CONTENT

1. OPTIONAL COMPONENTS OF THE CYCLE OF CORE COURSES

Optional component 1

Course: **Web design in Python**
Intensity of the Course: 5academic credits
Module Code: DTSE 501/1
Module Name: Digital technologies in science and education
Prerequisites: Courses of programming languages
Purpose: Formation of practical skills in designing, developing and implementing web scripts in Python.
Short Description: Web 2.0 Application Basics. HTML and CSS basics. A practical introduction to the Python programming language for Django. Development of modern web applications in the Python programming language using Django. Web forms in Django. Validation. JavaScript. The administrative section of Django. Authentication and authorization in Django. Using databases in Django. SQLite. Models in Django. Development of an online project.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 6- Develops software products, mobile and web applications used in professional and practical activities
Learning Outcomes in Course (LOC):
LOC 1 - creating programs in high-level programming languages
LOC 2 - project development using network technologies
LOC 3-design, development of web scripts in Python
Post requisites: Computer modeling of applied problems

Optional component 1

Course: **High-level programming**
Intensity of the Course: 5academic credits
Module Code: DTSE 501/2
Module Name: Digital technologies in science and education
Prerequisites: Courses of programming languages
Purpose: formation of skills for building programs in high-level programming languages.
Short Description: Basic language syntaxes. Modern methods and technologies of programming. Building programs using a programming language. Configuration and testing of the developed software product. Analysis of the results obtained. Building programs in high-level programming languages.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 6- Develops software products, mobile and web applications used in professional and practical activities
Learning Outcomes in Course (LOC):
LOC 1 - creating programs in high-level programming languages
LOC 2 - project development using network technologies
LOC 3-design, development of web scripts in Python
Post requisites: Computer modeling of applied problems

Optional component 2

Course: **Scientific research seminar**
Intensity of the Course: 5academic credits
Module Code: RW 502/1
Module Name: Research work
Prerequisites: no
Purpose: Formation of skills for developing a research work plan, working with scientific, educational and methodological literature, interpreting data and formulating conclusions.
Short Description: Features of research in mathematical education. Organization and conduct of methodological research. Development of a research work plan. Work with scientific, educational and reference literature. Determining the purpose of the study.Problem statement (definition of the object and subject of research).Development of a hypothesis and a concept of research. Selection of methods and their combinations. Collecting actual data using different methods. Quantitative and qualitative analysis. Interpretation of data and formulation of conclusions.Language and style of scientific work. Requirements for the term. Diagrams, tables, graphs. Bibliographic apparatus. The reference device. Citation. Methods of qualitative analysis. Ethical aspects of the development of science. Ethical analysis of the phenomenon of plagiarism.
Learning Outcomes in EP (LOP):
LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;
LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining
Learning Outcomes in Course (LOC):
LOC 1 - Performing research work
LOC 2 - Using data analysis methods
Post requisites: Undergraduate research work

Optional component 2

Course: **Qualitative research methods**
Intensity of the Course: 5academic credits
Module Code: RW 502/2
Module Name: Research work
Prerequisites: no
Purpose: Formation of skills for conducting scientific research, using qualitative research methods, conducting qualitative analysis.
Short Description: Methodology of scientific research. General characteristics of research methods. Stages and levels of scientific research. Definition of concepts: qualitative methodology, qualitative research methods, qualitative analysis. Classification of scientific research methods. The research potential of qualitative methods. Practical problems solved with the help of qualitative research. Advantages and limitations of qualitative research methods. Principles and forms of organization of scientific and technical activities, its results. Conducting a pedagogical experiment. Work on the manuscript. Approbation of the dissertation research and publication of its results.
Learning Outcomes in EP (LOP):
LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;
LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining

Learning Outcomes in Course (LOC):
LOC 1 - conducting scientific research
LOC 2 - conducting a pedagogical experiment
Post requisites: Undergraduate research work

