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“APPROVED”

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USING ARTIFICIAL INTELLIGENCE IN SCIENTIFIC AND PEDAGOGICAL ACTIVITIES COURSE SYLLABUS

level of higher education	third (educational and scientific)
branch of knowledge	01 Education / Pedagogy
specialty	011 Educational, pedagogical sciences
educational program	Educational, Pedagogical sciences
type of discipline	on request
a year of training	1
semester	2
the number of credits	5
the total number of hours	150
Full-time education	lectures – 32 hours, practical, seminar classes – 32 hours, independent work 86 hours.
Correspondence (distance) form of education	lectures – 10 hours, practical, seminar classes – 10 hours, independent work – 130 hours.

1. Description of the academic discipline

1.1 The purpose of teaching the selective educational discipline "Using artificial intelligence in scientific and pedagogical activities" is to acquaint students with the basics of artificial intelligence, their understanding of modern approaches to the creation and use of artificial intelligence systems in science, and the formation of the ability to critically apply them in scientific and pedagogical activities.

1.2 The main tasks of studying the discipline are:

- study of the history of the creation of artificial intelligence and the areas of its application in scientific and pedagogical activities;
- assessment of potential risks and threats of artificial intelligence for society and the environment;
- familiarization with the main subfields of artificial intelligence: expert systems, machine learning, supervised and unsupervised learning; neural networks, deep learning, natural language processing, computer vision, etc.;
- study of the impact of artificial intelligence on moral values, rights and responsibilities of people;
- implementation of best practices in the application of the potential of artificial intelligence in the research and educational activities of participants in the educational process.

The discipline "Using artificial intelligence in scientific and pedagogical activities" ensures that students acquire the following competencies:

CC 3 – the ability to generate new ideas in the process of solving professional-pedagogical and research tasks.

CC 5 – ability to use modern computer, digital and mobile technologies in pedagogical and educational activities.

CC 6 – ability to search, process, critically analyze, interpret and apply information from various sources in scientific and pedagogical activities.

CC 7 – the ability to carry out complex scientific research based on compliance with the norms of professional ethics and academic integrity.

PC 1 – ability to master pedagogical terminology, mastering systematic knowledge in the field of philosophy of education, research methodology in the field of pedagogy/education, in particular, about modern trends in the development of education, innovative educational methods and technologies, basic pedagogical theories and concepts, methodology of pedagogical research.

PC 6 – the ability to pedagogically competently carry out the educational process in higher education, to choose and implement optimal for a specific educational situation traditional and innovative educational methods, technologies, methods and forms of education with the aim of forming the educational, pedagogical and scientific competence of students, activating the professional and personal development of each of them.

PC 8 – the ability to adhere to the norms of professional ethics in educational and professional activities and to focus on national and universal values.

PC 9 – the ability to improve and develop one's own educational methods and technologies, to use a wide arsenal of expediently selected methods and forms of training of students in classes.

1.3. Planned learning results:

PLO 1 – to demonstrate knowledge of the philosophy of education and pedagogy, ontology, epistemology, operate with modern philosophical and educational concepts, knowledge of the methodology of scientific knowledge, analyze current problems of social and individual life;

PLO 4 – to identify and apply basic scientific approaches, pedagogical theories, concepts, models in scientific and educational activities;

PLO 6 – to generalize trends in the further development of pedagogical science and education in the modern information society;

PLO 7 – to manifestation of a culture of written and oral communication, infographic skills in the process of professional communication, which ensures mutual understanding with other people, promotes constructive interaction with them, and ensures effective influence on the addressee, taking into account the current situation, goals and objectives;

PLO 11 – to operate with professional terminology in Ukrainian and foreign languages, to identify similarities and differences in the interpretation of key concepts by various domestic and foreign authors, to clearly and competently formulate author's definitions of leading research categories;

PLO 12 – to conduct original experimental, historical or comparative pedagogical research based on the processing of various types of information sources, to apply various methods and means of scientific research;

PLO 15 – to apply innovative information and communication technologies, specialized software in teaching and research activities, develop didactic materials based on their use;

PLO 17 – to critically evaluate theoretical and practical developments presented in historical, pedagogical and comparative studies, modern scientific and pedagogical research;

