and methods of calculus;

LOD 3 – can analyze solutions to boundary value problems based on the results obtained during the study.

Post requisites: Doctoral student research work, including internship and doctoral dissertation.

Optional component 1

Course: **Functional literacy assessment model**

Intensity of the Course: 5 academic credits

Module Code: **FPMM -3**

Module Name: **Fundamental problems of modern mathematics**

Prerequisites: mathematical literacy, basic knowledge of mathematics

Purpose: formation of skills for developing models for evaluating functional literacy by studying the ideas and tools of the main components of functional literacy: mathematical literacy, reading literacy, natural science literacy, financial literacy, global competencies and creative thinking.

Short Description: receives information about the international context of the development of research on functional literacy, on monitoring the formation of functional literacy, on general approaches to assessing the functional literacy of primary school students, on the development of specifications for measuring materials and requirements for tasks for assessing functional literacy and on models for assessing the functional literacy of students. In the process of applying a certain model of functional literacy assessment, a doctoral student can specify and supplement the content of individual blocks.

Learning Outcomes in EP (LOP):

LOP 4 – uses information and communication and digital technologies in research and teaching activities;

LOP 7 – constantly expands methodological competence, deepening knowledge in the field of mathematics and mathematical education and improving research abilities;

LOP 9 – Possesses high-level critical and creative thinking skills, is capable of self-regulation and reflection to solve professional tasks.

Learning Outcomes in Course (LOC):

LOD 1 – to recognize problems that arise in the surrounding reality, which can be solved with the help of a certain object;

LOD 2 – to explain the results obtained taking into account the task in mathematics and mathematical education; to formulate and record the final results of solving the problem;

LOD 3 – can distinguish between the main documents defining the content of the assessment and the form of presentation of the results, conceptual and methodological approaches to measurement.

Post requisites: Doctoral student research work, including internship and doctoral dissertation.