COURSE UNIT DESCRIPTION

Course unit title	Code
Fundamentals of Artificial Intelligence	

Annotation
This course introduces the basics of artificial intelligence including search methods and algorithms, principles of knowledge representation, expert systems, machine learning methods, genetic algorithms, natural language processing methods.

Lecturer(s)	Department, Faculty
Coordinating: Assoc. Prof. Dr. Vytautas Rudžionis **Other:**	Kaunas Faculty, Institute of Social Sciences and Applied Informatics

Study cycle	Type of the course unit
Bachelor	Compulsory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Auditorium	3	LT/EN

Requisites	
Prerequisites: Algorithm Theory and Data Structures	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	130	52	78

Purpose of the course unit: programme competences to be developed		
To develop the ability to work with artificial intelligence algorithms, the ability to evaluate the quality of algorithms, determine qualitative requirements, to assess the limits of the application of intelligent algorithms.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
Will master the basic theories of artificial intelligence methods and algorithms; will be able to evaluate artificial intelligence algorithms quality and parameters; will be able to formulate achievable requirements for technical tasks	Lectures, exercises, lab works, individual work. Active learning methods (algorithm development, algorithm analysis, systems prototype design).	Lab works, defence of laboratory works, individual analysis of algorithms, problem solving, exam.

Course content: breakdown of the topics	Contact hours	Individual work: time and assignments

	Lectures	Tutorials	Exam	Workshops	Laboratory work	Internship/work placement	**Contact hours, total**	**Individual work**	**Assignments**
1. Search methods and algorithms: uninformed search; uninformed search algorithms; informed search; heuristics; informed search strategies.	2			4			**6**	**12**	
2. Knowledge mapping and expert systems: knowledge; ways of representing knowledge; logic; frames; semantic systems; uncertain knowledge; expert systems; ES architecture; ES development stages; ES building instruments.	2			4			**6**	**12**	
3. Games: the importance of games; games modeling; minimax strategy; heuristics; practical strategies	2			4			**6**	**12**	
4. Machine learning: learning types; learning without a teacher; learning with teacher; induction; classification and regression trees; efficiency of learning algorithms	2			4			**6**	**12**	
5. Neural networks: neural network; neurons; biological networks; artificial neural network models; learning methods; quality of training; generalization; retraining and its effects.	2			4			**6**	**6**	
6. Genetic Algorithms: Genetic Algorithms and Their features; evolution strategies and stages; efficiency of genetic algorithms.	2			4			**6**	**6**	
7. Natural language processing: natural language processing; difficulties and challenges; statistical language processing; grammatical examination; machine translation; data extraction.	2			4			**6**	**9**	
8. Spoken Language Processing: Spoken language processing; speech synthesis; fusion algorithms; language recognition; hidden Markov chains; statistical grammatical models. Computer vision: image properties; basic image processing techniques; images improvement; object detection in images; image recognition.	2			4			**6**	**9**	
Exam		4					**4**		
Total	**16**	**4**		**32**			**52**	**78**	

Assessment strategy	Weight %	Deadline	Assessment criteria
Lab. No. 1	15%	At the agreed time	The student is given a task to create a prototype of the system. Once the work is ready, it must be defended. The 10-point system is evaluated according to the evaluation factors: - understanding of the operation of the algorithm, the accuracy of the system prototyping, and complexity, - system efficiency, - system prototype documentation. The mark obtained in the final assessment is multiplied by coefficient.
Lab. No. 2	15%	At the agreed time	The student is given a task to analyze the operation of the algorithm. Once the work is ready, it must be defended. The 10-point system is evaluated according to the evaluation factors: - understanding of the operation of the algorithm, - quality and completeness

			of the analysis, - ability to draw conclusions, - quality of work documentation. The mark obtained in the final assessment is multiplied by coefficient
Lab. No. 3	20%	At the agreed time	The student is given a task to analyze the operation of the algorithm and create a system prototype. Once the work is ready, it must be defended. The 10-point system is evaluated according to the evaluation factors: - understanding of the operation of the algorithm, the accuracy of the system prototyping, and complexity, - system efficiency, - quality and completeness of the analysis, - ability to draw conclusions, - quality of work documentation. The mark obtained in the final assessment is multiplied by coefficient
Exam	50%	At the agreed time	The test consists of 10 closed-ended questions (of varying difficulty, from understanding the algorithm to knowing the theoretical basis), each rated at one point. Evaluated as follows: each question - one point. Exam scores are evaluated in the final grade with a weighting factor of 0.5

Author	Publishing year	Title	Issue of a periodical or volume of a publication; pages	Publishing house or internet site
Required reading				
Barrat J.	2015	Our Final Invention: Artificial Intelligence and the End of the Human Era		St. Martin's Griffin.
Russel S., Norwig P.	2009	Artificial Intelligence: Modern Approach		New York: Prentice-Hall.
Toshinori M.	2008	Fundamentals of the New Artificial Intelligence		Berlin: Springer.
Čyras V.	2008	Dirbtinis Intelektas		Vilnius: VU. Prieiga: http://www.mif.vu.lt/~cyras/AI/konspektas-dirbtinisintelektas.pdf
Recommended reading				
Pranevičius H., Raudys Š., Rudžionis V. ir kiti	2008	Agentinių sistemų modeliai		Vilnius: Mokslo aidai.
Nilsson N.	1998	Artificial Intelligence: A New Synthesis		New York: Morgan Kaufman.
Eibe F., Witt I.	2011	Data Mining: Practical Machine Learning Tools and Techniques (Third Edition)		New York: Morgan Kaufman.