PLO 19 – to teach academic disciplines in accordance with the requirements set forth in regulatory documents, to develop and implement organizational and methodological support for the educational process, to choose the best methods, forms, technologies, and teaching aids for each specific learning situation;

PLO 20 – to pedagogically competent to monitor students' academic achievements, apply effective methods of diagnosing the results of their educational activities, the ability to make timely changes to the educational process based on their analysis;

PLO 21 – to creatively apply the achievements of innovative pedagogy in teaching and research activities, to critically evaluate the pedagogical significance of the proposed educational innovations, to generate their own innovative ideas, to identify topical and pedagogical problems that require urgent solutions;

PLO 23 – to design and evaluate the educational context aimed at training competent teachers and researchers with developed critical and creative thinking and capable of successfully performing their professional duties;

PLO 24 – to manage the educational activities of students based on the implementation of their own educational methodology and author's teaching technologies, ensuring the quality of education through the systematic use of various teaching methods and forms;

PLO 26 – to demonstrate creativity in pedagogical and research activities, generate innovative scientific ideas, propose new non-standard ways to solve problems, demonstrate the ability to formulate and justify the author's concept of research.

2. Thematic plan of the educational discipline

Section 1 Basics of artificial intelligence

Topic 1 Trends and prospects for the development of artificial intelligence.

Topic 2 History of artificial intelligence.

Topic 3 Ethics of artificial intelligence.

Section 2 Artificial intelligence and machine learning

Topic 4 Content of machine learning.

Topic 5 Supervised and unsupervised learning. Reinforcement learning.

Topic 6 Neural networks.

Topic 7 Deep learning. Natural language processing. Computer vision.

Section 3 Artificial intelligence in education and pedagogical science

Topic 8 The role of artificial intelligence in education.

Topic 9 Personalized training using artificial intelligence technologies.

Topic 10 Artificial intelligence for learning analytics.

Topic 11. Artificial intelligence and digital inclusion in education.

Topic 12. Ethical aspects of using artificial intelligence in education.
Topic 13 Artificial intelligence in pedagogical research.

3. The structure of the academic discipline

Names of topics	Number of hours											
	Full-time						Correspondence					
	Total	including					Total	including				
		L	P	L ab	Ind.	I.W.		L	P	Lab.	Ind.	I.W.
1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Section 1 Basics of artificial intelligence</i>												
Topic 1 Trends and prospects for the development of artificial intelligence	10	2	2	0	0	6	10	2	0	0	0	8
Topic 2 History of artificial intelligence	10	2	2	0	0	6	10	0	0	2	0	8
Topic 3 Ethics of artificial intelligence	10	2	2	0	0	6	10	0	0	0	0	10
Together according to content section 1	30	6	6	0	0	18	30	2	2	0	0	26
<i>Section 2 Artificial intelligence and machine learning</i>												
Topic 4 Content of machine learning	10	2	2	0	0	6	10	2	0	0	0	8
Topic 5 Supervised and unsupervised learning. Training with reinforcement	10	2	2	0	0	6	10	0	0	0	0	8
Topic 6 Neural networks	10	2	2	0	0	6	10	2	2	0	0	8
Topic 7 Deep learning. Natural language processing. Computer vision	10	2	2	0	0	6	10	0	0	0	0	10
Together according to content section 2	40	8	8	0	0	24	40	4	2	0	0	34
<i>Section 3 Artificial intelligence in education and science</i>												
Topic 8 The role of artificial intelligence in education	12	2	4	0	0	6	16	2	2	0	0	12
Topic 9 Personalized training using	18	4	4	0	0	10	12	0	0	0	0	12

artificial intelligence technologies												
Topic 10 Artificial intelligence for learning analytics	12	2	2	0	0	8	12	0	0	0	0	12
Topic 11 Artificial intelligence and digital inclusion in education	12	4	2	0	0	6	12	0	0	0	0	12
Topic 12 Ethical aspects of using artificial intelligence in education	12	2	2	0	0	8	12	0	0	0	0	12
Topic 13 Artificial intelligence in pedagogical research	14	4	4	0	0	6	16	2	2			12
Together according to content section 3	80	18	18	0	0	44	80	4	4			72
Total	150	32	32	0	0	86	150	10	10	0	0	130