Optional component 3

Course: **AR and VR in education**
Intensity of the Course: 5academic credits
Module Code: RW 503/1
Module Name: Problems of Teaching Informatics
Prerequisites: no
Purpose: Formation of skills for using the possibilities of virtual and augmented realities.
Short Description: Virtual reality. Augmented reality. Representation of the subject area of education in a multidimensional system. The use of virtual reality in education. Application of augmented reality in education. The safety of using virtual reality and augmented reality in education. The use of virtual and augmented reality (VR and AR) technologies.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 5- Organizes educational and creative activities of students using advanced pedagogical technologies and products of innovative systems
LOP 6- Develops software products, mobile and web applications used in professional and practical activities
Learning Outcomes in Course (LOC):
LOC 1 - Development of a digital educational resource
LOC 2 - Mobile and Web application development
Post requisites: Development of educational Smart applications

Optional component 3

Course: **Modern problems of pedagogical technologies**
Intensity of the Course: 5academic credits
Module Code: RW 503/2
Module Name: Problems of Teaching Informatics
Prerequisites: no
Purpose: Formation of skills for using the possibilities of virtual and augmented realities
Short Description: The essence of pedagogical technologies. Implementation and management of curricula and projects. Evaluation of training programs and projects. Information management and training. Automated and electronic systems for ensuring the educational process of the organization. Current trends and problems in primary education. Current trends and problems in secondary education. Modern trends and problems in higher education. The main problems of the introduction of pedagogical technologies. Organization of independent work. Development of creativity. Formation of a communicative culture. Support of the teacher's activities. Development of pedagogical technologies.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 5- Organizes educational and creative activities of students using advanced pedagogical technologies and products of innovative systems

LOP 6- Develops software products, mobile and web applications used in professional and practical activities

Learning Outcomes in Course (LOC):

LOC 1 - Development of a digital educational resource

LOC 2 - Mobile and Web application development

Post requisites: Development of educational Smart applications

2. OPTIONAL COMPONENTS OF THE CYCLE OF MAJOR COURSES

Optional component 1

Course: **Pedagogical management and educational marketing**

Intensity of the Course: 5 academic credits

Module Code: ISE 505/1

Module Name: Integration of science and education

Prerequisites: no

Purpose: Formation of skills in management, marketing activities in an educational organization.

Short Description: Marketing as a direction of management activity. The concept of educational marketing. The essence and features of marketing in the field of education. Subjects and objects of marketing of an educational organization, their functions. Marketing environment of educational organizations. Management of marketing activities in an educational organization. Competitive position of educational organizations in the market of educational services. The model of marketing monitoring of the labor market of teachers. The program of consumer monitoring of the quality of education at the university.

Learning Outcomes in EP (LOP):

LOP 2 - To present the theoretical and methodological foundations for the development of the science of pedagogy and psychology, the management and knowledge processes, the nature and content of psychological and pedagogical research

LOP 5 - Organizes educational and creative activities of students using advanced pedagogical technologies and products of innovative systems

Learning Outcomes in Course (LOC):

LOC 1 - Organization and management of educational and creative activities of students

Post requisites: Modern problems of pedagogical technologies

Optional component 1

Course: **Leadership in Science and Education**

Intensity of the Course: 5academic credits

Module Code: ISE 505/2

Module Name: Integration of science and education

Prerequisites: no

Purpose: Formation of leadership functions of the head of education

Short Description: Theoretical and practical problems of leadership in education and science. Analysis of approaches to leadership as a tool for personal development of teachers and researchers. Leadership in education as a kind of social type of leadership. Leadership functions of the head of education. Styles of activity of leaders in education. Formal and informal leadership in the practice of education. The head of the education system, the educational institution as a leader. Requirements for leaders in education and science. Conditions for the development and realization of the individual's leadership potential in education and science.

