



## SYLLABUS OF THE EDUCATIONAL COURSE "FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE"

### Educational Program Component – Mandatory (4 credits)

<b>Educational and Professional Program</b>	<i>Information Technologies and Project Management</i>
<b>Specialty</b>	<i>122 – Computer Science</i>
<b>Field of Study</b>	<i>12 – Information Technologies</i>
<b>Level of Higher Education</b>	<i>First (Bachelor's)</i>
<b>Language of Instruction</b>	<i>Ukrainian / English</i>
<b>Instructor Profile:</b>	<i>Tonia Mykhailivna Fratavchan,</i> Ph.D. in Physical and Mathematical Sciences, Associate Professor, <a href="https://mathmod.chnu.edu.ua/pro-nas/spivrobitnyky/fratavchan-tonia-mykhailivna/">https://mathmod.chnu.edu.ua/pro-nas/spivrobitnyky/fratavchan-tonia-mykhailivna/</a>
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<b>E-mail</b>	<a href="mailto:t.fratavchan@chnu.edu.ua">t.fratavchan@chnu.edu.ua</a>
<b>Course Page in Moodle</b>	<a href="https://moodle.chnu.edu.ua/course/view.php?id=6317">https://moodle.chnu.edu.ua/course/view.php?id=6317</a>
<b>Consultations</b>	<i>By appointment</i>

### COURSE DESCRIPTION

The course "Fundamentals of Artificial Intelligence" is aimed at familiarizing students with the basic concepts, methods, and technologies of artificial intelligence (AI). The primary goal of the course is to provide fundamental knowledge about AI models and algorithms, teach students how to analyze and develop AI-based systems, and foster an understanding of the potential and future use of AI in various fields.

The course plays an important role in developing critical thinking in students and their ability to solve complex problems using intelligent systems. It lays the groundwork for understanding key areas such as machine learning, natural language processing, computer vision, neural networks, computational intelligence, and robotics.

"Fundamentals of Artificial Intelligence" holds a central place in the professional training of students in technical disciplines, particularly in the fields of information technology, computer science, cybernetics, and automation. It is an integral part of the training of specialists in today's world, where intelligent systems play an increasingly important role in various aspects of life.

**Course Objective.** The objective of the course is to equip students with a comprehensive set of knowledge, skills, and abilities in the use of artificial intelligence methods and systems for application in professional activities. It aims to provide students with theoretical foundations and practical skills in the field of modern neural network and neurocomputing technologies.

Students will acquire hands-on experience with software tools for modeling neural networks and learn how to use neural network technologies and software products to solve applied tasks in areas such as recognition, clustering, classification, assessment, and prediction of the state of complex objects and processes. The course also focuses on developing general and professional competencies related to the advancement of modern scientific concepts and progressive artificial intelligence methods, including convolutional deep learning networks.

## EDUCATIONAL CONTENT OF THE COURSE

<b>MODULE 1. ARTIFICIAL INTELLIGENCE SYSTEMS, PROBLEM SOLVING, KNOWLEDGE REPRESENTATION. MATHEMATICAL FOUNDATIONS OF PATTERN RECOGNITION THEORY</b>	
<b>Topic 1</b>	Introduction. History of AI Development. Key Concepts in the Field of AI.
<b>Topic 2</b>	Problem-Solving Methods in AI Systems.
<b>Topic 3</b>	Knowledge Representation in AI Systems.
<b>Topic 4</b>	Mathematical Methods of Classification. Pattern Recognition Tasks.
<b>MODULE 2. NEURODYNAMIC SYSTEMS FOR DATA PROCESSING AND PATTERN RECOGNITION. EXPERT SYSTEMS. ELEMENTS OF DATA MINING</b>	
<b>Topic 5</b>	Neural Networks
<b>Topic 6</b>	Principles of Evolutionary Modeling. Genetic Algorithm
<b>Topic 7</b>	Expert Systems. Key Concepts
<b>Topic 8</b>	Elements of Data Mining. The Concept of Data Mining. Tasks of Data Mining
<b>Topic 9</b>	Big Data Technologies. Key Concepts.

## FORMS, METHODS, AND EDUCATIONAL TECHNOLOGIES OF TEACHING

Lectures, laboratory work, testing, classroom, and online distance learning using Moodle and Google Meet platforms.

### Teaching Methods:

- Verbal methods (lectures, discussions, debates, explanations, storytelling, etc.);
- Practical methods (laboratory work);
- Visual methods (demonstration, illustration);
- Work with information resources: using educational, scientific, regulatory literature, and online resources;
- Independent work on individual assignments or according to the curriculum of the course;
- Distance learning using appropriate online platforms.