4. Topics of seminar (practical, laboratory) classes

№ s/n	Topic name	hours number
1	Trends and prospects for the development of artificial intelligence	2
2	The history of artificial intelligence	2
3	Ethics of artificial intelligence	2
4	The content of machine learning	2
5	Supervised and unsupervised learning. Reinforcement learning	2
6	Neural networks	2
7	Deep learning. Natural language processing. Computer vision	2
8	The role of artificial intelligence in education	4
9	Personalized training using artificial intelligence technologies	4
10	Artificial intelligence for learning analytics	2
11	Artificial intelligence and digital inclusion in education	2
12	Ethical aspects of using artificial intelligence in education	2
13	Artificial intelligence in pedagogical research	4
	Total	32

5. Tasks for independent work

№ s/n	Types, content of independent work	hours number
1	Stand report on the topic "Trends and prospects of the development of artificial intelligence"	6
2	Creating an infographic "History of artificial intelligence"	6
3	Creating an educational video "Ethics of artificial intelligence"	6

4	Prepare the "Machine Learning" project	6
5	Prepare for the discussion on the topic "Controlled and uncontrolled learning. Reinforcement learning"	6
6	Create a virtual whiteboard (Padlet) on the topic "Neural networks"	6
7	Prepare for a discussion on the topic "Deep learning. Natural language processing. Computer vision"	6
8	Stand report on the topic "The role of artificial intelligence in education"	6
9	Prepare the project "Personalized training using artificial intelligence technologies"	10
10	Stand report on the topic "Artificial intelligence for learning analytics"	8
11	Stand report on "Artificial intelligence and digital inclusion in education"	6
12	Creation of the infographic "Ethical aspects of the use of artificial intelligence in education"	8
13	Preparation and holding of a "round table" based on the use of materials from online repositories on the topic "Use of artificial intelligence in pedagogical science: advantages and risks"	10
	Total	90

6. Individual tasks

Not provided by the program

7. Teaching methods

- verbal methods (lecture-discussion, interview, debate, dispute, instruction, etc.);
- practical methods (practical classes, exercises);
- visual methods (the method of illustrations and the method of demonstrations, observations);
- work with educational and methodical literature and digital open educational resources (OER) (note-presentation, thesis, annotation, review, essay writing);
- video method (webinars) in combination with digital technologies and open educational resources (OER)
- e-learning (mixed, distance, online, etc.);
- independent work (performance of tasks – infographics, mind-maps, databases, electronic encyclopedias, directories, manuals, automated dictionaries, projects, storytelling, blogs, simulation web-oriented laboratories, social networks);
- individual research work (portfolio development, micro-research, OER – open educational resources, MOOC – mass open online courses) of students of higher education;
- interactive (discussions, PRES, creative projects: development of posters, quests, tests, virtual and augmented reality for simulating real situations, multimedia games)

8. Control methods

- oral and written survey (frontal and individual (sample));
- presentations of the results of completed tasks and research;
- frontal verification of tasks for independent work;
- assessment of work in practical classes;
- final control (written exam).

9. Points calculation scheme

An example for the final semester control in the form of credit without performance of credit work

Current control, independent work, individual tasks														S u m
Section 1			Section 2				Section 3				Control work provided by the curriculum		Credit	
T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13		
4	4	4	4	4	4	4	4	4	4	4	3	3	10	40
														100

Criteria for evaluating educational achievements

Rating scale

The sum of points for all types of educational activities during the semester	Mark	
	Score for four-point (national) scale	for a two-level rating scale
90-100	Excellent	credit
70-89	Good	
50-69	Satisfactorily	
1-49	Unsatisfactory	not credit

10. Recommended literature

Basic literature

1. Dvorak V. V., Talakh M. V. Glybynne navchannya dlya komp'yuternogo zoru [Deep learning for computer vision] Part 1. Chernivtsi: Technoprint, 2022. 271 p. (In Ukraine)
2. Dotsenko C. I., Kharchenko V. S., Morozova O. I., Rusynski A., Dotsenko S. O. Evrystychna samoorganizaciya predstavleniya ta formuvannya znan ta pravyl logichnyx vyveden: analiz v konteksti bezpechnogo ta poyasnyuvanogo shtuchnogo intelektu [Heuristic self-organization of representation and formation of knowledge and rules of logical deductions: analysis in the context of safe and explainable artificial intelligence. Intelligent cybernetic systems: evolution of principles, theories and security technologies: col. monograph.] Ministry of Education and Science of Ukraine, M. E. Zhukovsky National Aerospace University "KHAI". K.: Euston, 2023. P. 261–284. (In Ukraine)