Learning Outcomes in EP (LOP):

LOP 2 - To present the theoretical and methodological foundations for the development of the science of pedagogy and psychology, the management and knowledge processes, the nature and content of psychological and pedagogical research

LOP 5 - Organizes educational and creative activities of students using advanced pedagogical technologies and products of innovative systems

Learning Outcomes in Course (LOC):

LOC 1 - owns teaching methods

LOC 2 - uses advanced pedagogical technologies

Post requisites: Modern problems of pedagogical technologies

Optional component 3

Course: **Data mining**

Intensity of the Course: 5 academic credits

Module Code: PTCS 501/1

Module Name: Research work

Prerequisites: Scientific research seminar

Purpose: Formation of skills of working with algorithms of computer mathematics related to self-developing algorithms of data analysis

Short Description: The field of system analysis, related to the acquisition of knowledge from large arrays of structured data. Questions of modeling and system analysis related to the extraction of knowledge from information stored in databases. Statistical methods of data analysis. Algorithms of computer mathematics related to self-developing algorithms of data analysis – neural network, evolutionary, genetic, etc.

Learning Outcomes in EP (LOP):

LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;

LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining

Learning Outcomes in Course (LOC):

LOC 1 - uses various methods of data analysis

LOC 2 - evaluates the results of scientific work through data mining

Post requisites: no

Optional component 3

Course: **Mathematical processing of the results of a scientific and pedagogical experiment**

Intensity of the Course: 5 academic credits

Module Code: PTCS 501/2

Module Name: Research work

Prerequisites: Scientific research seminar

Purpose: Formation of skills for processing the results of a pedagogical experiment

Short Description: Descriptive statistics and their methods. Methods of presenting statistical data. Statistical data processing. Statistical hypotheses and criteria. Classification of research tasks. Identification of differences in the level of the studied trait. Comparison of research data with normative data. Consent criteria. Criteria χ^2. Assessment of reliability. Justification of the measurement research task. Comparison of two independent aggregates. The concept of an independent population. Using the Laplace function and t-Student statistics. Correlation analysis. Studies of dependencies between variables.

Correlation and regression analyses. Types of dependencies used in science. Types of applied goals in the framework of statistical dependency analysis.

Learning Outcomes in EP (LOP):

LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;

LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining

Learning Outcomes in Course (LOC):

LOC 1 - Performs research activities

LOC 2 - processing the results of a pedagogical experiment

Post requisites: no

Optional component 3

Course: **High-performance computing and supercomputing technologies**

Intensity of the Course: 5 academic credits

Module Code: PTCS 502/1

Module Name: Problems of Teaching Informatics

Prerequisites: High-level programming

Purpose: Teaching undergraduates the basics and principles of high-performance computing and the formation of skills in the use of supercomputer technologies to solve complex problems

Short Description: The study of supercomputer architecture, parallel programming, code optimization, distributed computing, as well as the application of parallel computing and supercomputer technologies in various fields such as scientific research, engineering, physics, economics and others.

The discipline examines the most important stages and trends in the development of computing systems, the basics of the theory of parallel computing in modern multiprocessor computers, practical skills in the use of parallelization, its feasibility, optimization of the time of its creation and repair. Examines the understanding of high-performance computing, supercomputer architecture, evaluation of high-performance systems, modern high-performance computing technologies, programming for high-performance computing and parallel programming based on MPI, programming with parallel data, computing of interacting systems, cloud computing, transformer systems, creation and launch of parallel applications.

Learning Outcomes in EP (LOP):

LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;

LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining

Learning Outcomes in Course (LOC):

LOC 1 – to develop and implement parallel algorithms for solving complex problems.

LOC 2 – The ability to analyze the requirements of a task and select suitable computing resources for its effective solution

LOC 3- develops skills of working with real supercomputer systems and software for high-performance computing

Post requisites: Digital technologies in scientific research

Optional component 3

Course: **Technology of organizing research work of students**

Intensity of the Course: 5 academic credits

Module Code: PTCS 502/2
Module Name: Problems of Teaching Informatics
Prerequisites: Scientific research seminar
Purpose: Formation of the skills of organizing and conducting research activities of students
Short Description: Organization and conduct of research activities of students. The role of research in a person-centered approach to learning. Research work of students within the framework of the implementation of state standards. Organization of research activities. Stages of research activity. Selection of the research topic. Research work. The reporting and presentation stage. The reasons for the decrease in the creative activity of students. The problem of attracting students to engage in research activities.
Learning Outcomes in EP (LOP):
LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;
LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining
Learning Outcomes in Course (LOC):
LOC 1 - organizes the research activities of students
LOC 2 - evaluates the results of scientific work
Post requisites: Undergraduate research work

