COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	

Academic staff	Core academic unit(s)
Coordinating: assoc. prof. Vytautas Rudžionis **Other:**	Institute of Languages, Literature, and Translation Studies ☐ Institute of Social Sciences and Applied Informatics ☒

Study cycle	Type of the course unit
First ☒ Second ☐	Mandatory course ☐ Elective course ☐ University-wide course ☐ Individualized course ☐ Interdisciplinary course ☐

Mode of delivery	Semester or period when it is delivered	Language of instruction
In class	3 semester	English

Requisites	
Prerequisites: Introduction to Programing	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	133	48	85

Purpose of the course unit		
Develop the ability to work with artificial intelligence algorithms, the ability to evaluate the quality of algorithms, set quality requirements for artificial intelligence systems, and assess the limits of the application of intellectual algorithms.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
Will know the main methods and algorithms of artificial intelligence theory, be able to evaluate the quality and parameters of artificial intelligence algorithms, be able to formulate achievable requirements for technical tasks.	Lectures, exercises, laboratory work, problem solving, active teaching (learning) methods (algorithm analysis, program prototype writing, system prototype design)	Laboratory work, defense of laboratory work, independent system analysis, problem solving, test, exam
Be able to evaluate the qualitative parameters of artificial intelligence systems and their evaluation methods, know the principles of AI system development and their applications	Be able to evaluate the qualitative parameters of artificial intelligence systems and their evaluation methods, know the principles of AI system development and their applications	Laboratory work, defense of laboratory work, independent system analysis, problem solving, test, exam
Will be able to identify the limits of artificial intelligence systems' capabilities	Lectures, exercises, laboratory work, problem solving, active teaching (learning) methods (algorithm	Laboratory work, defense of laboratory work, independent system analysis, problem

and applications	analysis, program prototype writing, system prototype design)	solving, test, exam

Content	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	**Contact hours, total**	**Individual work**	**Tasks for individual work**
1. Search methods and algorithms: uninformed search; uninformed search algorithms; informed search; heuristics; informed search strategies.	2			2			4	14	Literature studies; completion of laboratory assignments
2. Machine learning: learning; types of learning; learning without a teacher; learning with a teacher; induction; classification and regression trees; statistical classification algorithms.	4			8			12	24	Algorithm analysis, problem solving, system prototype development (customer data analysis area)
3. Neural networks: neural network; neuron; biological networks; artificial neural network models; learning methods; training quality; generalization; overfitting and its effects; deep learning, neural network architectures	4			8			12	12	Algorithm analysis, problem solving, system prototype development
4. Areas of application of artificial intelligence: natural language processing: natural language processing; models, methods, applications	4			8			9	18	Algorithm analysis, problem solving, system prototype development
5 Areas of application of artificial intelligence: computer vision: image properties; basic image processing methods; image recognition using neural networks.	2			6			9	12	Algorithm analysis, problem solving, system prototype development
Total	**16**			**32**			**48**	**85**	

Assessment strategy	Weight %	Deadline	Assessment criteria
I laboratory work	15	On a predefined date	Students are given the task of creating a prototype of the system. Once completed, the work must be defended. It is graded on a 10-point scale, taking into account the following evaluation factors: - understanding of how the algorithm works, - accuracy and complexity of the prototype system, - system efficiency,

			- documentation of the system prototype. The final grade is multiplied by a coefficient. The use of artificial intelligence systems for report generation is prohibited.
II laboratory work	15	On a predefined date	Students are given the task of creating a prototype of the system. Once completed, the work must be defended. It is graded on a 10-point scale, taking into account the following evaluation factors: - understanding of how the algorithm works, - accuracy and complexity of the prototype system, - system efficiency, - documentation of the system prototype. The final grade is multiplied by a coefficient. The use of artificial intelligence systems for report generation is prohibited.
III laboratory work	15	On a predefined date	create a prototype of the system. The algorithm is described in Python. Once completed, the work must be defended. A 10-point system is used for assessment, taking into account the following factors: - understanding of how the algorithm works, - accuracy and complexity of the system prototype, - system efficiency, - quality and completeness of analysis, - ability to draw conclusions, - quality of work documentation. The final grade is multiplied by a coefficient The use of artificial intelligence systems for report generation is prohibited.
IV laboratory work	15		create a prototype of the system. The algorithm is described in Python. Once completed, the work must be defended. A 10-point system is used for assessment, taking into account the following factors: - understanding of how the algorithm works, - accuracy and complexity of the system prototype, - system efficiency, - quality and completeness of analysis, - ability to draw conclusions, - quality of work documentation. The final grade is multiplied by a coefficient The use of artificial intelligence systems for report generation is prohibited.
Exam	40	On a predefined date	The test consists of 10 closed-ended questions (of varying difficulty, ranging from understanding algorithms to knowledge of theoretical foundations), each worth one point. The scoring is as follows: each question is worth one point. Exam scores are weighted with a coefficient of 0.5 in the final grade.
Final mark: 0.2*K1+0.2*K2+0.20*S+0.4*E Extern exam assessment strategy: Not applicable Using of AI tools not permited if not stated otherwise by lecturer			

REGARDING TAKING THE COURSE AS AN EXTERNAL STUDENT

Check ☒					**If permitted, specify the conditions**
Not permitted	☐	**Permitted**	☒		After completing all the work independently and submitting it to the instructor no later than 5 business days before the scheduled exam date

REGARDING THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (GAI) TOOLS (SUCH AS "CHATGPT" OR OTHERS) WHILE STUDYING THE COURSE:

Check ☒	**If permitted, specify the conditions**

Not permitted	☒	**Permitted**	☐	

Check ☒				**If permitted, specify the conditions**
Not permitted	☒	**Permitted**	☐	

REGARDING PROGRESS IN ACHIEVING LEARNING OUTCOMES
A student who (1) consistently fails to demonstrate, throughout the semester during practical sessions (seminars, exercises, etc.) and (2) who has not fulfilled all interim assessment requirements and assignments within the timeframe specified in the course description, shall not be permitted to participate in the examination session.

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web link
Required reading				
Zhang A., Lipton Z., Mu Li, Smola A	2021	Dive into Deep Learning		https://d2l.ai
Ian Goodfellow, Yoshua Bengio, Aaron Courville	2016	Deep Learning		https:// www.deeplearningbook.org
Russel, S., Norwig, P.	2022	Artificial Intelligence: Modern Approach, fourth edition		New York: Prentice–Hall.
Chollet F., Watson M.	2025	DEEP LEARNING with Python		Manning, ; https://deeplearningwithpython.io
Xiao T., Zhu L.	2025	Foundations of Large Language Models		https://arxiv.org/pdf/2501.09223?
Recommended reading				
Nielsen M.	2022	Neural Networks and Deep Learning		http:// neuralnetworksanddeeplearning.com
Ng A.	2018	Machine Learning Yearning		https:// wordpress.deeplearning.ai/wp-content/uploads/2022/03/andrew-ng-machine-learning-yearning.pdf
Eibe F., Witt I., Hall M., Pal Ch.	2016	Data Mining: Practical Machine Learning Tools and Techniques (Fourth Edition)		New York: Morgan Kaufman.

NOTE: *Including Open Educational Resources in the reading list is recommended*