3. Maryenko M., Kovalenko V. Shtuchnyj intelekt ta vidkryta nauka v osviti [Artificial intelligence and open science in education.] Physical and mathematical education. 2023. Issue 1 (38). P. 48–53. DOI: 10.31110/2413-1571-2023-038-1-007 (In Ukraine)

4. Kasilov O., Nikitina L., Borysova L. Metody ta systemy shtuchnogo intelektu [Methods and systems of artificial intelligence] academic. manual Kharkiv: Tochka, 2021. 221 p. (In Ukraine)

5. Tkalichenko S. V. Shtuchni nejronni merezhi [Artificial neural networks]: ed. manual Kryvyi Rih, 2023. 150 p. (In Ukraine)

Supporting literature

6. Metody ta systemy shtuchnogo intelektu [Methods and systems of artificial intelligence]: tutorial. for students of the direction of training 6.050101 "Computer Science "/ compilers: A.S. Savchenko, O.O. Sinelnikov. K.: NAU, 2017. 190 p. (In Ukraine)

7. Vizniuk I. M., Buglay N. M., Kutsak L.V., Polishchuk A. S., Kylyvnyk V.V. Vykorystannya shtuchnogo intelektu v osviti [The use of artificial intelligence in education]. *Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems*, 14–22. <https://doi.org/10.31652/2412-1142-2021-59-14-22>. (In Ukraine)

8. Ding J., Akiki Ch., Jernite Ya., Steele A. L., & Popo T. (2023). Towards Openness Beyond Open Access: User Journeys through 3 Open AI Collaboratives. URL: <http://doi.org/10.48550/arXiv.2301.08488>.

Links to information resources on the Internet, video lectures, other methodological support

9. Neuromeasures and "piecemeal intelligence" in a simple way. 1. Basics. URL: <https://youtu.be/ji1n7iqsgjU?si=dyyPRvSVdLFxG9o5>.

10. Crossroads Yu. How piecemeal intelligence can help enlighten you? URL: <https://osvitoria.media/experience/yak-shtuchnyj-intelekt-mozhe-dopomogty-/osviti>.

11. Artificial intelligence. Destroy or save? URL: <https://youtu.be/lsqlR1JCwBY?si=8oeH-Na0ARsO6du6>.

12. Why scientists are afraid of artificial intelligence/danger ChatGPT, DeepMind, Midjourney (ENG Sub). URL: <https://youtu.be/hlWxLw2SF3U?si=kJkbOeD5JqMGT6Jg>.

13. Artificial intelligence. URL: <https://www.britannica.com/technology/artificial-intelligence>.

14. Artificial Intelligence (AI) URL: <https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp>.

15. How Is AI Used In Education – Real World Examples Of Today And A Peek Into The Future. URL: <https://bernardmarr.com/default.asp?contentID=1541#:~:text=AI%20has%20already%20been%20a>

16. Roles For Artificial Intelligence In Education. URL: <https://www.teachthought.com/the-future-of-learning/10-roles-for-artificial-intelligence-in-education/>.

17. How AI Could Save (Not Destroy) Education | Sal Khan | TED. URL: <https://youtu.be/hJP5GqnTrNo?si=jpgqRI-5aG0PB0V7>.

18. How is artificial intelligence (AI) used in education? URL: <https://youtu.be/xW1jg1UiVwo?si=WAZiOpXDwsjbaPbR>.

19. 11 of the Best AI Tools for Teachers. URL: https://youtu.be/KG4_CYbVpTo?si=VPjM7jKSu8QFY4RE.

20. The Top 5 Ways to Use AI in Education. URL: https://youtu.be/nhI5g2hRVKA?si=GsqCEhoF_78qO3by.

21. Education in the age of AI (Artificial Intelligence) | Dale Lane | TEDxWinchester. URL: https://youtu.be/m6dyCRS8EmI?si=rMU3T6xH_dVY_Db8.

22. Neural Networks Explained in 5 minutes. URL: <https://youtu.be/jmmW0F0biz0?si=DOReZxVvZV9swDPL>.