Optional component 4

Course: **The CLIL method in computer science training**
Intensity of the Course: 5 academic credits
Module Code: PTCS 601/1
Module Name: Problems of Teaching Informatics
Prerequisites: Modern problems of pedagogical technologies
Purpose: Formation of skills of using CLIL technology, organization of subject-language activities of students in an integrated educational process
Short Description: Theoretical foundations of CLIL technology. Modern methods and technologies of integrated training and diagnostics. Issues of organizing students' cooperation aimed at the development of subject-language activities in the integrated educational process. Creative abilities for diagnostics, evaluation of the quality of the educational process. Formation of the educational environment, implementation of the tasks of innovative educational policy. Solutions to research problems.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 5- Organizes educational and creative activities of students using advanced pedagogical technologies and products of innovative systems
Learning Outcomes in Course (LOC):
LOC 1 - uses advanced pedagogical technologies and products of innovative systems
LOC 2 - Organizes educational and creative activities of students
Post requisites: Digital transformation of education

Optional component 4

Course: **Digital technologies in inclusive education**
Intensity of the Course: 5 academic credits

Module Code: PTCS 601/2
Module Name: Problems of Teaching Informatics
Prerequisites: Modern problems of pedagogical technologies
Purpose: Formation of skills in the use of digital technologies to support inclusive education.
Short Description: Types of digital technologies used in inclusive education. The benefits of using digital technologies to support inclusive education. Analysis of the policy of using digital technologies in inclusive education. International legislation. Implementation of the digital technology policy at the state level. Policy recommendations for the use of digital technologies to support inclusive education. Support for teachers and students. Development of curricula for inclusive education.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 5- Organizes educational and creative activities of students using advanced pedagogical technologies and products of innovative systems
Learning Outcomes in Course (LOC):
LOC 1 - uses digital educational resources
LOC 2 - uses advanced pedagogical technologies in individual or team work
Post requisites: Digital transformation of education

Optional component 5

Course: **Creating and using of digital educational and Internet resources**
Intensity of the Course: 6 academic credits
Module Code: DTSE 601/1
Module Name: Digital technologies in science and education
Prerequisites: AR and VR in education
Purpose: Formation of skills for the development and implementation of a training application project on a different platform
Short Description: The concept of mobile learning and features of its use. Analysis of the subject area of creating training applications on mobile platforms. Study of existing approaches to the use of training applications in the educational process. A method of consolidating previously acquired knowledge using training applications on a mobile platform. Development and implementation of the project of the training application on the mobile platform. Requirements for training applications to consolidate previously acquired knowledge. Description of the training application and the training process. Application development stages. Testing applications
Learning Outcomes in EP (LOP):
LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;
LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining
Learning Outcomes in Course (LOC):
LOC 1 - Develops digital educational resources
LOC 2 - Develops software products, mobile and web applications
Post requisites: Digital transformation of education

Optional component 5

Course: **Digital technologies in scientific research**
Intensity of the Course: 6 academic credits

Module Code: DTSE 601/2

Module Name: Digital technologies in science and education

Prerequisites: Scientific research seminar

Purpose: Formation of skills of work in the information and educational space, preparation of research papers, processing of research results.

Short Description: The concept of pedagogical design. Analysis of the needs of the target audience, its competence and expected results of training. Determination of goals and objectives of the educational material. Analysis and structuring of materials in accordance with the objectives. Selection of resources and methods of academic work. Creation of elements, style and visual design of the course. Development of tests and tasks, environment control and information collection. Creation of a course with the help of appropriate instruments, the task of the command's members to develop specific elements. Download the course in the management training system (LMS). Development of methods for evaluating the results and effectiveness of materials. Development of solutions for further improvement of educational content.