## FORMS AND METHODS OF CONTROL AND EVALUATION

**Types and forms of control:** Current control forms include oral or written responses (testing, laboratory work, individual research tasks).

### Evaluation Methods:

- Oral control: in the form of individual and frontal questioning during lectures and laboratory sessions, defense of laboratory work, and individual research tasks;
- Written control: in the form of a final test survey.

Current control: laboratory work, control testing.

**Final control:** exam.

## CRITERIA FOR EVALUATING LEARNING OUTCOMES

The assessment system of academic achievements is based on the principles of ECTS and is cumulative. Throughout the semester, students complete 6 laboratory works and one final test. Laboratory works (LW) are graded from 5 to 7 points, with a total of 40 points available (see the table below). The final test consists of 20 questions in a multiple-choice format and is worth 20 points.

When performing a laboratory task, the student must prepare and upload a report along with working files of the program implementation for verification on the electronic learning platform (the formatting rules are provided on the course page on the website).

- **50% of the points** for the laboratory work are awarded for completing the task correctly and submitting a well-prepared report.
- The remaining **50% of the points** are awarded after the student defends the completed laboratory work.
- In case of a minor error, **10-20%** of the points will be deducted, while for a significant mistake, **20-40%** of the points will be deducted.
- If the student has not mastered the theoretical material, confuses definitions, or provides logically incorrect statements, up to **50% of the points** for the laboratory work can be deducted.

The maximum number of points for the final module (testing) is 40 points. The final grade is based on the total number of points accumulated throughout the semester on the content modules and the final module, according to the table provided below.

**Distribution of Points Earned by Students**

Current Assessment (Auditorium and Independent Work)								
							The number of points (credit)	Total number of points
LW 1	LW 2	LW 3	LW 4	LW 5	LW 6	Final testing	40	100
6	6	7	7	7	7	20		

LW1, LW2 ... LW6 – Topics of Laboratory Work.

**Grading Scale: National and ECTS**

Total Points	ECTS Grade	National Grade (for Exam, Course Project/Work, Practice)	National Grade (for Credit)
90–100	A	Excellent (відмінно)	Passed (зараховано)
80–89	B	Good (добре)	
70–79	C		
60–69	D	Satisfactory (задовільно)	

Total Points	ECTS Grade	National Grade (for Exam, Course Project/Work, Practice)	National Grade (for Credit)
50–59	E		
35–49	FX	Fail with the possibility of retake (незадовільно з можливістю повторного складання)	Fail with the possibility of retake (не зараховано з можливістю повторного складання)
0–34	F	Fail with mandatory retake of the course (не зараховано з обов'язковим повторним вивченням дисципліни)	Fail with mandatory retake of the course (не зараховано з обов'язковим повторним вивченням дисципліни)

## EVALUATION OF LEARNING OUTCOMES

The evaluation of the educational outcomes of students is carried out according to the European Credit Transfer and Accumulation System (ECTS). The criterion for successful evaluation is the achievement of the minimum threshold levels (points) for each planned learning outcome by the student.

## ACADEMIC INTEGRITY POLICY

Compliance with the academic integrity policy by participants in the educational process during the study of the discipline is regulated by the following documents:

- ✓ "Ethical Code of Yuriy Fedkovych Chernivtsi National University"  
[https://www.chnu.edu.ua/media/jxdfs0zb/etychnyi-kodeks-chernivets\\_koho-natsionalnoho-universytetu.pdf](https://www.chnu.edu.ua/media/jxdfs0zb/etychnyi-kodeks-chernivets_koho-natsionalnoho-universytetu.pdf)
- ✓ "Regulation on the Detection and Prevention of Academic Plagiarism at Yuriy Fedkovych Chernivtsi National University"  
[https://www.chnu.edu.ua/media/n5nbzwgb/polozhennia-chnu-pro-plahi\\_at-2023plusdodatky-31102023.pdf](https://www.chnu.edu.ua/media/n5nbzwgb/polozhennia-chnu-pro-plahi_at-2023plusdodatky-31102023.pdf)

## INFORMATION RESOURCES

1. <https://course.fast.ai/>
2. <https://www.youtube.com/watch?v=O2Qe908Xki4>
3. <https://www.youtube.com/watch?v=dfQ7MgK-Kcs>
4. <https://www.teachingenglish.org.uk/teaching-resources/teaching-secondary/lesson-plans/intermediate-b1/what-ai>