Learning Outcomes in EP (LOP):

LOP 3 - Performs research activities using digital technologies, computer modeling, high-performance computing, supercomputer technologies and various methods of data analysis;

LOP 7 - simulates applied tasks in the field of computer technology by critically evaluating the results of scientific work in this field through data mining

Learning Outcomes in Course (LOC):

LOC 1 - Performs research activities using digital technologies

LOC 2 - evaluates the results of scientific work

Post requisites: Undergraduate research work

Optional component 6

Course: **Development of educational Smart applications**

Intensity of the Course: 6 academic credits

Module Code: **PTCS 602/1**

Module Name: Problems of Teaching Informatics

Prerequisites: High-level programming

Purpose: Formation of skills for the development and implementation of a training application project on a different platform

Short Description: The concept of mobile learning and features of its use. Analysis of the subject area of creating training applications on mobile platforms. Study of existing approaches to the use of training applications in the educational process. A method of consolidating previously acquired knowledge using training applications on a mobile platform. Development and implementation of the project of the training application on the mobile platform. Requirements for training applications to consolidate previously acquired knowledge. Description of the training application and the training process. Application development stages. Testing applications

Learning Outcomes in EP (LOP):

LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work

LOP 6- Develops software products, mobile and web applications used in professional and practical activities

Learning Outcomes in Course (LOC):

LOC 1 - Develops digital educational resources

LOC 2 - Develops software products, mobile and web applications

Post requisites: Digital transformation of education

Optional component 6

Course: **Development of elective courses in computer science**
Intensity of the Course: 6 academic credits
Module Code: **PTCS 602/2**
Module Name: Problems of Teaching Informatics
Prerequisites: Modern problems of pedagogical technologies
Purpose: Formation of skills for creating a course with the help of appropriate tools, the development of tests and assignments, controls and information collection.
Short Description: The concept of pedagogical design. Analysis of the needs of the target audience, its competence and expected results of training. Determination of goals and objectives of the educational material. Analysis and structuring of materials in accordance with the objectives. Selection of resources and methods of academic work. Creation of elements, style and visual design of the course. Development of tests and tasks, environment control and information collection. Creation of a course with the help of appropriate instruments, the task of the command's members to develop specific elements. Download the course in the management training system (LMS). Development of methods for evaluating the results and effectiveness of materials. Development of solutions for further improvement of educational content.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 6- Develops software products, mobile and web applications used in professional and practical activities
Learning Outcomes in Course (LOC):
LOC 1 - Develops elective courses in computer science
LOC 2 - Develops software products, mobile and web applications
Post requisites: Digital transformation of education

Optional component 7

Course: **Online platforms in education**
Intensity of the Course: 6 academic credits
Module Code: ***DTSE 602/1***
Module Name: Digital technologies in science and education
Prerequisites: Development of elective courses in computer science
Purpose: Formation of skills for creating online courses, training courses, user management.
Short Description: Overview of platforms and services for online learning in education and their capabilities. Tools for creating online courses. Content support, creation of online courses. User management. Online learning platforms: Coursera, khanacademy, Bilim media Group, Daryn Online, Opiq, NIS Play, Atameken Academy, Blended learning. Using online services to create a training course.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 6 - Develops software products, mobile and web applications used in professional and practical activities
Learning Outcomes in Course (LOC):
LOC 1 - - Develops elective courses in computer science
LOC 2 - Develops software products, mobile and web applications
Post requisites: Digital transformation of education

Optional component 7

Course: **Digital transformation of education**
Intensity of the Course: 6 academic credits
Module Code: **DTSE 602/2**
Module Name: Digital technologies in science and education
Prerequisites: Scientific research seminar
Purpose: Formation of skills to work with updated educational content, digital transformation of education.
Short Description: Digital transformation of education: prospects and challenges. Updating the content of education. Key aspects of digital transformation of education. Digital transformation of education: world and domestic experience. A model of digital transformation of an educational organization. Universal principles and schemes. «Mass personal» education. Transformable activities at school. Digital educational environment. Stages of digital transformation. Digital gaps.
Learning Outcomes in EP (LOP):
LOP 4- Develops digital educational resources for blended and online learning in high-level programming languages through individual or team work
LOP 6 - Develops software products, mobile and web applications used in professional and practical activities
Learning Outcomes in Course (LOC):
LOC 1 - Develops elective courses in computer science
LOC 2 - Develops software products, mobile and web applications
Post requisites: нет